

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ УКРАЇНИ
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ ІМЕНІ ІГОРЯ СІКОРСЬКОГО»

АНГЛІЙСЬКА МОВА ПРОФЕСІЙНОГО СПРЯМУВАННЯ. ЕКОЛОГІЧНА БЕЗПЕКА

Навчальний посібник

У двох частинах

Частина перша

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за освітньою програмою «Екологічна безпека»
спеціальності 101 «Екологія»

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Професійно-орієнтовані теми – Introduction to Environmental Engineering, Ecosystems, Biodiversity, Water Resources and Their Characteristics, Water Pollution and Treatment Strategies, Air Pollution, Acid Rain and Ozone Depletion, Environment and Sustainability, Conventional and Sustainable Energy, Solid and Hazardous Waste – викладено у семи розділах; кожен розділ містить автентичні англійські тексти з розробленими до них вправами. Мета посібника – формування у студентів здатності й готовності до комунікації англійською мовою у сфері професійної діяльності еколога.

Для здобувачів ступеня бакалавра за спеціальністю 101 «Екологія» факультету автоматизації, промислової інженерії та екології, буде корисним для використання в позааудиторний час.

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ПЕРЕДМОВА

Навчальний посібник «Англійська мова професійного спрямування. Екологічна безпека. Частина І» розроблено для студентів третього курсу спеціальності 101 «Екологія» факультету автоматизації, промислової інженерії та екології з метою формування професійної англомовної компетентності.

Навчальне видання відповідає вимогам силабусу навчальної дисципліни «Практичний курс іноземної мови професійного спрямування» і може використовуватися як для роботи на заняттях з викладачем, так і для самостійної роботи студентів, що дає можливість студентам працювати над власними навчальними потребами.

Навчальний посібник складається з семи розділів, кожен з яких охоплює різні аспекти англійської мови (Introduction to Environmental Engineering, Ecosystems, Biodiversity, Water Resources and Their Characteristics, Water Pollution and Treatment Strategies, Air Pollution. Acid Rain and Ozone Depletion, Environment and Sustainability, Conventional and Sustainable Energy, Solid and Hazardous Waste). Кожен розділ навчального посібника містить автентичні англомовні тексти за фахом та розроблені до них вправи (некомунікативні, умовно-кому-нікативні, комунікативні).

Розроблені комплекси вправ сприяють розвитку всіх видів мовленнєвої діяльності: говоріння, читання, аудіювання та письма. У кінці кожного розділу студентам пропонуються завдання на самоперевірку – картки з лексикою (Quizlet) і тести на множинний вибір, що сприяють закріпленню знань та вдосконаленню іншомовних умінь.

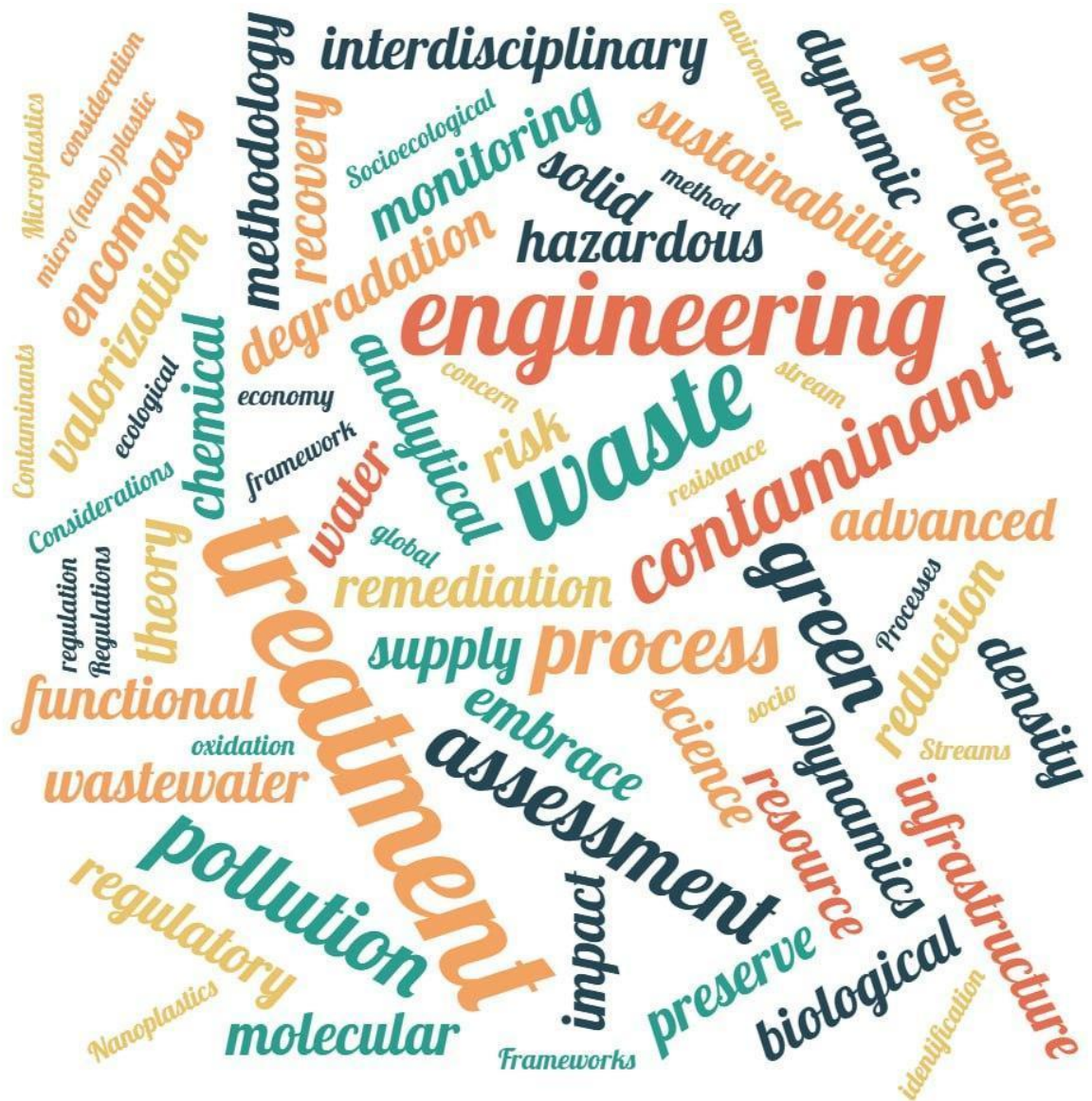
Рефлексія та самооцінювання є одними з ключових особливостей цього навчального посібника, що дозволяє студентам оцінити свій прогрес та перспективи подальшого розвитку. Такий підхід допомагає студентам оцінити свої сильні та слабкі сторони, зрозуміти, які навички потребують вдосконалення. Завдання на рефлексію мотивує студентів до самоорганізації та відповідальності за власне навчання.

Крім того, навчальний посібник містить корисні додатки для студентів: словник до кожного розділу, методичні рекомендації до написання доповідей та інших письмових завдань. З метою кращого запам'ятовування матеріалу та підвищення мотивації студентів до вивчення англійської мови професійного спрямування, навчальний посібник містить різноманітні графічні матеріали, такі як словесні хмаринки, ілюстрації, відео та інші візуальні засоби. Використання візуальних елементів допомагає зрозуміти складні поняття та краще засвоїти матеріал, робить освітній процес цікавим та зрозумілим для студентів.

Розроблений методичний матеріал в навчальному посібнику сприяє формуванню професійно орієнтованих англомовних компетентностей в читанні, говорінні (діалогічному і монологічному мовленні), аудіюванні та письмі у студентів третього курсу факультету автоматизації, промислової інженерії та екології.

Unit 1

Introduction to Environmental Engineering



LEAD-IN

1. Look at the items shown in the pictures (A–F). Identify the real-world tools and instruments used in environmental engineering. The names of the tools in the box below can help you match them with the items shown.

For each tool:

- **explain its purpose;**
- **describe its operational context;**
- **explain its engineering significance;**
- **say how and when an environmental engineer would use it;**
- **mention the type of data it collects or the problem it helps solve.**

*Air Pollution Detector | Microscope | Autoclave |
X-Ray Fluorescence (XRF) Analyzer |
Radiation Detector | Water sampling kit |
pH meter for direct soil measurements | MicroCentrifuge |
Satellite Imagery |*



A



B



C



D



E



F

Pictures taken from:

https://www.greenwaterlab.com/wp-content/uploads/2020/08/00000IMG_00000_BURST20200812140014321_COVER-2.jpg

2. Watch the video “[An Introduction to Environmental Engineering](#)” and answer the following questions.

- 1.** What inspires students to study environmental engineering?
- 2.** What disciplines are combined in environmental engineering?
- 3.** What is one specialty within environmental engineering?
- 4.** What department connects to chemical and biological processes?
- 5.** What environmental challenges require engineering skills?
- 6.** What opportunity is built into the program?
- 7.** Where did students conduct fieldwork during major floods?

3. Look at these pictures and read how environmental engineers are portrayed as protectors of the environment and public health, using their skills and knowledge to prevent pollution. Match the pictures with the corresponding quotations.

 A	 B	 C
1. “Climate change is the defining issue of our time, and we are at a defining moment. The actions we take now will determine the health of the planet for generations.” – Antonio Guterres	2. “We do not inherit the Earth from our ancestors, we borrow it from our children.” – Native American proverb	3. “Clean water, clean air, and safe sanitation are fundamental rights that should be ensured by engineering solutions world-wide.” – Gretchen Daily
 D	 E	 F
4. “Sustainability is no longer about doing less harm. It’s about doing more good” – Jochen Zeitz	5. “Environmental engineering is not just about technology; it’s about understanding human impacts and designing systems that protect both people and ecosystems.” – Peavy, 1985	6. “Engineers have a moral obligation to society to make the world a better place, especially by protecting the natural environment.” – Robert L. Peters

Pictures taken from:

<https://www.nqa.com/getattachment/f8ff394d-ef2c-4f77-b81b-1076d2168192/Aspects-Impact-Register-NQA.jpg>

READING

4. Read the text below. Match choices (A–H) to (1–5). There are three choices you do not need to use.

- A** Evolution from Sanitation to Sustainability
- B** Economic Engineering and Pollution
- C** Protecting People and Nature
- D** History of Environmental Engineering
- E** Environmental Engineering as Military Technology
- F** Goals of Environmental Engineering
- G** Global Environmental Challenges
- H** Environmental Engineering in Ancient Times

The Evolution, Scope, and Future Challenges of Environmental Engineering

1. _____. The last two to three decades have **confirmed** a growing understanding that no part of our world is immune to the environmental **consequences** of human activities. There is a pressing need for international cooperation and solidarity to preserve our forests, safekeeping our water and oceans, and stabilize the Earth’s atmosphere. The strong interest in protecting the environment has placed new responsibilities, especially on the engineers.

Although the first description of the title “environmental engineer” appears somewhere around the 1960s, the history of practice itself goes back long into history. Environmental engineering had its origins in the latter half of the 1800s, beginning first in the United Kingdom and soon after in the United States. The Great Sanitary Awakening occurred during this period, when sanitary sewers were constructed in cities to eliminate nuisances and protect the public from overloaded **cesspools and privy vaults**.

2. _____. The first environmental engineer is said to have been Joseph Bazalgette, who designed the first large-scale **sewerage** system in London in the mid-nineteenth century. This engineering **venture** is considered the beginning era of modern environmental engineering. Since then, the main idea – to improve the natural environment for human **habitation** – remains the same, but the **amplitude** of work has been severely intensified.

Over time, the discipline evolved to cover additional **concerns**, but importantly, grew to **encompass** regional and global concerns. Environmental engineering also **evolved** from primarily **embracing treatment** as the preferred

method of waste management to integrating more preferred concepts of pollution **prevention**, industrial ecology, and green engineering.

3. _____. It is the branch of engineering concerned with the **application** of scientific and engineering principles for the protection of human populations from the effects of **adverse** environmental factors; protection of environments, both local and global, from potentially **deleterious** effects of natural and human activities; and improvement of environmental quality.

It is the branch of engineering that is concerned with protecting the environment from the potentially deleterious effects of human activity, protecting human populations from the effects of adverse environmental factors, and improving environmental quality for human health and wellbeing.

4. _____. Major activities of environmental engineers involve water **supply**, wastewater and solid management, air and noise pollution control, environmental **sustainability**, environmental **impact assessment**, climate change, etc.

Despite a long list of breakthroughs, this progress is **incomplete**. Pollution and waterborne **disease** persist around the globe, and billions of people today continue to **suffer** from inadequate access to clean water, food, sanitation, and energy. As the human population continues to grow, pressures on the environment continue to mount.

One of the major responsibilities of environmental engineering is to monitor and potentially predict or even **prevent harmful events** in the environment.

5. _____. The first is to clean and protect the environment from pollution.

The second goal is to control waste streams generated as a result of human activities.

The third goal is to provide and ensure safe water, air, and land for future generations of humans and organisms.

Borrowed and modified from:

https://pubs.acs.org/doi/epdf/10.1021/acs.est.9b03244?ref=article_openPDF
<https://www.oxfordbibliographies.com/display/document/obo-9780199363445/obo-9780199363445-0029.xml>

Follow-up

5. Explain the words / phrases in bold from the text, and make up sentences with these words. Use the [dictionary](#) if necessary.

6. Read the text again and answer the following questions, choosing the best option.

1. Where did environmental engineering originate in the 1800s?

- a)** In China and Japan.
- b)** In Africa and South America.
- c)** In the United Kingdom and the United States.

2. Who came under a huge spotlight in recent decades?

- a)** Environmental engineers.
- b)** Automation engineers.
- c)** Mechanical engineers.

3. What did Joseph Bazalgette design in London?

- a)** The first plate heat exchanger.
- b)** The first nuclear power plant.
- c)** The first large-scale sewerage system.

4. What remained the same idea in environmental engineering over time?

- a)** Improving the natural environment for human habitation.
- b)** Building larger factories.
- c)** Expanding costs on steel making.

5. What is the main goal of environmental engineers?

- a)** To increase industrial waste.
- b)** To prevent or reduce undesirable impacts of human activities.
- c)** To destroy forests.

6. What problems still persist worldwide today?

- a)** Excessive reforestation in urban areas.
- b)** Overproduction of renewable energy.
- c)** Pollution and waterborne disease.

7. What is the first core goal of environmental engineering?

- a)** To clean and protect the environment from pollution.
- b)** To build taller skyscrapers in metropolitan areas.
- c)** To produce more sophisticated weapons.

8. What responsibility do environmental engineers have today?

- a)** To increase carbon emissions from factories.
- b)** To monitor and prevent harmful environmental events.
- c)** To expand landfills without regulation.

9. What concerns did environmental engineering later encompass?

- a)** Regional and global concerns like ozone and climate change.
- b)** Noise reduction in music concerts.
- c)** Soil erosion caused by overgrazing only.

10. What was constructed in cities during the Great Sanitary Awakening?

- a)** Sanitary sewers.
- b)** Massive dams for hydroelectric power.
- c)** Large composting facilities for organic waste.

11. When did the first description of “environmental engineer” appear?

- a)** In the 1940s.
- b)** In the 1860s.
- c)** Around the 1960s.

12. What is the second core goal of environmental engineering?

- a)** To control waste streams from human activities.
- b)** To increase plastic production without recycling.
- c)** To expand fossil fuel extraction projects.

USE of ENGLISH

7. Using the information from the text (Ex. 4), match items (1–15) with (A–O) to form phrases. After that, choose any three of the completed phrases and use them in your own sentences.

1.	the environmental consequences	A	environmental factors
2.	a pressing need for international	B	environment for human habitation
3.	to control waste streams generated	C	three primary objectives
4.	protect the public from overloaded	D	of natural resources
5.	to improve the natural	E	cooperation and solidarity
6.	integrating more preferred	F	clean water, food, energy
7.	the effects of adverse	G	expanded roles for environmental engineers
8.	improving environmental quality	H	of human activities
9.	potentially deleterious	I	sustainability principles
10.	new thinking, perspectives, and	J	concepts of pollution prevention
11.	suffer from inadequate access to	K	as a result of human activities
12.	prevent harmful events	L	cesspools and privy vaults
13.	ensure the management	M	effects of human activity
14.	satisfy economic and technical	N	for human health and well-being
15.	a field of study dedicated to	O	in the environment

8. Fill in the table with the words derived from the given ones.

	Noun	Verb	Adjective
1	.....	satisfy	.....
2	.....	.....	industrial
3	environment	.....	.....
4	.....	characterise	.....
5	.....	.....	deleterious
6	pressure	.....	.....
7	.....	monitor	.....
8	.....	.....	local
9	management	.....	.....
10	.....	ensure	.....
11	.....	.....	sustainable
12	knowledge	.....	.....
13	.....	prevent	.....
14	.....	.....	harmful
15	development	.....	.....

9. Match the words in column A with the words in column B to form meaningful phrases. You can also do it using the LearningApps platform at this [link](#).

Column A		Column B	
1.	environmental	A	development
2.	deleterious	B	principles
3.	natural	C	science
4.	previous	D	access
5.	sustainable	E	spotlight
6.	inadequate	F	engineering
7.	international	G	population
8.	interdisciplinary	H	events
9.	overloaded	I	resources
10.	human	J	concerns
11.	harmful	K	cooperation
12.	huge	L	management
13.	additional	M	effects
14.	scientific	N	cesspools
15.	waste	O	knowledge

10. Fill in the words from the list below. Use each word only once.

clean, solidarity, consequences, events, waste, list, monitor, cover, effects, impact, natural, treatment, resources, system, noise

- 1.** primarily embracing _____;
- 2.** inadequate access to _____ water;
- 3.** to improve _____ environment
- 4.** international cooperation and _____;
- 5.** environmental _____ assessment;
- 6.** _____ pollution control;
- 7.** potentially deleterious _____;
- 8.** long _____ of breakthroughs;
- 9.** to _____ additional concerns;
- 10.** large-scale sewerage _____;
- 11.** _____ the quality of the environment;
- 12.** management of natural _____;
- 13.** preferred method of _____ management;
- 14.** prevent harmful _____;
- 15.** environmental _____ of human activities.

11. Match the words with similar meanings. You can also do it using the LearningApps platform at this [link](#).

1.	treatment	A	anticipation
2.	waste	B	surroundings
3.	activity	C	advancement
4.	pollution	D	supply
5.	environment	E	admission
6.	event	F	care
7.	resource	G	collaboration
8.	development	H	contamination
9.	population	I	duty
10.	access	J	residence
11.	cooperation	K	litter
12.	responsibility	L	affair
13.	prevention	M	alliance
14.	solidarity	N	action
15.	habitation	O	inhabitants

12. Write the opposites of the following words. Use the [dictionary](#) if necessary.

1	reduce	
2	additional	
3	satisfy	
4	human	
5	monitor	
6	clean	
7	improve	
8	sustainable	
9	suffer	
10	previous	
11	prevent	
12	harmful	
13	ensure	
14	natural	
15	cover	

13. Match the key terms on the topic “Introduction to Environmental Engineering” with their definitions.

	<i>waste, pollution, sustainability, environment, resource, hazard, ecology, protection, mankind, activity, atmosphere, pollutant, consequence, treatment, prevention</i>	
--	---	--

1. The air, water, and land on which people, animals, and plants live.
2. Damage caused to water, air, etc. by harmful substances or waste.
3. The way you deal with or behave towards someone or something.
4. The mixture of gases around the Earth.
5. The work of a group or organization to achieve an aim.
6. A result of a particular action or situation, often one that is bad or not convenient.
7. Unwanted matter or material of any type, especially what is left after useful substances or parts have been removed.
8. The act of stopping something from happening or someone from doing something.
9. The relationship of living things to their environment and each other, or the scientific study of this.
10. The act of keeping someone or something safe from injury, damage, or loss, or the state of being protected in this way.
11. The whole of the human race, including both men and women.
12. Something dangerous and likely to cause damage.
13. A useful or valuable possession or quality of a country, organization, or person.
14. A harmful substance that causes pollution.
15. The quality of causing little or no damage to the environment, and therefore able to continue for a long time.

Borrowed and modified from:
<https://dictionary.cambridge.org/dictionary/english/>

14. Match the first part of the sentence (1–12) with the second one (a–l).

1. Environmental engineers design and implement strategies for minimizing ...

2. It is problematic to detect new pollutants in diverse environmental ...

3. The application of the functional materials plays a critical role ...

4. Developing cost-effective functional materials from earth-abundant ...

5. In wastewater purification, adsorbents are usually used to ...

6. AI-based prediction models have been successfully used for ...

7. Catalysts are needed in the photocatalysis, electrocatalysis, ...

8. For chemistry-involved remediation processes, it is highly encouraged ...

9. In traditional environmental management concepts, wastes are ...

10. “Waste-to-wealth” practices help to build a closed-loop approach for ...

11. Recent achievements in converting solid, organic, and gaseous wastes ...

12. Jointly considering the environmental, technical, and economic aspects is ...

a) ... wastewater remediation, air pollution, and solid waste management.

b) ... in enhancing purification efficiency.

c) ... into value-added materials, chemicals, and energy fuels has profoundly unleashed the inherent potential of wastes.

d) ... the valorization of wastes and accelerate the circular economy.

e) ... the adverse effects of human activities on the integrity of water resources.

f) ... to uncover the degradation mechanism on an atomic and molecular level.

g) ... substances with facile methods are urgent for sustainable pollution control.

h) ... generally recognised as a burden on our society because of their hazardous nature.

i) ... matrices with a wide concentration range, especially emerging pollutant derivatives.

j) ... extract organic and inorganic pollutants.

k) ... thus suggested to maximise the waste valorization scheme and benefit sustainable pollutant management.

l) ... thermocatalysis, advanced oxidation processes, and advanced reduction processes.

15. Choose the most appropriate word to complete the extract. You can also do it using the LearningApps platform at this [link](#).

Fundamental Ecological Engineering Principles

Research aimed at 1) _____ engineering has been less developed than other 2) _____ used for 3) _____ management and has been scattered across different fields. Ecologists tend to focus their 4) _____ on natural or wild ecosystems that can 5) _____ information on the dynamics of nature. Some applied 6) _____, such as forestry, agriculture, and landscape planning, focus on the 7) _____ and maintenance of productive ecosystems for 8) _____ human benefits. In the middle are ecosystems that are neither completely 9) _____ nor entirely controlled for commodity production. These are the types of ecosystems that are of interest in ecological 10) _____. These are ecosystems that may have been damaged so much that they can no longer revert to a natural state, become self-organised into an ecologically desirable 11) _____, or be used for human commodity production without substantial efforts.

Borrowed and modified from:
Meixler, M.S., and Bain, M.B., 2022. Conservation Techniques. Rutgers University Library Press, New Brunswick, NJ.
<https://www.sciencedirect.com/science/article/pii/S2095809924003783>

1	a)	ecological	b)	environmental	c)	modern
2	a)	technology	b)	methiods	c)	techniques
3	a)	environmental	b)	successful	c)	ecological
4	a)	work	b)	research	c)	efforts
5	a)	provide	b)	improve	c)	develop
6	a)	sciences	b)	techniques	c)	methods
7	a)	development	b)	management	c)	control
8	a)	additional	b)	direct	c)	sustainable
9	a)	artificial	b)	wild	c)	natural
10	a)	engineers	b)	engineering	c)	research
11	a)	condition	b)	form	c)	shape

16. Choose the correct option. You can also do it using the LearningApps platform at this [link](#).

1. Environmental scientists aim to understand cycles in the _____ and natural systems.

- a) environ b) environment c) environmental

2. Environmental engineering requires a broad understanding of _____ drivers, governing regulations, and social influences.

- a) economize b) economy c) economic

3. Scientists and engineers work to understand the influence of human _____ on ecosystems and cycles.

- a) act b) activity c) active

4. Pollution _____ and future resource protection can be viewed as “planning for the future.”

- a) avoid b) avoidance c) avoidable

5. To protect human health and the _____ of the environment, environmental regulations were introduced.

- a) integrate b) integrity c) integral

6. There is a _____ overlap between environmental science and environmental engineering.

- a) signify b) significance c) significant

7. The _____ constraints on what could persist in the ecosystem need attention.

- a) physicalise b) physics c) physical

8. Culture and human values are equally important because _____ people will be part of the ecosystem and internally shape the outcome.

- a) locate b) locality c) local

9. Environmental engineers bridge _____ systems with engineered systems and the built environment.

- a) naturalize b) nature c) natural

10. This ambitious goal encourages groundbreaking work in _____ development and green engineering.

- a) sustain b) sustainability c) sustainable

11. Environmental engineers require fundamental _____ in many disciplines.

- a) know b) knowledge c) knowledgeable

12. Recent advances focus on minimizing waste _____ by reusing, recycling, and recovering resources.

- a) generate b) generation c) generational

13. Engineers design _____ systems to restore contaminated sites, study the transport and fate of pollutants through natural systems.

- a) treat b) treatment c) treatable

14. In addition to ensuring clean ambient air, water, and soil, _____ safe drinking water for all people.

- a) provide b) provision c) providable

15. Environmental engineers _____ with many fields of study, including environmental science.

- a) overlap b) overlapper c) overlappable

17. Fill in the blanks with the appropriate words from the list below. Use each word only once. You can do it using the LearningApps platform at this [link](#)

constraints
environmental
vision
creation
resilience
ecosystem
waste
ecological
mitigation
natural
people
structure
nature
incorporation
engineering

Ecosystems that are of interest to 1) _____ engineering are those that have the capacity to support natural communities with 2) _____ activity, highly managed systems for 3) _____ treatment, abandoned lands and waters, newly constructed habitats such as wetlands, and environments constructed for housing 4) _____, which still retain some natural attributes. The science aimed at studying these ecosystems tends to focus on 5) _____ stress and environmental health, independent of 6) _____ conditions. Concepts that can define ecosystem quality are 7) _____, resistance to change, self-organization capacity, and a diverse 8) _____. There is a need for a framework that defines the successful 9) _____ and improvement of ecosystems that provide persistent benefits for both 10) _____ and people. This has not been accomplished yet, but researchers' interest in pursuing this 11) _____ is now growing.

The 12) _____ of ecological principles into ecosystem engineering is what distinguishes this 13) _____ management technique from standard 14) _____ practices.

Public support and natural 15) _____ are associated with the local context and define what can be achieved and maintained in an ecosystem with diverse benefits.

*Borrowed and modified from:
Meixler, M.S., and Bain, M.B., 2022. Conservation Techniques. Rutgers
University Library Press, New Brunswick, NJ.*

18. Complete the text by choosing the correct option (a, b, c, or d) to fill each gap.

Engineering designs traditionally aim 1) _____ a static end product that will provide benefits 2) _____ people and maintain operations. Ecosystems are dynamic, meaning they vary 3) _____ time, but persist 4) _____ a range that defines system behaviors. One principle 5) _____ ecological engineering is shifting 6) _____ classic engineering designs 7) _____ a looser ecological design that recognises a flexible functional space. That is, ecological engineering has to acknowledge that ecosystems do need space to vary, but not so much that the ecosystem transitions 8) _____ a new stable status. Wide tolerances and multiple natural components have to be specified, as well as measures that keep the system's dynamics 9) _____ a range that is seen as acceptable. Another ecological principle that should be followed is to design and manage projects with efficiency, low-energy inputs, and sustainability 10) _____ mind. Ecosystems are like any other system, which has internal components that interact to shape properties and self-organize. Relying 11) _____ ecosystem self-organization leads 12) _____ sustainability, because an emergent system is more likely to remain 13) _____ an approximate configuration.

A final principle based 14) _____ the science 15) _____ ecosystems and their maintenance focuses on place. Designs should be very context sensitive. Specialised species and habitat-linked communities need full consideration.

Borrowed and modified from:

Meixler, M.S., and Bain, M.B., 2022. *Conservation Techniques*. Rutgers University Library Press, New Brunswick, NJ.
<https://www.sciencedirect.com/science/article/pii/S2095809924003783>

1	a)	for	b)	on	c)	of	d)	from
2	a)	from	b)	for	c)	to	d)	of
3	a)	in	b)	through	c)	with	d)	on
4	a)	within	b)	in	c)	of	d)	with
5	a)	in	b)	to	c)	for	d)	of
6	a)	of	b)	from	c)	on	d)	in
7	a)	to	b)	for	c)	in	d)	with
8	a)	of	b)	to	c)	through	d)	for
9	a)	in	b)	for	c)	within	d)	of
10	a)	within	b)	in	c)	on	d)	to
11	a)	on	b)	within	c)	of	d)	for
12	a)	in	b)	at	c)	for	d)	to
13	a)	to	b)	in	c)	on	d)	at
14	a)	on	b)	to	c)	from	d)	of
15	a)	at	b)	from	c)	of	d)	for

19. Complete the sentences with the missing words. Use the definitions to help you.

Grand Challenges in Environmental Engineering

Environmental engineering represents one of the most important domains for a sustainable human 1) _____. Success in environmental engineering requires joint efforts by pollution reduction methodology, 2) _____, engineering design, etc. Herein, several grand challenges in advancing environmental engineering are highlighted to identify future directions in this field.

Challenge 1: Accurate identification of 3) _____. Accurately identifying contaminants in the environment is a 4) _____ in determining the pollution level and analysing the effectiveness and mechanism of the degradation process.

Challenge 2: Cost-effective and safe functional materials/chemicals for pollution control. For most pollutants, 5) _____/control processes, functional materials or 6) _____ are required.

Challenge 3: Atomic, molecular, and genetic level understanding for mechanistic studies. The in-depth understanding of pollutant degradation mechanisms remains a big challenge, especially in complex 7) _____ systems.

Challenge 4: Integrated technologies. Generally, it is difficult to treat multiple pollutants with an individual method, owing to the differences in pollutants' properties, such as species, 8) _____, concentration, 9) _____, and chemical resistance. Accordingly, the treatment of most real environmental problems necessitates the 10) _____ of integrated technologies.

Borrowed and modified from:

<https://www.frontiersin.org/journals/environmental-engineering/articles/10.3389/fenv.2022.1052154/full>

1 – a large group of people who live together in an organized way, making decisions about how to do things and sharing the work that needs to be done; all the people in a country, or several similar countries, can be referred to as a society;

2 – an area of science that deals with developing and producing extremely small tools and machines by controlling the arrangement of separate atoms;

3 – a substance that pollutes, spoils, or poisons something;

4 – something that must exist or happen before something else can exist or happen;

5 – the process in which the beauty or quality of something is destroyed or spoiled;

6 – any basic substance that is used in or produced by a reaction involving changes to atoms or molecules;

7 – relating to the environment in which people, animals, and plants live;

8 – the number of people or things in a place in relation to the size of the place;

9 – the level of poison contained in a drug or other substance and its ability to harm the body or the environment, or the result of a harmful substance affecting the body;

10 – the process in which someone or something grows or changes and becomes more advanced.

PHRASAL VERBS and IDIOMS

20.1. Watch the video “*Phrasal Verbs with BREAK*” and match the phrasal verbs with BREAK and their definitions. Some phrasal verbs have more than one definition.

BREAK AWAY	1) to manage to get past something that is in your way
	2) to begin or arise suddenly
BREAK DOWN	3) to achieve success, make a discovery, etc., especially after lengthy efforts
BREAK IN (INTO)	4) to go through decomposition
BREAK OUT	5) to put an end to (a relationship); to set or force apart
	6) to leave or escape, especially suddenly or hurriedly
BREAK OFF	7) to enter something (such as a building or computer system) without consent or by force
	8) to erupt (in a rash, pimples, etc.)
BREAK THROUGH	9) to stop working or not be successful
	10) to separate a part from a larger piece, or to become separate
BREAK UP	11) to depart from former or accustomed ways

20.2. Watch the video “*Phrasal Verbs with BRING: Mastering the Many Meanings of ‘Bring’ in English*” and match the phrasal verbs with BRING and their definitions. Some phrasal verbs have more than one definition.

BRING ABOUT	1) convert or persuade someone
	2) to return something to where it came from
	3) to cause someone to lose power
BRING AROUND	4) to succeed in doing something difficult
	5) to start to talk about a particular subject
BRING BACK	6) to ask somebody to do a particular job or to be involved in something
BRING DOWN	7) to care for a child until they are an adult, often giving them particular beliefs
	8) to cause to take place
BRING IN	9) to reduce the level of something
BRING OFF	10) to start to do or use something that was done or used in the past
	11) to restore to consciousness

21.1. Complete the sentences with the correct prepositions to form phrasal verbs with BREAK.

away down into out through up

1	Breaking _____ the environmental monitoring network can trigger alarms caused by misconfigurations or unauthorized software installations.
2	Emergency responders had to break _____ a collapsed tunnel to reach the contaminated soil beneath the landfill.
3	When harmful algal blooms begin to break _____ and die, they can decrease dissolved oxygen levels, a change that can be lethal to other aquatic organisms.
4	Due to conflicts over environmental policies, some collaborations between countries have broken _____, delaying important global conservation efforts.
5	Environmental engineering as a discipline started to break _____ from traditional sanitation engineering when global ecological concerns became more urgent.
6	Despite strict safety protocols, a chemical reaction unexpectedly intensified during the wastewater treatment process, causing a hazardous vapor cloud to break _____ and spread rapidly through the facility.

21.2. Complete the sentences with the correct prepositions to form phrasal verbs with BRING.

about around back down off up

1	Public pressure over environmental scandals has even brought _____ leaders in corporations that ignored ecological warnings.
2	Environmental engineers work to bring _____ positive change in pollution prevention through innovative green technologies.
3	A recent environmental report brought _____ the urgent need for international cooperation in climate adaptation and the role of environmental engineering in this process.
4	The goal of bringing _____ ecosystems to their pre-industrial state, roughly a century ago, is strongly supported by environmental engineers through sustainable design and restoration efforts.
5	Environmental engineers brought _____ a challenging river basin restoration, removing pollutants and restoring the ecosystem.
6	Environmental engineers hope to bring _____ policymakers and industries to adopt greener technologies and prioritize sustainability over short-term profits.



For more practice, go to [Practice file 1](#) on pages 296–298.

22. Replace the idioms in bold with their appropriate equivalents, as in the example. Then make your own sentences with the suggested idioms. If necessary, make some changes in the sentences. Appendix 4 has a list of relevant idioms.

*Designing eco-friendly infrastructure pushes environmental engineers to **think outside the box** and combine innovation with environmental ethics.*

*Designing eco-friendly infrastructure pushes environmental engineers to **use creative thinking** and combine innovation with environmental ethics.*

1. Environmental engineering **breaks new ground** by uniting scientific knowledge with innovative technologies to tackle complex pollution challenges.

2. The innovative solutions developed by environmental engineers may require upfront investment, but they are more efficient **in the long run**.

3. Pollution is just the **tip of the iceberg**; environmental engineers also deal with resource depletion and climate change.

4. Developing one green technology might feel like **a drop in the ocean**, yet environmental engineers know it can spark broader innovations in the field.

5. The 19th-century sanitation crisis was **a wake-up call** that led to the birth of environmental engineering as a profession.

6. Environmental engineers are starting **to make waves** with new carbon capture technologies that help reduce emissions and fight climate change.

7. Environmental engineers often **go the extra mile** to protect the environment and improve people's health.

8. Environmental engineers often need to **change gears** when new regulations or technologies emerge.

23. Choose the most appropriate idiom to complete the sentence.

1	Visible oil spills represent only _____ of marine pollution; countless chemical contaminants remain dissolved and invisible to the naked eye.	a) a wake-up call b) a drop in the ocean c) the tip of the iceberg
2	By creating biodegradable materials to replace concrete, engineers continue to _____ in sustainable design.	a) go the extra mile b) break new ground c) change gear
3	Although wastewater treatment technologies may seem costly at first, they significantly reduce health risks and operational costs _____.	a) make waves b) in the long run c) go the extra mile
4	Planting a few trees near a factory is just _____ compared to the extensive deforestation caused by industrial expansion worldwide.	a) a drop in the ocean b) a wake-up call c) change gear
5	When engineers and local communities work together on sustainable development projects, they often _____ to balance environmental goals with technical requirements.	a) break new ground b) change gear c) go the extra mile
6	The increasing number of climate-related disasters serves as _____, reminding societies that sustainability must be a top engineering priority.	a) a drop in the ocean b) a wake-up call c) the tip of the iceberg
7	The introduction of carbon-negative cement technology has _____ across the construction industry by challenging long-standing emission norms.	a) made waves b) broken the ground c) gone the extra mile
8	When environmental impact assessments reveal delays in mitigation projects, engineers often have to _____ to meet environmental safety standards.	a) break new ground b) change gear c) make waves

Grammar Box

24. Watch the video about *using Present Tenses in English*, and complete the rules (1–7) with the correct tense. Then, match the rules with the sentences (A–G) that represent each of them.

1.	We use _____ to talk about general truths, scientific facts, and regular processes.	A	The research team is analysing water samples for traces of industrial chemicals.
2.	_____ is used with stative verbs that describe knowledge, preference, and mental states.	B	Environmental engineers have been working on new biofiltration methods for months.
3.	We use _____ to describe temporary actions, activities happening now, or changing situations.	C	The laboratory has implemented new safety protocols in its handling of toxic materials.
4.	_____ is used to describe future plans and fixed arrangements.	D	Solar panels produce clean energy without emitting harmful gases.
5.	To describe an action that began in the past and continues until now, we use _____.	E	The city council has been delaying the installation of air quality monitoring systems again!
6.	_____ is used for recently completed actions with present results, or when the exact time is not mentioned.	F	Many experts believe that green infrastructure is key to sustainable development.
7.	We use _____ to emphasise the duration of a recent activity or irritation about repeated recent behaviour.	G	Our department is presenting a report on wastewater treatment at the annual forum next week.

25. Complete the sentences with the options given (a, b, or c) and match them to the corresponding explanation.

1.	Before an environmental engineering student _____ their first field study, they will learn about soil sampling and water quality analysis techniques. a) is beginning b) has begun c) begins	A	Present Simple – repeated or habitual action.
2.	Universities _____ recently more interdisciplinary programs that combine environmental engineering with urban planning and public policy. a) have created b) create c) are creating	B	Present Perfect Continuous – since / until construction showing action that started in the past and continues to the present.
3.	The university research group constantly _____ innovative methods to reduce carbon emissions in urban areas. a) is developing b) develops c) has developed	C	Present Continuous – action happening right now.
4.	These days, engineers can choose from a wide range of internships in environmental consulting firms, as sustainability audits and ecological risk assessments _____ essential in many industries. a) become b) are becoming c) have been becoming	D	Present Perfect – past experiences without a specific time.
5.	To initiate the anaerobic digestion process, you _____ the temperature at 35 °C and exclude all oxygen from the reactor. a) maintain b) have maintained c) are maintaining	E	Present Simple – used in subordinate time clauses after “before / when / as soon as” etc.
6.	_____ you ever _____ the impact of a major storm on a city’s drainage system using advanced modeling software? a) are __ simulating b) do __ simulate c) have __ simulated	F	Present Continuous – describing annoyance or emphasis (with <i>always, constantly, forever</i>).

7.	At this moment, the guest lecturer from the EPA _____ how to use environmental modeling software. <i>a) demonstrates</i> <i>b) is demonstrating</i> <i>c) have demonstrated</i>	G	Present Simple – for instructions and directions.
8.	Renewable energy sources like solar and wind _____ electricity without emitting greenhouse gases during operation. <i>a) produce</i> <i>b) is producing</i> <i>c) has produced</i>	H	Present Perfect – recent changes or new developments with present relevance; actions or events that have occurred at an unspecified time in the past and are still relevant to the present.
9.	Since 2020, environmental engineers _____ have been collaborating on a global water scarcity project. <i>a) collaborate</i> <i>b) are collaborating</i> <i>c) have been collaborating</i>	I	Present Continuous – temporary process or ongoing trend.
10.	Our project manager continually _____ the sustainability criteria, making it impossible to finalize the impact assessment. <i>a) changes</i> <i>b) is changing</i> <i>c) has been changing</i>	J	Present Simple – scientific facts and universal truths.

26. Read the abstract and open the brackets, using the correct tense form of the verbs.

Present Simple	Present Continuous	Present Perfect Perfect	Present Perfect Continuous
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Sustainable Solutions in Environmental Engineering

Modern environmental engineering 1) _____ (**FOCUS**) on developing sustainable solutions for global ecological problems. Scientists 2) _____ (**STUDY**) renewable energy systems, waste recycling, and water purification technologies intensively nowadays. Over the last decades, environmental engineers 3) _____ (**MAKE**) significant progress in reducing industrial pollution.

At the same time, society 4) _____ (**BECOME**) more aware of the importance of biodiversity and natural resource management. Many international organizations 5) _____ (**PROMOTE**) ecological policies that 6) _____ (**SUPPORT**) both nature conservation and sustainable development.

In recent years, advanced monitoring systems 7) _____ (**HELP**) governments to control emissions and improve urban air quality. For instance, in many European cities, engineers 8) _____ (**IMPLEMENT**) smart sensors that constantly 9) _____ (**MEASURE**) levels of pollutants in the atmosphere.

Environmental engineers 10) _____ (**WORK**) on clean energy projects for decades, and they still 11) _____ (**SEARCH**) for new ways to reduce carbon emissions. In fact, some researchers 12) _____ (**DEVELOP**) innovative solutions that combine solar energy with advanced storage systems.

In this context, global collaboration 13) _____ (**PLAY**) a crucial role. Environmental engineers from different countries already 14) _____ (**SHARE**) their knowledge and experience, and many international projects 15) _____ (**GROW**) rapidly in order to address urgent environmental challenges.

LISTENING

27. Before watching the video, check if you know the meaning of the following words and phrases. Use the [dictionary](#) if necessary.

treatment plants	food scraps	biodegradable materials	soak up
tackle challenges	carbon emissions	smart grids	vulnerable communities
be at the forefront	sustainable urban	waste management	purify water

28. Watch the video “[Introduction to Environmental Engineering: Sustainability and Impact](#)”. Decide whether the following statements are true (T), false (F), or not mentioned (NM). Correct the wrong statements. Fill in the table with your answers.

	statements	T	F	NM
1	Environmental engineering is defined as a field that applies science, technology, and creativity to solve environmental problems and support human life.			
2	Environmental engineering originated in the late 20th century as a response to climate change.			
3	In this video, sustainability is compared with a game of Jenga to emphasize the challenge of maintaining balance while allowing progress.			
4	The main goal of water-related systems designed by environmental engineers is to ensure that no water is wasted.			
5	Purified water is compared with liquid silver to highlight its value.			
6	Technologies developed by environmental engineers focus mainly on monitoring air quality, not on capturing carbon emissions.			
7	Environmental engineers are portrayed as key contributors to the design and implementation of both large-scale and portable water purification systems.			
8	The role of environmental engineers includes designing and implementing technologies that not only monitor air quality in real time but also actively reduce harmful emissions.			
9	Environmental engineers collaborate closely with international space agencies to monitor air quality from satellites.			
10	The video emphasizes that environmental engineers prioritize developing solar energy over other renewable technologies.			
11	Environmental engineers contribute to climate change solutions by designing renewable energy systems, sustainable urban infrastructure, and protective measures for vulnerable communities.			
12	It is stated that only individuals with a background in chemistry can pursue a career in environmental engineering.			

29. Watch the video again and complete the following sentences with missing information.

1	Environmental engineering is all about solving problems that affect our environment, think air pollution, water contamination, waste _____, and more.
2	In the world of environmental engineering, sustainability is all about creating solutions that meet today's needs without compromising the _____ of future generations to meet theirs.
3	Environmental engineers design and implement systems to _____ water, manage wastewater, and even recycle water for reuse.
4	These systems range from massive treatment plants that serve entire cities to small, _____ units that can provide clean water in disaster zones.
5	Environmental engineers work on the front lines to design systems that _____ emissions, filter out harmful particles, and monitor air quality in real time.
6	We live in a world that's producing more waste than ever before, from plastic bottles to electronic gadgets to food _____.
7	This includes designing efficient recycling processes, developing _____ materials, and even finding ways to convert waste into energy.
8	Environmental engineers are at the forefront of the fight against climate change, working on everything from renewable energy solutions to _____ capture technologies to sustainable urban planning.
9	They're the ones designing wind farms, solar power plants, and smart grids that reduce our _____ on fossil fuels.
10	They're also creating systems to protect _____ communities from rising sea levels, extreme weather, and other impacts of a warming climate.
11	Environmental engineering isn't just about _____ problems, it's about creating a world where we can all fly, both now and in the future.
12	Whether you're passionate about clean energy, water _____, waste reduction, or climate action, there's a place for you in this exciting and impactful field.

SPEAKING

30. Your friend is considering a career in environmental engineering, but doesn't have a clear understanding of what environmental engineers do and why their work is important. Explain the role of environmental engineers. Speak about key tasks, responsibilities of environmental engineers, and the areas they work in. Discuss how their work contributes to environmental sustainability, public health protection, and the preservation of natural resources.

Useful phrases:

- *An environmental engineer is someone who*
- *Environmental engineers help to*
- *Their job involves*
- *Their responsibilities include*
- *One of their main tasks is to*
- *Common areas include*
- *Their work is important because*

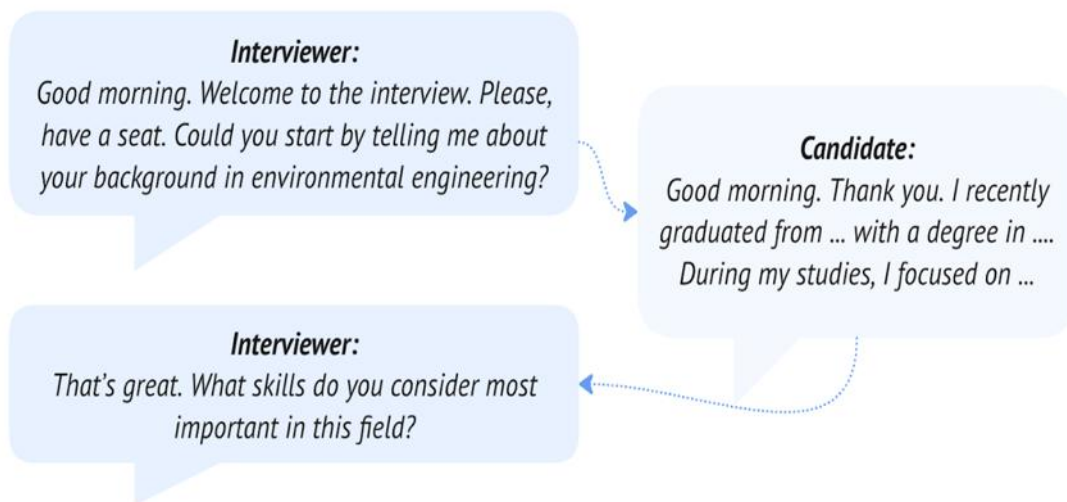
31. You are a member of the recruiting team selecting candidates for work at a company that deals with sustainable development and green engineering. You have to choose an applicant who is the most suitable for the position of an environmental engineer. Make a list of essential skills and areas of knowledge in environmental engineering (critical thinking, problem-solving, project planning and design, communication skills, etc.). Rank the skills and areas of knowledge on your list from most to least important, and explain your choices. Use real-world examples if possible.

risk assessment *technical knowledge*
data analysis *collaboration* *fieldwork*
waste management *teamwork* **design process**
critical thinking **digital skills** **project planning**
communication skills **creativity** *time management*

Useful phrases:

- *The most important skills for an environmental engineer are*
- *The most essential skill is*
- *It is extremely important when*
- *The second most important is*
- *This skill is essential because*
- *[The skill] is slightly less important*
- *For example, in real life*

32. You are applying for the position of environmental engineer at an international sustainable design firm. Work in pairs and rehearse for an interview, with one student acting as the interviewer and the other as a candidate for the position. Prepare a list of interview questions related to a career in environmental engineering and practice answering them. These questions can focus on areas such as educational background, technical skills, areas of specialization, work experience, personal goals and motivation, as well as soft skills and professional competencies. Then, role-play the job interview for the position of an environmental engineer.



Useful phrases:

- *Can you tell me a little about ...*
- *I'm currently studying / I recently graduated with a degree ...*
- *During my studies, I focused on ...*
- *One of my key strengths is ...*
- *I have strong skills in ...*
- *I have experience in ...*
- *I'm mainly interested in ...*

33. Work in groups. You are preparing a presentation for the university competition on environmental engineering. Design a presentation that outlines the development of environmental engineering throughout history, highlighting its key milestones and influential figures. The topic of the presentation for Group A is about early foundations and origins of environmental engineering (The Great Sanitary Awakening, the contribution of Joseph Bazalgette, etc). Group B designs a presentation about one of the famous environmental engineers and his / her contribution to solving environmental problems (for example, Ellen Swallow Richards, Robert A. Gearheart, G. D. Agrawal). Group C prepares a presentation about modern trends and the future of environmental engineering (monitoring, sustainable development, pollution prevention, etc.).

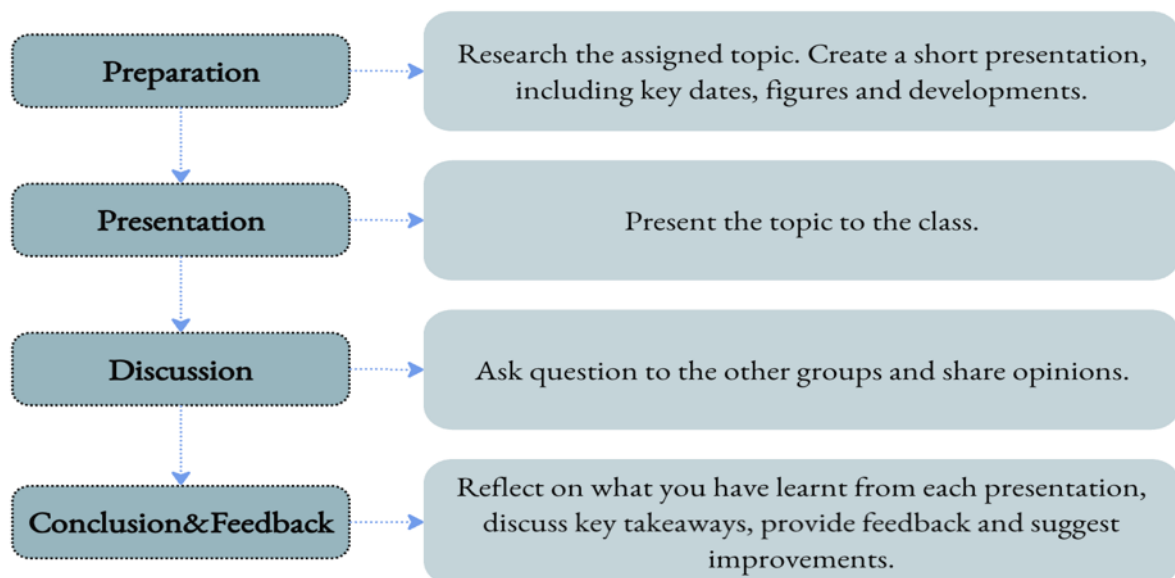
Improve your presentation by following the presentation requirements, the outline, and the useful phrases provided below.

Presentation requirements:

- 1. Time limit: 2–3 minutes per presentation.**
- 2. Visuals: slides or pictures with keywords / bullet points, not full sentences.**
- 3. Structure: introduction – main part – conclusion.**
- 4. Speak in your own words; do not read.**

Useful phrases:

- *In this presentation, we will explore / overview*
- *The purpose / aim of this presentation is to*
- *The focus of our presentation is on the evolution / development of*
- *Moving forward to*
- *The key figure(s) who significantly contributed to*
- *One major contribution was*
- *In conclusion / To sum up*



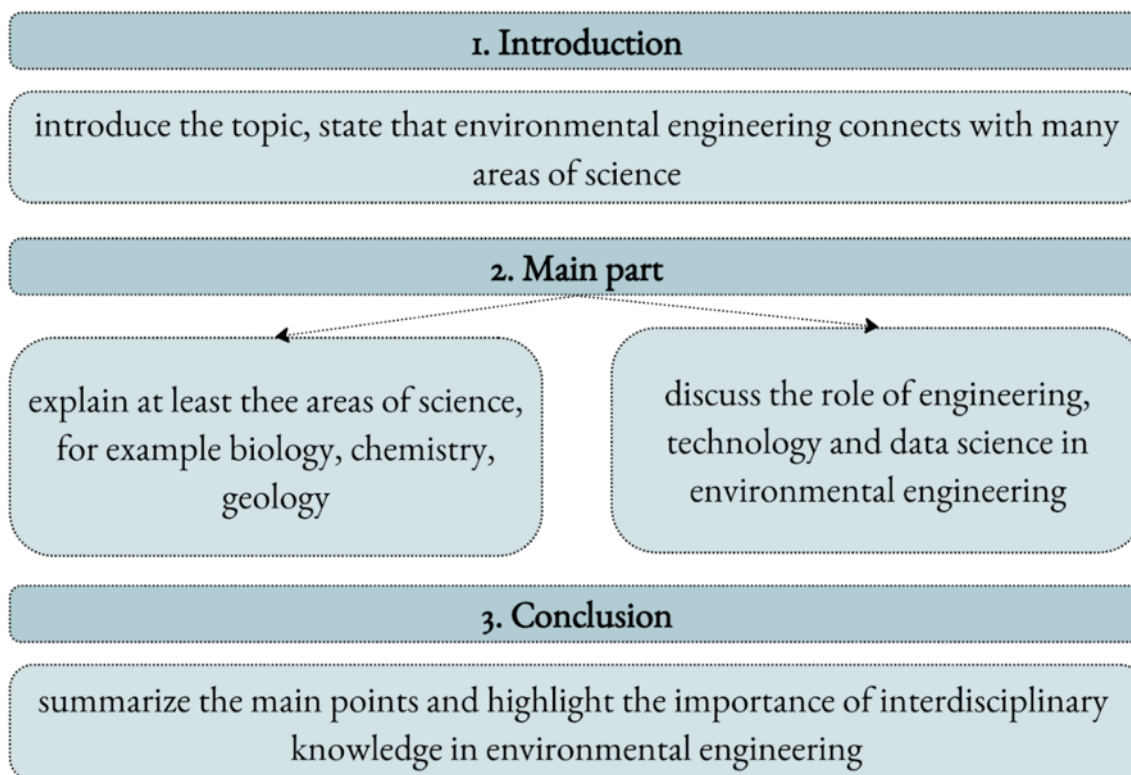
WRITING

34. You are taking part in a writing contest dedicated to environmental protection and sustainable development. Write an essay (160–180 words) on how environmental engineering is interconnected with other areas of science. Structure your essay with an introduction, a main body, and a conclusion. Pay attention to clarity, coherence, and accuracy in your writing.

***See Appendix 5 for a writing model.**

Useful phrases:

- *This essay / looks into / explores / discusses*
- *This area is closely connected to many other sciences*
- *One important connection is with*
- *Environmental engineers need knowledge of*
- *As an example / To illustrate this*
- *It is worth noting / highlighting that*
- *In conclusion / To sum up / In closing*



35. You write for a student blog called EcoToday. Write a post for your blog (160–180 words) explaining the major challenges of environmental engineering today. Use the phrases and follow the outline provided below, including an introduction, a main part, and a conclusion. Pay attention to clarity, coherence, and accuracy in your writing.

***See Appendix 5 for a writing model.**

Useful phrases:

- *In this blog post, we'll look at*
- *First of all, / For starters*
- *Nowadays, environmental engineering plays a critical role in*
- *One significant challenge is*
- *To solve this problem*
- *This is difficult because*
- *Let's rewind / To sum up*

1. Introduction

state the importance of environmental engineering, mention its development and main challenges

2. Main part: discuss 2-3 main challenges

introduce each challenge, explain why it is a problem, suggest possible solutions

3. Conclusion

summarize the main points

emphasise the importance of addressing these challenges and call for actions

SELF-ASSESSMENT

36. Explore the target vocabulary related to the topic “Introduction to Environmental Engineering” using *flashcards* and then assess comprehension through a *Quizlet quiz*.

37. Check yourself and do the quiz.

1. Which of the options below can be defined as “the development of processes and infrastructure for the supply of water, the disposal of waste, and the control of pollution of all kinds”?
 - A. *public health*
 - B. *ecology*
 - C. *environmental engineering*
 - D. *Civil Engineering*
2. Which of the following substances is not a pollutant?
 - A. *sulphur dioxide*
 - B. *carbon monoxide*
 - C. *nitric oxide*
 - D. *oxygen*
3. Which word below is a synonym of “deleterious”?
 - A. *harmful*
 - B. *global*
 - C. *undesirable*
 - D. *inadequate*
4. Which of the following refers to the systems for taking dirty water and other waste products away from buildings in order to protect people’s health?
 - A. *water supply*
 - B. *sanitation*
 - C. *impact assessment*
 - D. *medicine*
5. Which of the following is not a sustainability principle?
 - A. *ecosystem integrity*
 - B. *sustainable use of resources*
 - C. *intergenerational equity*
 - D. *unlimited use of resources*

6. Which of the following is not an objective of environmental engineering?
- A. *encouraging consumerism*
 - B. *protecting environment from pollution*
 - C. *controlling waste disposal*
 - D. *ensuring safe water*
7. Which word best matches the definition “liquid waste that is sent out from factories or other places, often into the sea or rivers”?
- A. *byproduct*
 - B. *ambient*
 - C. *effluent*
 - D. *stream*
8. Which word has a similar meaning to “adverse”?
- A. *negative*
 - B. *natural*
 - C. *ambitious*
 - D. *ambient*
9. Which term refers to a substance that makes something less pure or makes it poisonous?
- A. *pollution*
 - B. *derivative*
 - C. *contaminant*
 - D. *adsorbent*
10. Which of the following is the best definition of “valorization”?
- A. *making something as good as possible*
 - B. *the process of removing dangerous or poisonous substances from the environment, or limiting the effect that they have on it*
 - C. *the act of protecting*
 - D. *making something useful from an existing substance*

Check yourself, Appendix 8. Self-Assessment Keys.

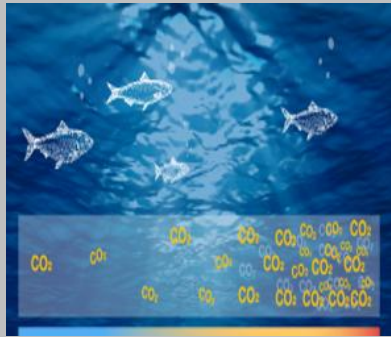
Unit 2

Ecosystems. Biodiversity



LEAD-IN

1. Match the predictions about ecosystems and biodiversity (1–6) with the correct pictures (A–F). Then, explain your opinion: Do you think these predictions are likely to come true in the future? Why or why not?

		
<u>A</u>	<u>B</u>	<u>C</u>
1. Protected natural reserves will become increasingly important for preserving endangered species.	2. Urban expansion will reduce natural habitats, forcing animals to adapt to human environments.	3. If deforestation continues at the current pace, many rainforest species will face extinction within the next few decades.
		
<u>D</u>	<u>E</u>	<u>F</u>
4. Coral reefs will struggle to survive bleaching events unless greenhouse gas emissions are significantly reduced.	5. Advances in biotechnology may help restore damaged ecosystems and revive nearly extinct species.	6. Marine ecosystems are expected to experience further biodiversity loss due to rising ocean temperatures and acidification.

Images taken from:

https://www.thelivingurn.com/blogs/news/83244673-the-impact-of-deforestation?srltid=AfmBOoo8G4lxNEcYML_2jR1aqONLYOmyrdvP76tl7b7Lxqx-w8bwg5cD

2. Work in pairs or small groups. Discuss the questions about ecosystems and biodiversity in your area. Give short answers and examples.

1. What ecosystems are near your town or city? (forests, rivers, fields, wetlands, parks)
2. Are there any protected areas or nature reserves nearby?
3. What animals or plants are common in your area?
4. Are there any rare or endangered species?
5. What human activities affect nature there? (roads, factories, farming, tourism)
6. What threatens biodiversity in your area the most? Why?
7. Has the local environment changed in recent years?
8. Do people in your area care about protecting nature? How?
9. What actions could help protect local ecosystems?
10. What can individuals do to support biodiversity where they live?

3. Study the diagram. Then watch the [video](#) on abiotic and biotic factors and answer the following questions.

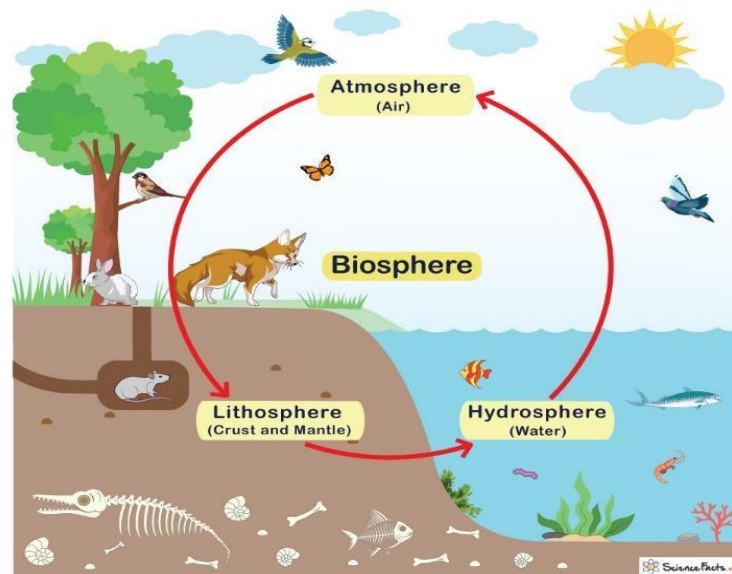


Image taken from:

<https://s3-us-west-2.amazonaws.com/imgds360live/storefront/3546038/blog/Ecosystem-biosphere.webp>

1. How to describe biotic factors?
2. What are your own 5 examples of biotic factors?
3. How to describe abiotic factors?
4. What are your own 5 examples of abiotic factors?
5. What do living things interact with?
6. What are ecosystems made of?
7. Which abiotic factors can be found in the picture?

READING

4. Read the text below. Match choices (A–H) to (1–5). There are three choices you do not need to use.

- A** Definition and Levels of Biodiversity
- B** The Importance of Biodiversity in Ecosystems
- C** Major Ecosystem Types
- D** Energy Flow, Ecosystem Dynamics, and Biodiversity
- E** Ecosystems are Never Disturbed
- F** All biomes are identical
- G** Biomes of Terrestrial Ecosystems
- H** Ecosystems exist only on land and are all deserts

Energy Flow Through Ecosystems

1. _____. An ecosystem is a **community** of organisms and their abiotic (non-living) environment. Ecosystems can be small, such as the **tide** pools found near the rocky shores of many oceans, or large, such as those found in the tropical rainforest of the Amazon in Brazil.

There are three broad categories of ecosystems based on their general environment: freshwater, marine, and terrestrial. Within these three categories are individual ecosystem types based on the **environmental habitat** and organisms present.

2. _____. Freshwater ecosystems are the least common, occurring on only 1.8 percent of Earth's surface. These systems comprise lakes, rivers, streams, and springs; they are quite diverse and support a variety of animals, plants, **fungi**, **protists**, and prokaryotes.

Marine ecosystems are the most common, comprising 75 percent of Earth's surface and consisting of three basic types: shallow ocean, deep ocean water, and deep ocean bottom. Shallow ocean ecosystems include extremely **biodiverse** coral reef ecosystems. Small photosynthetic organisms suspended in ocean waters, collectively known as phytoplankton, perform 40 percent of all photosynthesis on Earth. Deep ocean bottom ecosystems contain a wide variety of marine organisms.

3. _____. **Terrestrial ecosystems**, also known for their **diversity**, are grouped into large categories called biomes. A **biome** is a large-scale community of organisms, primarily defined on land by the dominant plant types that exist in geographic regions of the planet with **similar climatic conditions**. Examples of biomes include tropical rainforests, savannas, deserts, grasslands, temperate

forests, and tundras. Grouping these ecosystems into just a few biome categories obscures the great diversity of the individual ecosystems within them.

4. _____. All living things require energy in one form or another. It is important to understand how organisms **acquire energy** and how that energy is passed from one organism to another through food webs. Food webs illustrate how energy flows directionally through ecosystems, including how efficiently organisms acquire it and how much remains for use by other organisms of the food web.

Ecosystems are complex with many interacting parts and are **routinely** exposed to various disturbances. Many **disturbances** are a result of natural processes. For example, when lightning causes a forest fire and destroys part of a forest ecosystem, the ground is eventually populated with grasses, followed by bushes and shrubs, and later **mature** trees. This process is called succession. The impact of environmental disturbances caused by human activities is now as significant as the changes wrought by natural processes.

5. _____. Biodiversity is a **crucial part** of nature's assets that provides many human needs and protects against environmental disasters. Scientists have not yet reached a consensus on the definition of **biodiversity**.

Biodiversity **encompasses** various life forms on Earth, including a variety of genes, **species**, ecosystems, and ecological processes. Biodiversity is commonly categorized into three levels: genetic diversity, species diversity, and ecosystem diversity. Genetic diversity refers to the **variety of genes** within a population or species. Species diversity measures the number and **abundance** of different species in a given area. Ecosystem diversity considers the variety of ecosystems present in a region.

Borrowed and modified from:
Fisher, M. R. (Ed.). (2017). Environmental biology (Revised ed.). Open Oregon Educational Resources.
<https://openoregon.pressbooks.pub/environmentalbiology/>

Follow-up

5. Explain the words / phrases in bold from the text. Use a [dictionary](#) if necessary.

**6. Read the text again and mark the statements as true (T) or false (F).
Correct the wrong statements.**

	statements	T	F
1	Ecosystems can have various sizes.	☐	☐
2	Categories of ecosystems are marine, tropical, and terrestrial.	☐	☐
3	Seas and oceans are part of the freshwater ecosystem.	☐	☐
4	Marine ecosystems comprise three-quarters of Earth.	☐	☐
5	Phytoplankton is one of the species that is too deep to see the light.	☐	☐
6	It is enough to group terrestrial ecosystems into just a few categories.	☐	☐
7	A food web describes how organisms get, use, and give energy to others.	☐	☐
8	Ecosystems are prone to natural processes, such as weather change.	☐	☐
9	Humans do little to negatively affect ecosystems.	☐	☐
10	Genetic diversity measures the number of different species.	☐	☐
11	The loss of biodiversity disrupts ecosystems.	☐	☐
12	Biodiversity is at risk due to some human activities.	☐	☐

USE of ENGLISH

7. Using the information from the text (Ex. 4), match items (1–15) with (A–O) to form phrases. After that, choose any three of the completed phrases and use them in your own sentences.

1.	the tide pools are found	A	reef ecosystems
2.	extremely biodiverse coral	B	a consensus
3.	collectively known	C	ecosystems together
4.	light is unable	D	into three levels
5.	require energy in one	E	near the rocky shores
6.	passed from one organism to	F	another through food webs
7.	environmental disturbances	G	concepts in ecology
8.	scientists have not yet reached	H	as phytoplankton
9.	flow of energy and matter	I	to food security
10.	the fabric that weaves	J	abundance of species
11.	enhance ecosystem services	K	to reach them
12.	biodiverse ecosystems contribute	L	including pollination
13.	commonly categorized	M	form or another
14.	measure the number and	N	caused by human activities
15.	one of the key	O	through the ecosystems

8. Fill in the table with the words derived from the given ones.

	Noun	Verb	Adjective
1	.....	conserve	.....
2	.....	.....	diverse
3	destruction	.....	.....
4	.....	organize	.....
5	.....	.....	contributive
6	regulation	.....	.....
7	.....	interact	.....
8	.....	.....	classifiable
9	illustration	.....	.....
10	.....	compose	.....
11	.....	.....	transformative
12	restoration	.....	.....
13	.....	identify	.....
14	.....	.....	expansive
15	explanation	.....	.....

9. Match the words in column A with the words in column B to form meaningful phrases. You can also do it using the LearningApps platform at this [link](#).

Column A		Column B	
1.	tropical	A	regions
2.	shallow	B	part
3.	photosynthetic	C	development
4.	geographic	D	rainforest
5.	yearly	E	rain
6.	former	F	organisms
7.	acid	G	assets
8.	crucial	H	organisms
9.	agricultural	I	deforestation
10.	sustainable	J	state
11.	living	K	pollution
12.	biological	L	ocean
13.	precious	M	practices
14.	air	N	diversity
15.	global	O	variations

10. Fill in the words from the list below. Use each word only once.

stability, fungi, deep, organisms, individual, disturbances, human, marine, forms, health, broad, acquire, destroy, parts, communities

- three _____ categories of ecosystems;
- support a variety of animals, plants, _____;
- _____ocean bottom ecosystems;
- large-scale community of _____;
- to understand how organisms _____energy;
- routinely exposed to various _____;
- to _____part of a forest ecosystem;
- to provide many _____ needs;
- _____ ecosystem types;
- a wide variety of _____ organisms;
- complex with many interacting _____;
- various life _____ on earth;
- providing _____ and resilience;
- the _____ and sustainability of ecosystems;
- _____ around the world.

11. Match the words with similar meanings. You can also do it using the LearningApps platform at this [link](#).

1.	community	A	stability
2.	plant	B	spread
3.	energy	C	conservation
4.	abundance	D	structure
5.	distribution	E	diversity
6.	disturbance	F	group
7.	composition	G	adjustment
8.	protection	H	plenty
9.	concept	I	region
10.	variety	J	meaning
11.	adaptation	K	vegetation
12.	area	L	disruption
13.	balance	M	decontamination
14.	purification	N	power
15.	definition	O	notion

12. Write the opposites of the following words. Use the [dictionary](#) if necessary.

1	acquire	
2	small	
3	include	
4	shallow	
5	contain	
6	common	
7	group	
8	dominant	
9	exist	
10	abundant	
11	destroy	
12	resilient	
13	restore	
14	terrestrial	
15	enhance	

13. Match the key terms on the topic “Ecosystems. Biodiversity” with their definitions.

<i>diversity, dumping, bottom, biome, ecosystem, surface, desert, pharmaceutical, stream, habitat, lightning, impact, deforestation, phytoplankton, species</i>
--

1. All the living things in an area and the way they affect each other and the environment.
2. Water that flows naturally along a fixed route formed by a channel cut into rock or ground, usually at ground level.
3. Very small plants that float near the surface of water and on which sea creatures feed.
4. A region of the Earth’s surface and the particular combination of climate, plants, and animals that are found in it.
5. An area, often covered with sand or rocks, where there is very little rain and not many plants.
6. A flash of bright light in the sky that is produced by electricity moving between clouds or from clouds to the ground.
7. A powerful effect that something has on someone or something.
8. The cutting down of trees in a large area, or the destruction of forests by people.
9. The act of throwing something away in a place that is not suitable or allowed by law.
10. The natural environment in which an animal or plant usually lives.
11. The outer or top part or layer of something.
12. The lowest part of something.
13. The condition or fact of being different or varied; variety.
14. A set of animals or plants in which the members have similar characteristics to each other and can breed with each other.
15. A medicine; a drug that is made by a big drug company.

Borrowed and modified from: <https://dictionary.cambridge.org/dictionary/>

14. Match the first part of the sentence (1–12) with the second one (a–l).

1. Climate change is increasingly affecting ecosystems across the planet –
...
 2. These changes are not driven by temperature alone, but also ...
 3. These factors interact with each other and with human-induced stressors
...
 4. One important focus of current research is how climate extremes can ...
 5. These rapid shifts, often called abrupt changes in ecological systems (ACES), are difficult to observe empirically ...
 6. Nonetheless, detecting, explaining, and anticipating such ...
 7. In addition to the aboveground effects, climate change also influences ...
 8. Microorganisms in soil play a key role in recycling nutrients ...
 9. Some microbes respond quickly to disturbance and help ecosystems recover, ...
 10. The complementary functions of fast and slow energy channels can ...
 11. Long-term data from natural archives show that ecosystems have ...
 12. Fire has often been a key driver of these changes, especially ...
- a) ... cause sudden and irreversible changes in ecosystems.
 - b) ... changes are now considered a high priority.
 - c) ... stressors such as pollution, deforestation, and habitat fragmentation.
 - d) ... while others are slower but help resist environmental change.
 - e) ... historically gone through both stable periods and abrupt transformations.
 - f) ... on land, in freshwater environments, and in the oceans.
 - g) ... when combined with climate shifts.
 - h) ... belowground ecosystems, especially soil microbial communities.
 - i) ... because extreme events are stochastic and seldom predictable.
 - j) ... facilitate rapid yet stable recovery from perturbations.
 - k) ... by shifts in precipitation, altered water cycles, changes in ocean chemistry.
 - l) ... and maintaining healthy ecosystems.

15. Choose the most appropriate word to complete the extract. You can also do it using the LearningApps platform at this [link](#).

Another major concern is the indirect **1)** _____ of climate change through land use change. As warming alters rainfall and growing conditions, some regions may become more suitable for agriculture. This often **2)** _____ to the expansion of cropland into forests and biodiversity-rich areas. Future cropland expansion is likely to have negative impacts on biodiversity and carbon **3)** _____ in many hotspots, including Mexico, Amazonia, and the Congo Basin.

Finally, while some studies suggest that warming could increase plant **4)** _____ in certain regions, especially in temperate zones, this may not be a **5)** _____ trend. In ecosystems with limited water or where replacement **6)** _____ are not nearby, warming is more likely to reduce plant diversity. Understanding these dynamics **7)** _____ more experimental studies across different regions and climates.

In conclusion, ecosystems are changing rapidly in response to climate and other global **8)** _____. These changes are complex, involving multiple interacting **9)** _____ above and below ground. Recognizing the role of extreme events, **10)** _____ legacies and indirect effects such as land use change is essential for predicting and managing the future of biodiversity and ecosystem **11)** _____.

Borrowed and modified from:

<https://royalsocietypublishing.org/doi/10.1098/rstb.2019.0104>

1	a)	affect	b)	impact	c)	import
2	a)	follows	b)	brings	c)	leads
3	a)	storage	b)	warehouse	c)	shop
4	a)	difference	b)	diversity	c)	diversion
5	a)	pandemic	b)	cosmic	c)	global
6	a)	spices	b)	species	c)	specials
7	a)	enquires	b)	inquires	c)	requires
8	a)	pressures	b)	weights	c)	loads
9	a)	factors	b)	reasons	c)	problems
10	a)	national	b)	cultural	c)	historical
11	a)	jobs	b)	functions	c)	chores

16. Choose the correct option. You can also do it using the LearningApps platform at this [link](#).

1. Biodiversity faces an array of threats, primarily because of human _____.

- | | | |
|-------------|---------------|-----------|
| a) activate | b) activities | c) active |
|-------------|---------------|-----------|

2. Habitat _____ is one of the most serious threats to species survival.

- | | | |
|------------|----------------|----------------|
| a) destroy | b) destruction | c) destructive |
|------------|----------------|----------------|

3. Extreme events may cause changes in the ecosystem _____.

- | | | |
|------------|----------------|------------------|
| a) compose | b) composition | c) compositional |
|------------|----------------|------------------|

4. The resilience of forests to changing fire patterns _____ on various ecological and historical factors.

- | | | |
|------------|---------------|--------------|
| a) depends | b) dependence | c) dependent |
|------------|---------------|--------------|

5. Long-term monitoring can show the effect of management actions and helps _____ evaluate the outcomes of their strategies.

- | | | |
|-----------|-------------|---------------|
| a) manage | b) managers | c) managerial |
|-----------|-------------|---------------|

6. Scientific research and regional _____ play a key role in biodiversity studies.

- | | | |
|-------------|------------------|----------------|
| a) document | b) documentation | c) documentary |
|-------------|------------------|----------------|

7. Protected areas aim to ensure the long-term _____ of biodiversity.

- | | | |
|-------------|-----------------|-----------------|
| a) conserve | b) conservation | c) conservative |
|-------------|-----------------|-----------------|

8. Management activities should _____ positive biodiversity outcomes.

- | | | |
|------------|-------------|----------------|
| a) deliver | b) delivery | c) deliverable |
|------------|-------------|----------------|

9. A biodiversity monitoring _____ is needed to track key values.

- | | | |
|----------------|-----------|-------------|
| a) systematize | b) system | c) systemic |
|----------------|-----------|-------------|

10. Managers must assess whether their site _____ as an OECM.

- | | | |
|--------------|------------------|----------------|
| a) qualifies | b) qualification | c) qualifiable |
|--------------|------------------|----------------|

11. Different parties steadfastly take some actions to limit the _____ loss of biodiversity at the global level.

- | | | |
|-------------|------------------|-----------------|
| a) consider | b) consideration | c) considerable |
|-------------|------------------|-----------------|

12. They also committed to taking responsibility at _____ levels to save lives on earth.

- | | | |
|----------------|----------------|-------------|
| a) nationalise | b) nationality | c) national |
|----------------|----------------|-------------|

13. It has motivated the scientists' societies to discover such _____ that can measure tendencies in various levels of biodiversity.

- | | | |
|-------------|---------------|---------------|
| a) indicate | b) indicators | c) indicative |
|-------------|---------------|---------------|

14. Beyond its ecological _____, biodiversity plays a crucial role in supporting human well-being.

- | | | |
|------------|-----------------|----------------|
| a) signify | b) significance | c) significant |
|------------|-----------------|----------------|

15. Biodiversity contributes to cultural and recreational _____.

- | | | |
|-------------|-----------|-------------|
| a) evaluate | b) values | c) valuable |
|-------------|-----------|-------------|

17. Fill in the gaps with the appropriate words from the list below. Use each word only once. You can also do it using the LearningApps platform at this [link](#)

limit

Earth

tendencies

regular

determine

regional

outcome

monitoring

extinction

improvement

authority

tool

approach

assess

responsibility

Biodiversity 1) _____ is the main tool to 2) _____ the state of biodiversity at a site. Long-term monitoring can show the effect of management actions and helps managers determine the 3) _____ of conservation measures. It is also an 4) _____ supporting establishing baseline information, scientific research, and 5) _____ documentation. A three-step assessment, 6) _____ requiring fulfilment of eight criteria, is available for managers to 7) _____ whether their site qualifies as an OECM. After all criteria are satisfied, the assessment is transferred to the governing 8) _____, who then reports the site through the World Database on Protected Areas.

Different parties that have participated in the Convention on Biological Diversity (CBD) in 2002, steadfastly take some actions to 9) _____ the considerable loss of biodiversity at the global level. They also committed to taking 10) _____ to save lives on 11) _____. The need for 12) _____ in biodiversity has been highlighted by this target. It has also helped and motivated the scientists' societies to discover such indicators that can measure 13) _____ in various levels of biodiversity. Two major reasons for the decline in biodiversity are the increasing population and the 14) _____ of species. However, biodiversity is continuously consumed rapidly. A promising trend in the form of slow and 15) _____ increases in

18. Complete the text by choosing the correct option (a, b, c, or d) to fill each gap.

The importance of biodiversity 1) _____ ecosystems.

Biodiversity is the fabric that weaves ecosystems together, providing stability and resilience. The ecological balance depends 2) _____ the presence of diverse species, as each organism contributes 3) _____ to the functioning of its ecosystem. Biodiversity enhances ecosystem services, including pollination, water purification, and nutrient cycling. The loss 4) _____ biodiversity can disrupt these services, exerting influence 5) _____ the health and sustainability of ecosystems.

Biodiversity and human well-being.

Beyond its ecological importance, biodiversity plays a crucial role 6) _____ supporting human well-being. Biodiverse ecosystems are vital 7) _____ food security, as a variety of species ensures resilient and productive agricultural systems. Medicinal resources, derived 8) _____ diverse plant and animal species, form the foundation of pharmaceuticals that benefit human health. Additionally, biodiversity enhances the quality of life 9) _____ communities 10) _____ the world.

Threats 11) _____ biodiversity.

Biodiversity faces an array of threats, primarily driven 12) _____ human activities. Habitat destruction combined 13) _____ pollution, climate change, overexploitation, and the introduction of invasive species might lead 14) _____ the decline of species and ecosystems. Understanding these threats is crucial 15) _____ implementing effective conservation strategies.

Borrowed and modified from:

Fisher, M. R. (Ed.). (2017). Environmental biology (Revised ed.). Open Oregon Educational Resources. <https://openoregon.pressbooks.pub/environmentalbiology/> (ISBN: 9781636350370)

1	a)	at	b)	on	c)	in	d)	out
2	a)	on	b)	in	c)	for	d)	from
3	a)	in	b)	to	c)	at	d)	for
4	a)	at	b)	out	c)	about	d)	of
5	a)	for	b)	in	c)	on	d)	by
6	a)	with	b)	in	c)	at	d)	from
7	a)	for	b)	with	c)	by	d)	at
8	a)	in	b)	from	c)	around	d)	of
9	a)	out	b)	by	c)	from	d)	for
10	a)	about	b)	from	c)	around	d)	with
11	a)	to	b)	of	c)	with	d)	by
12	a)	in	b)	at	c)	for	d)	by
13	a)	at	b)	with	c)	in	d)	for
14	a)	in	b)	by	c)	to	d)	from
15	a)	for	b)	at	c)	in	d)	out

19. Complete the sentences with the missing words. Use the definitions to help you.

The decision-making framework for biodiversity monitoring includes four phases.

Preparatory Phase. Site management activities are guided by management

1) _____ objectives, protected assets, identified threats, stakeholder demands, and land-use dynamics. This phase identifies knowledge gaps and results in a programme-specific statement of 2) _____, outlining 3) _____ monitoring questions and methodological approaches.

Conceptual Phase. This phase formulates key monitoring questions using the worksheet, structured around six core elements: purpose, target variables, spatial and 4) _____ scale, stakeholders, and resource needs. The process is 5) _____ and supports alignment with existing monitoring efforts. A key outcome is the 6) _____ of appropriate tools and methods for implementation.

Implementation Phase. This phase operationalises monitoring through field-work, 7) _____ collection protocols, and 8) _____. A 9) _____ is developed and tested through trial runs, followed by iterative refinement. Monitoring is conducted in repeated cycles.

Re-evaluation Phase. Triggered by reporting obligations or funding cycles, this phase assesses programme 10) _____, identifying transferable elements and areas for improvement. Outcomes inform decisions to continue, revise, or terminate monitoring.

Borrowed and modified from:

<https://portals.iucn.org/library/sites/library/files/documents/PATRS-007-En.pdf>

1 – a set of decisions about how to do something in the future;

2 – the reason why you do something or why something exists;

3 – something that is very important and must be dealt with before other things;

4 – relating to time;

5 – (of a process) that involves repeating a process or set of instructions again and again, each time applying it to the result of the previous stage;

6 – a choice or range of different types of something;

7 – information, especially facts or numbers, collected to be examined and considered and used to help decision-making, or information in an electronic form that can be stored and used by a computer;

8 – the activity of learning or teaching the skills and knowledge needed for a particular job or activity;

9 – a book that gives you practical instructions on how to do something or how to use something, such as a machine;

10 – the ability to be successful and produce the intended results.

PHRASAL VERBS and IDIOMS

20.1. Watch the video “*Phrasal Verbs - Expressions with ‘CALL’*” and match the phrasal verbs with CALL and their definitions. Some phrasal verbs have more than one definition.

CALL BACK CALL FOR CALL IN CALL OFF CALL OUT CALL UP	1) to phone a place in order to give or get information
	2) to order someone to join a military organization or to ask someone to join an official, especially national, team
	3) to phone someone again or to phone someone who called you earlier
	4) to need or deserve a particular action, remark, or quality
	5) to utter aloud, especially loudly
	6) to ask that something be returned
	7) to ask someone to come to help in a difficult situation
	8) to cancel or abandon
	9) to go to get someone or something
	10) to criticize somebody, especially publicly

20.2. Watch the video “*12 phrasal verbs with COME*” and match the phrasal verbs with COME and their definitions. Some phrasal verbs have more than one definition.

COME ACROSS COME ALONG COME DOWN WITH COME OFF COME OUT COME ROUND COME UP WITH	1) to accompany someone who leads the way
	2) to become conscious again after an accident or operation
	3) to happen as planned, or to succeed
	4) to produce an impression
	5) to start to suffer from an illness, especially one that is not serious
	6) to accede to a particular opinion or course of action
	7) to meet or find by accident
	8) to suggest or think of an idea or plan
	9) to make an appearance
	10) to be made public or revealed

21.1. Complete the sentences with the correct prepositions to form phrasal verbs with CALL.

back for in off out up

1	The environmental agency called _____ a team of ecologists to respond to the crisis following the industrial spill near the protected forest.
2	After the environmental impact report was submitted, the research team was called _____ by the ministry for further clarification on the biodiversity assessment.
3	Due to unforeseen flooding in the wetland reserve, the biodiversity monitoring expedition was called _____ to ensure researchers' safety.
4	When invasive species threatened the local marine ecosystem, the conservation center called _____ marine biologists to develop a containment strategy.
5	Scientists have called _____ large corporations for their role in accelerating habitat destruction and loss of biodiversity through unsustainable practices.
6	The alarming decline in pollinator populations calls _____ immediate international cooperation and conservation strategies.

21.2. Complete the sentences with the correct prepositions to form phrasal verbs with COME.

across along off out round up

1	The initiative to reintroduce native predators into the ecosystem came _____ successfully, resulting in improved ecological balance.
2	When the long-term climate impact study came _____, it highlighted the urgent threat posed to biodiversity hotspots worldwide.
3	Initially skeptical of the proposed marine reserve, the local fishing communities came _____ to the idea after evidence showed an increase in fish populations.
4	The ecological restoration project is coming _____ steadily, with signs of increased pollinator activity and native vegetation returning.
5	Researchers came _____ with a conservation strategy that integrates community-based monitoring to protect biodiversity in fragile wetland ecosystems.
6	During a biodiversity assessment, the researchers came _____ a species of orchid believed to be extinct for over two decades.



For more practice, go to Practice file 2 on pages 299–301.

22. Replace the idioms in bold with their appropriate equivalents, as in the example. Then make your own sentences with the suggested idioms. If necessary, make some changes in the sentences. Appendix 4 has a list of relevant idioms.

*The sudden decline of bee populations is a **canary in the coal mine**, warning us of deeper problems in our agricultural ecosystems and the overuse of pesticides.*

*The sudden decline of bee populations **serves as an early warning sign** of deeper problems in our agricultural ecosystems and the overuse of pesticides.*

1. Although conservation measures have helped stabilize the population of endangered turtles, the species is not **out of the woods** yet, as their nesting habitats remain under threat from coastal development.

2. The massive forest fire destroyed thousands of acres, but **every cloud has a silver lining** - it sparked renewed public support for stricter forest management and rewilding efforts.

3. Without proper maintenance and grazing regulation, the once-diverse meadow **has gone to seed**, losing many of its native pollinators and wildflowers.

4. While pollution and poaching are serious concerns, **the root of the problem** in the region is unchecked deforestation, which disrupts entire ecosystems.

5. Targeting only single flagship species may be **barking up the wrong tree**, since protecting entire ecosystems is often more effective for preserving biodiversity as a whole.

6. After decades of industrial damage, the government has decided **to turn over a new leaf** by investing in green infrastructure and restoring degraded ecosystems.

7. From coastal erosion to freshwater loss, all nations are **in the same boat** when it comes to the consequences of global biodiversity decline.

8. For years, ecologists warning about insect population collapse were **just a voice in the wilderness** - now the data confirms their concerns were valid all along.

23. Fill in the gaps with the appropriate idioms from the list below.
Use each idiom only once.

	<i>a canary in the coal mine | out of the woods | the root of the problem | barking up the wrong tree | in the same boat | turn over a new leaf | a voice in the wilderness | gone to seed</i>	
--	--	--

1	Many governments are still _____ by blaming individual farmers for ecosystem collapse instead of addressing industrial pollution and deforestation.
2	Conservationists often feel _____ when they argue for the protection of endangered species over short-term economic gain.
3	Some urban parks have completely _____, with invasive weeds replacing native plants and wildlife disappearing due to neglect.
4	Different nations facing deforestation, soil erosion, and freshwater scarcity are _____ when it comes to global environmental challenges.
5	Scientists warn that the sudden decline in bee populations could be _____ for global agriculture, signaling serious ecological imbalance.
6	After years of habitat restoration, the forest ecosystem is finally regenerating, but scientists caution that it's not yet fully _____.
7	The overuse of chemical fertilizers is _____ behind soil degradation and loss of biodiversity in many agricultural regions.
8	Despite decades of pollution and deforestation, some communities are beginning to reforest degraded land and adopt sustainable farming – proving that it's never too late to _____.

Grammar Box

24. Watch the video about *All Past Tenses in English*, and complete the rules (1–7) with the correct tense. Then, match the rules with the sentences (A–G) that represent each of them.

1.	We use _____ to describe finished actions in the past, often with time expressions.	A	The community was holding a public meeting while the engineers explained the risks of hazardous waste.
2.	_____ is used to talk about an action that was in progress at a certain moment in the past.	B	By the time the researchers presented their findings, they had collected all the necessary data.
3.	We use _____ to show that one past action happened before another past action.	C	In 2015, engineers introduced new waste management strategies.
4.	We use _____ for cause-and-effect relations in the past.	D	Environmental activists had been campaigning against illegal logging long before the government introduced stricter regulations.
5.	_____ is used when we want to highlight an activity that had already been going on for some time before another event in the past.	E	The monitoring station was recording data when a sudden blackout shut down the system.
6.	We use _____ to describe interrupted past actions.	F	The city had been struggling with poor waste collection for years before new recycling facilities were introduced.
7.	_____ can be used for ongoing processes or activities that had a certain duration before another event.	G	The laboratory floor was wet because the cooling system had leaked .

25. Complete the sentences with the options given (a, b, or c) and match them to the corresponding explanation.

1.	After reviewing the field notes, the biologist understood that the bird population _____ sharply over the past decade. a) declined b) had declined c) was declining	A	Past Perfect Continuous – an action that started in the past and continued until a certain point in the past.
2.	The ecologists _____ water pollution in the river, _____ sediment samples, and _____ the results with data from the previous decade. a) measured, collected, compared b) had measured, were collecting, compared c) were measured, had collected, compared	B	Past Continuous – an action in progress when another action occurred.
3.	The coral reefs _____ severely before any protective measures were implemented. a) were damaging b) had been damaged c) damaged	C	Past Perfect – an action that happened before another past action.
4.	By the time researchers began their fieldwork, the rainforest _____ already a significant portion of its biodiversity due to illegal logging. a) had lost b) lost c) had been lost	D	Past Simple – indicates past events in a sequence.
5.	Researchers _____ endangered animals for months before they collected enough data to map migration routes. a) tagged b) were tagging c) had been tagging	E	Past Perfect – after verbs like explained, realized, understood, etc., to emphasize that the action was completed before the moment of realization, understanding, or explanation.

6.	In 1998, rising ocean temperatures _____ the first major coral bleaching event in the region. a) had caused b) caused c) had been causing	F	Past Perfect – experience by a specific point in the past.
7.	By 1995, conservation organisations _____ enough evidence to show that habitat fragmentation had severely weakened ecosystem resilience. a) had accumulated b) accumulated c) were accumulating	G	Past Perfect Continuous – when explaining the cause of side effects in the past.
8.	While scientists _____ data on bird migration, they suddenly noticed a species thought to be extinct. a) had collected b) were collecting c) collected	H	Past Perfect Passive – an action that was done to the subject before another past action.
9.	The river delta _____ agricultural run-off for years, eventually causing eutrophication that wiped out several native fish species. a) accumulated b) were accumulating c) had been accumulating	I	Past Continuous – an action in progress at a specific moment in the past.
10.	Throughout the 1990s, invasive plant species _____ rapidly across the wetland, slowly outcompeting native flora. a) were spreading b) spread c) had been spreading	J	Past Simple – a single event that occurred at a definite time in the past.

26. Read the abstract and open the brackets, using the correct tense form of the verbs.

Past Simple	Past Continuous	Past Perfect	Past Perfect Continuous
------------------------	----------------------------	-------------------------	------------------------------------

	Energy Flow and Biodiversity in Ecosystems In the early 20th century, ecologists 1) _____ (BEGIN) to study the complexity of energy flow through ecosystems. They 2) _____ (REALIZE) that every organism played a crucial role in maintaining balance. During the 1970s, research teams 3) _____ (CONDUCT) long-term observations in tropical rainforests, while many of them simultaneously 4) _____ (MEASURE) changes in biodiversity caused by deforestation. By the time modern ecological models appeared, scientists already 5) _____ (COLLECT) vast amounts of data about food chains and energy pyramids. They 6) _____ (DISCOVER) that ecosystems with high biodiversity were more resilient to external disturbances. In some regions, local communities 7) _____ (DEPEND) heavily on forest resources for centuries, while conservation experts 8) _____ (TRY) to introduce sustainable practices long before governments 9) _____ (IMPLEMENT) protective laws. At the same time, industrial pollution 10) _____ (AFFECT) rivers and wetlands, and many species 11) _____ (BECOME) endangered as a result. In fact, some species 12) _____ (DISAPPEAR) completely before scientists even 13) _____ (IDENTIFY) them. By the late 1990s, international organizations 14) _____ (HAVE) enough evidence to prove that energy flow disruptions and biodiversity loss 15) _____ (BE) interconnected processes that demanded urgent global action.	

LISTENING

27. Before watching the video, check if you know the meaning of the following words and phrases. Use the [dictionary](#) if necessary.



28. Watch the video “**BIODIVERSITY & calculating INDEX of DIVERSITY. Human impact and definitions for A-Level Biology**” and put the sentences in the correct order. Fill in the table with your answers.

	statements	No
A	A drop in biodiversity, especially where it was previously high, is a cause for concern.	
B	So capital N in the Simpson’s index is the total number of organisms of all the species present.	
C	Monocultures result in low species diversity by growing only one plant species.	
D	Measuring biodiversity helps us track changes in ecosystems over time.	
E	The diversity index includes not just species number but also how many individuals belong to each species.	
F	There are three types: species diversity, genetic diversity, and ecosystem diversity.	
G	Farming practices are a major human activity that reduces biodiversity.	
H	A higher index of diversity value means greater biodiversity.	
I	AQA A-Level Biology focuses mainly on species diversity.	
J	Destroying hedgerows removes important habitats for insects, birds, and mammals.	
K	Crop rotation and keeping some hedgerows are examples of such compromises.	
L	Species richness refers to the number of different species in a particular area at a particular time.	

29. Watch the video again and complete the following sentences with missing information.

1	Species diversity is the number of different species and _____ within each species in a community.
2	Genetic diversity is the variety of _____ amongst all the individuals in a population of just one species.
3	Ecosystem diversity could be a _____ on a small scale, or it could be considered the entire Earth.
4	AQA A-Level Biology only focuses on species diversity and, in particular, species _____.
5	In those ecosystems, you wouldn't be surprised that there was a low biodiversity because the _____ factors are so harsh.
6	If animals are left to overgraze, they're _____ the plants too much is a knock-on effect on the food web.
7	It might be that ponds are filled in or wetlands are _____ to provide space for farming.
8	Simpson's index of diversity _____ both the number of species and how many individuals are in each species.
9	In the Simpson's formula, lowercase n represents the _____ size of one species.
10	The value of the index of diversity usually _____ between one and ten, typically between three and six.
11	Selective breeding, now this is when plants or could be animals that are displaying _____ characteristics are constantly selected to reproduce.
12	Instead of destroying the _____, there might be an agreement that you can remove two but not all of them.

SPEAKING

30. *You are an environmental science student presenting at the international students' conference on ecosystems and biodiversity. Choose one of the ecosystems illustrated in the images below for your presentation at the conference (terrestrial: rainforest, desert, aquatic: marine (coral reef) and freshwater (river), or other ones, for instance, an artificial ecosystem). Briefly describe the ecosystem you chose to present. Your presentation may include such information:*

- *What kind of ecosystem is it, and where is it typically found?*
- *What makes this ecosystem unique or important for biodiversity?*
- *What are some plants, animals, or organisms that live there?*
- *What are the main threats to this ecosystem (e.g., pollution, deforestation, climate change)?*

➤ *What actions can be taken to protect or restore this ecosystem?*

Presentation requirements:

- 1. Time limit:** 2–3 minutes per presentation.
- 2. Visuals:** slides or pictures with keywords / bullet points, not full sentences.
- 3. Structure:** introduction – main part – conclusion.
- 4. Speak in your own words; do not read.**



Images borrowed from:
<https://unsplash.com/photos/green-plants-and-trees-near-water-falls-VDPFEyIrAn0>

Useful phrases:

- *This is a picture of a*
- *This ecosystem is located in*
- *It looks / seems*
- *We can see / find different species of*
- *It supports species like*
- *One main feature of this ecosystem is*
- *In my opinion, this ecosystem is important because*

31. You are an environmental expert invited to speak at the Global Ecosystem Protection Forum. Choose one of the questions below related to the ecosystem you are an expert in, and explain what would happen if that ecosystem were threatened or disappeared. Use the vocabulary provided in the box below.

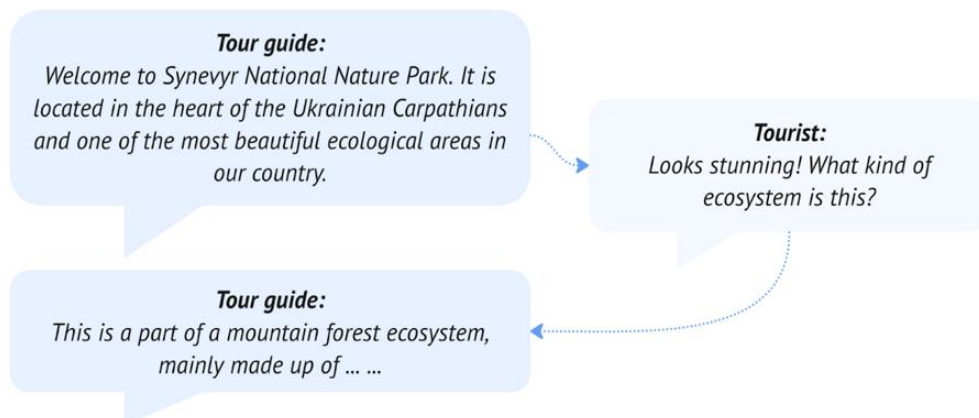
- 1. What if rainforests disappeared?**
- 2. What if bees became extinct?**
- 3. What if acidification of the ocean doubled every year?**
- 4. What if people stopped protecting endangered species?**
- 5. What if we lost all freshwater rivers and lakes?**
- 6. What if frogs became extinct?**
- 7. What if the sea level rose by 3 meters?**

food chain	habitat	vegetation	pollinators	migration
adaptation	predator	prey	deforestation	habitat loss
ecosystem degradation	carbon footprint	eco-friendly	ecological balance	environmental engineering

32. Work in pairs. Student A is a tour guide offering eco-tours for tourists and climate activists who would like to explore Ukraine's natural biodiversity and ecosystems, national nature parks, and nature reserves. Student B is a climate activist visiting Ukraine to explore protected natural areas and learn how you can contribute to conservation and biodiversity protection. Student A chooses one of the nature reserves or national natural parks of Ukraine (Shatsky National Nature Park, Carpathian Biosphere Reserve, Black Sea Biosphere Reserve, Podilski Tovtry National Nature Park, Ukrainian Steppe Nature Reserve, etc.) he / she describe the ecosystem, species, any endangered animals, activities to do there, rules, and provide useful advice. Student B should ask at least three questions related to the location, the best time to visit, park rules, available activities, and other relevant topics.

Example questions may include:

- Are there any opportunities for volunteers to participate in conservation or eco-initiatives?
- What environmental challenges does the area face, and how are they being addressed?
- Does the park's management involve any local communities in decision-making or operations?
- Is the park a part of any international environmental programs or UNESCO networks?
- How do you educate visitors about climate change and biodiversity loss?



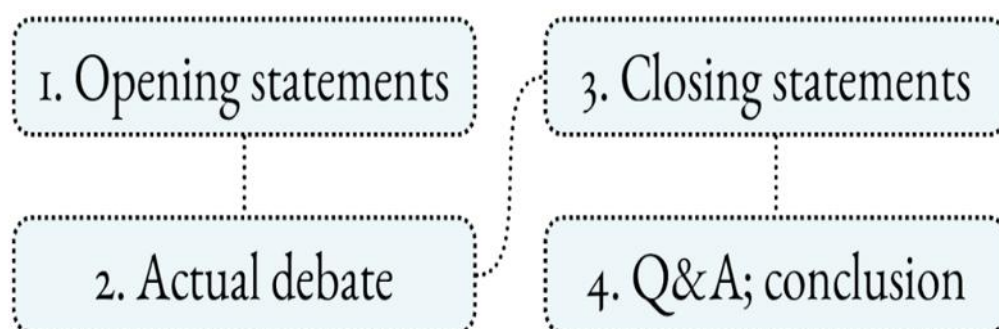
Useful phrases:

- Let me introduce one of the unique natural areas
- The area / location is known for its
- This ecosystem consists of / is made up of
- This area is home / habitat for
- One of the most common species here is
- You might even spot a
- Be sure to / Please stay on trails

33. You represent your university in the Global Student Forum on sustainability and environmental responsibility. Work in groups. Participate in debates on whether individuals should change their lifestyles and everyday habits, and make more sustainable choices to protect biodiversity and ecosystems. Group A's role is to argue for the individual changes. Group B's role is to advocate against the individual changes, focusing on the large-scale changes and the role of governments. Group C introduces the topic, outlines the procedure of the debate, facilitates and encourages fair discussion, ensures equality, and summarises the outcomes. Each group prepares an opening statement, arguments, examples, and visuals to support the arguments, and closing statements.

Useful expressions for debating:

- *To start with / I would like to begin by addressing*
- *One key point to consider is*
- *My first / second / next argument is*
- *An argument for / in favour of / against*
- *There are many examples for / Let me illustrate with an example*
- *I'm afraid I can't quite agree with / It's worth considering the opposing view, which argues that*
- *To sum up, here are the main points / In conclusion, we have presented ...*



1. Opening statements.

Group A presents the arguments for the individual lifestyle changes (e.g., eating less meat, recycling, reducing waste, etc.) to save biodiversity and ecosystems.

Group B introduces the arguments in favour of changes made by governments and reforms as being more effective than individual changes.

Group C acts as moderator, introduces the topic, establishes the rules and conditions for fair and well-organized openings, ensures that both groups have equal opportunities, and moves the debate to the next stage.

2. Actual debate.

Group A provides strong arguments highlighting the advantages of individual lifestyle changes for protecting biodiversity and ecosystems. The group includes examples of sustainable choices and supports their arguments with statistics, real-life cases of how individual actions can be beneficial and lead to positive changes.

Group B presents persuasive arguments that changes driven by policy-makers are more effective than individual changes. The group may refer to the role of government and the global scale of the problem, and support their points with real-life examples of successful initiatives.

Group C monitors the progression of the debate, maintains order, manages time, and facilitates fair and respectful interactions between the debating teams.

3. Closing statements.

Group A summarizes the main points and reinstates the arguments supporting the need for individual lifestyle changes.

Group B summarizes the key points and reinforces the idea of systematic changes.

Group C moderates and assists in summarizing important points from both groups, closes the debates, and leads to the Q&A session.

WRITING

34. *You are an environmental activist concerned with a local ecological problem (e.g., biodiversity loss, pollution / destruction of a local ecosystem or nature reserve, etc.) Write an email (160–180 words) to a local official, raising awareness on the issue and asking for support to reduce or solve it.*

Maintain the structure:

- 1) subject, indicating the purpose of your email;*
- 2) greeting;*
- 3) opening and body, introducing the context of the email, explaining a problem, its importance, and how it impacts local ecosystems and biodiversity; suggesting a realistic solution(s);*
- 4) closing, wrapping up an email, and asking for support and cooperation;*
- 5) signature, including sender name and / or other relevant information, such as contact details.*

Pay attention to clarity, coherence, and accuracy in your writing. Use the phrases listed below.

***See Appendix 5 for a writing model.**

Useful phrases:

- *Dear [Name] / To whom it may concern*
- *My name is*
- *I am contacting you to bring your attention to*
- *This problem has a serious impact on*
- *I would like to suggest*
- *I kindly ask for your support in*
- *Best / Kind regards,*

35. You are a member of a local conversation group protecting endangered species in your area. You are currently working on creating a guide for volunteers on how to monitor biodiversity. Write a step-by-step guide (150-170 words) explaining how biodiversity monitoring can be used to conserve a local endangered species. Pay attention to clarity, coherence, and accuracy in your writing. Ensure your guide is clear and concise. Use phrases and keywords in the box below.

***See Appendix 5 for a writing model.**

biodiversity monitoring	endangered species	habitat	natural environment	long-term observation
data collection	species population	reporting process	deforestation	poaching
indicator species	protected area	assessment criteria	site-level conservation	monitoring system

SELF-ASSESSMENT

36. *Explore the target vocabulary related to the topic “Ecosystems. Biodiversity.” Using **flashcards** and then assessing comprehension through a **Quizlet quiz**.*

37. *Check yourself and do the quiz.*

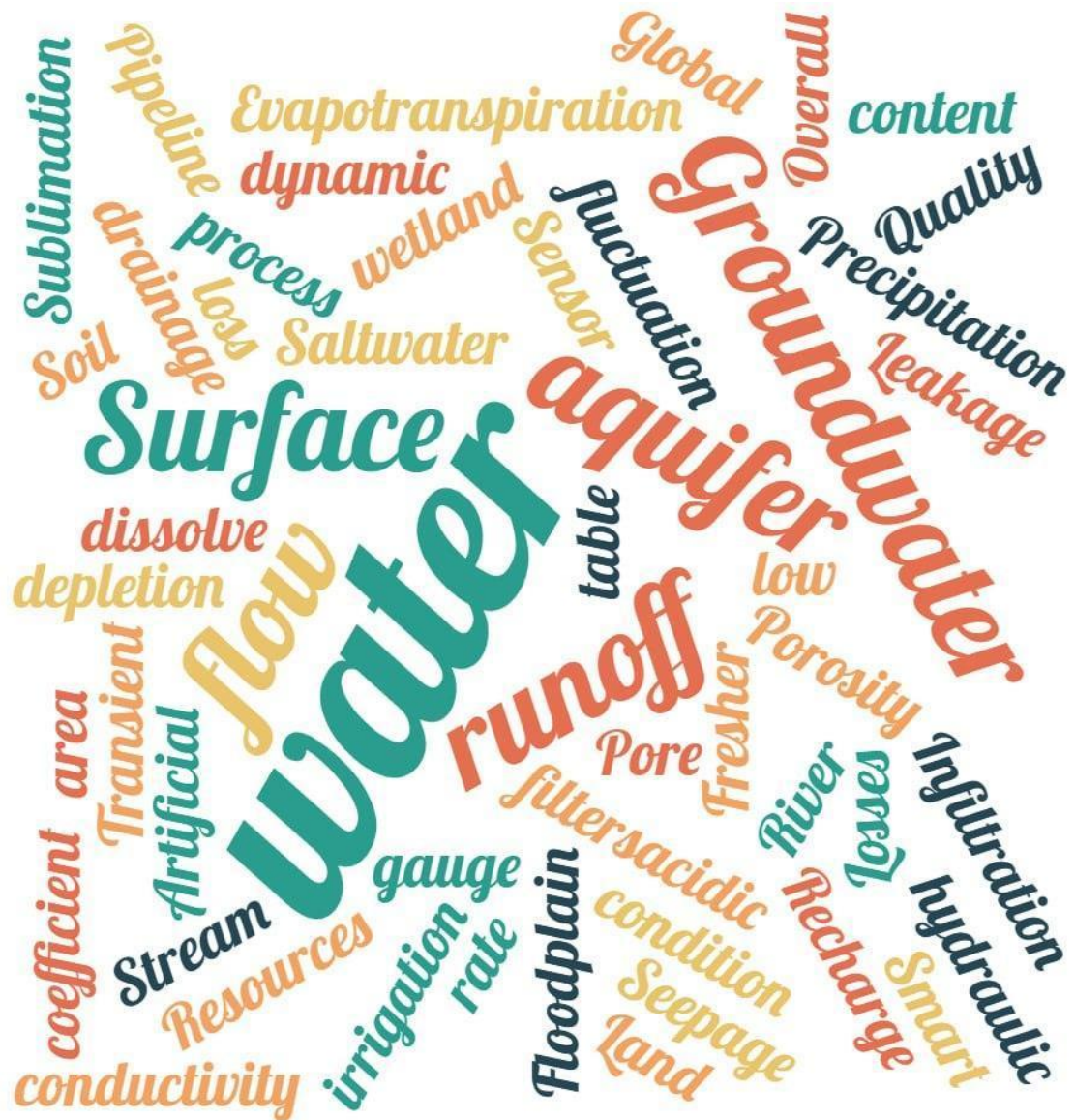
1. Which of the options below is not a type of ecosystem?
 - A. *industrial*
 - B. *terrestrial*
 - C. *marine*
 - D. *desert*
2. Which of the following terms relates to things in the environment that are not living?
 - A. *abiotic*
 - B. *antibiotic*
 - C. *individual*
 - D. *habitat*
3. Which word below best matches the definition “a region of the Earth’s surface and the particular combination of weather conditions, plants, and animals that are found in it”?
 - A. *biodiversity*
 - B. *ecosystem*
 - C. *biomass*
 - D. *biome*
4. Which of the following refers to the number and types of plants and animals that exist in a particular area or the world generally, or the problem of protecting them?
 - A. *biodiversity*
 - B. *ecosystem*
 - C. *biomass*
 - D. *biome*

5. Which of the following is the best definition of “food web”?
- A. *the series of changes that a living thing goes through from the beginning of its life until death*
 - B. *the length of time that something lasts or can be used*
 - C. *to get or obtain energy*
 - D. *the relationship between all the living things in a particular area, when thinking about how they eat each other*
6. Which of the following is not a synonym of “abundance”?
- A. *plenitude*
 - B. *loads*
 - C. *plenty*
 - D. *shortage*
7. Which word best matches the definition “the process by which the mix of species and habitat in an area changes over time.”?
- A. *succession*
 - B. *disturbance*
 - C. *variation*
 - D. *distribution*
8. Which word has a similar meaning to “conservation”?
- A. *distribution*
 - B. *protection*
 - C. *succession*
 - D. *abundance*
9. Which of the following is not a level of biodiversity?
- A. *population density*
 - B. *genetic diversity*
 - C. *species diversity*
 - D. *ecosystem diversity*
10. Which of the following is a human-induced factor of climate change?
- A. *deforestation*
 - B. *habitat fragmentation*
 - C. *options A and B*
 - D. *volcanic eruptions*

Check yourself, Appendix 8. Self-Assessment Keys.

Unit 3

Water Resources and Their Characteristics. Water Pollution and Treatment Strategies.



LEAD-IN

1. Match each word (1–7) related to the Water Cycle and Fresh Water Supply to its corresponding description (A–G). Discuss your matches with your partner or group members, explaining the importance of each component of the system. Then, reflect on how these processes are interconnected and why managing freshwater resources is vital for human health, agriculture, and ecosystems.

1	<i>Reservoir</i>	A	The process by which water vapor in the air cools down and changes into liquid droplets, usually forming clouds. This is a key stage before rain or snow occurs.
2	<i>Precipitation</i>	B	The process where water turns from a liquid to a gas (vapor) due to heat, especially from the sun. It often happens from surfaces like oceans, lakes, or even soil.
3	<i>Evaporation</i>	C	The movement of water from the surface into the soil and rock layers below. It helps recharge groundwater supplies and is essential for maintaining aquifers.
4	<i>Groundwater</i>	D	An underground layer of porous rock, gravel, or sand that can store and transmit groundwater. These are tapped through wells to provide fresh water.
5	<i>Aquifer</i>	E	Any form of water (like rain, snow, sleet, or hail) that falls from the sky to the ground, usually as a result of condensation in the atmosphere.
6	<i>Condensation</i>	F	Water that is located beneath the Earth's surface, in the spaces between soil, sand, and rocks. It can feed wells, springs, and support agriculture in dry regions.
7	<i>Infiltration</i>	G	A large natural or artificial storage area for water, such as a lake or man-made dam, used to collect and distribute water for different purposes (e.g., drinking, irrigation, electricity).

2. Study the structure of the water use cycle. Then watch the [video](#) on water and wastewater management and answer the following questions.

1. What are the primary sources of fresh water for the North Saskatchewan River?
2. What is done to water during the treatment process?
3. How many tests do EPCOR specialists conduct a year?
4. How much time does water treatment take?
5. Where is freshwater used?
6. What is done to wastewater to ensure it is ready to return to the water cycle?
7. Why is it important that the water we return is safe for us and the environment?



Image taken from:
<https://pw-cdn.watercorporation.com.au/-/media/images/our-water/wastewater/advanced-wastewater-treatment-process.jpg>

3. Discuss the following quotations in pairs. Choose the one(s) you agree with and justify your responses with examples or experiences.

Use the phrases:

- *It's a complicated / difficult issue, but ...*
- *My (point of) view (on this) is ...*
- *Obviously, ...*
- *Some people may disagree with me, but ...*
- *This is just my opinion, but ...*
- *Without a doubt, ...*
- *You probably won't agree, but ...*

1. "Only by working within the laws that govern the flow of water will happiness be achieved."

Lao-Tse, cited by the OAEC Water Institute in "Water Quotes."

2. "We forget that the water cycle and the life cycle are one."

Jacques Cousteau, cited in OAEC Water Quotes

3. "Of all our planet's activities ... no force is greater than the hydrologic cycle."

Richard Bangs & Christian Kallen,

from the Water Quotations collection on Rivers.gov

4. "Water is the most critical resource issue of our lifetime and our children's lifetime. The health of our waters is the principal measure of how we live on the land."

Luna Leopold, from Water Quotations on Rivers.gov

5. "The trouble with water – and there is trouble with water – is that they're not making any more of it."

Marq de Villiers, from Better World Quotes (Water)

6. "Rain is a blessing when it falls gently on parched fields, turning the earth green, causing the birds to sing."

Donald Worster, cited in Better World Quotes (Water)

7. "The hydrological cycle is the lifeblood of many of the organisms ... it is, in many ways, the engine of the climate system."

*from Global Change and the Earth System,
A Planet Under Pressure (W. Steffen et al.)*

READING

4. Read the text below. Match choices (A–H) to (1–5). There are three choices you do not need to use.

- A.** Surface Water and Groundwater Resources
- B.** Importance of Water
- C.** Atmosphere Holds Most Freshwater
- D.** Water is Only Used for Electricity
- E.** Energy Transfers and Salinity in the Water Cycle
- F.** Climate and Geography Don't Affect Water
- G.** Precipitation as the Main Source of Freshwater
- H.** Water Reservoirs and the Hydrologic Cycle

The Water Cycle and Fresh Water Supply

1. _____. Water, though **fluid**, is the “backbone” of everything alive. This is because clean, safe, and adequate freshwater is **vital to the survival** of all living organisms and the smooth functioning of ecosystems, communities, and economies. Water is utilized in **diverse ways**, among which are: public (domestic) water supply, industrial water supply, agricultural water supply, fresh and **marine water fisheries**, recreational and other **aesthetic enjoyments**, and water transportation.

2. _____. Water is the only **common substance** that occurs naturally on Earth in three forms: solid, liquid, and gas. It is distributed in various locations, called **water reservoirs**. The oceans are the largest reservoirs, with about 97 % of all water, but that water is too saline for most human uses.

The water (or hydrologic) cycle shows the movement of water through different reservoirs, including oceans, the atmosphere, glaciers, groundwater, lakes, rivers, and the biosphere. Water moves between reservoirs via processes like **evaporation, transpiration, condensation, precipitation, sublimation, infiltration**, surface runoff, and **subsurface flow**, going through phases: liquid, solid (ice), and **vapor**.

3. _____. The water cycle is driven by energy exchanges as heat transfers between phases. Heat is absorbed during evaporation (latent heat of vaporization) and released during condensation or melting. Globally, water transfers heat from the tropics to the poles via ocean circulation.

Salinity varies across reservoirs. Ocean water has about 35,000 mg of dissolved ions per liter. Evaporation produces nearly pure water, leaving salts behind. Rainwater **dissolves minerals** from rocks and soil, increasing salinity.

4. _____. Precipitation is the primary source of freshwater, but it is unevenly distributed. High rainfall occurs near the equator, while descending warm air around 30° north and **south latitude** creates deserts. These patterns are influenced by **wind circulation**, continental size, ocean currents, and mountains.

5. _____. Surface water originates from runoff and groundwater seepage. Rivers receive water from rainfall and snowmelt; discharge varies with precipitation, **vegetation, topography**, land use, and soil. **Drainage basins** are geographic areas drained by rivers and their **tributaries**.

Lakes also store freshwater and are replenished by runoff and groundwater. They form through glaciation, tectonics, or volcanic activity. Artificial lakes or reservoirs are created by damming rivers. Glaciers are the largest freshwater reservoirs. They release water through melting, contributing to rivers and sea-level changes. Climate warming accelerates glacial melting and sea-level rise.

Groundwater contains over 30 times the volume of all rivers and lakes combined, supplying 98 % of rural U.S. households. It is stored in pores and fractures of subsurface materials and originates from precipitation infiltrating into the saturated zone.

*Borrowed and modified from
Harris, E. P. (2023). Introduction to Environmental Sciences and Sustainability.
University of West Florida Pressbooks.*

Follow-up

5. Explain the words / phrases in bold from the text, and make up sentences with these words. Use the [dictionary](#) if necessary.

6. Read the text again and answer the following questions, choosing the best option.

1. Which is NOT mentioned about water in the first paragraph?

- a)** It can be used for pleasure.
- b)** It is used by all people.
- c)** It occurs in all forms of water.

2. What does “saline water” mean?

- a)** Fresh water.
- b)** Salty water.
- c)** Cold water.

3. Why is water special among other substances?

- a)** It is mainly found in oceans.
- b)** It moves through different reservoirs.
- c)** It occurs in three forms.

4. How does water behave over time?

- a)** It's never constant and always moves.
- b)** It depends on many factors.
- c)** It remains constant.

5. Which process turns water vapor into liquid water?

- a)** Condensation.
- b)** Evaporation.
- c)** Precipitation.

6. After which process does water have very few ions?

- a)** Condensation.
- b)** Evaporation.
- c)** Precipitation.

7. How is freshwater distributed through precipitation?

- a)** There is more rain near the equator.
- b)** There is more rain around 30° north and south latitude.
- c)** There is more rain in the Middle East.

8. Where is most of the Earth's water stored?

- a)** It is stored in the oceans, holding about 97 % of all water.
- b)** It is stored in glaciers.
- c)** It is stored in underground aquifers.

9. How does water move in the cycle?

- a)** Only as rain and rivers.
- b)** Through evaporation, condensation, precipitation, and runoff.
- c)** Only by melting and freezing in glaciers.

10. Do we use glaciers as a freshwater source?

- a)** No, they are not big enough.
- b)** Yes, but they are not always convenient.
- c)** Yes, glaciers provide freshwater, but not always conveniently.

11. Which freshwater source is the biggest?

- a)** Rivers.
- b)** Lakes.
- c)** Groundwater.

12. What do wetlands do?

- a)** They help recharge groundwater.
- b)** They prevent water from infiltration.
- c)** They prevent water from evaporation.

USE of ENGLISH

7. Using the information from the text (Ex. 4), match items (1–15) with (A–O) to form phrases. After that, choose any three of the completed phrases and use them in your own sentences.

1.	vital to the survival of	A	frequent rainstorms
2.	due to a variety of physical and	B	runoff and groundwater
3.	plays a key role in	C	of freshwater on Earth
4.	governed by global wind	D	movement of water
5.	lose moisture through	E	and sea-level changes
6.	involves the continuous	F	by groundwater input
7.	fill with sediments	G	the water cycle
8.	replenished by both surface	H	through different reservoirs
9.	remains fairly constant	I	chemical processes
10.	represent the largest reservoir	J	transfers between different phases
11.	normal flow is typically sustained	K	all living organisms
12.	the largest accessible	L	transported by rivers
13.	contributing to both river flow	M	over time
14.	shows the movement of water	N	circulation cells
15.	exchanges in the form of heat	O	freshwater source

8. Fill in the table with the words derived from the given ones.

	Noun	Verb	Adjective
1	.....	supply	.....
2	.....	.....	vital
3	precipitation	.....	.....
4	.....	infiltrate	.....
5	.....	.....	safe
6	evaporation	.....	.....
7	.....	represent	.....
8	.....	.....	recreational
9	condensation	.....	.....
10	.....	originate	.....
11	.....	.....	accessible
12	vaporization	.....	.....
13	.....	store	.....
14	.....	.....	global
15	movement	.....	.....

9. Match the words in column A with the words in column B to form meaningful phrases. You can also do it using the LearningApps platform at this [link](#).

Column A		Column B	
1.	water	A	evaporation
2.	common	B	characteristics
3.	freshwater	C	heat
4.	geographic	D	rainfall
5.	tectonic	E	source
6.	volcanic	F	cycle
7.	artificial	G	activity
8.	groundwater	H	ice
9.	soil	I	transportation
10.	heavy	J	input
11.	biogeochemical	K	inaccessibility
12.	latent	L	lakes
13.	solid	M	conditions
14.	dry	N	substance
15.	global	O	uplift

10. Fill in the words from the list below. Use each word only once.

ecosystems, cycle, water, result, movement, source, climate, wind, supply, desert, heat, materials, vapor, rivers, levels

- 1.** industrial _____ supply;
- 2.** the primary _____ of freshwater;
- 3.** the latent _____ of vaporization;
- 4.** to retain water _____;
- 5.** agricultural water _____;
- 6.** continuous _____ of water;
- 7.** smooth functioning of _____;
- 8.** _____ in temperature changes;
- 9.** global _____ circulation cells;
- 10.** subsurface earth _____;
- 11.** created by damming _____;
- 12.** high _____ of rainfall;
- 13.** creating _____ regions;
- 14.** shrink due to _____ change;
- 15.** essential components of the water _____.

11. Match the words with similar meanings. You can also do it using the LearningApps platform at this [link](#).

1.	transportation	A	breakage
2.	reservoir	B	stream
3.	cycle	C	amount
4.	substance	D	condensation
5.	surface	E	material
6.	volume	F	fluctuation
7.	space	G	vehicle
8.	fracture	H	capacity
9.	precipitation	I	waterway
10.	flow	J	basin
11.	location	K	outside
12.	movement	L	downpour
13.	flux	M	order
14.	channel	N	motion
15.	rainfall	O	position

12. Write the opposites of the following words. Use the [dictionary](#) if necessary.

1	supply	
2	adequate	
3	depend	
4	vital	
5	infiltrate	
6	recreational	
7	represent	
8	accessible	
9	originate	
10	global	
11	store	
12	artificial	
13	evaporate	
14	latent	
15	facilitate	

13. Match the key terms on the topic “Water Resources and Their Characteristics. Water Pollution and Treatment Strategies” with their definitions.

	<i>freshwater, groundwater, glacier, climate, vapor, seepage, runoff, rainfall, evaporation, liquid, vaporisation, condensation, precipitation, water cycle, reservoir</i>	
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1. The way that water is taken up from the sea, rivers, soil, etc., and then comes back down as rain or snow.
2. Water that falls from the clouds towards the ground, especially as rain or snow.
3. The process of a liquid changing to a gas, especially by heating.
4. The general weather conditions are usually found in a particular place.
5. Relating to, living in, or consisting of water that does not contain salt.
6. A place for storing liquid, especially a natural or artificial lake providing water for a city or other area.
7. A process in which a liquid flows slowly out of a hole or through something.
8. Water that collects below the surface of the earth.
9. A substance, such as water, that is not solid or a gas, and that can be poured easily.
10. Water from rain or melting snow, or liquid from an industrial or farming process, that flows into a place such as a river.
11. A large mass of ice that moves slowly over land, esp. down the side of a mountain, often moving rocks with it and changing the shape of the land.
12. Rain, or the amount of rain that falls.
13. The process by which water vapor in the atmosphere (= air surrounding the earth) cools and changes into liquid water.
14. The process of turning, or causing something to turn, from a solid or liquid state into a gas.
15. Gas or extremely small drops of liquid that result from the heating of a liquid or solid.

Borrowed and modified from:
<https://dictionary.cambridge.org/dictionary/english/>

14. Match the first part of the sentence (1–12) with the second one (a–l).

1. On a global scale, water plays a critical role in transferring heat from the ...
 2. Bioremediation entails the introduction of microorganisms or bacteria ...
 3. A number of novel chemical processes, including chlorination and ozonation, have been devised to eliminate particular contaminants ...
 4. Anaerobic processes employ potent oxidizing agents, including ...
 5. In the realm of clean-up technologies, the development of ...
 6. The distinctive characteristics of nanomaterials, including carbon nanotubes and nanoparticles, render them ...
 7. Including pharmaceuticals, pesticides, and dyes, the technique is ...
 8. In chemical treatment, pollutants are neutralized, or their removal is ...
 9. Biological treatment methods have experienced a surge in popularity in ...
 10. Strict filtration systems have evolved to the point where even the most ...
 11. The nanomaterials are suitable for water treatment applications due to ...
 12. The technique exhibits notable efficacy when applied to water sources ...
- a) ... exceptionally efficient at purifying water of contaminants.
 - b) ... that are compromised by elevated concentrations of pollutants or heavy metals.
 - c) ... tropics to the poles via ocean circulation.
 - d) ... exceptionally efficient at eliminating a vast array of contaminants.
 - e) ... their large surface area and ability to absorb or catalyze pollutants.
 - f) ... facilitated through the addition of particular chemicals to water.
 - g) ... into polluted water with the purpose of decomposing contaminants and reinstating water quality.
 - h) ... chemical remediation methods are an additional significant development.
 - i) ... and guarantee that the water satisfies safety requirements.
 - j) ... recent years as a sustainable method for removing water pollution.
 - k) ... minute particles can be eliminated, thereby guaranteeing potable water.
 - l) ... hydrogen peroxide or ozone, to decompose contaminants into innocuous metabolites.

15. Choose the most appropriate word to complete the extract. You can also do it using the LearningApps platform at this [link](#).

Understanding Water Pollution and Modern Cleanup Solutions

Water is regarded as polluted if it contains **1)** _____ or conditions that **2)** _____ it from being used for a certain purpose. Water **3)** _____ is defined as the presence of excessive concentrations of a danger (pollutants) in **4)** _____ to the point where it is no longer appropriate for bathing, cooking, drinking, or other purposes. The introduction of contaminants into the **5)** _____ is referred to as pollution. Industrialised and marketable **6)** _____, farming activities, everyday human activities, and, most crucially, carrying modes all contribute to it.

The development of more effective **7)** _____ technologies has been instrumental in mitigating this issue throughout time. **8)** _____ is one of the most extensively implemented technologies for remediating water pollution. Filtration systems utilise a **9)** _____ material or membrane to eliminate contaminants and impurities from water.

This **10)** _____ has become increasingly sophisticated and effective over time, enabling the **11)** _____ of heavy metals, chemicals, microorganisms, and a vast array of other pollutants.

Borrowed and modified from:

Khan, W. A., Ali, S., & Shah, S. (2022). Water pollution: Sources and its impact on human health, control and managing. Journal of International Cooperation and Development, 5, 69.

<https://doi.org/10.36941/jicd-2022-0005>

1	a)	waste	b)	substances	c)	material
2	a)	prevent	b)	use	c)	avoid
3	a)	pollution	b)	waste	c)	evaporation
4	a)	soil	b)	air	c)	water
5	a)	environment	b)	nature	c)	atmosphere
6	a)	garbage	b)	things	c)	litter
7	a)	modern	b)	IT	c)	clean-up
8	a)	condensation	b)	filtration	c)	evaporation
9	a)	solid	b)	liquid	c)	porous
10	a)	technology	b)	method	c)	technique
11	a)	purification	b)	creation	c)	elimination

16. Choose the correct option. You can also do it using the LearningApps platform at this [link](#).

1. The _____ is a distillation process that produces nearly pure water with almost no dissolved ions.

- a) evaporate b) evaporation c) evaporative

2. A key geological structure for groundwater _____ is an aquifer.

- a) store b) storage c) storable

3. Water vaporises and leaves the dissolved ions in the _____ liquid phase.

- a) originate b) origin c) original

4. Nanotechnology is an _____ dynamic domain that has brought about a paradigm shift in water pollution remediation technologies.

- a) add b) addition c) additional

5. Drainage basins or watersheds are _____ areas drained by rivers and their tributaries.

- a) geographize b) geography c) geographic

6. In recent years, advanced oxidation processes have surfaced as an _____ technology for remediating water pollution.

- a) innovate b) innovation c) innovative

7. The aquifers are accessed through wells for agricultural, _____, and domestic purposes.

- a) industrialize b) industry c) industrial

8. Demand predictions allow efficient _____ of water demand.

- a) manage b) management c) manageable

9. An aquifer, a porous and permeable rock unit that holds _____ water volumes.

- a) signify b) significance c) significant

10. Optimum timing and supply of water and fertilizers are required for the efficient _____ of crops.

- a) grow b) growth c) growthful

11. Transient pressure analysis using wavelets is performed for the _____ of burst events.

- a) detect b) detection c) detectable

12. Ongoing climate warming is expected to _____ glacial melting and sea-level rise.

- a) accelerate b) acceleration c) accelerative

13. Common aquifers _____ sand, gravel, uncemented sandstone, and fractured rock.

- a) include b) inclusion c) inclusive

14. By adopting smart _____, water consumption can be reduced.

- a) irrigate b) irrigation c) irrigational

15. An important part of the water cycle is how water varies in salinity, which is the _____ of dissolved ions in water.

- a) abound b) abundance c) abundant

17. Fill in the blanks with the appropriate words from the list below. Use each word only once. You can also do it using the LearningApps platform at this [link](#)

concern

pathogenetic

fauna

sediment

wastewater

toxic

water

health

surface

bacteria

loads

pollution

radioactive

concern

eutrophication

Types of Water Pollution

Contamination of 1) _____ resources comes in the form of chemical, biological, and physical 2) _____. Chemical pollution includes things such as 3) _____ metals, organic compounds, acidic waters from mining activities and industry, pharmaceuticals, and many other 4) _____ compounds from industries, and 5) _____ treatment plants. Another form of chemical pollution is 6) _____ waste, which has a significant potential to cause harm to living things. Physical pollution includes 7) _____ pollution, trash thrown in the water bodies, thermal pollution and other suspended 8) _____. Temperature typically affects the metabolism of aquatic 9) _____ in a negative way and can encourage 10) _____. Biological pollution usually refers to pathogenic 11) _____, viruses, and parasitic protozoa. Common 12) _____ microbes introduced into natural water bodies are pathogens from untreated sewage or 13) _____ runoff from intensive livestock grazing.

Water pollution is a pervasive global 14) _____ that presents a substantial peril to both human and environmental 15) _____.

*Borrowed and modified from:
Khan, W. A., Ali, S., & Shah, S. (2022). Water pollution: Sources and its impact on human health, control and managing. Journal of International Cooperation and Development, 5, 69.
<https://doi.org/10.36941/jicd-2022-0005>*

18. Complete the text by choosing the correct option (a, b, c, or d) to fill each gap.

Smart Water Systems for the Water Distribution System

Leakages are the main sources 1) _____ NRW (Non-Revenue Water) losses, which highly depend 2) _____ pressure and water consumption, and increase water contamination. Acoustic sensors are old and commonly used methods 3) _____ leakage detection in WDS (Water Distribution System). Ground-penetrating radar, infrared thermography, and electromagnetic sensors are other developed techniques available 4) _____ leakage detection. These techniques suffer 5) _____ a limited surveying range 6) _____ leakage detection. With recent advances 7) _____ science and technology, researchers are coming 8) _____ with SWT (Smart water technology), having the capability to automatically detect and locate the burst event.

Sensor technology provides real-time monitoring 9) _____ water infrastructures. Measured data taken 10) _____ these sensors, when combined 11) _____ efficient data processing techniques, enable better management and response 12) _____ case 13) _____ infrastructure failure. In the UK, a decision support system (DSS) is installed to improve the operations 14) _____ the water supply system, 15) _____ the Neptune Project Research Consortium.

Borrowed and modified from:

https://www.researchgate.net/publication/346335079_Smart_Water_Technology_for_Efficient_Water_Resource_Management_A_Review

1	a)	off	b)	of	c)	for	d)	from
2	a)	on	b)	in	c)	at	d)	upon
3	a)	for	b)	of	c)	on	d)	at
4	a)	from	b)	up	c)	for	d)	with
5	a)	with	b)	from	c)	off	d)	of
6	a)	of	b)	with	c)	under	d)	for
7	a)	up	b)	in	c)	on	d)	at
8	a)	for	b)	under	c)	up	d)	with
9	a)	of	b)	on	c)	at	d)	for
10	a)	in	b)	off	c)	of	d)	from
11	a)	on	b)	for	c)	with	d)	at
12	a)	at	b)	on	c)	under	d)	in
13	a)	of	b)	at	c)	in	d)	from
14	a)	from	b)	of	c)	for	d)	at
15	a)	with	b)	in	c)	on	d)	under

19. Complete the sentences with the missing words. Use the definitions to help you.

Smart Water Systems for Water Distribution Systems.

Leakage Detection. Flow and 1) _____ sensor data have been analyzed for leakage identification, pump scheduling, and investigate steady and dynamic properties of the 2) _____ under Pressure Relief Valves (PRV) control. Leakage assessment is performed in the Lisbon water supply system using the Bottom-up approach. Flow meters and pressure transducers are installed at some predefined points for data measurements. The 3) _____ of leakages is identified using acoustic sensors.

Smart Water Grid (SWG). The 4) _____ of SWT is a costly affair. The government can involve the public sector in the development of smart infrastructures in the cities. This will improve the quality of service. In Singapore, the government, in 5) _____ with a private firm known as Water-Wise, has taken an initiative to reduce water losses by 50 %. Pressure, water 6) _____, pH, and oxidation-reduction potential (ORP) sensors have been installed to form a smart water grid network.

Smart Farming. To satisfy the demand of a growing 7) _____, it is expected to enhance crop production by 70 % by 2050. This indicates an increase in 8) _____ demands for this additional cultivation of crops. Real-time 9) _____ helps to protect the field from lateral damage. By adopting smart farming technology, yield can be increased by 8.5 %, with a reduction in fuel and water 10) _____.

Borrowed and modified from:

https://www.researchgate.net/publication/346335079_Smart_Water_Technology_for_Efficient_Water_Resource_Management_A_Review

1 – the force that a liquid or gas produces when it presses against an area;

2 – a particular method of counting, measuring, or weighing things;

3 – the place or position that something is in or where something happens;

4 – the act of putting a plan into action or of starting to use something;

5 – the act of working together with other people or organizations to create or achieve something;

6 – the movement of something in one direction;

7 – all the people living in a particular country, area, or place;

8 – a clear liquid, without colour or taste, that falls from the sky as rain and is necessary for animal and plant life;

9 – facts about a situation, person, event, etc.;

10 – an amount of something that is used, or the process of using something, esp. so that there is less of it.

PHRASAL VERBS and IDIOMS

20.1. Watch the video “**CUT phrasal verbs**” and match the phrasal verbs with CUT and their definitions. Some phrasal verbs have more than one definition.

CUT ACROSS	1) to make something fall down by cutting it at the base
	2) to move or pass easily through water or air
CUT BACK ON	3) to break in or interrupt
	4) to affect or concern a number of different groups of persons or things
CUT DOWN	5) to quickly and easily deal with something that is confusing or difficult
CUT IN	6) to move across an area, often as a shortcut
CUT OFF	7) to not allow someone to share something or be included in something
CUT OUT	8) to intercept or interrupt something, esp a telephone conversation
CUT THROUGH	9) to spend less, do less, or use less of something
	10) to separate someone or something from things that they are normally connected with

20.2. Watch the video “**6 Phrasal Verbs with DRAW! English Lesson!**” and match the phrasal verbs with DRAW and their definitions. Some phrasal verbs have more than one definition.

DRAW AWAY	1) to remove, extract
	2) to move ahead of (one's competitors) in a race
	3) to move away from someone or something, usually because you are surprised or frightened
DRAW BACK	4) to prepare a draft or version of
DRAW IN	5) to take the focus of a situation away from someone or something else
DRAW ON	6) to cause or entice to enter or participate
DRAW OUT	7) to use information or your knowledge of something to help you do something
	8) to extend beyond a minimum in time
DRAW UP	9) to decide not to do something, especially because you think it would be bad for you
	10) to come to a halt

21.1. Complete the sentences with the correct prepositions to form phrasal verbs with CUT.

back on for in off out up

1	Several rural communities were cut _____ from clean water supplies after chemical waste contaminated the main reservoir.
2	Advanced membrane technologies can cut _____ the complexity of treating industrial effluents by efficiently separating contaminants from water.
3	The issue of industrial water pollution cuts _____ multiple sectors, including agriculture, public health, and environmental regulation.
4	To minimize pollutant input into the river, municipal authorities cut _____ several deteriorating trees that posed a risk of collapsing into the waterway.
5	In order to minimize wastewater discharge, the factory was mandated to cut _____ its reliance on hazardous cleaning agents in routine operational processes.
6	When the policymaker overlooked the effects of chemical pollutants, an environmental advocate cut _____ to bring attention to the issue.

21.2. Complete the sentences with the correct prepositions to form phrasal verbs with DRAW.

away back in on out up

1	The engineering team drew extensively _____ advanced computational fluid dynamics (CFD) modelling and multiphase flow simulations to optimize hydraulic performance and enhance contaminant transport efficiency within the complex geometry of the water treatment facility.
2	A multidisciplinary engineering team was commissioned to draw _____ a comprehensive groundwater remediation protocol in accordance with EU directives.
3	The recent media coverage of urban water shortages drew attention _____ from critical issues related to rural water infrastructure maintenance.
4	During a routine inspection of the high-pressure filtration unit, the technician had to draw _____ quickly when a sudden hiss from the pressurized pipe indicated a possible leak, raising immediate safety concerns.
5	The decommissioning of the obsolete chlorination unit was drawn _____ due to regulatory compliance reviews and unforeseen infrastructure constraints.
6	The integrated watershed management initiative successfully drew _____ multiple stakeholders, including hydrologists, municipal authorities, and NGOs.

 **For more practice, go to Practice file 3 on pages 302–304.**

22. Replace the idioms in bold with their appropriate equivalents, as in the example. Then make your own sentences with the suggested idioms. If necessary, make some changes in the sentences. Appendix 4 has a list of relevant idioms.

*Instead of challenging outdated treatment protocols, the plant managers continued to **go with the flow**, risking further contamination events.*

*Instead of challenging outdated treatment protocols, the plant managers passively **accepted** existing procedures, thereby increasing the risk of future contamination incidents.*

1. The municipality promised residents that the new water treatment plant would be operational by year's end, **come hell or high water**.

2. After years of neglecting wastewater standards, the manufacturing company had **to face the music** when toxic runoff was traced back to their facility.

3. Public warnings about contaminated tap water seemed to roll off some officials like **water off a duck's back**, as no action was taken for months.

4. The final environmental report was clearly **watered down**, omitting critical details about heavy metal concentrations in the local reservoir.

5. The company's conflicting statements about chemical discharge only served **to muddy the waters** in the public inquiry.

6. Without prior training in hydrology, the consultant looked **like a fish out of water** during the technical briefing on groundwater modeling.

7. With aging infrastructure and limited funding, the rural water utility is barely **keeping its head above water** while trying to meet safety standards.

8. A former employee **blew the whistle** on the illegal dumping practices that had been contaminating the groundwater for over a decade.

23. Choose the most appropriate idiom to complete the sentence.

1	After years of ignoring maintenance problems in the old treatment plant, the city had to _____ when the contamination levels became impossible to hide.	a) face the music b) keep their heads above water c) water down the problem
2	During her first fieldwork at a wastewater treatment facility, the student engineer felt like a _____, unsure how to operate complex testing equipment.	a) drop in the ocean b) muddy the waters c) fish out of water
3	A group of engineers _____ after discovering falsified emissions data from a power plant.	a) go with the flow b) blow the whistle c) face the music
4	In dynamic hydrological systems, engineers sometimes need to _____ when weather conditions or flow rates change unexpectedly.	a) water down b) go with the flow c) face the music
5	With rising costs and stricter laws, many small municipal plants struggle to _____ while keeping drinking water safe.	a) come hell or high water b) blow the whistle c) keep their heads above water
6	When experts publicly criticized the government's "clean river" campaign, officials tried to _____ by releasing vague and conflicting data.	a) muddy the waters b) water down c) face the music
7	The new regulations were so _____ after industrial lobbying that they lost nearly all their potential to reduce water contamination.	a) watered down b) blown the whistle c) come hell or high water
8	Even after repeated government alerts, polluting companies treated the warnings _____, ignoring the calls for change.	a) muddy the waters b) like water off a duck's back c) go with the flow

Grammar Box

24. Watch the video about [all English Future Tenses](#), and complete the rules (1–7) with the correct tense. Then, match the rules with the sentences (A–G) that represent each of them.

1.	We use _____ to express predictions, spontaneous decisions, and promises.	A	By next summer, the research group will have been monitoring ground-water quality for two years.
2.	_____ is used to describe actions already planned or intentions based on present evidence.	B	Scientists will develop in-novative filtration systems to reduce heavy metal contamination.
3.	We use _____ to describe actions in progress at a specific moment in the future.	C	Look at the river colour – it is obvious that untreated waste is going to cause pollution downstream.
4.	We use _____ to emphasise the duration of an activity up to a certain future moment.	D	The government is going to impose stricter regulations on wastewater discharge.
5.	_____ is often used with verbs of movement or when the speaker notices clear signs of what is going to happen.	E	At 8 p.m. tomorrow, the environmental experts will be presenting their findings on microplastics in rivers.
6.	We use _____ to make assumptions about what is happening at a given moment in the future.	F	This time tomorrow, the engineers will be testing a new desalination prototype.
7.	_____ is used to show that an action will be completed before a certain time in the future.	G	By 2035, many countries will have achieved universal access to clean drinking water.

25. Complete the sentences with the options given (a, b, or c) and match them to the corresponding explanation.

1.	While desalination is currently energy-intensive, ongoing advancements in reverse osmosis and solar-powered systems _____ probably its operational costs. a) will be reducing b) will reduce c) will have reduced	A	Future Continuous – an action at a specific moment in the future (with an emphasis on the duration or process of the action).
2.	According to the published maintenance schedule, the desalination plant _____ its annual full-system inspection next week. a) will undergo b) will have undergone c) will be undergoing	B	Future Perfect – an action that will have been completed before another future action.
3.	By next summer, the region _____ severe drought conditions for three consecutive years, pushing its water systems to the brink. a) will have experienced b) will have been experiencing c) will experience	C	Future Simple – predictions and forecasts about the future (especially when you're not 100 % sure).
4.	The chemical plant _____ the mandated closed-loop water recycling system before its operating license is renewed in December. a) will install b) will be installed c) will have installed	D	Future Simple Passive – something be done by someone in the future.
5.	As monitoring intensifies, microplastics and pharmaceutical residues _____ at trace levels in virtually every major river basin and estuary. a) will be found b) will have found c) will find	E	Future Continuous – two continuous actions that will be happening at the same time in the future.

6.	The Environmental Protection Agency (EPA) promises that they _____ significantly the permitted levels of nutrient runoff from all upstream agricultural and industrial operations to save the endangered species in the vital estuary. a) will have tighten b) will be tightening c) will tighten	F	Future Simple – facts about the future.
7.	Throughout this decade, farmers in the area _____ gradually to drip irrigation to cope with declining water availability. a) will have switched b) will be switching c) will switch	G	Future Perfect – an action that will or won't have been completed by a certain point in the future.
8.	Unfortunately, many regions _____ mandatory water metering by 2030, delaying crucial consumption data. a) will not have implemented b) will not implement c) won't be implemented	H	Future Simple – decisions made on the spot.
9.	Unfortunately, for the next several hours, the contaminant plume _____ deeper into the aquifer, while emergency crews on the surface _____ the equipment needed to start the extraction. a) will migrate; will be assembling b) will have migrated; will assemble c) will be migrating; will be assembling	I	Future Perfect Continuous – actions or events that will have been ongoing for a period of time before a specific moment in the future.
10.	“Hearing these test results from our own wells is shocking. I _____ now an immediate moratorium on new industrial permits in the recharge zone.” a) will have proposed b) will propose c) will be proposing	J	Future Simple – promises and threats (dangerous promises automatically become threats).

26. Read the abstract and open the brackets, using the correct tense form of the verbs.

Future Simple	Future Continuous	Future Perfect	Future Perfect Continuous
--------------------------	------------------------------	---------------------------	--------------------------------------

Water Pollution and Treatment Strategies

In the coming decades, scientists 1) _____ (**FOCUS**) on improving water management systems across urban and rural areas. By 2035, global research institutions 2) _____ (**DEVELOP**) new technologies for wastewater purification and desalination. Environmental engineers 3) _____ (**WORK**) on innovative treatment plants that remove microplastics and pharmaceutical residues from rivers and seas.

At the same time, many cities 4) _____ (**IMPLEMENT**) smart monitoring systems that constantly track water quality indicators. These systems 5) _____ (**HELP**) local authorities predict contamination risks before they become critical. By the end of the next decade, several countries 6) _____ (**ACHIEVE**) significant progress in restoring polluted lakes and wetlands.

In developing regions, communities 7) _____ (**STILL STRUGGLE**) with access to clean drinking water, but international programs 8) _____ (**SUPPORT**) them through funding and technical assistance. Meanwhile, scientists 9) _____ (**ANALYZE**) the long-term effects of agricultural chemicals on groundwater.

By 2040, if current trends continue, advanced filtration systems 10) _____ (**ELIMINATE**) most industrial pollutants from wastewater. However, population growth and climate change 11) _____ (**CREATE**) new challenges for global water sustainability. Experts

12) _____ (**CONTINUE**) to search for adaptive solutions that balance human demand with ecosystem protection.

By the middle of the century, humanity 13) _____ (**SPEND**) over fifty years developing efficient strategies for water reuse and conservation. Hydrologists 14) _____ (**HAVE**) a clearer understanding of how energy, pollution, and biodiversity interact within aquatic ecosystems. Ultimately, by 2050, international cooperation 15) _____ (**ENSURE**) that clean and safe water becomes a universal human right.

LISTENING

27. Before watching the video, check if you know the meaning of the following words and phrases. Use the [dictionary](#) if necessary.

electrolyzer	chemical regenerant	chloramines	to embrace
hydronautics	clog downstream system	to meet the benchmark	semipermeable membrane
colloidal particle	desalination technology	stringent quality standard	ion-exchange resins

28. Watch the video “[Water Treatment Technologies for Green Hydrogen Electrolysis](#)”. Decide whether the following statements are true (T), false (F), or not mentioned (NM). Correct the wrong statements. Fill in the table with your answers.

	statements	T	F	NM
1	Green hydrogen production through electrolysis requires ultra-pure water to avoid damaging electrolyzers.			
2	Impurities such as salts and trace organics can reduce the efficiency and lifespan of electrolyzers.			
3	The energy consumption of water treatment processes can significantly affect the overall efficiency and carbon footprint of green hydrogen production.			
4	Water used for electrolysis must have a resistivity of less than 1 megohm per centimeter.			
5	The water treatment process typically involves pretreatment, primary treatment, and final polishing.			
6	Reverse osmosis is capable of removing up to 99 % of dissolved salts and impurities from water.			
7	Membrane fouling in reverse osmosis systems is a common operational challenge that can lead to increased maintenance and reduced water purification performance.			
8	Electrodeionization (EDI) is used during pretreatment to remove large debris and suspended solids.			
9	Integrating rainwater harvesting systems with hydrogen production facilities could offer an additional sustainable water source, especially in regions with seasonal rainfall.			
10	Producing 1 kilogram of green hydrogen typically requires about 19 liters of highly purified water.			
11	Desalination and wastewater recycling are emerging solutions to tackle water scarcity in hydrogen projects.			
12	Digital monitoring and AI technologies are being integrated into water treatment systems to accelerate hydrogen combustion.			

29. Watch the video again and complete the following sentences with missing information.

1	While the process of _____ water into hydrogen and oxygen is powered by renewable electricity, the quality of the water used is just as important as the source of energy.
2	Water treatment technologies are a cornerstone of green hydrogen production, ensuring that water meets the stringent _____ standards required for this advanced process.
3	These stages remove contaminants ranging from _____ solids to dissolved salts and trace organics.
4	The journey of water treatment begins with pretreatment processes designed to remove visible and _____ contaminants.
5	Filtration removes suspended solids, debris, and particulates that could clog _____ systems or interfere with subsequent treatment steps.
6	Pretreatment technologies prepare the water for the more advanced _____ processes that follow.
7	Rho systems rely on semipermeable membranes to separate water _____ from contaminants, producing water with extremely low levels of total dissolved solids.
8	For the final _____ step, advanced technologies like deionization, DI, and electrodionization, EDI, come into play.
9	Dow Water and Process Solutions, under the DuPont brand, offers FilmTech membranes that are widely recognized for their high performance and _____.
10	Large-scale hydrogen projects often face challenges related to water _____, particularly in regions where freshwater resources are limited.
11	Kizenkrupp Utochlorine Engineers and Nell Hydrogen are also exploring seawater electrolysis, which integrates _____ with hydrogen production to reduce reliance on freshwater sources.
12	Additionally, there is growing interest in combining water treatment plants with renewable energy systems, such as solar and wind, to further reduce the carbon _____ of green hydrogen production.

SPEAKING

30. You are an invited expert being interviewed on a local radio program about environmental challenges. In the interview, the host will ask you questions about water cycle disruptions and freshwater shortages. The list of questions and the vocabulary in the box provided below can help you to be well-prepared for the interview.

1. How does the water cycle function as a system, and what makes it essential for sustaining life on Earth?

2. How is the water cycle being disrupted by human activity and urbanization?

3. What are some of the major water scarcity issues around the world today?

4. What are the consequences of overusing groundwater?

5. Do climate change, deforestation, and land use impact the natural water balance?

6. What technologies are used to manage the water cycle?

7. What are innovative ways to recycle or harvest water in urban environments?

evaporation	condensation	precipitation	infiltration	surface runoff
transpiration	sublimation	glaciers	rivers	lakes
groundwater	renewable resource	water scarcity	to replenish	contamination

31. You are preparing a presentation for a student environmental conference. Prepare a short presentation about a local freshwater resource (e.g., lake, river, groundwater well, etc.). Work with your partner and gather information for your presentation, which may include the following points:

- ✓ **water source location and type;**
- ✓ **the main use and purpose of the water source, those who depend on it;**
- ✓ **ecological threats and the level of pollution of the water source, main sources of pollution, and threats;**
- ✓ **potential or actual protection measures;**
- ✓ **predictions on future changes and impact.**

Presentation requirements:

- 1. Time limit: 2–3 minutes per presentation.**
- 2. Visuals: slides or pictures with keywords / bullet points, not full sentences.**
- 3. Structure: introduction – main part – conclusion.**
- 4. Speak in your own words; do not read.**

Useful phrases:

- *We'd like to present / focus on*
- *It is located in / lies within the region of*
- *It plays a vital / crucial role in*
- *The water source is mainly used for*
- *Unfortunately, it is under threat from*
- *The sources of pollution include / are*
- *One possible solution is*

32. Work in pairs. You are civil engineers who tackled the challenge of providing clean drinking water to a remote community. To address this, your task is to examine the pros and cons of various methods of water purification (e.g., nanotechnology in water treatment, membrane filtration technology, advanced oxidation processes, biological treatment, etc.) and decide which is most suitable for the environmental conditions, available resources, and long-term sustainability of the community. When comparing different methods, consider the following aspects: effectiveness, cost, environmental features, suitability for different areas, technical features, and maintenance aspects. Use the vocabulary provided in the box below.

Useful phrases:

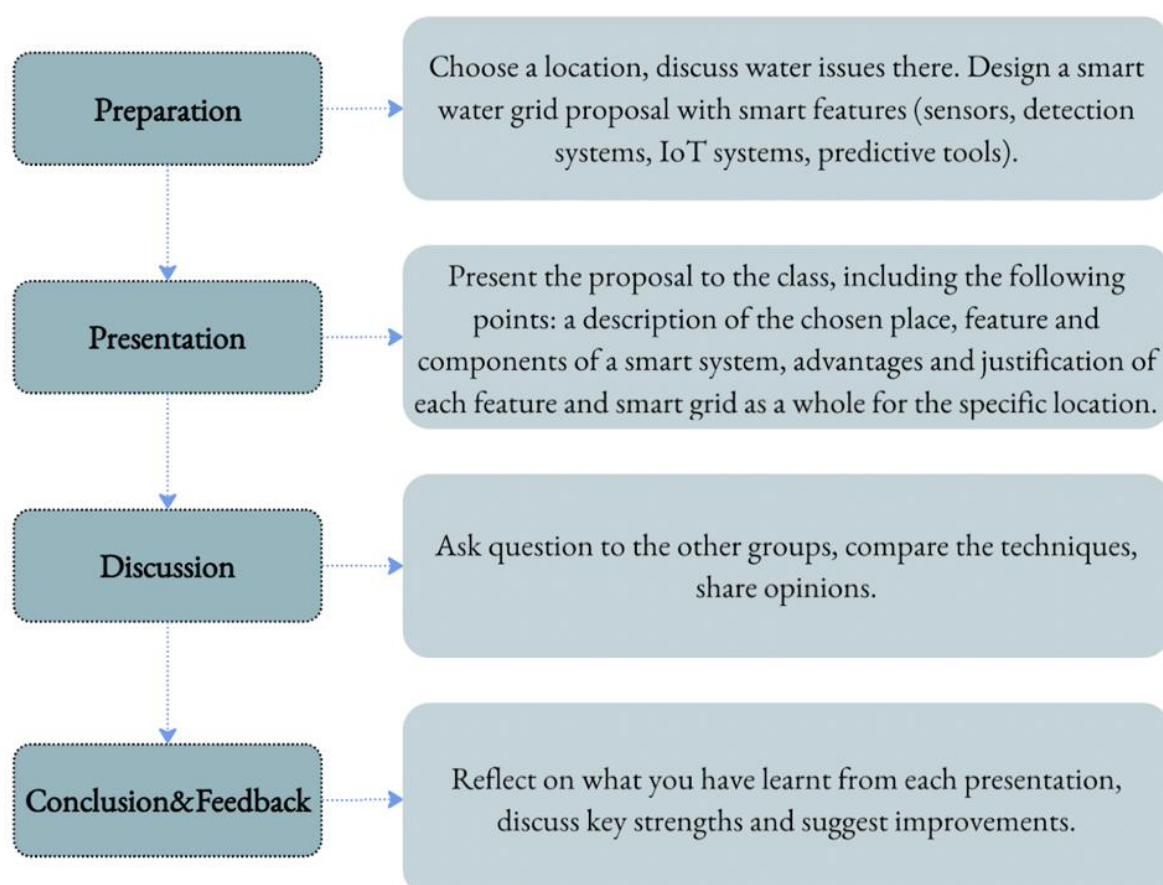
- *Our task is to choose / consider the best approach for*
- *We're going to compare / comparing*
- *... is a modern technique that / used for*
- *Compared to ..., ... is more efficient / cost-effective*
- *One of the advantages / drawbacks of this method is*
- *This treatment method is more suitable for*
- *The best option / choice is ... because*

filtration	chlorination	ozonation	UV disinfection	bioremediation
activated carbon	nanofiltration	smart sensors	leakage detection	pressure sensors
flow meters	sustainable	cost-effective	energy- efficient	eco-friendly

33. You are environmental advisors, and you've been asked to assist in planning a smart water grid proposal for a specific location. Work in groups. Each group chooses a location (real or fictional town, mountain area, rural area, coastal city, island, etc.) and introduces a plan for a smart water grid. Improve your presentation by following the outline and useful phrases provided below.

Useful expressions for presenting:

- *The purpose / aim of this presentation is to*
- *The focus of our presentation is on*
- *This area is facing problems with*
- *The solution includes*
- *We choose this technology because*
- *The main advantage of this system is*
- *In conclusion / To sum up, our smart grid will*



WRITING

34. You are taking part in a student writing contest. Write an essay (160–180 words) expressing your opinion: “Groundwater is a more reliable long-term source of freshwater than surface water.” Do you agree or disagree? Support your ideas with facts and examples. Follow the outline provided below, including an introduction, a main part, and a conclusion. Pay attention to clarity, coherence, and accuracy in your writing.

***See Appendix 5 for a writing model.**

Useful phrases:

- *Nowadays, the question of freshwater supply is*
- *Some believe that ..., while others disagree*
- *The essay will explain why I agree / disagree with*
- *Unlike surface water, groundwater is*
- *On the other hand, surface water is*
- *Furthermore / Moreover / Additionally / In addition to*
- *In conclusion / Overall*

I. Introduction

- introduce the topic
- state the purpose of the essay
- clearly state your opinion (agree / disagree)

2. Main part

- provide 2-3 reasons to support your opinion
- include facts, examples, comparisons

3. Conclusion

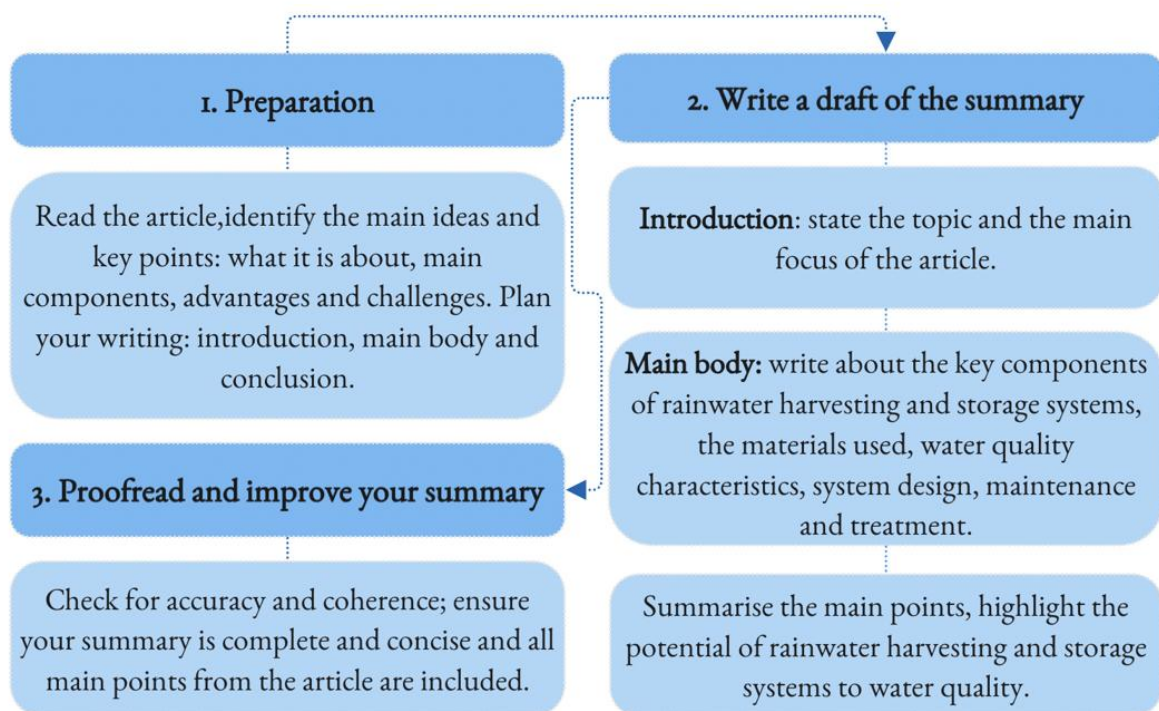
- restate your opinion
- summarize your main points

35. You are currently working as an environmental consultant, and you've been asked to research rainwater harvesting systems. Write a summary of the article "Rainwater harvesting and storage systems for domestic supply: An overview of research for water scarcity management in rural areas" (160–180 words) by the [link](#). Pay attention to clarity, coherence, and accuracy in your writing, and check if your summary is complete.

***See Appendix 5 for a writing model.**

Useful phrases:

- *The article reviews / discusses*
- *The article focuses mainly on*
- *The main components of a rainwater harvesting system include*
- *According to the source,*
- *The article highlights / emphasizes the importance of*
- *The article suggests that*
- *Overall / To sum up*



SELF-ASSESSMENT

36. Explore the target vocabulary related to the topic “Water Resources and their Characteristics. Water Pollution and Treatment Strategies” using *flashcards* and then assess comprehension through a *Quizlet quiz*.

37. Check yourself and do the quiz.

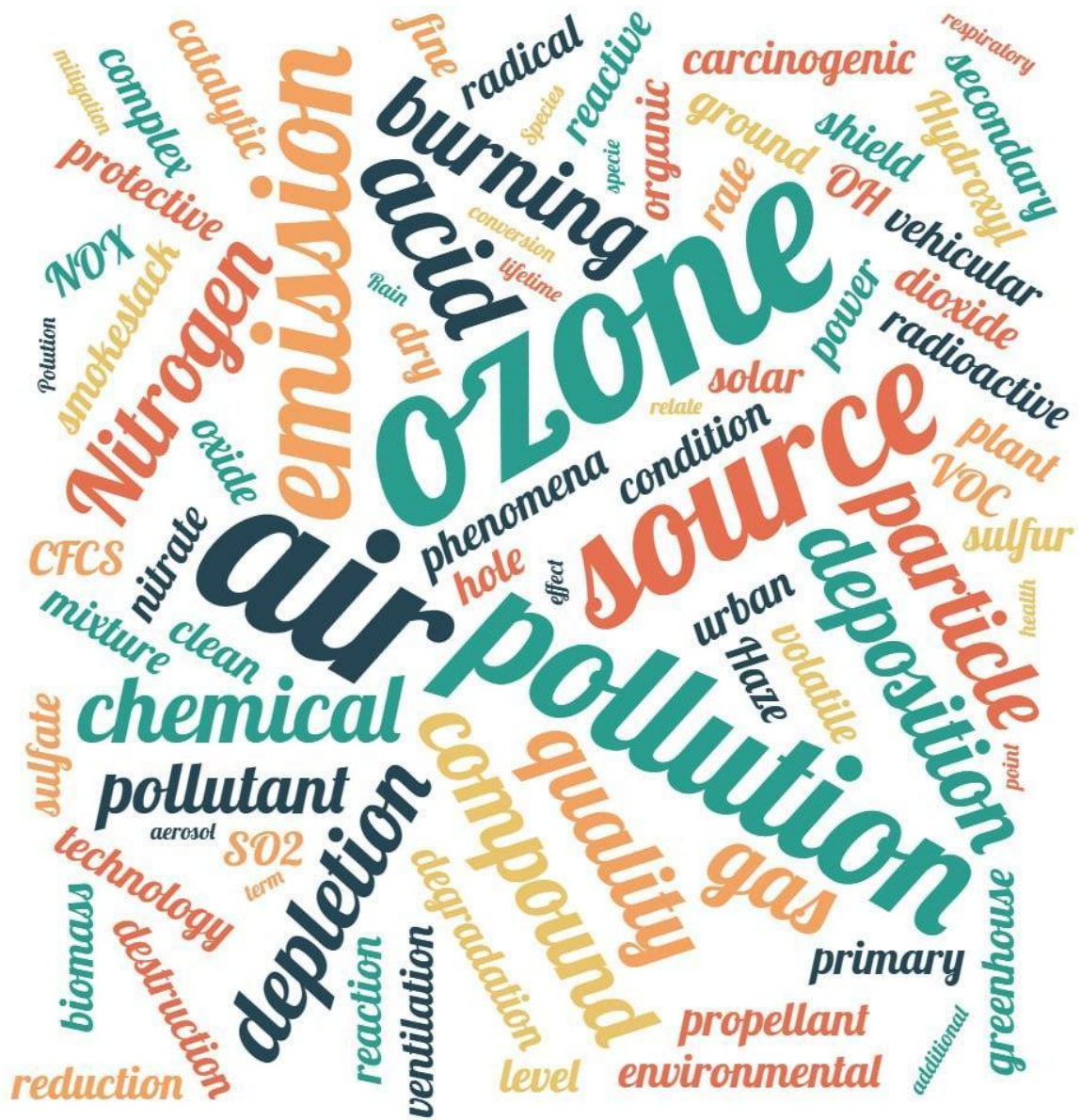
1. Which of the words has a similar meaning to “vital”?
 - A. *essential*
 - B. *crucial*
 - C. *necessary*
 - D. *all of the above*
2. Which of the following is not a natural form of water?
 - A. *foam*
 - B. *ice*
 - C. *liquid*
 - D. *gas*
3. Which word matches the definition “a liquid mixture of salt and pure water, used to kill bacteria or to replace liquid lost from the body”?
 - A. *glacier*
 - B. *saline*
 - C. *ocean*
 - D. *fluid*
4. Which of the following refers to the process by which water vapor in the atmosphere cools and changes into liquid water?
 - A. *condensation*
 - B. *evaporation*
 - C. *precipitation*
 - D. *sublimation*
5. Which of the following refers to the process of a liquid changing to a gas, especially by heating?
 - A. *condensation*
 - B. *evaporation*
 - C. *precipitation*
 - D. *sublimation*

6. Which of the following is the primary source of freshwater?
- A. *condensation*
 - B. *evaporation*
 - C. *precipitation*
 - D. *sublimation*
7. Which of the following options is not a source that surface water originates from?
- A. *surface runoff*
 - B. *groundwater seepage*
 - C. *ocean tides*
 - D. *precipitation*
8. Which of the following affects river discharge?
- A. *vegetation*
 - B. *topography*
 - C. *land use*
 - D. *all of the above*
9. Which term refers to a river or stream that flows into a larger river or a lake?
- A. *tributary*
 - B. *derivative*
 - C. *runoff*
 - D. *current*
10. Which of the following is the best definition of “irrigation”?
- A. *very wet, soft land*
 - B. *supplying land with water so that crops and plants will grow*
 - C. *slow flowing through something*
 - D. *very dry and without enough rain for plants*

Check yourself, Appendix 8. Self-Assessment Keys.

Unit 4

Air Pollution. Acid Rain and Ozone Depletion



LEAD-IN

1. Look at the pictures (A–F) showing the main causes of air pollution. Then, match each picture (A–F) with the correct cause of air pollution (1–6).

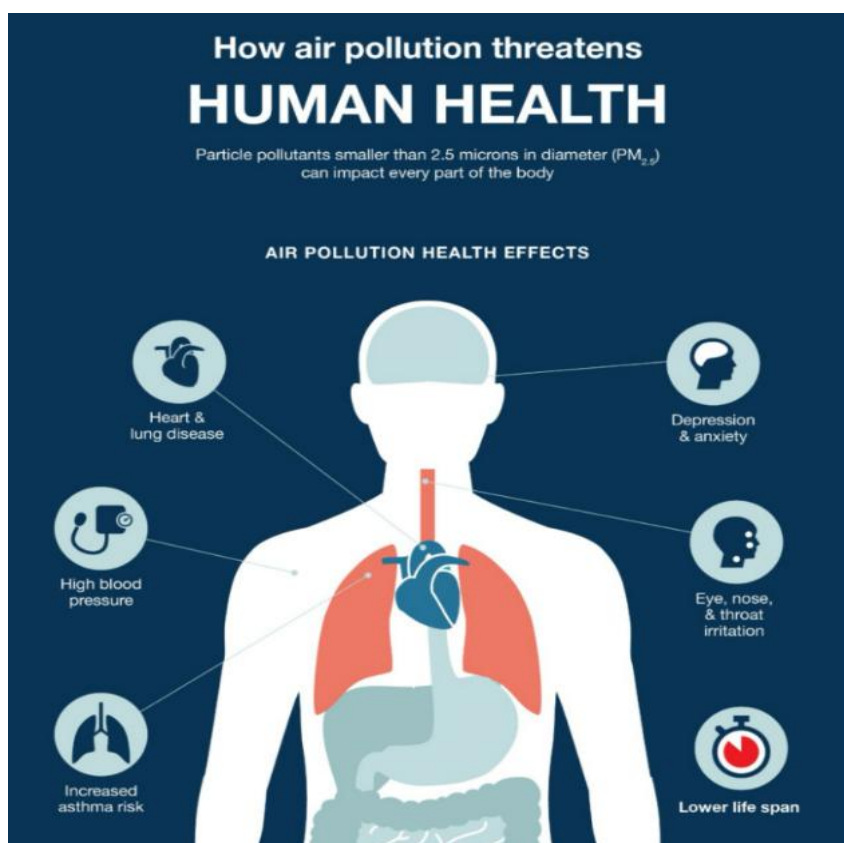
Choose and describe one source (e.g., household energy use), focusing on the most serious or long-term pollution problem it creates. Explain how this cause is connected to another one (e.g., waste management), and predict the possible long-term environmental impact of their interaction.

<u>Causes of air pollution</u>	
1. Agricultural practices 2. Waste management 3. Industry and energy supply 4. Transport 5. Household energy use 6. Dust	

		
A	B	C
		
D	E	F

Images taken from: <https://scx1.b-cdn.net/csz/news/800a/2023/air-pollution.jpg>

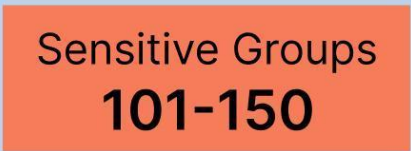
2. Study the infographic “How air pollution threatens human health”. Then watch the [video](#) and answer the following questions.



1. People of which ages are prone to air pollution?
2. Why is air pollution a dangerous and deadly weapon?
3. Why does inflammation happen?
4. What are some toxic compounds that we breathe in?
5. Which organs does air pollution destroy?
6. Which diseases are caused by air pollution?
7. Which mental disorders are caused by air pollution?

Image taken from:
<https://www.myjoyonline.com/wp-content/uploads/2024/03/image-250-796x1024.png>

3. Look at air quality codes and their description. Match the pictures with the corresponding quotations.

1		A	"Health warning: everyone is at risk of increased adverse health impacts."
2		B	"Health warning of emergency conditions; Everyone is prone to be seriously impacted. Taking a step outdoors may be fatal for many."
3		C	"Members of vulnerable populations, such as asthma patients, may suffer health consequences; the general public is less prone to be impacted."
4		D	"Air quality is considered adequate, and pollution poses little or no harm."
5		E	"Some healthy people may suffer health implications, while members of vulnerable groups may suffer more catastrophic effects."
6		F	"The air quality is satisfactory. However, some people, mainly those sensitive to air pollution or who have breathing problems, may be at risk."

Text and images borrowed and modified from:
<https://www.pickcel.com/learn/what-is-air-quality-index-and-how-to-monitor-air-quality/>

Discuss the following quotations in pairs. Choose the one(s) you agree with and justify your responses with examples or experiences.

Use the phrases:

- *It's a complicated / difficult issue, but ...*
- *My (point of) view (on this) is ...*
- *Obviously, ...*
- *Some people may disagree with me, but ...*
- *This is just my opinion, but ...*
- *Without a doubt, ...*
- *You probably won't agree, but ...*

1. “Outdoor air pollution represents a significant environmental health challenge worldwide, impacting populations across all income levels.”

Applications of machine learning and IoT for Outdoor Air Pollution Monitoring

2. “Indoor air pollution poses serious health risks, particularly in urban areas where biomass or solid fuels are widely used in households.”

Indoor air pollution: a global health concern, British Medical Bulletin

3. “Primary pollutants are emitted directly from identifiable sources, including vehicles, industrial facilities, and natural events such as wildfires.”

What Are Primary and Secondary Air Pollutants?

4. “Secondary pollutants arise from chemical reactions in the atmosphere, often forming harmful substances such as ozone and secondary particulate matter.”

Toxicological Effects of Secondary Air Pollutants

5. “Air pollution monitoring systems provide real-time measurements of atmospheric pollutants, enabling informed decisions to protect public health.”

Towards a Framework Air Pollution Monitoring System Based on IoT

6. “Modern air quality monitoring systems integrate sensor networks and data analytics to evaluate pollution levels and generate air quality indexes for the public.”

Environment 4.0: An IoT-Based Pollution Monitoring Model

7. “The Internet of Things enables continuous monitoring of multiple pollutants, offering high-resolution data where traditional stations are limited or costly.”

Environment 4.0: An IoT-Based Pollution Monitoring Model

8. “Artificial intelligence and machine learning models can predict air pollution trends from IoT sensor data, providing early warnings and supporting mitigation strategies.”

Applications of machine learning and IoT for Outdoor Air Pollution Monitoring

READING

4. Read the text below. Match choices (A–H) to (1–5). There are three choices you do not need to use.

- A** Internet of Things in Pollution Monitoring
- B** Air Pollution: Sources and Pollutants
- C** Indoor Air Pollution
- D** Sources and Types of Air Pollution
- E** Air Pollution Monitoring
- F** Urban Growth Boosts Air Quality Worldwide
- G** Artificial Intelligence in Pollution Monitoring
- H** IoT Eliminates Air Pollution

Outdoor And Indoor Air Pollution

1. _____. Air pollution refers to the introduction, into the atmosphere, of substances that have harmful effects on humans, other living organisms, and the environment, either as solid **particles**, liquid **droplets**, or gases. Air pollution can result from natural processes such as dust storms, forest fires, and volcanic **eruptions**, or from human activities such as biomass burning, **vehicular emissions**, mining, agriculture, and industrial processes.

Outdoor air pollution. They are categorized into two major types based on how they originated, namely **primary and secondary pollutants**. Primary pollutants are those released directly from the source into the air in a harmful form. The primary pollutants that account for nearly all air pollution problems are carbon monoxide, volatile organic compounds, nitrogen oxides, sulfur dioxide, and particulate matter. Secondary pollutants are produced through reactions between primary pollutants and normal atmospheric compounds.

2. _____. Indoor air pollution (IAP) is a serious threat to human health, causing millions of deaths each year. IAP normally is a complex mixture of particulate and various gaseous components. IAP compositions differ significantly depending on sources, emission rates, and ventilation conditions. For effective control of IAQ, therefore, it is necessary to determine the sources of air pollution.

According to the World Health Organization (WHO), around 3 billion people in the world still cook and heat their homes using dirty solid fuels on open fireplaces, **cooking stoves**, or **kangs**, which generate a large amount of air pollutants. There are also many **anthropogenic** sources (such as wooden

construction materials, oil-based paints, **fragrant** decorations, and indoor plants) emitting VOCs (Volatile Organic Compounds) at a variety of concentrations.

3. _____. Air quality monitoring is a long-term assessment of pollutant levels that helps to assess the extent of pollution and provide information about air quality trends. New advancements in technology have opened up new **avenues** for **combating** air pollution. Nanotechnology-based **interventions**, for instance, offer the potential for enhanced pollutant **capture** and removal due to the unique properties of nanomaterials. Nanoparticles, when **incorporated** into filtration systems or catalytic converters, can exhibit improved reactivity and selectivity, leading to more efficient pollutant conversion.

4. _____. The integration of Artificial Intelligence (AI) and Machine Learning (ML) into air quality monitoring systems has **revolutionized** data collection and analysis. AI-driven models can process vast datasets from various sources, such as satellite imagery, ground-level sensors, and meteorological data, to generate accurate and real-time air quality assessments.

5. _____. With the advancement in **sensing** and **embedded** technology, the Internet of Things (IoT) has become one of the economic alternatives to **implement** an air quality monitoring system (AQMS) compared to costly and fixed air quality monitoring stations. These systems are designed for outdoor air quality monitoring. They use sensors to measure air quality parameters, temperature, and humidity. These technologies have been implemented in various applications, from monitoring indoor air quality to predicting pollution patterns in urban areas, thus helping **mitigate** the **adverse** effects of air pollution on human health and the environment.

Borrowed and modified from:

Ghamari, M. (2023). Emerging technologies and strategies to combat air pollution: A comprehensive review. *Journal of Pollution*, 6(2). <https://doi.org/10.37421/2684-4958.2023.6.298>

Follow-up

5. Explain the words / phrases in bold from the text. Use a [dictionary](#) if necessary.

6. Read the text again and mark the statements as true (T) or false (F). Correct the wrong statements.

	statements	T	F
1	Air pollution refers solely to harmful gases.	☐	☐
2	It is possible to reduce most types of outdoor air pollution.	☐	☐
3	A factory would be a stationary air pollution source.	☐	☐
4	Volatile organic compounds and nitrogen oxides are the second and third biggest primary pollutants, respectively.	☐	☐
5	Reactions between atmospheric gases and primary pollutants create secondary pollutants.	☐	☐
6	‘Anthropogenic’ sources mean ‘made out of natural materials’.	☐	☐
7	Some volatile organic compounds cause cancer.	☐	☐
8	Indoor air pollutants are non-biological and are mostly gases.	☐	☐
9	Traditional pollution control technologies are still considered effective.	☐	☐
10	AI can analyze air quality through images and sensors.	☐	☐
11	One of IoT’s advantages is lower cost compared to fixed air quality monitoring stations.	☐	☐
12	A vehicle is used to acquire data for IoT.	☐	☐

USE of ENGLISH

7. Using the information from the text (Ex. 4), match items (1–15) with (A–O) to form phrases. After that, choose any three of the completed phrases and use them in your own sentences.

1.	have harmful effects on humans	A	on how they originated
2.	result from natural processes such	B	air pollution problems
3.	reduce outdoor air pollution	C	and the environment
4.	come from stationary sources	D	enhancement of IAQ
5.	move from place to place	E	while emitting pollutants
6.	categorised into two types based	F	on sources, emission rates
7.	released directly from the source	G	pollutant concentrations
8.	account for nearly all	H	in industrialized countries
9.	ground-level ozone	I	causing millions of deaths
10.	a serious threat to human health,	J	of air pollution
11.	a complex mixture of particulate	K	as dust storms, forest fires
12.	differ significantly depending	L	and gaseous components
13.	necessary to determine the sources	M	formed over urban areas
14.	key strategies for control and	N	into the air
15.	systems for the measurement of	O	or mobile sources

8. Fill in the table with the words derived from the given ones.

	Noun	Verb	Adjective
1	.....	emit	.....
2	.....	.....	generative
3	measurement	.....	.....
4	.....	produce	.....
5	.....	.....	combustible
6	implementation	.....	.....
7	.....	assess	.....
8	.....	.....	estimative
9	ventilation	.....	.....
10	.....	intervene	.....
11	.....	.....	categorical
12	decision	.....	.....
13	.....	reduce	.....
14	.....	.....	collectible
15	removal	.....	.....

9. Match the words in column A with the words in column B to form meaningful phrases. You can also do it using the LearningApps platform at this [link](#).

Column A		Column B	
1.	solid	A	burning
2.	liquid	B	fireplaces
3.	biomass	C	location
4.	vehicular	D	areas
5.	fixed	E	sources
6.	construction	F	particles
7.	immune	G	products
8.	urban	H	stoves
9.	primary	I	system
10.	open	J	emissions
11.	cooking	K	decorations
12.	anthropogenic	L	pollutants
13.	fragrant	M	droplets
14.	consumer	N	materials
15.	building	O	sites

10. Fill in the words from the list below. Use each word only once.

mobile, fuels, breathing, emit, toxic, ventilation, immune, policies, reactions, generate, health, particles, colourless, accumulate, combustion

1. improved technology and government _____;
2. _____ sources of air pollutants;
3. through _____, powered by sunlight;
4. using dirty solid _____;
5. _____ a large amount of air pollutants;
6. people with _____ problems;
7. seriously affect the _____ of the inhabitants;
8. _____ Volatile Organic Compounds;
9. secondary fine suspended indoor _____;
10. indoor sources of _____ organics;
11. _____ carcinogenic radioactive gas;
12. basements with poor _____;
13. _____ in the indoor environment;
14. underdeveloped _____ systems;
15. conducting _____ processes.

11. Match the words with similar meanings. You can also do it using the LearningApps platform at this [link](#).

1.	atmosphere	A	airflow
2.	emission	B	rule
3.	component	C	collect
4.	ventilation	D	quantity
5.	enhancement	E	air
6.	accumulate	F	incorporation
7.	assessment	G	increase
8.	strategy	H	improvement
9.	regulation	I	cause
10.	integration	J	discharge
11.	wood	K	lumber
12.	concentration	L	building
13.	construction	M	evaluation
14.	growth	N	plan
15.	factor	O	part

12. Write the opposites of the following words. Use the [dictionary](#) if necessary.

1	emit	
2	mobile	
3	release	
4	primary	
5	accumulate	
6	indoor	
7	increase	
8	complex	
9	improve	
10	dirty	
11	heat	
12	open	
13	move	
14	colorless	
15	form	

13. Match the key terms on the topic “Air Pollution. Acid Rain and Ozone Depletion” with their definitions.

	<i>mitigation, source, particle, ventilation, sensor, regulation, filtration, gas, emission, compound, acid, combustion, depletion, ozone, reaction</i>	

1. An extremely small piece of something such as dust, dirt, or sand.
2. An amount of a substance that is produced and sent out into the air that is harmful to the environment.
3. The movement of fresh air around a closed space, or the system that does this.
4. A colorless gas that is a form of oxygen.
5. The process of burning.
6. An official rule or law.
7. A chemical that combines two or more elements.
8. The place something comes from or starts at, or the cause of something.
9. The change that happens when two or more substances are mixed with each other.
10. The act of passing a liquid or gas through a piece of equipment in order to remove solid pieces or other substances.
11. A substance in a form like air that is neither solid nor liquid.
12. A device that discovers and reacts to changes in such things as movement, heat, and light.
13. A reduction in something, or the act of reducing it.
14. The act of reducing how harmful, unpleasant, or bad something is.
15. Any of various usually liquid substances that can react with and sometimes dissolve other materials.

Borrowed and modified from:
<https://dictionary.cambridge.org/dictionary/english/>

14. Match the first part of the sentence (1–12) with the second one (a–l).

1. The integration of AI into air quality monitoring systems has ...
2. AI-driven models can process vast datasets from various sources, ...
3. This not only enhances our understanding of pollution patterns ...
4. Recognising the multifaceted nature of air pollution, ...
5. These strategies encompass a combination of regulatory measures, ...
6. Collaborative efforts are essential for creating synergistic ...
7. The Internet of Things (IoT) becomes one of the economic alternatives

...

8. Numerous IoT-based air quality monitoring systems ...
9. They use sensors to measure air quality parameters ...
10. Users can subscribe to the list and ...
11. This system allows real-time localised air ...
12. These technologies have been implemented in various applications,

from ...

- a) ... but also enables timely interventions and informed policy decisions.
- b) ... receive information about local pollution.
- c) ... governments are increasingly adopting holistic strategies.
- d) ... solutions that address both local and global air quality challenges.
- e) ... such as *CO₂*, *CO*, *PM₁₀*, *NO₂*, temperature, and humidity.
- f) ... revolutionized data collection and analysis.
- g) ... have been proposed using micro-sensors for data collection.
- h) ... monitoring indoor air quality to predict pollution patterns in urban areas.
- i) ... promoting sustainable urban planning, and fostering public awareness.
- j) ... quality monitoring and sending data to customers.
- k) ... such as satellite imagery, ground-level sensors, and meteorological data.
- l) ... to implement an air quality monitoring system (AQMS) compared to costly and fixed air quality monitoring stations.

15. Choose the most appropriate word to complete the extract. You can also do it using the LearningApps platform at this [link](#).

The ozone layer is a layer in Earth's atmosphere that contains relatively 1) _____ concentrations of ozone (O₃). Ozone (O₃) is a stratospheric layer that plays an important 2) _____ in providing support to humans for their survival. It is an essential factor for many global, biological, and environmental phenomena. This layer 3) _____ 93–99 % of the sun's high-frequency ultraviolet light, which is potentially damaging to life on Earth. Over 91 % of the ozone in Earth's atmosphere is present here. It is mainly located in the lower 4) _____ of the stratosphere from approximately 10 km to 50 km above Earth, though the 5) _____ varies seasonally and geographically.

The ozone layer was 6) _____ in 1913 by the French physicists Charles Fabry and Henri Buisson. Its 7) _____ were explored in detail by the British meteorologist G. M. B. Dobson, who developed a simple spectrophotometer (the Dobson meter) that could be used to 8) _____ stratospheric ozone from the ground. Between 1928 and 1958, Dobson established a worldwide 9) _____ of ozone monitoring stations, which continues to operate today. The "Dobson unit", a 10) _____ measure of the total amount of ozone in a column overhead, is named in his 11) _____.

Borrowed and modified from:

Fisher, M. R., Doršner, K., Geddes, A., Theis, T., & Tomkin, J. (2018). Environmental biology.

OpenStax; Open Oregon Educational Resources.

<https://openoregon.pressbooks.pub/envirobiology/>

1	a)	tall	b)	high	c)	thick
2	a)	action	b)	act	c)	role
3	a)	resists	b)	absorbs	c)	attracts
4	a)	portion	b)	potion	c)	passion
5	a)	weakness	b)	sickness	c)	thickness
6	a)	discovered	b)	invented	c)	designed
7	a)	quantities	b)	properties	c)	features
8	a)	compute	b)	measure	c)	evaluate
9	a)	link	b)	web	c)	network
10	a)	contagious	b)	continuous	c)	convenient
11	a)	honesty	b)	honour	c)	respect

16. Choose the correct option. You can also do it using the LearningApps platform at this [link](#).

1. Satellite _____ of concentrations of atmospheric ozone began in 1970 and continue today.

- a) measure b) measurements c) measurable

2. The data are acquired with a set of sensors placed on an _____ car.

- a) electrify b) electricity c) electric

3. This hypothesis was based mostly on the physical and chemical properties of these compounds and _____ about atmospheric conditions.

- a) know b) knowledge c) knowledgeable

4. Lakes and streams become acidic when the water itself and its surrounding soil cannot buffer the acid rain enough to _____ it.

- a) neutralize b) neutralization c) neutral

5. It becomes a major _____ ecological problem in most of the countries.

- a) localize b) localization c) local

6. With the constant _____ of air in the lower atmosphere, CFCs eventually make their way into the stratosphere.

- a) move b) movement c) moveable

7. Sulfur dioxide and nitrogen oxide gases _____ to visibility degradation and harm public health.

- a) contribute b) contribution c) contributive

8. Acid rain causes _____ of lakes and streams.

- a) acidify b) acidification c) acid

9. CFCs are extremely _____ molecules and do not react with other chemicals in the lower atmosphere.

- a) stabilise b) stability c) stable

10. The excessive use of chlorofluorocarbons (CFCs) in the past contributed significantly to the _____ of the ozone layer.

- a) destroy b) destruction c) destructive

11. Certain chemical reactions in the stratosphere are accelerated by the _____ activity of compounds like chlorine and bromine.

- a) catalize b) catalysis c) catalytic

12. Scientists rely on satellite data to gather accurate _____ about atmospheric ozone levels.

- a) inform b) information c) informative

13. _____ ozone concentrations change periodically with regular natural cycles.

- a) Globalize b) Globe c) Global

14. Ozone depletion occurs when the rate at which ozone is broken down is greater than the rate of its _____.

- a) create b) creation c) creative

15. Scientists were able to _____ the specific sources of pollution using satellite data and ground measurements.

- a) identify b) identification c) identifiable

17. Fill in the blanks with the appropriate words from the list below. Use each word only once. You can do it using the LearningApps platform at [this link](#).

scale

sources

react

emissions

coal

precipitation

redistribution

acidic

borders

blow

surface

vehicles

solution

anthropogenic

power

Acid Rain: Causes, Effects, and Environmental Impact

Rainwater plays an important role in balancing biogeochemical cycles, through the 1) _____ and cycling of chemical elements on the earth's 2) _____, and interacting with various chemical and physical processes, such as transport and removal of elements.

Acid 3) _____, or the more popular term "acid rain", is largely the result of chemical reactions in the atmosphere, facilitated by 4) _____ action for the most part, favored by the terrestrial burning of 5) _____, and oil, smelting of metallic materials, use of 6) _____, agricultural and industrial activities and 7) _____ from thermal 8) _____ plants, with emissions of sulfur dioxides (SO₂) and nitrogen oxides (NO_x/4NO₂), producing strong acids such as sulfuric acid and nitric acid.

Acid rain occurs when these gases 9) _____ in the atmosphere with water, oxygen, and other chemicals to form various acidic compounds. The result is a mild 10) _____ of sulfuric acid and nitric acid. When sulfur dioxide and nitrogen oxides are released from power plants and other 11) _____, prevailing winds 12) _____ these compounds across state and national 13) _____, sometimes over hundreds of miles. Acid rain is measured using a 14) _____ called "pH." The lower a substance's pH, the more 15) _____ it is. Pure water has a pH of 7.0. However, normal rain is slightly acidic because carbon dioxide (CO₂) dissolves into it, forming weak carbonic acid, giving the resulting mixture a pH of approximately 5.6 at typical atmospheric concentrations of CO₂.

Borrowed and modified from:

Leal, R. de A., Silva, T. A. da, Mergulhão, T. J. C., Monteiro, E. C. B., & Takaki, G. M. C. (2023). Factors and consequences of acid rain incidence. A Look at Development.

18. Complete the text by choosing the correct option (a, b, c, or d) to fill each gap.

The ozone layer, acts **1)** _____ a protective shield that protects life **2)** _____ the surface of the Earth **3)** _____ absorbing most of the harmful portions of high-energy UV radiation coming **4)** _____ the sun. UV is subdivided **5)** _____ three types namely UV-A, UV-B, and UV-C. Of these three types, UV-A is the least energetic and least harmful but can cause some damage **6)** _____ living cells, resulting **7)** _____ sunburns and skin damage. UV-A is also not absorbed **8)** _____ ozone in the stratosphere and is therefore transmitted **9)** _____ the atmosphere to the surface of the Earth. UV-C is the most harmful and most energetic of all UV, but is strongly absorbed **10)** _____ both the thermosphere and the stratosphere and does not make it **11)** _____ the Earth's surface. UV-C is the one responsible **12)** _____ the splitting of oxygen molecules in the stratosphere that leads **13)** _____ the formation of ozone. When ozone absorbs UV it regenerates oxygen atoms and releases heat, which warms the upper part **14)** _____ the stratosphere. Because UV-C is completely filtered out before reaching us, the most harmful form of UV radiation that reaches the surface is UV-B. Natural conditions **15)** _____ the stratosphere sustain a dynamic balance between the creation and destruction of ozone, which helps to ensure the continued existence of the ozone layer.

Borrowed and modified from:

Fisher, M. R., Doršner, K., Geddes, A., Theis, T., & Tomkin, J. (2018). Environmental biology. OpenStax; Open Oregon Educational Resources.

<https://openoregon.pressbooks.pub/envirobiology/>

1	a)	for	b)	as	c)	from	d)	in
2	a)	on	b)	at	c)	by	d)	with
3	a)	at	b)	to	c)	in	d)	by
4	a)	in	b)	by	c)	from	d)	at
5	a)	for	b)	from	c)	to	d)	into
6	a)	at	b)	to	c)	in	d)	by
7	a)	in	b)	at	c)	for	d)	from
8	a)	for	b)	at	c)	by	d)	to
9	a)	for	b)	through	c)	out	d)	at
10	a)	with	b)	to	c)	for	d)	in
11	a)	from	b)	for	c)	to	d)	by
12	a)	for	b)	in	c)	from	d)	at
13	a)	at	b)	to	c)	for	d)	in
14	a)	on	b)	by	c)	with	d)	of
15	a)	out	b)	by	c)	in	d)	for

19. Complete the sentences with the missing words. Use the definitions to help you.

The ecological effects of acid rain are most clearly seen in the **1)** _____, or water environments, such as streams, lakes, and **2)** _____. Most lakes and streams have a pH between 6 and 8, although some lakes are naturally acidic. Acid rain primarily **3)** _____ sensitive bodies of water, which are located in watersheds, whose soils have a limited ability to neutralize acidic compounds (called “buffering capacity”).

In areas where buffering capacity is low, acid rain releases **4)** _____ from soils into lakes and streams; this metal is highly **5)** _____ to many species of aquatic organisms. Acid rain causes slower growth, **6)** _____, or death of forests. Of course, acid rain is not the only cause of such conditions. Other factors contribute to the overall stress of these areas, including air pollutants, insects, disease, **7)** _____, or very cold weather.

Acid rain and the dry deposition of acidic particles contribute to the **8)** _____ of metals (such as bronze) and the deterioration of paint and **9)** _____ (such as marble and limestone).

Many scientific studies have identified a relationship between elevated levels of fine particles and increased illness and premature death from heart and **10)** _____ disorders, such as asthma and bronchitis.

Borrowed and modified from:

Leal, R. de A., Silva, T. A. da, Mergulhão, T. J. C., Monteiro, E. C. B., & Takaki, G. M. C. (2023). Factors and consequences of acid rain incidence. A Look at Development. <https://doi.org/10.56238/alookdevelopv1-062>

1 – living or growing in, happening in, or connected with water;

2 – large areas of ground near a lake, a river, or the sea that often flood and are always wet;

3 – to have an influence on someone or something, or to cause a change in someone or something;

4 – a light, silver-colored metal used esp. for making containers, cooking equipment, and aircraft parts;

5 – poisonous;

6 – physical harm or damage done to a living thing;

7 – a long period when there is little or no rain;

8 – a destruction caused by acid or rust, usually over a long period of time;

9 – the hard, solid substance found in the ground that is often used for building;

10 – either of the two organs in the chest with which people and some animals breathe.

PHRASAL VERBS and IDIOMS

20.1. Watch the video “***SUPER USEFUL PHRASAL VERBS w FALL Build Your Vocabulary***” and match the phrasal verbs with FALL and their definitions. Some phrasal verbs have more than one definition.

FALL APART	1) to use something, especially a form of financial support, when other things have failed
FALL BACK ON	2) to become loose and drop
	3) to become disorganized and ineffective
FALL BEHIND	4) to have a disagreement; quarrel
	5) to fail to do something fast enough or on time
FALL FOR	6) to drop from something towards the ground by accident
FALL INTO	7) to break into pieces
	8) to fail or stop in a sudden or final way
FALL OFF	9) to start doing something, often without intending to
FALL OUT	10) to diminish in size, intensity, etc.; decline or weaken
FALL THROUGH	11) to allow oneself to be deceived by (a lie, trick, etc.)

20.2. Watch the video “***Phrasal Verbs with Give***” and match the phrasal verbs with GIVE and their definitions. Some phrasal verbs have more than one definition.

GIVE AWAY	1) to finally agree to what someone wants, after refusing for a period of time
GIVE BACK	2) to stop hoping or believing that somebody will change, get better, etc.
GIVE IN	3) to hand out or distribute
	4) to stop owning, using, or claiming something
GIVE OFF	5) to return something to its owner
	6) to donate or bestow as a gift, prize, etc.
GIVE OUT	7) to stop operating or functioning
	8) to stop doing or to stop having something
GIVE UP	9) to tell people something secret, often without intending to
GIVE UP ON	10) to produce heat, light, a smell, or a gas

21.1. Complete the sentences with the correct prepositions to form phrasal verbs with FALL.

apart back on for off out through

1	When renewable energy sources failed to meet demand, some countries had to fall _____ coal, worsening air pollution.
2	Residents fell _____ government assurances that air quality had improved, even though independent tests showed rising nitrogen dioxide levels.
3	The deal to ban certain aerosols that damage the ozone layer fell _____ due to strong lobbying from chemical manufacturers.
4	The efficiency of catalytic converters fell _____ noticeably when exposed to high levels of sulfur dioxide from acid rain.
5	Without regular maintenance, the air filtration units started to fall _____, reducing their effectiveness in trapping harmful pollutants.
6	Prolonged exposure to airborne pollutants caused particles of insulation to fall _____ from the ductwork, risking system failure.

21.2. Complete the sentences with the correct prepositions to form phrasal verbs with GIVE.

away back in off out up

1	The local council initially resisted, but finally gave _____ to public pressure to invest in stormwater management upgrades.
2	During testing, the leak detection sensor gave _____ the location of a crack in the treated water pipeline.
3	Engineers were advised not to give _____ testing under variable pH conditions, as it affects coagulant performance.
4	The outdated chlorination process was found to give _____ harmful disinfection byproducts, prompting a shift to UV treatment.
5	After calibration, the temporary filtration unit was dismantled and given _____ to the lab for reuse in future field trials.
6	Engineers gave _____ water testing kits to residents near the polluted lake to monitor contamination levels.



*For more practice, go to **Practice file 4** on pages 305–307.*

22. Replace the idioms in bold with their appropriate equivalents, as in the example. Then make your own sentences with the suggested idioms. If necessary, make some changes in the sentences. Appendix 4 has a list of relevant idioms.

*After the city introduced strict anti-pollution laws, factories were given a chance to start with a **clean slate** and adopt greener technologies.*

*After the city introduced strict anti-pollution laws, factories were given a chance to **begin anew** and adopt greener technologies.*

1. With the installation of advanced HEPA filtration units, the facility is clearly **on the right track** to meet international air quality standards.

2. The timeline for deploying decentralized air purification systems remains **up in the air** due to unresolved budget issues and regulatory approvals.

3. The introduction of a new high-efficiency electrostatic precipitator **raises the bar** for particulate removal efficiency and energy consumption, setting a new standard for regional air treatment plants.

4. The protocol for chemical scrubber dosing is currently **under the microscope** as environmental regulators assess its effectiveness and potential impacts on local air emissions.

5. Thanks to the implementation of novel photocatalytic oxidation technologies, the treated air was **as clean as a whistle**, surpassing all regulatory limits for volatile organic compounds.

6. All the efforts invested in the pilot air filtration system could **go up in smoke** if a power failure occurs and no backup system is available during peak pollution episodes.

7. Policy makers **have been blowing hot and cold** about adopting large-scale urban air purification initiatives, citing fluctuating concerns over cost, maintenance, and long-term sustainability.

8. Technical evaluations highlighting the adverse effects of increased nitrogen oxides emissions **have thrown cold water on** plans for expanding certain industrial air treatment facilities.

23. Fill in the gaps with the appropriate idioms from the list below. Use each idiom only once.

	<i>raise the bar | on the right track | throw cold water on | up in the air | under the microscope | with a clean slate | go up in smoke | blowing hot and cold</i>	
--	--	--

1	The recent improvements in particulate matter reduction suggest that the city is finally _____ to achieving healthier air.
2	After the old industrial site was fully decontaminated, developers were able to plan the area _____.
3	Some of the costly pollution-control measures seemed to _____ after nearby factories failed to comply with the new standards.
4	Experts warned that early dismissal of community proposals could _____ innovative ideas for combating smog and acid rain.
5	By introducing stricter emission limits for power plants, policymakers hope to _____ for environmental protection nationwide.
6	Public opinion about the effectiveness of ozone layer protection programs has been _____, shifting between optimism and skepticism.
7	The city's new air quality monitoring system is _____ after residents reported a sudden increase in respiratory problems.
8	The government's proposal to introduce stricter regulations on acid rain-causing pollutants is still _____, with several ministries unable to reach a consensus.

Grammar Box

24. Watch the video about *How to use Active and Passive Voice in English*, and complete the rules (1–7) with the correct voice. Then, match the rules with the sentences (A–G) that represent each of them.

1.	_____ is used for facts, general truths, and routines.	A	New emission standards will be introduced next year.
2.	_____ is used for actions happening now.	B	By 2010, many harmful pesticides had been banned in Europe.
3.	_____ is used for actions that happened in the past with a present result.	C	The old power plant was being demolished when inspectors arrived.
4.	_____ is used for completed past actions.	D	Several coastal areas were flooded after the hurricane.
5.	_____ is used for actions in progress at a past moment.	E	Millions of trees have been planted in restoration projects worldwide.
6.	_____ is used for actions completed before another past action.	F	New air-quality sensors are being installed across the city right now.
7.	_____ is used for predictions, decisions, and future facts.	G	The water in many cities is purified before it reaches households.

25. Complete the sentences with the options given (a, b, or c).

1.	Large amounts of sulfur dioxide _____ into the atmosphere by coal-fired power plants during daily electricity generation in industrial regions. a) emit b) are emitted c) were emitting
2.	A groundbreaking and widely cited study on air quality _____ by the European Environmental Agency last year, attracting significant attention from environmental researchers. a) published b) was published c) has publishing
3.	New and highly advanced technologies for carbon capture and storage _____ rapidly in industrial sectors today in response to stricter environmental regulations. a) are being implemented b) implemented c) are implementing
4.	Several strategically placed monitoring stations _____ in remote and environmentally sensitive areas to ensure accurate long-term data collection. a) are locating b) located c) have been located
5.	If renewable energy targets are not met, stricter financial and legal penalties _____ in the near future to encourage faster policy compliance. a) are imposing b) imposed c) will be imposed
6.	Several rare and previously undocumented species _____ when scientists first arrived at the protected conservation site for initial field observations. a) were observing b) were observed c) were being observed

7.	Throughout the extended testing phase, updated air-quality data _____ continuously in real time by fully automated monitoring stations across multiple locations. <i>a) will be collected</i> <i>b) will be being collected</i> <i>c) will collect</i>
8.	When researchers carefully compared the collected samples, they noticed that large sections of the coral reef _____ by rising ocean temperatures over the previous decade. <i>a) had damaging</i> <i>b) had been damaging</i> <i>c) had been damaged</i>
9.	Modern coal-fired power plants _____ their emissions continuously _____ to ensure they do not exceed safe limits for sulfur and nitrogen oxides. <i>a) have ... monitoring</i> <i>b) have ... monitored</i> <i>c) get ... monitor</i>
10.	CFC chemicals, which harm the ozone layer, _____ in new refrigeration systems under international law. <i>a) can't be ban</i> <i>b) should banned</i> <i>c) must be banned</i>

26. Read the abstract and open the brackets, using the correct tense form of the verbs.

Passive Voice

Active Voice

Acid Rain and Ozone Depletion

Air pollution 1) _____ (**CONSIDER**) one of the most serious environmental issues of the 21st century. Every year, millions of tons of harmful substances 2) _____ (**RELEASE**) into the atmosphere by factories, vehicles, and power plants. Scientists 3) _____ (**STUDY**) the effects of air pollutants for decades, and the results clearly show how deeply ecosystems 4) _____ (**AFFECT**) by human activities.

When sulfur dioxide and nitrogen oxides 5) _____ (**EMIT**) into the air, they react with water molecules and 6) _____ (**FORM**) acid rain. This phenomenon 7) _____ (**DAMAGE**) forests, soils, and aquatic life, while also corroding buildings and monuments. In many industrial regions, special filters and scrubbers 8) _____ (**INSTALL**) to reduce toxic emissions, but the problem 9) _____ (**NOT / SOLVE**) completely yet.

Meanwhile, scientists 10) _____ (**DISCOVER**) that certain chemical compounds, such as chlorofluorocarbons (CFCs) 11) _____ (**DESTROY**) the ozone layer in the upper atmosphere. To prevent further damage, international agreements such as the Montreal Protocol 12) _____ (**SIGN**) to phase out the production of ozone-depleting substances.

Today, renewable energy technologies 13) _____ (**PROMOTE**) as cleaner alternatives, and air quality 14) _____ (**MONITOR**) continuously by global networks of satellites and sensors. However, rapid urbanization and industrial growth 15) _____ (**CONTINUE**) to challenge even the strictest environmental standards.

LISTENING

27. Before watching the video, check if you know the meaning of the following words and phrases. Use the [dictionary](#) if necessary.

permeate the ecosystem	diatom communities	network of interactions	load exceedances
mortality	lichen diversity	mycorrhizal fungi	nitrogen emissions
iconic herb communities	nitrogen emissions	mitigate harm	exchange of nutrients

28. Watch the video “Air Quality and Healthy Ecosystems Applying Critical Loads” and put the sentences in the correct order. Fill in the table with your answers.

	statements	No
A	Air specialists may use critical loads when reviewing Clean Air Act permit applications.	
B	As nitrogen and sulfur deposition increase and permeate the ecosystem, more organisms and processes within an ecosystem are harmed.	
C	By preserving this biodiversity with critical loads, land managers will also be making ecosystems more resilient against other environmental changes, such as climate change or invasive species.	
D	To mitigate these effects, Rocky Mountain National Park managers are working with local partners to reduce their nitrogen emissions on days when the wind blows pollutants into the park.	
E	Air pollution is also a major threat to our ecosystems and the many living things within them.	
F	Forest and park managers use critical loads in planning.	
G	A critical load is the level of deposition at which an ecosystem begins to experience harm.	
H	For many ecosystems, land managers consider multiple critical loads when assessing the effects of air pollution and planning for mitigation measures.	
I	If nitrogen deposition exceeds the critical load for mycorrhizal fungi, it reduces the growth of the more sensitive fungi and diminishes the fungi’s partnerships with tree roots.	
J	Wilderness managers use critical loads to assess trends in wilderness character.	
K	Air pollution refers to the release of chemicals into the air that are harmful to human health and the planet.	
L	One concept they use to do this is critical loads.	

29. Watch the video again and complete the following sentences with missing information.

1	Air pollution is the leading cause of early _____ worldwide.
2	The World Health Organization estimates that _____ % of people live in places with harmful levels of air pollution.
3	As nitrogen and sulfur deposition increase, more organisms and _____ within an ecosystem are harmed.
4	Land management agencies have responsibilities to protect _____ species and ecosystems.
5	A critical load is the level of _____ at which an ecosystem begins to experience harm.
6	Air specialists may use critical loads when reviewing Clean Air Act _____ applications.
7	Forest and park managers use critical loads to prioritize _____ projects.
8	Managers _____ critical loads to current or projected future deposition.
9	There are critical loads that protect sensitive diatom communities in high _____ lakes.
10	As deposition increases, nitrogen affects a greater _____ of the ecosystem.
11	Mycorrhizal fungi form _____ with tree roots and help trees absorb nutrients.
12	If nitrogen deposition _____ the critical load, trees become more vulnerable to drought or insects.

SPEAKING

30. *You are a scientist invited to participate in an interview for the TV show about air pollution, “Our Planet”. Read the list of questions below. Choose the one that you understand best and feel ready to answer. Use the vocabulary provided in the box below.*

- 1.** *What is air pollution / acid rain / ozone depletion?*
- 2.** *What is the ozone layer, and why is it important?*
- 3.** *What are the sources and causes of these environmental issues?*
- 4.** *What is its impact on people and the environment?*
- 5.** *What are the solutions to these problems?*
- 6.** *Are there any innovative ways to reduce the negative impact of air pollution / acid rain / ozone depletion?*
- 7.** *What role can individuals play in reducing air pollution?*

emissions	fossil fuels	pollutants	carbon monoxide	smog
vehicle exhausts	respiratory diseases	skin cancer	ozone hole	acid deposition
deforestation	ultraviolet (UV) radiation	emission control	air quality index	carbon footprint

31. You are preparing a presentation for a student environmental conference. Prepare a short presentation about a specific air pollution problem in your city or country, human-made or natural (e.g., smog, traffic exhaust, volatile organic compounds, waste incineration, wildfires, sandstorms, etc.). Work with your partner and gather information for your presentation, which may include the following points:

- *the type of air pollution;*
- *main sources of pollution;*
- *ecological threats and the level of air pollution;*
- *locations that are impacted most and should be monitored;*
- *solutions and technologies that can help address this issue;*
- *predictions on future changes and impact.*

Presentation requirements:

- 1. Time limit: 2–3 minutes per presentation.**
- 2. Visuals: slides or pictures with keywords / bullet points, not full sentences.**
- 3. Structure: introduction – main part – conclusion.**
- 4. Speak in your own words; do not read.**

Useful phrases:

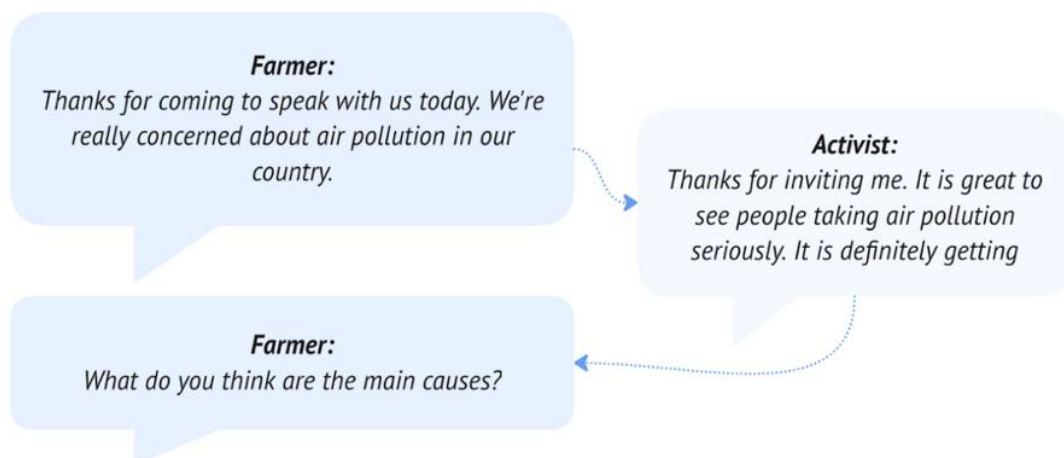
- *We'd like to present / focus on a major air problem in*
- *The type of pollution we will discuss is*
- *It is mainly caused by*
- *Unfortunately, this type of air pollution is a serious threat to*
- *Pollution levels are particularly high in*
- *The sources of pollution include / are*
- *One possible solution is*

32. Work in pairs. Student A is an environmental activist presenting ideas for reducing air pollution at a local community meeting. Student B is a farmer from a Nearby Village. He / she shows concern about crops and animals, which may be affected by pollution from the city. During the discussion, Student A describes the main sources of air pollution, the areas affected, the effects on health, and the efforts and actions already taken to reduce pollution, among other topics. Student B asks questions about how air pollution affects rural areas, including nature and agriculture, how city residents and farmers can cooperate, and whether there are any programs to help rural communities protect nature. Example questions may include:

- 1. What are the main reasons for air pollution in your country?**
- 2. Which human activities contribute to air pollution the most?**
- 3. What are the consequences of air pollution on health?**
- 4. How does air pollution impact the environment?**
- 5. What actions can be taken to address this issue?**
- 6. Are there any awareness movements among the country's population?**
- 7. What are the main challenges in combating air pollution?**

Useful phrases:

- *I'm here today to talk about*
- *Air pollution is caused by*
- *The main / major sources of air pollution are*
- *Pollution levels are rising mainly because*
- *The steps an individual can take*
- *Governments need to*
- *One practical solution we could try*



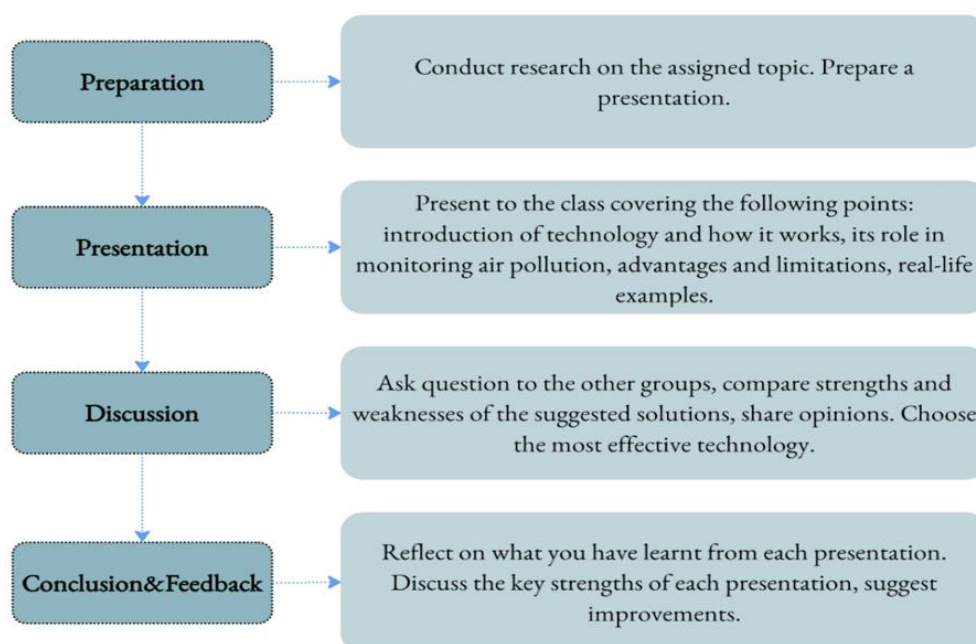
33. You are environmental analysts attending a council meeting on how to improve air quality in a city. Work in groups. Each group presents a technological solution that can be used for monitoring air pollution. The topic of the presentation for Group A is artificial intelligence (AI) in air pollution monitoring. Group B designs a presentation about the Internet of Things (IoT) in air pollution monitoring. Group C prepares a presentation about satellite-based air pollution monitoring. Improve your presentation by following the presentation requirements, the outline, and the useful phrases provided below.

Presentation requirements:

- 1. Time limit: 2–3 minutes per presentation.**
- 2. Visuals: slides or pictures with keywords / bullet points, not full sentences.**
- 3. Structure: introduction – main part – conclusion.**
- 4. Speak in your own words; do not read.**

Useful expressions for presenting:

- *The purpose / aim of this presentation is to*
- *The focus of our presentation is on*
- *This technology works by*
- *One of the advantages / benefits is*
- *A good example of its use is*
- *There are some limitations / drawbacks, such as*
- *In conclusion / To sum up*



WRITING

34. You are a member of a student environmental club, and you are currently working on a campaign to raise awareness about the seriousness of air pollution. Write a short guide (150–170 words) explaining how to improve indoor air quality.

Maintain the structure:

1) introduction, explaining the importance of indoor air quality monitoring;

2) main body: mention the main indoor pollutants, suggest at least 4 tips to improve air quality, for example, ventilation, plants, air purifiers, cleaning, etc.;

3) conclusion, encouraging actions, and offering a final piece of advice on how to improve indoor air quality.

Pay attention to clarity, coherence, and accuracy in your writing. Ensure your guide is clear and concise. Use phrases and keywords in the box below.

***See Appendix 5 for a writing model.**

Useful phrases:

- *Indoor air quality is / plays*
- *This guide offers simple steps / tips to*
- *One way to improve indoor air quality is*
- *Make sure to / Avoid using / Try to reduce*
- *Another effective solution is*
- *By following these simple steps*
- *To sum up / Overall / In conclusion*

household chemicals	synthetic fragrances	pollutants	cleaning products	dust mites
mold	pet dander	humidity	respiratory irritation	asthma attacks
headaches	ventilation	air circulation	air purifier	filter

35. You are taking part in an international student writing competition, dedicated to innovative solutions for cleaner air. Write an essay (160-180 words) expressing your opinion: “Technology is a key to solving the issues of air pollution”. Do you agree or disagree? Support your ideas with facts and examples. Follow the outline provided below, including an introduction, a main part, and a conclusion. Pay attention to clarity, coherence, and accuracy in your writing.

***See Appendix 5 for a writing model.**

Useful phrases:

- *Nowadays, the issue of air pollution is*
- *Some believe that ..., while others disagree*
- *In my opinion, technology*
- *The essay will explain why I agree / disagree with*
- *One of the most effective technologies in combating air pollution is*
- ...
- *Furthermore / Moreover / Additionally / In addition to*
- *In conclusion / Overall*

1. Introduction

- introduce the topic
- state the purpose of the essay
- clearly state your opinion (agree / disagree)

2. Main part

- provide 2-3 arguments to support your opinion
- Examples of technical solutions may include the following: electric vehicles, AI sensors, air quality sensors, IoT monitoring, etc.
- include facts, examples, comparisons

3. Conclusion

- restate your opinion
- summarize your main points

SELF-ASSESSMENT

36. *Explore the target vocabulary related to the topic “Air Pollution. Acid Rain and Ozone Depletion” using **flashcards** and then assess comprehension through a **Quizlet quiz**.*

37. *Check yourself and do the quiz.*

1. Which of the following is not a mobile source of air pollution?
 - A. *farmlands*
 - B. *vehicles*
 - C. *ships*
 - D. *trains*
2. Which word matches the definition “a chemical containing carbon that changes easily into a gas and that can be harmful to people’s health or the environment”?
 - A. *volatile organic compound*
 - B. *carbon monoxide*
 - C. *particulate material*
 - D. *oxygen*
3. Which word below is a synonym of “accumulate”?
 - A. *dwindle*
 - B. *recede*
 - C. *increase*
 - D. *contract*
4. Which of the options below is not an anthropogenic source of VOCs?
 - A. *oil-based paints*
 - B. *indoor plants*
 - C. *wooden construction materials*
 - D. *glass windows*
5. What does AQMS stand for?
 - A. *air quantity monitoring system*
 - B. *air quality monitoring sequence*
 - C. *air quality monitoring strategy*
 - D. *air quality monitoring system*

6. Which of the terms refers to “having a very severe effect, or being extremely limiting”?
- A. *indulgent*
 - B. *tolerant*
 - C. *stringent*
 - D. *lenient*
7. Which word has a similar meaning to “mitigation”?
- A. *decrease*
 - B. *moderation*
 - C. *reduction*
 - D. *all of the above*
8. What is the best definition of “synergy”?
- A. *the combined power of working together that is greater than the power achieved by working separately*
 - B. *the mixture you get when two or more things are combined*
 - C. *to work together for a special purpose*
 - D. *dealing with or treating the whole of something*
9. Which of the options below is not a subtype of UV radiation?
- A. *UV-A*
 - B. *UV-B*
 - C. *UV-C*
 - D. *UV-D*
10. Which of the following refers to “a reduction in something”?
- A. *release*
 - B. *depletion*
 - C. *destruction*
 - D. *absorbency*

Check yourself, Appendix 8. Self-Assessment Keys.

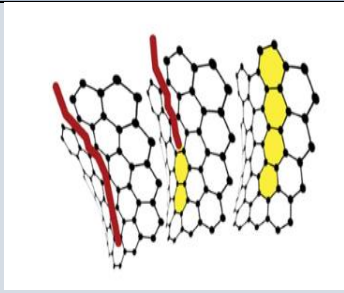
Unit 5

Environment and Sustainability



LEAD-IN

1. Look at the pictures (A–F) showing different sustainable inventions and match each picture with the correct invention name (1–6).

<u>Sustainable inventions</u> 1. Self-healing concrete 2. Biodegradable packaging 3. Solar panels 4. Electric vehicle charging station 5. Industrial Carbon capture systems 6. Smart irrigation systems		
		
A	B	C
		
D	E	F

Images taken from:
https://environment.umn.edu/wp-content/uploads/2020/10/alrawasmarwan_83477_12613114_photovoltic-system-2742302_1920-868x556.jpg

Then choose one invention from the list and discuss the following questions with your partner:

- 1. What environmental problem does it solve?**
- 2. How does it work?**
- 3. Why is it important for sustainability?**
- 4. Where could it be most useful?**
- 5. Can you suggest an improvement or new use for this invention?**
- 6. How does it compare with existing alternatives?**
- 7. Who would benefit the most from using it?**

2. Watch the [video](#) about how simple everyday actions can help protect the environment. Answer the following questions based on the content.

1. What is the main idea of the text?
2. Why are LED bulbs recommended instead of conventional bulbs?
3. What means of transport is suggested for short trips, and why?
4. How much carbon dioxide can a car emit, according to the text?
5. What simple actions in the kitchen help reduce energy consumption while cooking?
6. Why is recycling used cooking oil important for the environment?
7. What products can the recycled oil be turned into?
8. How can consumers contribute to sustainability when shopping?

3. Discuss the following quotations in pairs. Choose the one you agree with and explain why. Use the phrases:

- *If you ask me ...*
- *I believe that ...*
- *From where I stand, ...*
- *No one can dispute that ...*
- *I have no doubt that ...*
- *It's common knowledge that ...*
- *There's no uncertainty that ...*

1. “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

Brundtland Report, World Commission on Environment and Development

2. “Environmental sustainability is about ensuring that future generations can enjoy the natural resources our planet has to offer. It is responsibly interacting with the planet to maintain natural resources and not jeopardize the ability for future generations to meet their needs.”

Environmental Sustainability: A Primer, Matthew N. O. Sadiku et al., IJTSRD

3. “The ecological footprint estimates the biologically productive land and sea area needed by a population to produce the resources it consumes and absorb the wastes it generates – using prevailing technology and resource-management practices.”

Encyclopedia of Quality of Life and Well-Being Research, SpringerLink Entry: “Ecological Footprint”

4. “Vulnerability refers to the potential to experience loss or harm. ... It is a function of the nature and degree of exposure to a potential source of harm, sensitivity to that harm, and the capacity to adapt.”

Vulnerability, Robert McLeman – Wiley Reference Works

5. “Resilience is the ability, competence, or capability to endure and overcome a change caused by a disturbance, shock, or stress.”

Encyclopedia of Sustainable Management, SpringerLink Entry “Resilience”

READING

4. Read the text below. Match choices (A–H) to (1–5). There are three choices you do not need to use.

A Defining Environmental Sustainability and Its Challenges

B The Role of Renewable Energy in Boosting Economic Growth

C The Importance of Sustainable Development for the Environment

D Environmental Sustainability and Ecological Balance

E Rapid Economic Growth Without Environmental Considerations

F Global Efforts and Challenges in Achieving Environmental Sustainability

G Ignoring Environmental Impact in Modern Development Plans

H Understanding the Ecological Footprint and Its Role in Sustainability

Environmental Sustainability: Concepts, Indicators, and Global Commitments

1. _____. Sustainable development and the environment are of **paramount** importance in the modern world economy. **Sustainable development** can be achieved through proper coordination of the environment, society, and economy.

2. _____. **Environmental sustainability** refers to the capacity of biological systems to maintain their functions and processes indefinitely. It focuses on natural capital and **highlights the irreplaceability** of some natural resources. The benefits for the environment concern the **preservation of fossil resources** and the good functioning of ecosystems.

3. _____. In the year 2015, the member states of the United Nations (UN) proposed 17 Sustainable Development Goals (SDGs), **targeted** by 2030, to ensure social, economic, and environmental sustainability for the peace and prosperity of the earth and its **inhabitants**. The failure to attain SDG 13 (i.e., climate actions) with SDG 7 (green and inexpensive energy) affects the achievement of SDG 8 (i.e., **decent work** and economic growth). SDGs (SDG 6, SDG 13, SDG 14, and SDG 15) necessitate a comprehensively integrated **approach** to address environmental **contamination**.

Environmental sustainability is the ability to **maintain** ecological balance in our natural environment and **to conserve natural resources** to support the health of current and future generations.

4. _____. Environmental sustainability is defined as responsible interaction with the environment to **avoid depletion** or **degradation of natural resources** and allow for long-term environmental quality. The practice of environmental sustainability helps to ensure that the needs of today's population are met without **jeopardizing** the ability of future generations to meet their needs.

Environmental sustainability aims to lower human environmental impacts and promote the conservation of natural habitats. The 2000 UN Millennium Development Goals (MDGs) 7 focuses on ensuring sustainable development. It addresses greenhouse gas **reduction**, strengthening collective efforts for forest management, conservation, and sustainable development; complete implementation of the Convention on Biological Diversity and the Convention to Combat Desertification for tackling **drought** and **desertification**, and implementing sustainable water management strategies for reducing unsustainable exploitation.

Although various frameworks exist to monitor sustainability, there remains a critical **gap** in applying integrated, quantitative methods such as Ecological Footprint Analysis combined with dynamic econometric models to systematically trace and predict the long-term impacts of economic activities on environmental resilience.

5. _____. The Ecological Footprint (EF) is an indicator that accounts for human demand for global biological resources. Being developed by Canadian ecologist and planner William Rees, it is an accounting tool that uses the land as the unit of measurement to **assess per capita consumption**, production, and discharge needs. It starts from the assumption that every category of energy, **material consumption**, and waste discharge requires the productive or absorptive capacity of a finite area of land or water. Ecological footprint analysis can tell us in a vivid, ready-to-grasp **manner** how much of the Earth's environmental functions are needed to support human activities.

Borrowed and modified from:
Bonnet, J., Coll-Martínez, E., & Renou-Maissant, P. (2021). Evaluating sustainable development by composite index: Evidence from French departments. *Sustainability*, 13(2), 761.
<https://doi.org/10.3390/su13020761>

Follow-up

5. Explain the words / phrases in bold from the text, and make up sentences with these words. Use the [dictionary](#) if necessary.

6. Read the text again and answer the following questions, choosing the best option.

1. Which is more important, economic development or environmental sustainability?

- a)** Economic development.
- b)** Environmental sustainability.
- c)** Both are intertwined.

2. “Sustainable” means

- a)** Last.
- b)** Durable.
- c)** Specific.

3. What does an ecosystem consist of?

- a)** Plants, animals, microorganisms, and their surroundings.
- b)** Only air and water.
- c)** Only humans and technology.

4. How long have humans been carbonizing the Earth for?

- a)** Nearly two million years.
- b)** Nearly two thousand years.
- c)** Nearly two hundred years.

5. What will be the result of environmental collapse?

- a)** Death of biodiversity.
- b)** Climate change.
- c)** All of the above.

6. What are SDGs?

- a)** Aims to achieve all-embracing sustainability.
- b)** Actions towards combating climate change.
- c)** Goals to achieve economic and environmental balance.

7. What are the consequences of human activities?

- a)** Unlimited fossil resources.
- b)** Global warming and biodiversity loss.
- c)** Stronger ecosystems.

8. What does environmental sustainability aim to reduce?

- a)** Natural biodiversity.
- b)** Renewable energy use.
- c)** Human environmental impacts.

9. What unit does the ecological footprint use?

- a)** Land area.
- b)** Monetary value.
- c)** Population size.

10. What increases the ecological footprint?

- a)** Production, consumption, and trade.
- b)** Use of renewable energy.
- c)** Environmental conservation.

11. What resources does environmental sustainability conserve?

- a)** Plastic waste.
- b)** Natural resources.
- c)** Nuclear weapons.

12. What highlights the irreplaceability of some resources?

- a)** Environmental sustainability.
- b)** Mass urbanization.
- c)** Overconsumption.

USE of ENGLISH

7. Using the information from the text (Ex. 4), match items (1–15) with (A–O) to form phrases. After that, choose any three of the completed phrases and use them in your own sentences.

1.	paramount importance in the	A	environment and societies
2.	the proper coordination of the	B	Earth and its inhabitants
3.	the relationship between the	C	environmental collapse
4.	rapid economic development by	D	environmental contamination
5.	highlights the irreplaceability of	E	assessment of climate change
6.	cause of the extinction of	F	modern world economy
7.	increasingly moving towards	G	natural habitats
8.	working towards the lofty goal of	H	for forest management
9.	integrated approach to address	I	environmental components
10.	for the peace and prosperity of the	J	environment, society, and economy
11.	strengthening collective efforts	K	natural biodiversity
12.	responsible for the scientific assessment of climate change	L	conserving natural resources
13.	to promote the conservation of	M	of natural resources
14.	to avoid depletion or degradation	N	some natural resource
15.	to maintain the qualities of various	O	decarbonizing our planet

8. Fill in the table with the words derived from the given ones.

	Noun	Verb	Adjective
1	.....	achieve	.....
2	.....	.....	economic
3	contamination	.....	.....
4	.....	embrace	.....
5	.....	.....	natural
6	degradation	.....	.....
7	.....	focus	.....
8	.....	.....	particular
9	preservation	.....	.....
10	.....	concern	.....
11	.....	.....	renewable
12	indicator	.....	.....
13	.....	refer	.....
14	.....	.....	responsible
15	extinction	.....	.....

9. Match the words in column A with the words in column B to form meaningful phrases. You can also do it using the LearningApps platform at this [link](#).

Column A		Column B	
1.	functional	A	biodiversity
2.	natural	B	countries
3.	negative	C	assessment
4.	human	D	generations
5.	sustainable	E	change
6.	renewable	F	systems
7.	scientific	G	development
8.	environmental	H	coordination
9.	overexploitation	I	life
10.	future	J	effects
11.	climate	K	sustainability
12.	global	L	resources
13.	biological	M	thresholds
14.	proper	N	unit
15.	low-lying	O	warming

10. Fill in the words from the list below. Use each word only once.

sustainability, world, global, benefit, negative, environmental, renewable, human, approach, climate, natural, collapse, conservation, biodiversity, components

- 1.** modern _____ economy;
- 2.** the so-called _____ resources;
- 3.** causing global _____ change;
- 4.** the extinction of natural _____;
- 5.** moving towards environmental _____;
- 6.** unsustainable _____ activities;
- 7.** _____ of future generations;
- 8.** supporting environmental _____;
- 9.** _____ effects of climate change;
- 10.** comprehensively integrated _____;
- 11.** promote the _____ of natural habitats;
- 12.** various environmental _____;
- 13.** degradation of _____ resources;
- 14.** long-term _____ quality;
- 15.** to reduce _____ temperatures.

11. Match the words with similar meanings. You can also do it using the LearningApps platform at this [link](#).

1.	collapse	A	maintenance
2.	irreplaceability	B	deterioration
3.	preservation	C	extermination
4.	overexploitation	D	impurity
5.	climate	E	execution
6.	extinction	F	resident
7.	biodiversity	G	protection
8.	prosperity	H	destruction
9.	inhabitant	I	abundance
10.	contamination	J	exposure
11.	degradation	K	weather
12.	conservation	L	preciousness
13.	reduction	M	ecosystem
14.	implementation	N	overcultivation
15.	vulnerability	O	decrease

12. Write the opposites of the following words. Use the [dictionary](#) if necessary.

1	cause	
2	collective	
3	maintain	
4	various	
5	exceed	
6	rapid	
7	promote	
8	renewable	
9	propose	
10	particular	
11	preserve	
12	proper	
13	affect	
14	undeniable	
15	warn	

13. Match the key terms on the topic “Environment and Sustainability” with their definitions.

collapse, preservation, vulnerability, prosperity, overexploitation, indicator, balance, biodiversity, depletion, irreplaceability, extinction, inhabitant, conservation, degradation, contamination

1. The quality of being easily hurt, influenced, or attacked.
2. Something that shows what a situation is like or how it is changing.
3. The quality of being too special, unusual, or valuable to replace with something or someone else.
4. The act of keeping something as it is, esp. in order to prevent it from decaying or to protect it from being damaged or destroyed.
5. The act of using too much of something, especially a natural resource (minerals, forests, coal, etc., that exist in a place and can be used by people).
6. A situation where different things are given equal importance, or are considered or divided equally or fairly.
7. The sudden failure of a system, organization, business, etc.
8. A situation in which something no longer exists.
9. The number and types of plants and animals that exist in a particular area or in the world generally, or the problem of protecting them.
10. A situation in which people are successful and have a lot of money.
11. A person or animal that lives in a particular place.
12. The process of making something dirty or poisonous, or the state of containing unwanted or dangerous substances.
13. A reduction in something, or the act of reducing it.
14. The process by which something is made worse, esp. the quality of land; the process by which the beauty or quality of something is destroyed or spoiled.
15. The protection of plants and animals, natural areas, and interesting and important structures and buildings, especially from the damaging effects of human activity.

Borrowed and modified from: <https://dictionary.cambridge.org/dictionary/english/>

14. Match the first part of the sentence (1–12) with the second one (a–l).

1. Environmental sustainability is the ability to maintain ecological balance in our natural environment and to conserve natural resources ...

2. Sustainable technologies have a broader scope than just minimising pollution and preventing ...

3. Indicators break complex issues into more readily understood chunks of information, thus ...

4. The complex relationship between economic development and environmental sustainability remains insufficiently understood, particularly ...

5. Sustainable technologies provide benefits to all stakeholders while ...

6. Indicators are central to many sustainability initiatives because they are ...

7. Sustainable technologies meet the needs of the population in a way that does not exceed the available ...

8. There are only six indicators that have a common outcome ...

9. There are only three indicators that use the same statistical measure across the three frameworks: GDP per capita, ...

10. The aim is to bring global production into line with the principles of nature and not to exceed the carrying capacity of the Earth, ...

11. Ecological footprint analysis can tell us in a vivid, ready-to-grasp manner how much of the Earth's ...

12. Sustainable technologies should be designed to balance ...

a) ... greenhouse gas emissions, and share of renewable energy.

b) ... minimizing negative impacts on the environment and society.

c) ... in the context of meeting the global needs of humanity.

d) ... environmental degradation through continuous improvement of production.

e) ... useful to generate knowledge and communicate about complex issues.

f) ... allowing communication between experts and non-experts.

g) ... to support the health of current and future generations.

h) ... regarding how ecological stress interacts with renewable energy transitions.

i) ... economic, environmental, and social considerations.

j) ... but differing statistical measures.

k) ... environmental functions are needed to support human activities.

l) ... capacity of the planet and, within that, the capacity of local ecosystems.

15. Choose the most appropriate word to complete the extract. You can also do it using the LearningApps platform at this [link](#).

Indicators of Sustainability

The indicators must fulfil certain criteria, namely:

– *Importance* – it is always necessary to ask the question, what is the importance of an indicator, whether it is only specific or can serve the whole 1) _____ context.

– *Representativeness* – it has to be certain what 2) _____ the indicator represents and what analyses should be performed.

– *Uniqueness* – it has to regard unique, new data, each 3) _____ has to be specific and original.

– *Measurability* – it has to be technologically possible to get the necessary data without an enormous 4) _____.

– *Costs and yield* – the costs of getting the data have to be balanced against the yield obtained.

– *Negative impacts minimising* – obtaining the data has to bring about a minimum 5) _____ on nature.

– *Correctness* – the indicators have to be correct and without errors, and that in every phase of the data obtaining and processing. It is never possible to state that they are completely correct, as it is always necessary to allow for a minor 6) _____.

– *Reliability* – the data have to be based on several independent 7) _____ or obtained by several different methods.

– *Comparability* – the data should be 8) _____ in the long run.

– *Transparency* – the data and indicators obtained have to be 9) _____; it has to be clear what methods and in which way were utilised.

– *Understandability* – the final data have to be easily understood, unanimous, and clear.

– *Timing* – it is important that the data and information are to the disposal at the proper 10) _____.

– *Utilisation* – it is important that the 11) _____ and information can be practically utilised.

Borrowed and modified from:

Bohdan Kovalov (2024). Relationship between sustainable development indicators and SMEs' development indicators: Evidence from the EU countries. Problems and Perspectives in Management, 22(2), 71-92. doi:10.21511/ppm.22(2).2024.07

1	a)	consumption	b)	production	c)	sustainability
2	a)	phenomenon	b)	data	c)	information
3	a)	indicator	b)	product	c)	sign
4	a)	cost	b)	effort	c)	measurement
5	a)	impact	b)	pollution	c)	protection
6	a)	cost	b)	effort	c)	error
7	a)	indicators	b)	measurements	c)	researches
8	a)	important	b)	significant	c)	comparable
9	a)	understandable	b)	transparent	c)	obvious
10	a)	location	b)	time	c)	place
11	a)	data	b)	indicator	c)	product

16. Choose the correct option. You can also do it using the LearningApps platform at this [link](#).

1. The Ecological Footprint (EF) that exists as a result of human pressure on nature affects a function of activities such as _____, consumption, and trade.

- a) produce b) production c) productive**

2. In relation to the sustainability of development, the overarching challenge is the general _____ of the environmental behaviour of production facilities.

- a) improve b) improvement c) improvable**

3. Models of economic growth, the concept of _____, technological, material, environmental, and energy innovations are closely related and build on each other.

- a) sustain b) sustainability c) sustainable**

4. Strategic decisions at both _____ and regional levels in the sphere of socio-economic policy must always take into account a longer time horizon.

- a) globalise b) globalisation c) global**

5. The EF is used as an indicator of corporate environmental _____.

- a) perform b) performance c) performable**

6. The use of indicators in the _____ of the SDGs should be handled carefully, but there are roles that the indicators can usefully play.

- a) implement b) implementation c) implementational**

7. The environmental impacts of _____ and production, technologies, and activities are also cumulative and sometimes irreversible.

- a) consume b) consumption c) consumptive**

8. The proper _____ of the indicator is important at the aggregated indicators; important are the choice of the variables and also the properly selected weights of them.

- a) choose b) choice c) choiceful**

9. The EF is an _____ for human demand for global biological resources.

- a) indicate b) indicator c) indicative**

10. Technological _____ is minimizing the use of natural resources, and societies can develop more environmentally friendly production methods.

- a) develop b) development c) developmental**

11. The indicator also makes _____ the extent to which consumer lifestyles and behaviors are ecologically sustainable.

- a) visualise b) vision c) visible**

12. Economic growth models and the concept of sustainability _____ a dependency in their development and institutional interdependence.

- a) create b) creation c) creative**

13. There is a strong link between today's _____ choices and society's future economic opportunities and quality of life.

- a) strategise b) strategy c) strategic**

14. Moreover, as globalization and _____ technology advance, societies will have more information about the importance of the environment.

- a) communicate b) communication c) communicative**

15. The Ecological Footprint was originally developed as an indicator of the _____ impact of nations, individuals, or populations.

- a) environ b) environment c) environmental**

17. Fill in the gaps with the appropriate words from the list below. Use each word only once. You can also do it using the LearningApps platform at this [link](#).

development

security

industry

production

society

competition

environment

condition

globalisation

tools

pollution

performance

innovation

customer

integration

The concept of 1) _____ of innovation links two fundamental phenomena of modern economies: the increasing international 2) _____ of economic activities and the growing importance of knowledge in economic processes. Today and in the future, the ability to innovate technologically is seen as the ultimate 3) _____ for maintaining competitiveness and managing the sustainable 4) _____ of companies and the economy as a whole. In a dynamically changing business 5) _____, driven by increasingly demanding 6) _____ requirements, the growth of products and services and the consequent increase in market 7) _____, technological development and the globalisation of business, 8) _____ is an effective means of coping with change.

In seeking and securing future gains, a globalised 9) _____ today can focus on the broad perspectives over time embodied in globally coordinated development strategies. The key instruments for improving environmental 10) _____ and greening technologies are:

Clean 11) _____ and environmental accounting;

Integrated 12) _____ prevention and control and recycling;

Any methods for comprehensive environmental optimisation of products and greening of 13) _____;

Methods and 14) _____ that have been incorporated into business strategies;

National 15) _____ and its long-term perspective.

Borrowed and modified from:

Majerník, M., Chovancová, J., Drábik, P., & Štofková, Z. (2023).

Environmental technological innovations and the sustainability of their development. Ecological Engineering & Environmental Technology, 24(4), 245–252. <https://doi.org/10.12912/27197050/162708>

18. Complete the text by choosing the correct option (a, b, c, or d) to fill each gap.

Sustainability Indicators

To simplify, the indicators have to be useful **1)** _____ the potential users, and it has to be possible to read **2)** _____ them the relevant information, e.g., **3)** _____ the strengths and weaknesses **4)** _____ the given locality. The indicators are formed **5)** _____ different sectors and areas. From another viewpoint, they can be divided according to the aggregation level. On the lowest level, the data are obtained **6)** _____ simple monitoring or statistical research. Other indicators are obtained **7)** _____ the aggregation **8)** _____ the obtained data (CEC 2005). The indicators can be divided **9)** _____ the key and aggregated ones. Key indicators should supply simple information **10)** _____ the selected key phenomena. They should be simple so that the issuing information is understandable **11)** _____ the general public and so that they can be quickly computed **12)** _____ minimum costs. The aggregated indicators combine a series **13)** _____ facts into one indicator to supply a complex picture. An example can be the Human Development Index.

Agenda 21 (para. 40.4) highlights that traditional indicators like GDP or pollution levels are not enough to assess progress toward sustainability. They don't show how environmental, economic, and social factors interact. Therefore, specific sustainability indicators are needed to support informed decision-making **14)** _____ all levels. The indicators could facilitate new understandings **15)** _____ sustainability and new learning through quantified analysis (such as modelling).

Borrowed and modified from:

Bohdan Kovalov (2024). Relationship between sustainable development indicators and SMEs' development indicators: Evidence from the EU countries. Problems and Perspectives in Management, 22(2), 71-92.

[doi:10.21511/ppm.22\(2\).2024.07](https://doi.org/10.21511/ppm.22(2).2024.07)

1	a)	at	b)	for	c)	of	d)	in
2	a)	from	b)	on	c)	with	d)	for
3	a)	with	b)	on	c)	in	d)	at
4	a)	at	b)	in	c)	of	d)	from
5	a)	to	b)	with	c)	from	d)	for
6	a)	for	b)	by	c)	with	d)	at
7	a)	to	b)	from	c)	by	d)	with
8	a)	of	b)	for	c)	with	d)	to
9	a)	in	b)	to	c)	for	d)	into
10	a)	on	b)	for	c)	from	d)	of
11	a)	of	b)	from	c)	for	d)	with
12	a)	with	b)	on	c)	in	d)	at
13	a)	for	b)	of	c)	on	d)	from
14	a)	of	b)	for	c)	at	d)	on
15	a)	on	b)	in	c)	for	d)	of

19. Complete the sentences with the missing words. Use the definitions to help you.

Characteristics of Sustainable Technologies

There are several key elements that sustainable technologies should include:

- *Environmental responsibility:* Sustainable technologies should minimize their

1) _____ on the environment and contribute to reducing

2) _____ emissions and pollution.

- *Resource efficiency:* Sustainable technologies should use resources, such as

3) _____ and raw materials, efficiently, reducing waste and minimising the 4) _____ of natural resources.

- *Longevity:* Sustainable technologies should be designed to last for a long 5) _____, reducing the need for frequent replacements and reducing waste.

- *Cost-effectiveness:* Sustainable technologies should be economically viable, both in terms of initial 6) _____ and ongoing 7) _____ costs.

- *Social impact:* Sustainable technologies should contribute to social equity and 8) _____, providing benefits to all members of society and avoiding negative impacts on marginalised communities.

- *Innovation:* Sustainable technologies should incorporate new and innovative approaches to solving environmental problems, encouraging ongoing 9) _____ and development.

- *Scalability:* Sustainable technologies should be designed to be scalable, so that they can be widely adopted and have a significant impact on reducing environmental 10) _____.

Borrowed and modified from:
Majerník, M., Chovancová, J., Drábik, P., & Štofková, Z.
(2023). Environmental technological innovations and the sustainability of their development. *Ecological Engineering & Environmental Technology*, 24(4), 245–252.
<https://doi.org/10.12912/27197050/162708>

1 – the strong effect or influence that something has on a situation or person;

2 – one of several gases, especially carbon dioxide, that prevent heat from the earth escaping into space, causing the greenhouse effect;

3 – the power from something such as electricity or oil that can do work, such as providing light and heat;

4 – a reduction in something, or the act of reducing it;

5 – the part of existence that is measured in minutes, days, years, etc., or this process considered as a whole;

6 – the act of putting money or effort into something to make a profit or achieve a result;

7 – a situation in which something continues to exist or is not allowed to become less;

8 – the act of including someone or something as part of a group, list, etc., or a person or thing that is included;

9 – to study a subject in detail, especially to discover new information or reach a new understanding;

10 – physical or other injury or damage done to something.

PHRASAL VERBS and IDIOMS

20.1. Watch the video “**Keep: Phrasal verbs**” and match the phrasal verbs with KEEP and their definitions. Some phrasal verbs have more than one definition.

KEEP AT	1) to stop using, touching, etc.
	2) to do whatever is necessary to stay level or equal with someone or something
KEEP Something AROUND	3) to refrain or prevent from coming (near)
	4) to continue happening, doing something, working, etc.
KEEP AWAY	5) to prevent (someone) from talking about (something)
KEEP OFF	6) to continue to do or work on something
KEEP ON	7) to keep adequately informed or up-to-date
KEEP UP	8) to continue to have someone or something at hand, in close proximity, or in one's employ
	9) to stop or prevent (someone or something) from being on (something)
KEEP UP WITH Something / Somebody	10) to continue without interruption
	11) to continue to have (someone) as an employee

20.2. Watch the video “**Phrasal Verbs con MAKE**” and match the phrasal verbs with MAKE and their definitions. Some phrasal verbs have more than one definition.

MAKE AFTER	1) to have an impression or an understanding of something
	2) to make progress
MAKE FOR	3) to go or run away in haste
	4) to see, hear, or understand something or someone with difficulty
MAKE OF Something	5) to invent something, such as an excuse or a story, often in order to deceive
MAKE OFF	6) to renovate or remodel
MAKE OVER	7) to set off in pursuit of; chase
	8) to go in the direction of a place or thing
MAKE OUT	9) to take the place of something lost or damaged or to compensate for something bad with something good
	10) to make room; clear a passage
MAKE UP FOR	11) to legally give something to somebody
	12) to form or constitute

21.1. Complete the sentences with the correct prepositions to form phrasal verbs with KEEP.

at around away off on up with

1	Green startups keep _____ introducing innovative solutions to reduce plastic waste despite limited funding.
2	Environmental activists keep _____ their campaign against deforestation in tropical regions, aiming to protect biodiversity and promote sustainable land use.
3	Governments are working to keep industries _____ from unsustainable practices through stricter environmental regulations.
4	Farmers use fencing to keep livestock _____ newly planted reforestation zones to ensure young trees can grow undisturbed.
5	Eco-conscious consumers try to keep _____ sustainable living trends, such as zero-waste shopping and plant-based diets.
6	Many eco-conscious households keep rainwater barrels _____ their homes to collect and reuse water efficiently for gardening and other outdoor needs.

21.2. Complete the sentences with the correct prepositions to form phrasal verbs with MAKE.

for off out over up way

1	Sustainable agriculture practices make _____ a crucial part of efforts to reduce environmental impact and improve food security.
2	Coastal regions are benefiting as the removal of abandoned oil infrastructure makes _____ for enhanced environmental protection and sustainable resource management.
3	Degraded riverbanks are made _____ by planting trees and grasses to prevent erosion and support local ecosystems.
4	Scientists are attempting to make _____ the intricate long-term impacts of climate change on local ecosystems by analysing extensive environmental data.
5	When confronted by local activists about the unauthorized deforestation, the loggers quickly made _____, disappearing into the dense forest before authorities could arrive.
6	As severe weather conditions intensified, the emergency response team swiftly made _____ the remote forest reserve to assess the damage and implement urgent conservation measures.



For more practice, go to Practice file 5 on pages 308–310.

22. Replace the idioms in bold with their appropriate equivalents, as in the example. Then make your own sentences with the suggested idioms. If necessary, make some changes in the sentences. Appendix 4 has a list of relevant idioms.

*In an effort to reduce its carbon footprint and appeal to environmentally conscious consumers, the company decided **to go green** by investing in solar panels, eliminating single-use plastics, and introducing eco-friendly packaging.*

*In an effort to reduce its carbon footprint and appeal to environmentally conscious consumers, the company chose **to adopt environmentally sustainable practices** by investing in solar panels, eliminating single-use plastics, and introducing eco-friendly packaging.*

1. Many world leaders are so focused on short-term economic growth and industrial output that they ***can't see the forest for the trees*** when it comes to the long-term environmental consequences of their policies.

2. Humanity is ***on thin ice*** as we continue to exploit natural resources at an unsustainable rate, ignoring the warnings of scientists about rising sea levels, extreme weather events, and collapsing ecosystems.

3. When building eco-tourism facilities in biodiverse regions, developers must ***tread lightly***, ensuring that construction methods preserve native wildlife and that local communities are respected and involved in decision-making.

4. By integrating climate education into school curricula, we ***sow the seeds*** of environmental awareness and responsibility, preparing future generations to make informed decisions that benefit the planet.

5. In their mission to develop a sustainable water purification system for remote villages, the engineering team ***left no stone unturned***, exploring every possible solution from natural filtration methods to solar-powered distillation.

6. Implementing small-scale composting programs in urban neighborhoods can have a powerful ***snowball effect***, eventually influencing city-wide waste management policies and raising public awareness about food waste and soil health.

7. People who ***have a green thumb*** can play a crucial role in promoting sustainability by growing their own food, maintaining community gardens, and encouraging others to reconnect with nature through hands-on planting and cultivation.

8. Trying to solve the climate crisis without addressing corporate pollution or governmental inaction is like ***spitting into the wind***; it's a noble effort, but it won't bring meaningful change unless systemic action follows.

23. Choose the most appropriate idiom to complete the sentence.

1	Urban gardeners who _____ often transform even the smallest balcony into a thriving mini-ecosystem.	a) tread lightly b) have a green thumb c) go green
2	The environmental impact of deforestation can rapidly escalate, creating a _____ that accelerates climate change and biodiversity loss.	a) snowball effect b) spit in the wind c) sow the seeds
3	Policymakers must _____ when approving projects that may disturb fragile wetlands or endangered habitats.	a) go green b) tread lightly c) leave no stone unturned
4	The environmental research team promised to _____ in their investigation of the city's rising air pollution levels.	a) sow the seeds b) tread lightly c) leave no stone unturned
5	Ignoring early warnings about groundwater contamination would only _____ future crises for nearby communities.	a) go green b) sow the seeds of c) have a green thumb
6	The public awareness campaign, _____, failed completely because officials refused to adapt their outdated strategies.	a) leave no stone unturned b) go green c) spit into the wind
7	Some leaders are so focused on short-term profits that they _____, overlooking the long-term environmental consequences of their actions.	a) can't see the forest for the trees b) go green c) tread lightly
8	After repeated warnings from environmental scientists, industries that continue to dump toxic waste are walking _____ with public opinion and regulatory agencies.	a) in the long run b) like water off a duck's back c) on thin ice

Grammar Box

24. Watch the video about **ALL THE CONDITIONALS EXPLAINED VISUALLY WITH EXAMPLES!** English grammar lesson and match each rule (1–7) with the statement (A–G) representing it.

1.	We use Zero Conditional to talk about general truths and scientific facts.	A	If nations had adopted stricter environmental po-licies earlier, the world would be more sustainable today.
2.	The First Conditional is used for real future possibilities and cause-and-effect relations.	B	If people cared more about sustainable transport, the next generation would breathe cleaner air.
3.	To describe hypothetical, unlikely, or imaginative situations, we use the Second Conditional .	C	If forests disappear, biodiversity declines .
4.	The Third Conditional helps us imagine alternative pasts and their consequences.	D	If governments invest in renewable energy, carbon emissions will be reduced .
5.	To combine past conditions with present results, we use a Mixed Conditional model.	E	If we relied only on fossil fuels, the planet would face a severe climate crisis.
6.	To express regret about a missed opportunity, we use Mixed Conditional .	F	If the factory had installed modern filters, the river would not have been polluted .
7.	The Second Conditional is used when the condition concerns the present, but the result concerns the future.	G	If local communities had supported the reforestation project, their region would not suffer from droughts now.

25. Complete the sentences with the options given (a, b, or c) and match them to the corresponding explanation.

1.	Coastal communities _____ large-scale flooding provided that the authorities _____ the dams in time. a) avoid / reinforce b) will avoid / reinforce c) would avoid / reinforced	A	First Conditional – advice or instructions. <i>Use to show that a present choice can lead to a positive future result.</i>
2.	If the factory _____ biochar in its processes, the soil near the site _____ more fertile. a) used / would now be b) has used / will be c) had used / would now be	B	Second Conditional – unreal present or unlikely future. <i>Use to talk about imaginary situations now or in the future.</i>
3.	If communities _____ wetlands from development, flood risks _____ and habitats can be preserved. a) protect / might decrease b) protected / decreased c) protect / would decrease	C	Zero Conditional – general truths or natural outcomes. <i>Use for facts or situations that are always true.</i>
4.	If consumers _____ products made from sustainable materials, demand for resource-intensive goods _____ and ecosystems are disrupted. a) will choose / will decrease b) choose / decreases c) chose / would decrease	D	Mixed Conditional – past action with present consequence. <i>Use to show how an unreal past event affects the present.</i>
5.	If fire preventive strategies _____ used earlier, ecosystem services in Mediterranean regions _____ better preserved. a) had been / would have been b) were / would be c) have been / will be	E	First Conditional – other conditional phrases. <i>Use unless, as long as / provided that, as soon as, in case instead of if.</i>
6.	If engineers _____ decentralized methods earlier, communities _____ less on the national grid now. a) adopted / relied b) had adopted / would rely c) have adopted / will rely	F	Third Conditional – different past result. <i>Use to show how a past action that didn't happen could have changed the past outcome.</i>
7.	Even if a factory _____ solar panels, it _____ proper waste management to prevent contamination. a) installed / would still need b) installs / will still need c) had installed / would still have needed	G	Second Conditional – unchanged result in an imaginary situation. <i>Use “even if” to show that the result would remain the same.</i>

8.	If engineers _____ buildings entirely with recycled materials, construction waste _____ minimized. a) <i>designed / will be</i> b) <i>design / would be</i> c) <i>designed / would be</i>	H First Conditional – likely future event from a present action. <i>Use to talk about something that will probably happen if a condition is met.</i>
9.	If you _____ sustainable construction methods, your projects _____ less environmental impact. a) <i>will adopt / have</i> b) <i>adopt / will have</i> c) <i>adopt / would have</i>	I First Conditional – possible / necessary future results. <i>Use with might, may, can, or must to show that a result is possible or required.</i>
10.	If we _____ the city's power grid to smart technology, we _____ energy waste significantly. a) <i>upgrade / would reduce</i> b) <i>upgraded / reduce</i> c) <i>upgrade / will reduce</i>	J Mixed Conditional – past action with hypothetical present result. <i>Use to imagine a present situation that would exist if a past action had been different.</i>

26. Read the abstract and open the brackets, using the correct tense form of the verbs.

Zero Conditional	First Conditional	Second Conditional	Third Conditional
-----------------------------	------------------------------	-------------------------------	------------------------------

Environmental Sustainability: Concepts, Indicators, and Global Commitments

Environmental sustainability has become a global priority in the 21st century. If societies 1) _____ (**IGNORE**) the need to balance economic growth with ecological stability, they eventually 2) _____ (**FACE**) severe environmental crises. If industries 3) _____ (**REDUCE**) their carbon footprint now, global warming 4) _____ (**DECREASE**) significantly over the next decades. However, many corporations still operate unsustainably because they 5) _____ (**NOT / IMPLEMENT**) green innovations in time. If governments 6) _____ (**TAKE**) stricter measures a decade ago, air and water quality 7) _____ (**BE**) much better today. But in reality, weak policies and corruption 8) _____ (**ALLOW**) pollution to spread unchecked.

Sustainability experts warn that if humanity 9) _____ (**CONTINUE**) consuming natural resources at the current rate, several ecosystems 10) _____ (**COLLAPSE**) within this century.

If consumers 11) _____ (**CHOOSE**) local and eco-friendly products, companies 12) _____ (**BE**) forced to adopt more sustainable production models.

If global cooperation on climate agreements 13) _____ (**FAIL**) completely, sea levels 14) _____ (**RISE**) faster, and millions of people 15) _____ (**LOSE**) their homes due to flooding.

LISTENING

27. Before watching the video, check if you know the meaning of the following words and phrases. Use the [dictionary](#) if necessary.

align with	verifiable facts	plummet	fiscal prudence
authentic commitment	germinate	subsequent decision	credibility
pollinators	immense opportunity	demistify	tangible result

28. Watch the video “[Sustainability & reduction of carbon footprint](#)”. Decide whether the following statements are true (T), false (F), or not mentioned (NM). Correct the wrong statements. Fill in the table with your answers.

	statements	T	F	NM
1	The success of any business, whether large or small, is completely independent of the natural environment from which it draws its resources and the society it serves.			
2	Research consistently shows that many customers are not just interested in sustainability but are also willing to pay more for products and services from environmentally responsible companies.			
3	Businesses that reduce their carbon footprint rarely discover remarkable efficiencies and continue operating in the same traditional ways.			
4	Sustainability efforts are only relevant for large corporations and do not apply to small or medium-sized enterprises.			
5	The first step on any sustainability journey is to clearly identify the starting point by calculating the carbon footprint.			
6	Switching from traditional incandescent or fluorescent bulbs to modern energy efficient LEDs can reduce lighting related energy consumption by up to 80 percent.			
7	Embracing sustainability only requires changes within a company’s own premises, not along the supply chain.			
8	Promoting electric vehicles for deliveries and company use, along with government incentives and improved charging networks, sends a strong message about commitment to sustainability.			

9	A thorough waste audit is unnecessary since simply providing clearly labelled recycling bins is enough to eliminate all waste problems.			
10	Investing in fossil fuel technologies is the most cost-effective way for businesses to reduce their environmental impact.			
11	Engaging employees with initiatives like pledges, competitions, and regular training helps build enthusiasm and knowledge, turning staff into strong supporters of sustainability efforts.			
12	Tracking progress with clear targets and openly reporting results builds trust and demonstrates a genuine commitment to sustainability, which supports long-term business success.			

29. Watch the video again and complete the following sentences with missing information.

1	For businesses across the United Kingdom, _____ sustainability is no longer a peripheral concern but a central pillar of survival and prosperity.
2	A strong sustainability strategy therefore, becomes a powerful tool for building brand loyalty and attracting a new generation of _____ consumers.
3	It is simply an accounting of the greenhouse gas _____ produced by your activities from the electricity that powers your computers to the fuel used in your delivery vans.
4	We can go further by _____ lighting in less frequented areas.
5	Upgrading to a modern energy efficient system or even installing a smart thermostat prevents the _____ waste of heating or cooling an empty building.
6	Our reliance on fossil-fuelled vehicles for transport is a major _____ to national emissions.
7	Furthermore, intelligent route planning software can _____ delivery schedules, reducing mileage, fuel consumption and driver time.
8	The goal is to move from a linear take-make-dispose model to a _____ one where resources are kept in use for as long as possible.
9	This could be as simple as creating a small green space for employees, planting a _____ meadow to support pollinators or installing a bug hotel on the premises.
10	Set clear _____ targets, for instance a goal to reduce carbon emissions by 20 % within three years or to achieve zero waste and landfill status.
11	Regular training and workshops can _____ sustainability, explaining the why behind the new policies and providing practical tips for both the workplace and home.
12	Participating in local conservation projects or helping to restore a nearby habitat _____ community ties and demonstrates a tangible commitment.

SPEAKING

30. You are an environmental science student presenting at the Global Students' Conference on Environment and Sustainability. Choose one of the images below for your presentation at the conference. Briefly describe how the chosen image is related to the environment and sustainability. Your presentation may include the following information: a description of what is shown in the picture, an environmental problem related to it, its effects on people and nature, possible solutions, and a call to action. Improve your presentation by following the presentation requirements and useful phrases provided below.

Presentation requirements:

- 1. Time limit: 2–3 minutes per presentation.**
- 2. Visuals: slides or pictures with keywords / bullet points, not full sentences.**
- 3. Structure: introduction – main part – conclusion.**
- 4. Speak in your own words; do not read.**



Images taken from:

<https://unsplash.com/photos/black-cattle-eating-grass-near-white-windmill-during-daytime-BcTzOLAKFus>

Useful phrases:

- *The image shows / illustrates*
- *I chose this picture because*
- *This environmental problem is caused by*
- *The consequence(s) is / are*
- *According to / For example*
- *To solve this problem*
- *In conclusion*

31. Work in pairs. Student A is a reporter interviewing an expert on sustainability about modern technological solutions for sustainability. Student B is a sustainability expert participating in an event dedicated to green solutions. During the interview, Student A asks questions about sustainable technologies, their pros and cons, and their overall impact. Student B responds to the questions using examples, facts, and real data. The list of questions and the vocabulary in the box provided below can help you prepare well for the interview.

sustainable development	green innovation	renewable energy	eco-friendly	zero-emissions
solar panels	wind turbines	smart grids	water purification	zero-waste
monitoring sensors	AI-based solutions	upcycling	recycling	eco-efficiency

- 1. What are the examples of sustainable technologies?**
- 2. What is the role of these technologies in sustainability?**
- 3. How do they help reduce pollution and solve environmental problems?**
- 4. What is the role of renewable energy in sustainability?**
- 5. How can smart technologies, like IoT or AI, be used for sustainable solutions?**
- 6. What are the main benefits of adapting these technologies?**
- 7. Are there any challenges or limitations in adopting these technologies and smart solutions?**

Useful phrases:

- Sustainable technologies are
- One example of this is
- Unlike traditional solutions / compared to
- These technologies help
- One main benefit is
- Some limitations include
- One main challenge is

32. Work in pairs. You are preparing a presentation for the university competition on the environment and sustainability, aimed at raising awareness on the matter. Design a presentation that explains one of the sustainable development goals (e.g., SDG 13, SDG 7, SDG 8, SDG 6, SDG 14, SDG 15, etc.) Your presentation may include the following elements: an introduction of the sustainable development goal, its global significance, targets, actions, and solutions related to this goal. Improve your presentation by following the presentation requirements and useful phrases provided below.

Presentation requirements:

- 1. Time limit: 2–3 minutes per presentation.**
- 2. Visuals: slides or pictures with keywords / bullet points, not full sentences.**
- 3. Structure: introduction – main part – conclusion.**
- 4. Speak in your own words; do not read.**

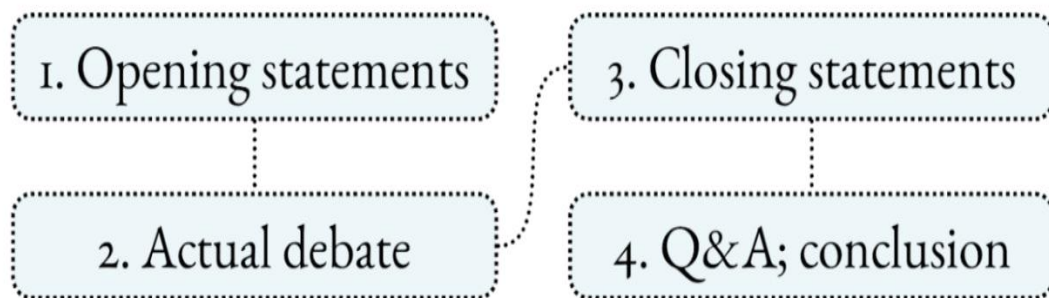
Useful phrases:

- *In this presentation, we will explore / overview*
- *The purpose / aim of this presentation is to*
- *The focus of our presentation is on the*
- *The main aim of this goal is*
- *This goal is important because*
- *One promising solution / technology is*
- *In conclusion / To sum up*

33. You represent your institute in the Intercultural Student Forum on sustainability and the environment. Work in groups. Participate in debates on whether you agree or disagree with the statement “Personal freedom is limited in the name of sustainability”. Group A’s role is to agree with the statement. Group B’s role is to disagree with the statement. Group C introduces the topic, outlines the debate procedure, facilitates and encourages fair discussion, ensures equality, and summarises the outcomes. Each group prepares an opening statement, arguments, visuals to support the arguments, and closing statements.

Useful expressions for debating:

- *To start with / I would like to begin by addressing*
- *One key point to consider is*
- *My first / second / next argument is*
- *An argument for / in favour of / against*
- *There are many examples for / Let me illustrate with an example*
- *I’m afraid I can’t quite agree with / It’s worth considering the opposing view, which argues that*
- *To sum up, here are the main points / In conclusion, we have presented ...*



1. Opening statements.

Group A introduces their positions and presents the key arguments to support their position.

Group B introduces their positions and the main arguments, offering a positive perspective on sustainability.

Group C acts as moderator, introduces the topic, establishes the rules and conditions for fair and well-organized openings, ensures that both groups have equal opportunities, and moves the debate to the next stage.

2. Actual debate.

Group A provides strong arguments supporting their view that sustainability restricts freedom. The group includes examples of sustainable choices and supports their arguments with statistics.

Group B presents counterarguments that claim that sustainability protects personal freedom. The group supports their points with real-life examples and clarifies overgeneralizations made by Group A (if relevant).

Group C oversees a debate, maintains order, manages time, and facilitates fair and respectful interactions between the debating teams.

3. Closing Statements.

Group A summarizes the main points and reinstates their final position.

Group B summarizes the key points and highlights the strongest arguments.

Group C moderates and assists in summarizing important points from both groups, closes the debates, and leads to the Q&A session.

WRITING

34. You were one of the representatives attending an international summit on environmental sustainability, where experts and young professionals from different countries gathered to discuss ways to reduce humanity's impact on the planet. One of the summit's key assignments is to compare the ecological footprints of various countries, highlighting the differences in environmental impact and exploring possible reasons behind them. Write a formal report (160–180 words) comparing the ecological footprints of two different countries of your choice. Focus on key aspects such as energy consumption, transportation, food production, and waste management. Consider factors like population size, lifestyle, industrial development, and environmental policies. Use the phrases and follow the outline provided below, including an introduction, a main part, and a conclusion. Pay attention to clarity, coherence, and accuracy in your writing.

***See Appendix 5 for a writing model.**

Useful phrases:

- *The aim of this report is to compare*
- *An ecological footprint refers to*
- *This report focuses on two countries:*
- *In comparison to*
- *One of the main reasons for the difference is*
- *One common feature for both countries is*
- *To sum up*

1. Introduction

introduce the aim of the report, and give the definition of an ecological footprint

2. Main part

- research the ecological footprint of two countries (e.g. USA vs Qatar, Canada vs Ukraine);
- compare the following: population size, lifestyle, policy, resource consumption, waste production and management, land use;
- explain why their footprints differ

3. Conclusion

summarize the main points

35. You are an environmental activist concerned with a local ecological problem (e.g., illegal logging, burning grass, leaves, and household waste, environmental consequences of missile and drone attacks, air pollution from generators, etc.) Write an email (160–180 words) to a local news channel expressing concern about an environmental issue to raise awareness and call for action.

Maintain the structure:

1) subject, indicating the purpose of your email;

2) greeting;

3) opening and body, introducing the context of the email, explaining a problem, its importance, and how it impacts the environment; suggesting actions;

4) closing, wrapping up an email, and asking for support;

5) signature, including sender name and / or other relevant information, such as contact details.

Pay attention to clarity, coherence, and accuracy in your writing. Use the phrases listed below.

***See Appendix 5 for a writing model.**

Useful phrases:

- *Dear [Name] / To whom it may concern*
- *My name is*
- *I am writing to express my concern / draw your attention to*
- *This problem has a serious impact on*
- *I would like to suggest*
- *I kindly ask for your support in*
- *Best / Kind regards,*

SELF-ASSESSMENT

36. *Explore the target vocabulary related to the topic “Environment and Sustainability” using **flashcards** and then assess comprehension through a **Quizlet quiz**.*

37. *Check yourself and do the quiz.*

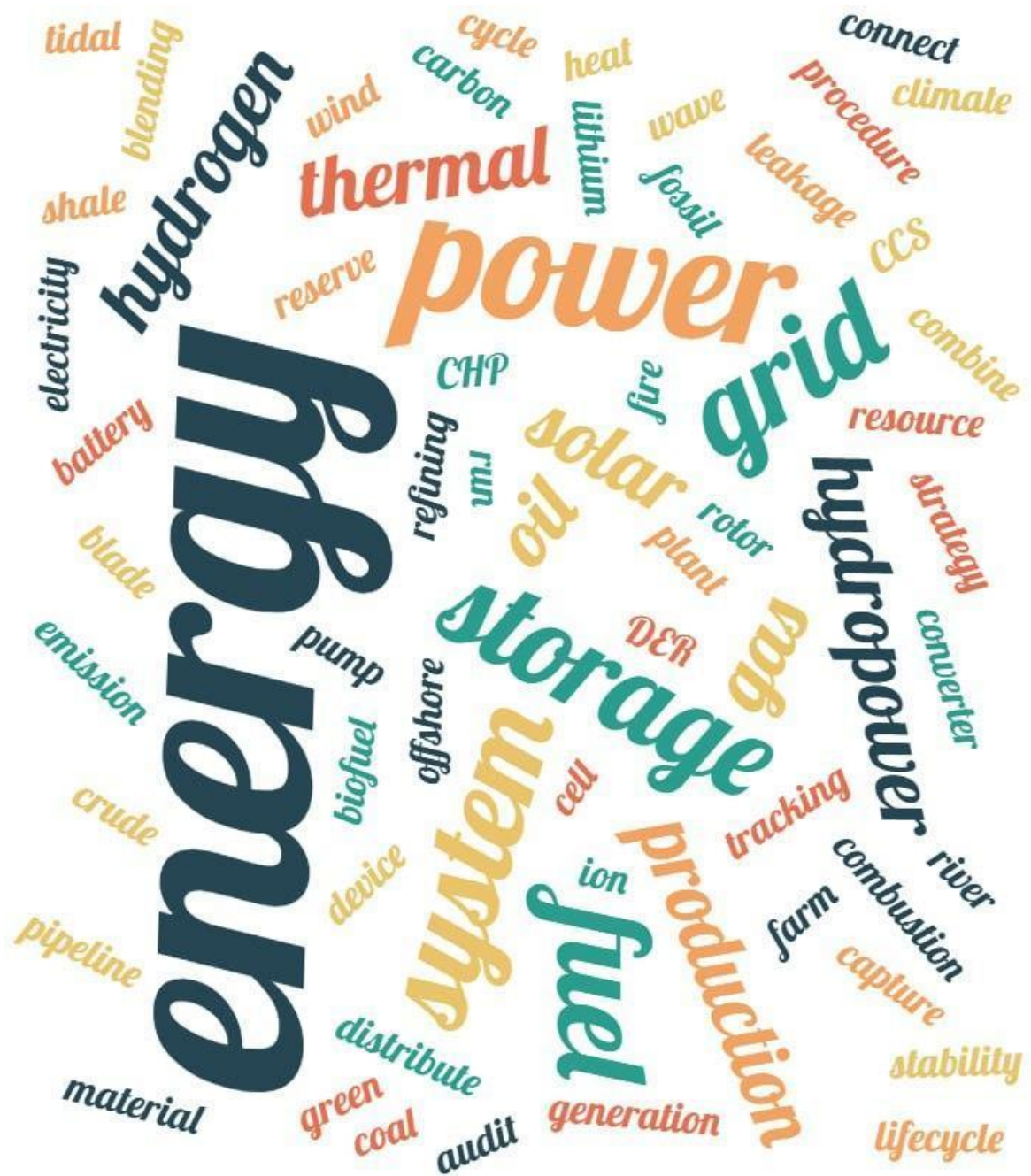
1. Which of the words below has a similar meaning to “preservation”?
 - A. *conservation*
 - B. *sustentation*
 - C. *protection*
 - D. *all of the above*
2. Which of the following can be defined as “the process of making something dirty or poisonous”?
 - A. *contamination*
 - B. *waste*
 - C. *omission*
 - D. *collapse*
3. Which word below is a synonym of “jeopardizing”?
 - A. *nonthreatening*
 - B. *unthreatening*
 - C. *undesirable*
 - D. *threatening*
4. Which of the following best matches the definition of ecological footprint?
 - A. *a measurement of the amount of plastic that someone uses and then throws away*
 - B. *the amount of the earth’s energy that someone or something uses*
 - C. *the mark made by a person’s foot*
 - D. *the amount of space on a surface that something needs*
5. GDP stands for ...
 - A. *general development project*
 - B. *Green development policy*
 - C. *global development plan*
 - D. *Gross Domestic Product*

6. Which word best matches the definition “a particular area”?
- A. *area*
 - B. *sector*
 - C. *locality*
 - D. *yield*
7. What is known as the “Human Development Index”?
- A. *a measurement of the development of a country*
 - B. *the process in which someone or something grows or changes and becomes more advanced*
 - C. *modern and well developed*
 - D. *something that shows how strong or common a condition is*
8. Which of the following is not an SDG indicator?
- A. *ensure inclusivity*
 - B. *end of hunger*
 - C. *end of poverty*
 - D. *GPD growth rate*
9. Which term refers to remaining useful for a long time?
- A. *efficiency*
 - B. *longevity*
 - C. *responsibility*
 - D. *scalability*
10. Which of the following refers to the ability of a system to grow larger?
- A. *efficiency*
 - B. *longevity*
 - C. *responsibility*
 - D. *scalability*

Check yourself, Appendix 8. Self-Assessment Keys.

Unit 6

Conventional and Sustainable Energy

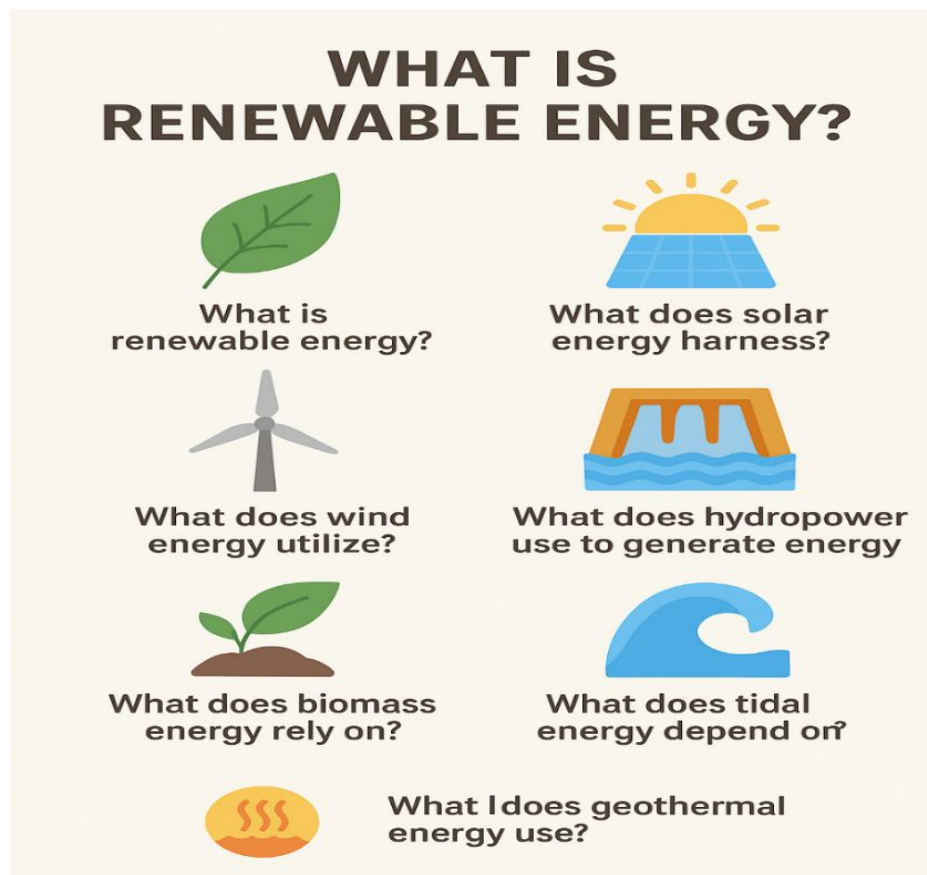


LEAD-IN

1. Match each energy source (1–8) with its corresponding description (A–H). Some descriptions include additional details; read carefully. Discuss your matches with your partner or group members.

1	Solar energy	A	Energy generated from the internal heat of the planet, accessed through underground reservoirs of hot water or steam.
2	Wind energy	B	Energy produced from organic matter that can be burned or converted into fuel, often derived from plants or biological waste.
3	Hydropower	C	Energy obtained from the movement of air masses caused by uneven heating of the Earth's surface.
4	Biomass energy	D	Energy created by the predictable rise and fall of sea levels due to the gravitational forces of the Moon and the Sun.
5	Tidal energy	E	Energy that comes from sources naturally replenished on a human timescale and used as an alternative to fossil fuels.
6	Geothermal energy	F	Energy generated by converting sunlight into electricity or heat using technological systems.
7	Renewable energy (general concept)	G	Energy produced from the controlled flow of water, usually in rivers or reservoirs, to drive turbines.
8	Non-renewable energy	H	Energy obtained from finite resources formed over millions of years and associated with depletion and pollution.

2. Study the infographic. Then watch the [video](#) “Renewable Energy 101” and complete the sentences, using one or two words from the infographic.



Infographics generated by AI (<https://designer.microsoft.com/>)

1. Solar energy harnesses _____ from the Sun to produce electricity.
2. Wind energy converts the _____ of moving air into electrical energy.
3. Hydropower generates electricity by using the _____ of flowing or falling water.
4. Biomass energy relies on _____ or recently living organic material and waste for fuel.
5. Tidal energy depends on the _____ of ocean tides caused by gravitational forces.
6. Geothermal energy utilizes the _____ heat stored within the Earth's crust.
7. Nuclear energy is considered an _____ energy source, not a renewable one.
8. One major environmental advantage of renewable energy is that it does not directly produce _____ or air pollutants.

3. Discuss the following quotations in pairs. Choose the one you agree with and explain why. Use the phrases:

- *If I'm being truthful,*
- *I lack in-depth knowledge of this, but*
- *From where I stand,*
- *If I may say so,*
- *For me / From my point of view,*
- *I am fully persuaded that*
- *There's a possibility I could change my view, but*

1. "Renewable energy sources, such as wind and solar, emit little to no greenhouse gases, are readily available, and in most cases cheaper than coal, oil, or gas."

Source: Renewable energy – powering a safer and prosperous future, United Nations. un.org

2. "The increase in the proportion of renewable energy use can reduce the climate risk ... The mechanism is to reduce CO₂, CH₄, NO, PM_{2.5} emissions and fossil fuel use."

Source: Impacts of renewable energy on climate risk: A global perspective for energy transition in a climate adaptation framework, Applied Energy, 2024. ScienceDirect

3. "An essential component of Nature is biodiversity, which increases Nature's productivity and resilience to shocks, and thereby reduces risks to the ecosystem services on which we rely for our sustainable development."

Source: Sustainable Development and Biodiversity: Hype or Hope?, SpringerLink, 2024

4. "As countries scale up climate action, they face the challenge of expanding renewable power while tackling biodiversity loss."

Source: Mainstreaming Biodiversity into Renewable Power Infrastructure, OECD 2024

5. "Despite their undeniable environmental benefits, renewable energies are not exempt from generating negative impacts on the environment."

Source: Euronews article "Experts urge rethink on renewable energy and its hidden environmental impact."

6. "The world faces simultaneous climate and biodiversity crises, with profound implications for human health, well-being, and the economy."

Source: Mainstreaming Biodiversity into Renewable Power Infrastructure, OECD, 2024

7. "Under the Environmental Protection Agency's Energy Star Program, homes are independently verified to be measurably more energy efficient than average houses."

Source: Melissa Bean, quoted in Fixquotes / Quotefancy

8. "Biodiversity is essential for sustainable development and human well-being. It underpins the provision of food, fibre and water; it mitigates and provides resilience to climate change; it supports human health, and ..."

Source: Biodiversity at the Heart of Sustainable Development – Input to the 2018 High-level Political Forum on Sustainable Development

READING

4. Read the text below. Match choices (A–H) to (1–5). There are three choices you do not need to use.

- A** Energy Resources and Biodiversity in Sustainable Development
- B** Environmental and Health Challenges of Energy Use
- C** Renewable Energy Depletes Resources and Harms Biodiversity
- D** Renewable Energy and Environmental Protection
- E** Understanding Energy: Types and Transformations
- F** Fossil Fuels Are Unlimited and Environmentally Friendly Energy Sources
- G** Renewable Energy Increases Environmental Degradation and Pollution
- H** Renewable Energy: Benefits and Environmental Challenges

What is Energy? Exploring the Link between Energy Resources and Global Biodiversity

1. _____. Energy is the ability to do work, transferring force across a distance. All energy is either kinetic or potential. Kinetic energy is energy of motion, such as a rolling rock, a flowing river, or moving wind. Potential energy depends on position or stored capacity, like a rock atop a hill or water behind a **dam**. Some forms combine both, such as chemical energy stored in food or fuel, which can transform into motion or heat when used.

2. _____. Energy and biodiversity are tightly linked in **sustainable** development. Energy sources fall into two groups: renewable and non-renewable. Non-renewable sources like **fossil fuels** and nuclear energy are finite and formed over millions of years from ancient organisms. They are energy-dense and efficient but cannot be **replenished** quickly, leading to **depletion** and pollution. Renewable energy comes from continuously replenished natural sources – sunlight, wind, water, and biomass. It supports economic growth while protecting ecosystems by cutting **emissions** and providing decentralized, clean energy. Sustainable development requires balancing growth, equality, and environmental care, which renewables help **achieve**.

3. _____. Solar, wind, hydropower, geothermal, and biomass energy are renewable, clean, and long-lasting. They emit little or no greenhouse gases, mitigating climate change and **enhancing** energy security through local generation. However, both renewable and **fossil fuels** affect ecosystems. Fossil fuel extraction **releases** greenhouse gases, causes pollution, and destroys habitats,

driving biodiversity loss. Renewables have a smaller **footprint** but are not **impact-free**: large solar or wind farms can fragment habitats, hydropower alters river ecosystems, and bioenergy **competes** with land use for food or forests. Transitioning to renewables, therefore, requires careful planning to minimize ecological **disruption** while reducing carbon emissions.

4. _____. Environmental harm from energy arises at every stage – extraction, processing, transport, and waste disposal. Fossil fuel extraction damages **fragile** habitats, and accidents like oil spills **devastate** ecosystems. Transport via pipelines, tankers, or trucks risks **leaks** and generates emissions. **Refining** fuels **consumes** water and releases pollutants, while power generation **emits** waste and greenhouse gases. The deeper we extract and the farther we drill, the greater the risk to both nature and human health. Pollution from these processes affects air, soil, and water, **threatening** biodiversity and communities worldwide.

5. _____. Renewable energy sources are vital for reducing environmental degradation. Global energy transformation relies on replacing fossil fuels with renewable energy sources and low-emission technologies. By cutting CO₂ emissions, conserving resources, and limiting pollution, renewables help fight climate change and protect ecosystems. Their use promotes sustainable economic and social growth while **maintaining** environmental stability. Renewable energy is a foundation for long-term environmental protection and sustainable development.

*Borrowed and modified from:
Andish, F., & Debo, D. (2024, December 30). Renewable energy: A pathway to sustainable development.
Energy, 1–6.*

Follow-up

5. Explain the words / phrases in bold from the text, and make up sentences with these words. Use the [dictionary](#) if necessary.

6. Read the text again and mark the statements as true (T) or false (F). Correct the wrong statements.

	statements	T	F
1	Energy is the ability of a system to do work.	☐	☐
2	Kinetic energy is stored in food and fuels.	☐	☐
3	Chemical energy is a type of kinetic energy.	☐	☐
4	Potential energy depends on an object's position.	☐	☐
5	Fossil fuels form from ancient plants and animals over millions of years.	☐	☐
6	Renewable energy sources cannot be replenished.	☐	☐
7	Fossil fuels have high energy density.	☐	☐
8	Solar and wind energy release large amounts of CO ₂ .	☐	☐
9	Renewable energy reduces greenhouse gas emissions.	☐	☐
10	Sustainable development ignores environmental protection.	☐	☐
11	Renewable energy always destroys more resources than it saves.	☐	☐
12	Power plants generate emissions and waste.	☐	☐

USE of ENGLISH

7. Using the information from the text (Ex. 4), match items (1–15) with (A–O) to form phrases. After that, choose any three of the completed phrases and use them in your own sentences.

1.	exert a force on another	A	resources and biodiversity
2.	keep track of how much energy	B	with motion
3.	types of energy associated	C	ancient plants and animals
4.	energy possessed by an	D	a chemical reaction
5.	describes the potential to undergo	E	in species distribution
6.	examples include energy stored	F	energy generation
7.	the interaction between energy	G	system over some distance
8.	promoting sustainable	H	within a human timespan
9.	play a significant role	I	despite their limited supply
10.	cannot be replenished	J	in the food you eat
11.	derived from the remains of	K	for their formation
12.	due to the extensive time required	L	transfers into a system
13.	making them highly efficient for	M	development globally
14.	continue to be widely sought after	N	as condensation
15.	undergo geological processes such	O	object or system

8. Fill in the table with the words derived from the given ones.

	Noun	Verb	Adjective
1	.....	energize	.....
2	.....	.....	extractive
3	distribution	.....	.....
4	.....	compete	.....
5	.....	.....	reliant
6	consumption	.....	.....
7	.....	depend	.....
8	.....	.....	rotational
9	utilisation	.....	.....
10	.....	operate	.....
11	.....	.....	transportable
12	injection	.....	.....
13	.....	relate	.....
14	.....	.....	powerful
15	conversion	.....	.....

9. Match the words in column A with the words in column B to form meaningful phrases. You can also do it using the LearningApps platform at this [link](#).

Column A		Column B	
1.	potential	A	distribution
2.	chemical	B	plants
3.	species	C	supply
4.	limited	D	equity
5.	finite	E	characteristics
6.	key	F	integration
7.	ongoing	G	energy
8.	fossil	H	sources
9.	extinct	I	demand
10.	industrial	J	gas
11.	harmonious	K	reaction
12.	social	L	growth
13.	environmental	M	fuels
14.	natural	N	protection
15.	greenhouse	O	availability

10. Fill in the words from the list below. Use each word only once.

drivers, require, conventional, transfer, clean, resilience, greenhouse, alternative, kinetic, heat, remains, depleting, fuels, environmental, mitigate

- _____ from one system to another;
- part _____ and part potential energy;
- non-renewable (_____) energy sources;
- undergo extreme _____ and pressure;
- _____ millions of years to form;
- created from the _____ of extinct animals;
- primary _____ of electricity production;
- sustainably used without _____ the resources;
- provide _____ and abundant energy;
- reduce dependence on fossil _____;
- foster _____ against energy shocks;
- have a lower _____ impact;
- produce little to no _____ gas emissions;
- help _____ climate change;
- sustainable _____ to fossil fuels.

11. Match the words with similar meanings. You can also do it using the LearningApps platform at this [link](#).

1.	system	A	accessibility
2.	force	B	removal
3.	reaction	C	difficulty
4.	availability	D	splitting
5.	challenge	E	structure
6.	investment	F	production
7.	gasoline	G	concentration
8.	density	H	catastrophe
9.	security	I	response
10.	extraction	J	fabrication
11.	crisis	K	funding
12.	concern	L	worry
13.	fragmentation	M	strength
14.	manufacture	N	safety
15.	generation	O	petrol

12. Write the opposites of the following words. Use the [dictionary](#) if necessary.

1	transform	
2	relative	
3	ancient	
4	replenish	
5	high	
6	continue	
7	decentralized	
8	include	
9	long	
10	compare	
11	generate	
12	favourable	
13	extract	
14	significant	
15	capture	

13. Match the key terms on the topic “Conventional and Sustainable Energy” with their definitions.

	<i>spill, remains, security, collision, fuel, grid, resilience, crust, bioenergy, feedstock, disposal, displacement, transmission, rotation, turbine</i>	

1. Pieces or parts of something that continue to exist when most of it has been used, destroyed, or taken away.
2. A substance that is used to provide heat or power, usually by being burned.
3. Energy that is produced from a biofuel (= a fuel that is made from living things or their waste).
4. The quality of being able to return quickly to a previous good condition after problems.
5. The process of sending something, for example, gas or electricity, from one place to another.
6. Protection against threats or risks.
7. The act of getting rid of something.
8. An amount of something that has flowed or fallen out of a container.
9. A type of machine through which liquid or gas flows and turns a special wheel with blades in order to produce power.
10. The outer layer of the Earth.
11. The act of forcing somebody / something away from their home or position.
12. A system of wires through which electricity is connected to different power stations across a region.
13. Movement in a circle around a fixed point.
14. The violent coming together of two or more moving objects.
15. Material that is used to produce something in an industrial process.

Borrowed and modified from:
<https://dictionary.cambridge.org/dictionary/english/>

14. Match the first part of the sentence (1–12) with the second one (a–l).

1. Environmental protection and combating climate change are ...
2. Awareness of the threats resulting from environmental degradation ...
3. RES helps reduce the negative effects of environmental degradation ...
4. The use of renewable energy supports sustainable socioeconomic ...
5. In comparison with conventional or nonrenewable energy sources, ...
6. However, the challenges of renewable energy are that their ...
7. Due to the uneven heating of the Earth's surface, air flow ...
8. The cost of wind energy decreases because of the significant ...
9. Moreover, integration of wind energy with the electricity grid for power

...

10. Geothermal energy offers a stable and continuous energy ...
11. Weather-dependent factors result in intermittent ...
12. Solar power has witnessed rapid growth due to advancements ...

a) ... because they contribute to reducing CO₂ emissions, reducing pollution.

b) ... source with relatively low environmental impact.

c) ... development by reducing its negative impact on the environment.

d) ... technologies are still at the development stage, yet to be well-established.

e) ... distribution is possible with the advances in direct-drive wind turbines.

f) ... currently among the most important global challenges.

g) ... improvement in turbine components such as blades and gearboxes.

h) ... in photovoltaic (PV) technology and system integration.

i) ... renewable energy has more advantages in terms of the free cost of materials.

j) ... supply of energy from wind.

k) ... has contributed to the ongoing energy transformation process.

l) ... is harnessed to convert mechanical energy to electrical.

15. Choose the most appropriate word to complete the extract. You can also do it using the LearningApps platform at this [link](#).

Hydropower. Hydropower is energy obtained from the flow of water to rotate a 1) _____ for electricity generation. The 2) _____ of hydropower as a renewable energy source are high yield and low production 3) _____, long lifespan and the ability to 4) _____ continuously. On the other 5) _____, the disadvantages of hydropower are the displacement of the 6) _____ community, high impact on the ecosystem at upstream and downstream river, the emission of greenhouse gases and high capital investment. In addition, other 7) _____ with the construction of hydropower is the impact on the local habitat and biodiversity.

Solar energy. Sunlight is captured and 8) _____ into electricity via photovoltaic cells installed in solar 9) _____. Solar energy is the fastest-growing energy source among renewable energy production. In just one hour, the amount of energy from sunlight reaching the Earth is so 10) _____ that it is enough to power the global economy for an entire year. In 11) _____ with other energy types like coal, oil and gas, the production cost of solar energy is almost 8 times higher. Besides that, the price of solar energy has to include a high cost for the balance system, including permits, interconnection, inspection, and financing customer acquisition.

Borrowed and modified from:

Al-Obaidi, A. S. M., & NguyenHuynh, T. (2018). Renewable vs. conventional energy: Which wins the race to sustainable development? IOP Conference Series: Materials Science and Engineering, 434, 012310.

<https://doi.org/10.1088/1757-899X/434/1/012310>

1	a)	propeller	b)	turbine	c)	engine
2	a)	advice	b)	advances	c)	advantages
3	a)	pay	b)	cost	c)	bill
4	a)	supply	b)	apply	c)	support
5	a)	foot	b)	arm	c)	hand
6	a)	local	b)	global	c)	residential
7	a)	benefit	b)	concern	c)	idea
8	a)	twisted	b)	turned	c)	spun
9	a)	plates	b)	planes	c)	panels
10	a)	tiny	b)	small	c)	huge
11	a)	contrast	b)	comparison	c)	difference

16. Choose the correct option. You can also do it using the LearningApps platform at this [link](#).

1. This section outlines key technological developments and their role in accelerating the _____ to cleaner energy sources.

- a) transit b) transition c) transitional**

2. Innovations such as passivated emitter rear cell (PERC) technology _____ electron recombination and improve light capture.

- a) minimize b) minimization c) minimal**

3. The expansion of Building-Integrated Photovoltaics (BIPV) _____ a growing trend in embedding solar technology into architectural elements.

- a) reflects b) reflection c) reflective**

4. Solar thermal systems, including concentrated solar power (CSP), have also advanced with the _____ of molten salt heat transfer systems.

- a) introduce b) introduction c) introductory**

5. It enables _____ energy generation beyond daylight hours.

- a) continue b) continuation c) continuous**

6. The _____ of micro- and small-scale hydropower has made clean energy more accessible to off-grid and remote communities.

- a) develop b) development c) developmental**

7. Hydropower continues to play a central role in _____ generation.

- a) electrify b) electricity c) electric**

8. These systems often utilise existing water infrastructure, minimizing new _____ and ecological disruption.

- a) construct b) construction c) constructive**

9. Hydropower's role in hybrid systems is also expanding, providing _____ base-load power alongside intermittent renewable sources.

- a) stabilize b) stability c) stable**

10. Technological _____ such as run-of-river systems and fish-friendly turbines reduce environmental impact.

- a) innovate b) innovations c) innovative**

11. Modern offshore wind turbines can _____ electricity even at lower wind speeds, increasing overall capacity.

- a) generate b) generation c) generative**

12. These systems expand geothermal geographical _____.

- a) apply b) applicability c) applicable**

13. Geothermal heat pumps (GHPs) have also _____ with better heat exchanger designs and smart control systems.

- a) evolved b) evolution c) evolutionary**

14. Fish passage solutions further enhance ecological _____.

- a) integrate b) integration c) integrative**

15. Direct-drive wind turbines are more _____ than traditional gearbox designs.

- a) rely b) reliance c) reliable**

18. Complete the text by choosing the correct option (a, b, c, or d) to fill each gap.

Biofuel energy. Extraction of energy 1) _____ biomass in food-sources or non-food-sources is biofuel energy. Bioenergy technology especially ethanol fuel has attracted increasing interest as a practical solution to solve environmental pollution caused 2) _____ fossil fuel usage due 3) _____ its carbon-neutral process, improvement 4) _____ national energy security and suitability 5) _____ agricultural countries. There are two platforms to produce ethanol fuel, i.e., syngas and sugar platforms. Conventionally, food source such as corn, rice, wheat and sugar are used as feedstock 6) _____ ethanol production. Hence it is called the first-generation ethanol fuel, which results 7) _____ a controversial issue 8) _____ using food versus fuel, and other negative impacts 9) _____ regional water source, biodiversity, soil quality. 10) _____ contrast, introduction 11) _____ the second-generation fuel ethanol from cellulosic feedstock that originated 12) _____ agricultural and forestry residuals (corn stovers, sugar bagasse, rice straw and palm empty fruit bunches) is able not only to avoid such issues but also to create an environmental-friendly way to reuse cellulosic biomass for producing a value-added fuel ethanol product instead 13) _____ conventional fertilizers, animal feedings. Although bioenergy is a renewable energy source in the carbon-neutral process, it also poses some challenges that need to be addressed. Poor land management for biofuel crop can result 14) _____ some environmental effects as serious as effects of using fossil fuel. Bioethanol from food-source (sugar and starches) induces the increase in feedstock price which has to compete 15) _____ agriculture and food industry.

Borrowed and modified from:

Al-Obaidi, A. S. M., & NguyenHuynh, T. (2018). Renewable vs. conventional energy: Which wins the race to sustainable development? IOP Conference Series: Materials Science and Engineering, 434, 012310. <https://doi.org/10.1088/1757-899X/434/1/012310>

1	a)	for	b)	as	c)	from	d)	in
2	a)	by	b)	at	c)	on	d)	with
3	a)	at	b)	to	c)	in	d)	by
4	a)	from	b)	by	c)	in	d)	at
5	a)	into	b)	from	c)	to	d)	for
6	a)	at	b)	for	c)	in	d)	by
7	a)	in	b)	at	c)	for	d)	from
8	a)	on	b)	at	c)	of	d)	to
9	a)	by	b)	on	c)	out	d)	at
10	a)	With	b)	To	c)	For	d)	In
11	a)	from	b)	for	c)	of	d)	by
12	a)	from	b)	in	c)	for	d)	at
13	a)	at	b)	of	c)	for	d)	in
14	a)	on	b)	for	c)	with	d)	in
15	a)	out	b)	in	c)	with	d)	by

19. Complete the sentences with the missing words. Use the definitions to help you.

The environmental impacts of energy use on humans and the 1) _____ can happen anywhere during the life cycle of the energy source. The impacts begin with the 2) _____ extraction of the resource. They 3) _____ with the processing, purification, or manufacture of the source; its transportation to the place of energy generation, and end with the disposal of 4) _____ generated during use. As we 5) _____ deeper into mountains, farther out at sea, or farther into pristine habitats, we risk damaging 6) _____ environments, and the results of accidents or natural disasters during extraction processes can be devastating. Fossil fuels are often located far from where they are utilised, so they need to be transported by 7) _____, tankers, rail, or trucks. These all present the potential for accidents, 8) _____ leakage, and spills. When transported by 9) _____ or truck, energy must be expended, and pollutants are generated. Processing petroleum, gas, and 10) _____ generates various emissions and wastes and utilises water resources. Energy production at power plants results in air, water, and, often, waste emissions.

*Borrowed and modified from:
Andish, F., & Debo, D. (2024, December 30).
Renewable energy: A pathway to sustainable development.
Energy, 1–6.*

1 – an extremely large, round mass of matter that moves in a circular path around the sun or another star;

2 – the process of removing or obtaining something from somewhere;

3 – to keep happening, existing, or doing something;

4 – unwanted matter or material of any type, especially what is left after useful substances or parts have been removed;

5 – to dig some substance out of the ground;

6 – easily damaged, broken, or harmed;

7 – a very long, large tube, often underground, through which liquid or gas can flow for long distances;

8 – a situation in which a liquid or gas escapes from an opening in a pipe or container;

9 – the system of transport that uses trains;

10 – a hard, black substance that is dug from the earth in pieces, and can be burned to produce heat or power.

PHRASAL VERBS and IDIOMS

20.1. Watch the video “*Phrasal Verbs - 4 - Run - Part 1*” and match the phrasal verbs with RUN and their definitions. Some phrasal verbs have more than one definition.

RUN AWAY FROM	1) to lose energy, power, or strength
	2) to examine or repeat something quickly
	3) to leave a place or person suddenly and secretly
RUN DOWN	4) to meet someone by chance
RUN INTO	5) to speak badly about someone or something, often unfairly
	6) to hit and drive over someone or something
RUN ON	7) to use all of something and have no more left
RUN OUT OF	8) to continue without stopping
	9) to avoid dealing with a problem or difficult situation
RUN OVER	10) to face difficulties or troubles

20.2. Watch the video “*Put Phrasal Verbs: 9 Phrasal Verbs using ‘Put’ with Multiple Meanings!*” and match the phrasal verbs with PUT and their definitions. Some phrasal verbs have more than one definition.

PUT DOWN	1) to postpone or delay
	2) to cover part of the body with clothes, shoes, make-up, or something similar
	3) to make a written record of
PUT OFF	4) to extinguish or douse (a fire, light, etc.)
PUT ON	5) to fix an object to a vertical surface
PUT OUT	6) to produce or provide something, especially for the good of other people or for a special purpose
	7) to disapprove or criticize
PUT TOGETHER	8) to produce information and make it available for everyone to read or hear
	9) to accept or continue to accept an unpleasant situation or experience, or someone who behaves unpleasantly
PUT UP WITH	10) to cause to lose interest in or enjoyment of
	11) to put the parts of something in the correct places and join them together

21.1. Complete the sentences with the correct prepositions to form phrasal verbs with RUN.

away from down into on out of over

1	While testing a hybrid solar-wind energy system in coastal conditions, the design team ran _____ unforeseen problems with corrosion-resistant materials that delayed deployment by several weeks.
2	During the trial phase of the off-grid microgeneration unit, the remote village nearly ran _____ diesel backup fuel, underscoring the need for more reliable energy storage systems in sustainable designs.
3	Critics quickly ran _____ the new wave energy converter, despite initial public support, arguing that the technology lacked cost-efficiency and posed ecological risks to marine habitats.
4	Many large-scale oil and gas companies are beginning to realize that they can no longer run _____ the global energy transition, and are investing in clean technologies to remain competitive.
5	Before launching the solar microgrid project, the engineering team ran _____ the technical specifications and safety protocols several times to ensure compliance with international standards.
6	The autonomous water filtration plant runs _____ beyond initial projections, thanks to its efficient use of bioenergy and solar power, eliminating the need for external energy input.

21.2. Complete the sentences with the correct prepositions to form phrasal verbs with PUT.

down off on out together up

1	Due to budget constraints and unstable international oil markets, the government decided to put _____ plans to build a large-scale solar power plant until 2026.
2	Decades ago, large oil companies put _____ extensive drilling infrastructure across the desert, much of which now stands abandoned or underused due to the shift toward green energy.
3	Some critics put the idea of wind farms in coastal regions _____, arguing that they are visually unappealing and can negatively impact local tourism.
4	Students participating in the Green Energy Innovation Challenge put _____ a prototype of a portable wind turbine suitable for disaster relief zones.
5	The environmental ministry put _____ a nationwide energy awareness campaign to educate citizens about reducing their carbon footprint through sustainable practices.
6	The International Energy Agency put _____ a new report detailing the urgent need to shift away from fossil fuels to prevent irreversible climate damage.



For more practice, go to Practice file 6 on pages 311–313.

22. Replace the idioms in bold with their appropriate equivalents, as in the example. Then make your own sentences with the suggested idioms. If necessary, make some changes in the sentences. Appendix 4 has a list of relevant idioms.

*During cloudy weeks, off-grid solar homes may find themselves **running on empty** if backup storage isn't sufficient.*

*During cloudy weeks, off-grid solar homes may **experience power shortages** if backup storage isn't sufficient.*

1. The government decided to ***pull the plug on*** several outdated coal-fired power plants to shift funding toward solar and wind energy development.

2. Hydropower remains ***a double-edged sword***; it provides clean electricity, but often harms aquatic ecosystems and displaces communities.

3. ***The jury is still out*** on small-scale nuclear reactors, as concerns about cost, waste, and safety continue to delay widespread adoption.

4. More rural communities are choosing to live ***off the grid***, relying on solar panels, wind turbines, and battery storage systems for electricity.

5. Transitioning from fossil fuels to 100 % renewables isn't something we can ***flip a switch on***; it requires massive infrastructure upgrades.

6. During the energy crisis, the utility company had to rely on gas-fired plants to ***keep the lights on***, despite its commitment to clean energy.

7. With declining solar panel costs and favorable legislation, the residential solar market has ***the wind in its sails***.

8. After months of intense lab work on battery efficiency, the team of engineers took a break to ***blow off some steam*** and get inspired after weeks of intense project work.

**23. Fill in the gaps with the appropriate idioms from the list below.
Use each idiom only once.**

	<i>flip a switch | the jury is still out | off the grid | blow off steam | have the wind in one's sails | double-edged sword | running on empty | keep the lights on</i>	
--	--	--

1	The rapid expansion of lithium mining has proven to be a _____ – it supports clean-energy technologies but also causes severe water depletion and ecosystem stress in mining regions.
2	Many citizens think the shift to renewables can happen overnight, but energy engineers know you can't just _____ and replace decades of fossil-based infrastructure.
3	After the EU's Green Deal was passed, research labs developing carbon capture systems suddenly _____, gaining unprecedented funding and public support.
4	Remote microgrid communities in Arctic regions operate almost entirely _____, relying on hybrid systems of wind, solar, and small-scale hydrogen storage to survive long winters.
5	Environmental engineers on long-term remediation projects often describe themselves as _____, drained by bureaucratic delays and limited funding but still committed to environmental recovery.
6	During the 2022 global energy crisis, several power utilities barely managed to _____, balancing supply shortages, fluctuating fuel prices, and mounting public pressure.
7	After a week of tense negotiations on carbon pricing, the delegates organized a kayaking trip to _____ and regain mental clarity before finalizing the agreement.
8	Although pilot projects for large-scale carbon sequestration have shown promise, _____ on whether they can be economically viable without major subsidies.

Grammar Box

24. Watch the video about *Articles: a, an, the* | *English Grammar Lesson* and match each rule (1–7) with the statement (A–G) representing it.

1.	<i>Indefinite article</i> before a vowel sound; one of many possible “urgent shifts.”	A	Scientists argue that solar power, which directly converts radiation from <i>the</i> Sun into electricity, represents one of the cleanest alternatives to fossil fuels.
2.	Refers to one of many subjects; general, <i>indefinite</i> .	B	When governments invest in wind farms, they often underestimate <i>the</i> complexity of integrating such systems into national energy grids.
3.	Unique celestial body; always <i>definite</i> .	C	Knowledge of environmental science and renewable energy technologies is becoming increasingly vital for engineers.
4.	Refers to a specific complexity mentioned in the context of integration; <i>definite</i> .	D	Nuclear power has always been <i>a</i> controversial subject, as it provides low-carbon electricity but poses unresolved questions about radio-active waste.
5.	Subjects and academic disciplines <i>take zero</i> articles when speaking generally.	E	Excessive carbon dioxide in the atmosphere accelerates global warming, while water scarcity threatens agricultural productivity in arid regions.
6.	Both plural countable and uncountable nouns can be used <i>without an article</i> for general categories or truths.	F	Many researchers claim that <i>an</i> urgent shift towards sustainable energy is the only way to secure both economic growth and ecological balance.
7.	Substances, materials, or abstract concepts used in a general sense <i>do not take an article</i> .	G	Pollution, deforestation, and over-fishing threaten ecosystems world-wide, while education and awareness can mitigate these impacts.

25. Complete the sentences with the options given (a, b, c, or d).

1.	_____ energy transition towards renewables is crucial for global biodiversity preservation.
2.	Burning coal remains _____ most significant source of greenhouse gas emissions worldwide.
3.	Hydropower is often considered _____ sustainable energy source, though it still impacts river ecosystems.
4.	_____ global electricity demand is increasing faster than expected, which puts pressure on ecosystems.
5.	Solar panels can be installed on rooftops, reducing the need for building new plants in _____ sensitive areas.
6.	Wind energy has become _____ essential component of many national sustainability strategies.
7.	_____ biodiversity hotspots are often threatened by extraction of fossil fuels and large-scale energy projects.
8.	Unlike fossil fuels, renewable resources such as sunlight and wind do not release CO ₂ into _____ atmosphere.
9.	Scientists argue that investing in sustainable energy is not just an option but _____ necessity for future survival.
10.	Energy policies should balance economic growth with protection of biodiversity at both national and _____ international levels.

1	a)	A	b)	An	c)	The	d)	-
2	a)	a	b)	the	c)	an	d)	-
3	a)	a	b)	the	c)	an	d)	-
4	a)	A	b)	An	c)	The	d)	-
5	a)	a	b)	the	c)	-	d)	an
6	a)	a	b)	an	c)	the	d)	-
7	a)	A	b)	The	c)	An	d)	-
8	a)	a	b)	the	c)	-	d)	an
9	a)	a	b)	an	c)	the	d)	-
10	a)	a	b)	the	c)	-	d)	an

26. Read the text below. Find and correct 10 mistakes in the use of articles in the text. For each numbered article (1–15) on the right, write *RIGHT* if it is correct. If it is wrong, write the correct article in its place.

Technological Innovations in Renewable Energy	
In recent years, 1) <u>the</u> growing demand for clean power has accelerated innovation in renewable energy technologies.	1)
Scientists have developed 2) <u>the</u> range of advanced materials for solar panels, making them lighter and more efficient than ever before.	2)
One of 3) ____ most remarkable breakthroughs involves using graphene, 4) <u>the</u> ultra-thin and highly conductive material, to improve energy storage systems. These innovations are not limited to solar energy; wind farms have also benefited from 5) <u>a</u> development of smart turbines that automatically adjust to weather conditions.	3)
As 6) <u>a</u> result, renewable energy has become more reliable and cost-effective, allowing -governments to invest in sustainable infrastructure. 7) ____ European Union, for instance, has launched several large-scale projects aimed at creating carbon-neutral cities by 2050.	4)
However, without 8) ____ adequate global cooperation, progress may slow down. Engineers emphasize that sharing know-ledge and technology between countries is essential to achieving	5)
9) <u>the</u> sustainable energy transition.	6)
In addition, 10) <u>a</u> focus on digitalization and artificial intelligence has opened 11) <u>the</u> new possibilities for optimizing energy systems. Researchers are exploring how data-driven models can predict consumption patterns and enhance efficiency in 12) ____ real-time.	7)
To ensure long-term success, societies must also focus on education and public awareness, because technological innovation alone cannot guarantee 13) <u>a</u> cleaner planet. Governments should establish 14) <u>the</u> framework for international collaboration and provide incentives for green investments to maintain 15) <u>a</u> steady progress toward sustainability.	8)
	9)
	10)
	11)
	12)
	13)
	14)
	15)

LISTENING

27. Before watching the video, check if you know the meaning of the following words and phrases. Use the [dictionary](#) if necessary.

semiconductor material	inundate	incentives	induce seismicity
embrace innovations	carbon-intensive sources	energy literacy	inject fluids
baseload power	socially equitable	align with	biomass combustion

28. Watch the video “[Environmental Impacts of Renewable Energy. The Full Picture](#)” and put the sentences in the correct order. Fill in the table with your answers.

	statements	No
A	Unsustainable practices can lead to habitat loss and soil degradation.	
B	The journey towards a sustainable energy future begins with each of us.	
C	Striking a balance between maximizing renewable energy production and minimizing environmental harm is crucial.	
D	Technological advancements, thoughtful policies, and increased public awareness are crucial for sustainable energy development.	
E	Climate change, driven by human activity, threatens the delicate balance of our natural world.	
F	Large-scale hydroelectric dams come with significant environmental consequences.	
G	One concern is the potential for induced seismicity or earthquakes triggered by human activity.	
H	Public awareness and understanding are essential for the successful transition to a renewable energy future.	
I	Solar energy converts sunlight into electricity, offering a clean solution to our energy needs.	
J	By fostering a culture of awareness and engagement, we can ensure that the transition to a renewable energy future is both environmentally sustainable and socially equitable.	
K	Wind energy harnesses the kinetic energy of wind through turbines, emerging as a leading renewable source.	
L	Implementing robust environmental regulations and policies is essential for guiding responsible development.	

29. Watch the video again and complete the following sentences with missing information.

1	Renewable energy sources offer a promising solution to _____ our reliance on fossil fuels.
2	PV panels use _____ materials to directly convert sunlight into electricity.
3	Embracing innovation and sustainable practices harnesses the sun's power while minimizing our _____.
4	_____ hydroelectric dams generate significant electricity, often providing baseload power to entire regions.
5	Reservoirs created by dams inundate vast areas of land, potentially displacing communities and flooding valuable _____.
6	Changes in water temperature and _____ levels can further disrupt delicate ecosystems.
7	_____ energy derived from organic matter offers a renewable alternative to fossil fuels.
8	Geothermal energy taps into _____ reservoirs of hot water or steam to drive turbines.
9	Construction of power plants and _____ operations require land clearing, potentially affecting wildlife habitats.
10	One environmental concern with biomass is the release of particulate matter and _____ into the air.
11	Technological advancements, thoughtful policies, and increased public _____ are crucial for sustainable energy development.
12	Open communication, _____, and addressing concerns raised by local communities can foster trust.

SPEAKING

30. You have been invited to speak on a live panel discussion as a sustainable energy specialist in order to raise awareness about various energy sources. Choose two energy sources to compare – one conventional (e.g., coal, oil, gas, nuclear) and one renewable (e.g., solar, wind, hydro, biofuel, geothermal). Briefly describe how each energy source works. Compare their advantages and disadvantages, considering environmental, social, and economic aspects. Suggest which one has more potential for future economic aspects, and explain why. Useful phrases and the vocabulary in the box provided below can help you prepare well.

Useful phrases:

- *One main difference between*
- *When comparing*
- *One main advantage / upside / benefit*
- *In terms of environmental / economic / social impact*
- *Another point to consider is*
- *A main concern with*
- *In conclusion, it is obvious / clear that*

fossil fuels	non- renewable	carbon footprint	power plant	depletion of resources
sustainable energy	biomass	hydropower	carbon- neutral	efficiency
cost- effectiveness	long-term benefits	sustainability	clean technologies	emissions reduction

31. You and your partner are engineers in the green initiative company attending a council meeting to pitch a green energy solution for the town. Present your proposal to decrease the dependence on conventional energy sources and gradually switch to renewable energy. Your proposal should include: a description of the current situation in the town, the suggested renewable technology (e.g. solar panels, solar-powered street lighting, wind turbines, smart grids, electrical public transport, etc.), an explanation of how this technology works, its major benefits (economic, environmental and social), any potential limitations or challenges, a clear step-by-step plan for introducing the solution gradually. Improve your proposal with the useful phrases provided below.

Useful phrases:

- *We're here today to present*
- *At present, our town relies on*
- *We propose implementing*
- *This technology / system / solution works by*
- *There are several key advantages*
- *One potential drawback is*
- *To sum up / Overall*

32. You are a university representative attending an international conference on conventional and sustainable energy. Prepare a presentation with a comparison of the energy mix (that is, types and percentages of energy sources used) in two different countries (e.g., Ukraine vs Poland, India vs the UK). Your presentation should include a visual representation of data, such as a graph, bar chart, pie chart, or infographic, to clearly illustrate the comparison. Describe the data shown in your visuals, and compare and contrast the two countries in terms of their reliance on fossil fuels, investment in renewable energy, and overall sustainability efforts.

Improve your presentation by following the presentation requirements and useful phrases provided below.

Presentation requirements:

- 1. Time limit: 2–3 minutes per presentation.**
- 2. Visuals: slides or pictures with keywords / bullet points, not full sentences.**
- 3. Structure: introduction – main part – conclusion.**
- 4. Speak in your own words; do not read.**

Useful phrases:

- *We're going to compare the energy mix of*
- *We chose these two countries because*
- *As you can see from the chart / graph / visual*
- *The visual shows*
- *The largest share of energy in ... comes from*
- *Compared to ..., ... relies more on*
- *The key difference / similarity is that*

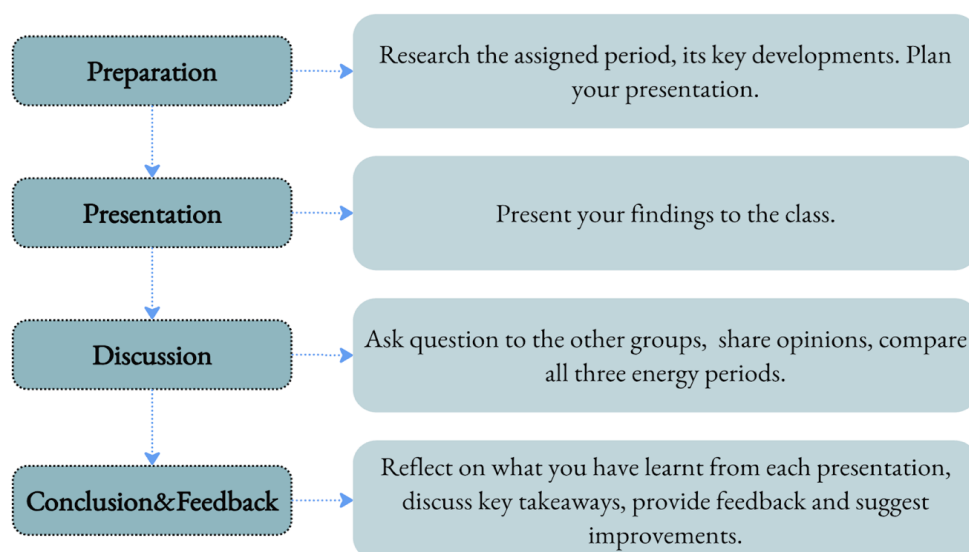
33. Work in groups. You are environmental engineers preparing a presentation for the conference on energy transition. Design a presentation that explores the evolution of energy sources over time, from fossil fuels to renewables. Highlight the major technologies powered by each source during their respective eras, and examine their environmental impacts. The topic of the presentation for Group A is about the fossil fuel era (the rise of coal, oil, and gas) and the main technologies of that time, for example, the steam engine and the internal combustion engine. Group B designs a presentation on the transition to nuclear power, covering its main developments and consequences. Group C prepares a presentation on the shift to renewable energy sources (such as solar, wind, etc.), including relevant solutions, technologies, and environmental impacts. Improve your presentation by following the outline, presentation requirements, and useful phrases provided below.

Presentation requirements:

- 1. Time limit: 2–3 minutes per presentation.**
- 2. Visuals: slides or pictures with keywords / bullet points, not full sentences.**
- 3. Structure: introduction – main part – conclusion.**
- 4. Speak in your own words; do not read.**

Useful phrases:

- *Our presentation focuses on the period*
- *During this time*
- *One of the most important developments was*
- *This period led to*
- *This transition / shift was caused by*
- *In comparison to previous energy sources*
- *To sum up / In conclusion*



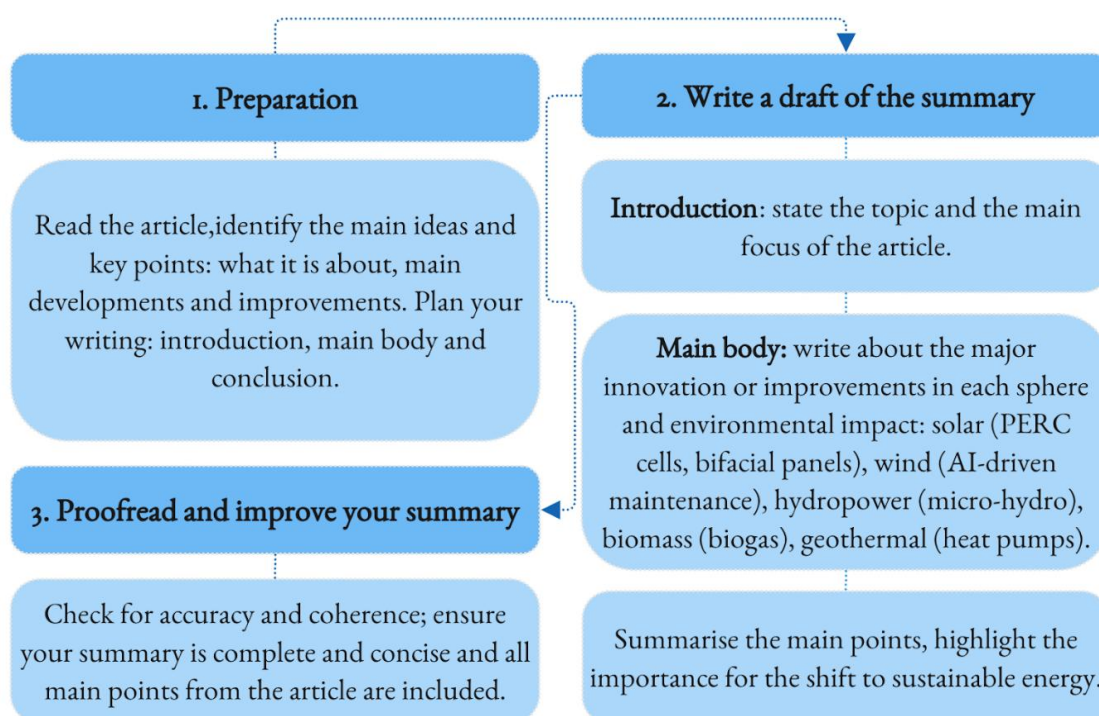
WRITING

34. *You are currently working as an environmental engineer, and you've been assigned to study the advancements in renewable energy and clean technologies. Write a summary of the article "Advancements in Renewable Energy Technologies: A Decade in Review" (160–180 words) by the [link](#). Pay attention to clarity, coherence, and accuracy in your writing, and check if your summary is complete.*

***See Appendix 5 for a writing model.**

Useful phrases:

- *The article reviews / discusses*
- *The article focuses mainly on*
- *The main components of ... include*
- *According to the source,*
- *The article highlights / emphasizes the importance of*
- *The article / findings suggest that*
- *Overall / To sum up*



35. You were one of the participants attending an international workshop on environmental sustainability, and you've been asked to prepare a report to share with your colleagues. Write a formal report (160–180 words) where you describe and compare the carbon footprint of various energy sources.

Maintain the structure:

- 1) introduction, stating the topic;**
- 2) in the main part, describe carbon footprint and its association with various energy sources (e.g., emissions from burning fossil fuels), compare the carbon footprints of renewable and non-renewable energy sources;**
- 3) conclusion, summarizing the importance of the transition to low-carbon sources. Use the phrases and key vocabulary provided below. Pay attention to clarity, coherence, and accuracy in your writing.**

***See Appendix 5 for a writing model.**

Useful phrases:

- *This report aims to*
- *The purpose of this report is to*
- *In comparison to / In contrast to*
- *Compared to ... this energy source produces / releases*
- *According to*
- *The data shows / indicates*
- *In conclusion / To conclude*

fossil fuels	petroleum	tidal energy	radioactive waste	energy intensity
emit	generate	produce	release	consume
contribute to	energy transition	clean technologies	zero-emission energy	low-carbon solutions

SELF-ASSESSMENT

36. *Explore the target vocabulary related to the topic “Conventional and Sustainable Energy” using **flashcards** and then assess comprehension through a **Quizlet quiz**.*

37. *Check yourself and do the quiz.*

1. Which of the verbs below doesn't collocate with “force”?
 - A. *exert*
 - B. *apply*
 - C. *use*
 - D. *make*
2. Which of the options is not an example of kinetic energy?
 - A. *the wind blowing through the trees*
 - B. *water flowing over a dam*
 - C. *water stored behind a dam*
 - D. *and a cyclist riding a bicycle*
3. Which word below is a synonym of “replenish”?
 - A. *refresh*
 - B. *drain*
 - C. *deplete*
 - D. *repair*
4. Which of the following refers to gas, coal, and oil?
 - A. *fossil fuels*
 - B. *biomass*
 - C. *renewable sources*
 - D. *green energy sources*
5. What is “energy security”?
 - A. *a company that supplies electricity, gas, etc. to homes and businesses*
 - B. *the fact that a place can produce or obtain enough energy for the needs of the people who live there*
 - C. *ways of producing energy to provide the heat, light, etc.*
 - D. *something that can be used to provide power*

6. Which of the following is an example of renewable energy?
- A. *biomass*
 - B. *wind*
 - C. *solar*
 - D. *all of the above*
7. Which option below best explains the meaning of the phrase “pertain to something”?
- A. *have a connection with something*
 - B. *to relate to something*
 - C. *both options A and B*
 - D. *none of the above*
8. Which word has a similar meaning to “pristine”?
- A. *untouched*
 - B. *natural*
 - C. *faded*
 - D. *used*
9. Which verb collocates with “energy”?
- A. *harness*
 - B. *consume*
 - C. *generate*
 - D. *all of the above*
10. Which of the following refers to something not happening regularly or continuously?
- A. *continuous*
 - B. *limiting*
 - C. *constant*
 - D. *intermittent*

Check yourself, Appendix 8. Self-Assessment Keys.

Unit 7

Solid and Hazardous Waste



LEAD-IN

1. Look at the pictures related to waste management. Match each picture (A–F) with the correct description (1–6). Then, imagine you are environmental engineers working for a city authority. Propose one technical or organizational solution for each chosen picture.

Your solution should include:

- **a method or technology (e.g., sorting systems, containment, recycling processes);**

- **a goal (risk reduction, resource recovery, pollution control).**

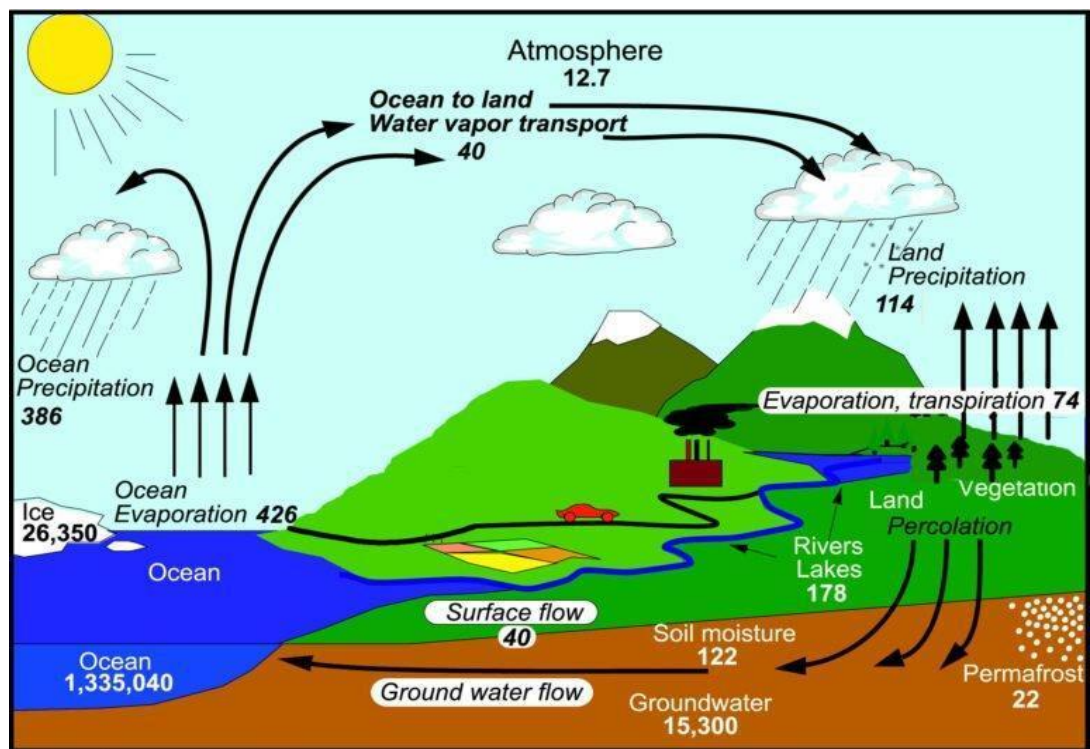
Useful verbs:

reduce, prevent, process, recover, treat, monitor, design, implement

- 1. ocean cleanup**
- 2. waste sorting facility**
- 3. e-waste recycling**
- 4. hazardous waste storage**
- 5. community composting**
- 6. landfill**



2. Study the structure of the Water use cycle. Then watch the [video](#) on Hazardous Waste and answer the following questions.



Units: Thousand cubic km for storage, and thousand cubic km/yr for exchanges

*1990s

Picture taken from

<https://www.metlink.org/resource/the-changing-water-cycle/>

1. What types of domestic waste can be hazardous?
2. What symbols can identify some hazardous waste?
3. What problems can hazardous chemicals cause?
4. What items should never be disposed of in the sewage system?
5. What items can poison soil or water if dispersed incorrectly?
6. Where should hazardous waste be taken for proper disposal?
7. Why is the correct disposal of hazardous waste important?

3. Discuss the following quotations in pairs. Choose the one you agree with and explain why. Use the phrases:

- *It seems to me that ...*
- *Personally, I would argue that ...*
- *What stands out to me is ...*
- *One could say that ...*
- *I would suggest that ...*
- *While I see the reasoning, I think that ...*
- *This aligns with my understanding of ...*

1. “Wastes may be hazardous if they exhibit any of the four characteristics: ignitability, corrosivity, reactivity, or toxicity.”

*U.S. Department of Toxic Substances Control (DTSC),
Defining Hazardous Waste, California, updated 2023*

2. “Construction and demolition waste makes up more than one-third of all waste generated in the European Union.”

European Environment Agency (EEA), Construction and Demolition Waste: Challenges and Opportunities in a Circular Economy, 2020.

3. “Municipal solid waste management remains one of the most serious environmental challenges in rapidly urbanizing regions.”

*United Nations Environment Programme (UNEP),
Global Waste Management Outlook 2, 2024.*

4. “Transitioning from landfills to waste-to-energy incineration can reduce carbon emissions by about 41 %.”

*Environmental, Energy, and Techno-Economic Assessment of
Waste-to-Energy Incineration, Sustainability (MDPI)*

5. “Less than 20 percent of global electronic waste is formally recycled, while the rest is often dumped or informally processed.”

United Nations University (UNU), Global E-Waste Monitor 2024

6. “A liquid waste with a flash point below 60 °C (140 °F) is considered ignitable and must be handled as hazardous.”

*U.S. Environmental Protection Agency (EPA),
Hazardous Waste Characteristics: Ignitability (D001)*

7. “Global solid waste generation is expected to increase by 70 % by 2050 unless urgent and transformative actions are taken.”

*World Bank, What a Waste 2.0:
A Global Snapshot of Solid Waste Management to 2050*

READING

4. Read the text below. Match choices (A–H) to (1–5). There are three choices you do not need to use.

- A** Integrated Waste Management for Health and Environmental Protection
- B** Criteria for Waste Classification
- C** The Scale and Impact of Global Waste Generation
- D** The Benefits of Waste Production for Economic Growth
- E** Waste Generation Only Comes from Household Activities
- F** Types and Quantities of Waste
- G** Waste Classification Based Solely on Color and Shape
- H** Types of Solid Waste and Hazardous Waste Criteria

Understanding Solid and Hazardous Waste: **Sources, Types, and Impacts**

1. _____. The things in our lives are converted to waste when they become unwanted and are **discarded, abandoned,** or simply forgotten. **Waste** is an unintended and often **inevitable** consequence of the use of products, as well as of the extraction and processing of materials to make these products. The collection, **treatment,** recovery, and **disposal** of wastes have become an industry in itself. These activities together are called waste management.

2. _____. Waste is the unwanted material that we discard. To describe the sources of waste, we refer to activities that fall within specific economic sectors.

- Mining and **quarrying.** This sector is responsible for extracting **fossil** fuels (coal, petroleum, gas), **metal ores,** and nonmetallic minerals (e.g., stone, salt). This sector generates mostly mineral waste.

- Agriculture, forestry, and fishing. This sector generates mostly biotic waste.
- Industry. This sector takes raw materials from the above two sectors to manufacture food, textiles, paper, chemicals, plastics, computers, cars, and so on.

- **Construction.** This sector is responsible for buildings, including housing, and infrastructure such as roads, bridges, tunnels, and waterways.

- Households and services. Household consumption and the service sector produce similar waste that is collected together as **municipal** solid waste (MSW).

- Waste management. This sector covers waste collection, treatment, and disposal. Waste from water collection, treatment, and supply is also included.

3. _____. There are several criteria for classifying waste depending on its origin, its capacity **to decompose** naturally in the environment (biodegradability), its composition, its **hazardousness,** or its physical state.

To be considered a **solid waste,** the material must be discarded by being:

- Abandoned (disposed of, burned, incinerated, or sham recycled)
- Inherently waste-like
- Discarded military munition
- Recycled in certain ways.

4. _____. Solid waste originates from various human activities and can be classified by source and type:

- Municipal Solid Waste
- Industrial Waste
- Commercial Waste
- Construction and Demolition Debris
- Hazardous Waste
- Electronic Waste (E-waste)
- Agricultural Waste

Solid Waste Vs. Hazardous Waste. Hazardous waste is defined by specific characteristics that make it potentially harmful to human health and the environment. There are four primary characteristics of hazardous waste:

- **Ignitability:** Materials exhibiting ignitability include liquids with a flashpoint below 140 degrees Fahrenheit, solids capable of causing fire through friction or absorption of moisture, and compressed gases.

- **Corrosivity:** Corrosive waste is highly acidic or alkaline and can corrode metals or cause damage to living tissues upon contact. Waste with a pH less than or equal to 2 or greater than or equal to 12.5 is considered corrosive.

- **Reactivity:** Reactive waste is unstable and can undergo **violent reactions** when exposed to heat, pressure, or water.

- **Toxicity:** Waste is classified as toxic if it contains substances harmful to human health or the environment at concentrations above specified regulatory levels.

5. _____. Inadequate solid waste management contributes to environmental contamination, occupational hazards, and increased morbidity. Integrated Waste Management strategies must **prioritize** waste minimization, material recovery, controlled landfilling, and **strict regulatory oversight** to ensure public health and environmental integrity.

Borrowed and modified from:

Lohchab, R. K. (2018, July). *Solid and hazardous waste management* (Course: Environment Management (CP-103), MBA–1st Semester, Distance Education). Guru Jambheshwar University of Science & Technology.

Follow-up

5. Explain the words / phrases in bold from the text, and make up sentences with these words. Use the [dictionary](#) if necessary.

6. Read the text again and answer the following questions, choosing the best option.

1. What is waste?

- a) Natural habitat.**
- b) Renewable resources.**
- c) Unwanted material that is discarded.**

2. What is the term for waste collection, treatment, and disposal?

- a) Waste management.**
- b) Energy conservation.**
- c) Climate adaptation.**

3. What kind of waste does mining generate?

- a) Plastic waste.**
- b) Mostly mineral waste.**
- c) E-waste.**

4. What type of waste comes from agriculture and forestry?

- a) Biotic waste.**
- b) Industrial sludge.**
- c) Nuclear waste.**

5. What is industrial waste usually like?

- a) Always biodegradable.**
- b) Purely organic.**
- c) Abiotic and process-specific.**

6. What do households and services mainly produce?

- a) Municipal solid waste.**
- b) Fossil fuel residues.**
- c) Corrosive acids.**

7. What is one criterion for classifying waste?

- a) Semi-conductivity.**
- b) Biodegradability.**
- c) Solubility in water**

8. What does ignitability mean in hazardous waste?

- a)** Ability to catch fire easily.
- b)** Ability to dissolve metals.
- c)** Ability to neutralize toxins.

9. What kind of waste has very low or very high pH?

- a)** Corrosive waste.
- b)** Organic waste.
- c)** Recyclable waste.

10. What does reactive waste do?

- a)** Improves soil fertility.
- b)** Supports biodiversity.
- c)** Undergoes violent reactions.

11. What makes waste toxic?

- a)** Natural decomposition.
- b)** Harmful substances above safe concentrations.
- c)** High oxygen levels.

12. What is the goal of Integrated Waste Management?

- a)** Protecting health and the environment.
- b)** Expanding landfills endlessly.
- c)** Ignoring waste regulations.

USE of ENGLISH

7. Using the information from the text (Ex. 4), match items (1–15) with (A–O) to form phrases. After that, choose any three of the completed phrases and use them in your own sentences.

1.	become unwanted and are	A	we discard
2.	unintended consequence	B	of mostly mineral waste
3.	the extraction and processing of	C	treatment and recovery
4.	7.5 kilograms of waste per	D	discarded or abandoned
5.	the unwanted material that	E	fuels (coal, petroleum, gas)
6.	waste generated by industry and	F	in the environment
7.	residual waste from waste	G	materials to make products
8.	refer to activities that fall	H	e.g., liquid, semi-solid
9.	responsible for extracting fossils	I	the construction sector
10.	cultivate crops (e.g., potatoes,	J	within specific sectors
11.	largely abiotic and highly specific	K	solid waste (MSW)
12.	produces vast quantities	L	of the use of products
13.	collected together as municipal	M	apples) and raise animals
14.	the capacity to decompose	N	to the individual process
	naturally		
15.	exist in a variety of physical states	O	person per day

8. Fill in the table with the words derived from the given ones.

	Noun	Verb	Adjective
1	.....	recover	.....
2	.....	.....	disposable
3	treatment	.....	.....
4	.....	decompose	.....
5	.....	.....	incinerable
6	exposure	.....	.....
7	.....	separate	.....
8	.....	.....	accumulative
9	innovation	.....	.....
10	.....	adapt	.....
11	.....	.....	various
12	construction	.....	.....
13	.....	include	.....
14	.....	.....	considerable
15	urbanization	.....	.....

9. Match the words in column A with the words in column B to form meaningful phrases. You can also do it using the LearningApps platform at this [link](#).

Column A		Column B	
1.	waste	A	paper
2.	food	B	consumption
3.	office	C	minerals
4.	iron	D	harmful
5.	non-metallic	E	production
6.	timber	F	munition
7.	aquatic	G	management
8.	raw	H	temperatures
9.	household	I	plants
10.	physical	J	cans
11.	military	K	packaging
12.	potentially	L	state
13.	primary	M	materials
14.	low	N	characteristics
15.	aerosol	O	ore

10. Fill in the words from the list below. Use each word only once.

ignite, undergo, moisture, hazardous, origin, generator, hunting, average, disposal, discard, utilities, surplus, flashpoint, tissues, demolition

1. an _____ waste generation rate;
2. waste collection, treatment, recovery and _____;
3. responsible for forestry and logging, _____ and fishing;
4. _____ appliances, furniture and clothing;
5. a taker rather than a _____ of waste;
6. _____, which supply mainly electricity and gas;
7. classifying waste depending on its _____;
8. _____ matter of urban, rural, and industrial streams;
9. four primary characteristics of _____ waste;
10. liquids with a _____ below 140 degrees Fahrenheit;
11. causing fire through friction or absorption of _____;
12. cause damage to living _____ upon contact;
13. unstable and can _____ violent reactions;
14. called construction and _____ (C&D) waste;
15. catch fire and _____ at relatively low temperatures.

11. Match the words with similar meanings. You can also do it using the LearningApps platform at this [link](#).

1.	industry	A	result
2.	forestry	B	constitution
3.	utilities	C	danger
4.	consequence	D	wreckage
5.	hazardousness	E	sector
6.	packaging	F	user
7.	furniture	G	dung
8.	manure	H	harvest
9.	recovery	I	services
10.	composition	J	cell
11.	crops	K	wrapping
12.	residues	L	remnants
13.	debris	M	logging
14.	battery	N	restoration
15.	consumer	O	furnishings

12. Write the opposites of the following words. Use the [dictionary](#) if necessary.

1	discard	
2	unwanted	
3	forget	
4	inevitable	
5	collect	
6	biotic	
7	recover	
8	hazardous	
9	dispose	
10	ignitable	
11	raise	
12	toxic	
13	hunt	
14	inadequate	
15	recycle	

13. Match the key terms on the topic “Solid and Hazardous Waste” with their definitions.

	<i>pesticide, pathogen, landfill, composting, leachate, incineration, forestry, monomer, vessel, pyrolysis, nutrient, scraps, fraction, fertilizer, demolition</i>	

1. The act of collecting and storing plant material so it can decay and be added to soil to improve its quality.
2. The process of burning something completely.
3. A place where waste is buried in the ground in large amounts.
4. A process in which substances are changed chemically by high temperatures.
5. A natural or chemical substance that is spread on the land or given to plants, to make plants grow well.
6. Liquid that takes in substances from the material through which it passes, often making the liquid harmful or poisonous.
7. A chemical substance whose basic molecules can join together to form polymers.
8. Any small organism, such as a virus or a bacterium, that can cause disease.
9. Small pieces of food that have not been eaten and are usually thrown away.
10. The act of destroying something, such as a building.
11. Any substance that plants or animals need in order to live and grow.
12. A small part of something, or a small amount.
13. A curved container that is used to hold liquid.
14. The science or industry of growing and managing forests.
15. A chemical substance used to kill harmful insects, small animals, wild plants, and other unwanted organisms.

Borrowed and modified from:
<https://dictionary.cambridge.org/dictionary/english/>

14. Match the first part of the sentence (1–12) with the second one (a–l).

1. Reactive waste can generate toxic gases, explode, or ...
 2. Examples include explosives, cyanide-containing waste, materials prone ...
 3. Waste is classified as toxic if it contains substances harmful to ...
 4. Toxic substances may include heavy metals, pesticides, ...
 5. Toxicity is typically determined through a specific laboratory ...
 6. To be considered hazardous under RCRA, waste must exhibit ...
 7. Hazardous waste regulations are in place to ensure proper handling, ...
 8. Inadequate solid waste management contributes to the environment ...
 9. Vulnerable populations are disproportionately affected by toxic ...
 10. Ecological degradation and socioeconomic disparities arise ...
 11. Integrated Waste Management (IWM) strategies must prioritize ...
 12. Reactive waste is unstable and can undergo violent reactions ...
-
- a) ... tests measuring the concentration of these substances.
 - b) ... treatment, storage, transportation, and disposal of these materials.
 - c) ... human health or the environment at concentrations above specified levels.
 - d) ... produce other hazardous conditions.
 - e) ... when exposed to heat, pressure, or water.
 - f) ... emissions, leachate infiltration, and inadequate sanitation infrastructure.
 - g) ... waste minimization, material recovery, and controlled landfilling.
 - h) ... one or more of these characteristics or be specifically listed as hazardous.
 - i) ... certain organic compounds and other hazardous constituents.
 - j) ... contamination, occupational hazards, and increased morbidity.
 - k) ... from inefficient collection, open dumping, and unregulated incineration.
 - l) ... to violent reactions, and some pharmaceuticals.

15. Choose the most appropriate word to complete the extract. You can also do it using the LearningApps platform at this [link](#).

Reuse and Recycling

Reuse and recycling are high up in the 1) _____ hierarchy preferences and are key strategies in the circular economy. Keeping products and materials in the economy for as 2) _____ as it is safe to reuse / reprocess them can 3) _____ their lives, reducing the need for extraction of virgin resources. Recycling can help countries reduce pollution and GHG emissions by displacing primary 4) _____ materials. Taking the 5) _____ of recycling of plastic waste, chemical recycling (specifically pyrolysis and gasification) are meant to play an important role in handling mixed plastic waste, 6) _____ that the main challenges to 7) _____ plants for chemical recycling are overcome and, therefore, it is considered now as complementary to the existing mechanical recycling that is a relatively established 8) _____ for mixed plastic waste treatment. Chemical recycling by pyrolysis involves converting plastic waste into its constituent building 9) _____, or monomers, which can be utilized in the production of new, high-quality plastics. In the case of chemical recycling of plastic waste by pyrolysis, it causes significantly lower GHG emissions than the 10) _____ made from virgin fossil resources. However, pyrolysis has higher impacts (including on acidification, eutrophication, photochemical and ozone formation), than for mechanical recycling and energy recovery due to the high energy 11) _____ in the pyrolysis and purification processes.

Borrowed and modified from:

https://www.ieabioenergy.com/wp-content/uploads/2025/04/IEA-Bioenergy-Task-36_Case-Study-Report-Env-Impacts-of-Waste-Management-Strategies.pdf

1	a)	rubbish	b)	waste	c)	garbage
2	a)	short	b)	tall	c)	long
3	a)	widen	b)	extend	c)	broaden
4	a)	raw	b)	rough	c)	rare
5	a)	template	b)	sample	c)	example
6	a)	provided	b)	supported	c)	supplied
7	a)	give up	b)	scale up	c)	make up
8	a)	progress	b)	process	c)	proceeds
9	a)	pieces	b)	bars	c)	blocks
10	a)	copy	b)	twin	c)	equivalent
11	a)	request	b)	demand	c)	desire

16. Choose the correct option. You can also do it using the LearningApps platform at this [link](#).

1. Waste _____ is the most preferred waste management strategy.
a) prevent b) prevention c) preventive
2. It has _____ environmental benefits.
a) signify b) significance c) significant
3. Many countries _____ circular economy models, keeping the value of products and materials in the economy longer.
a) adopt b) adoption c) adoptive
4. Such models can reduce and prevent excessive waste _____.
a) generate b) generation c) generative
5. It can also help _____ the life cycle of resources and products.
a) extend b) extension c) extensive
6. Reducing waste can result in reduced resource _____, reducing the need for raw materials.
a) extract b) extraction c) extractive
7. This is done to _____ linear production which generates significant volumes of waste.
a) replace b) replacement c) replaceable
8. This strategy may also help decrease greenhouse gas (GHG) _____ from production and waste processing.
a) emit b) emissions c) emissive
9. Further, _____ demand from manufacturing and transport can be reduced, resulting in significant environmental benefits.
a) energize b) energy c) energetic
10. For example, a _____ minimisation strategy for wasted food showed the best environmental performance.
a) use b) usefulness c) useful
11. It _____ eutrophication and acidification potential impacts when compared to business-as-usual treatment of landfilling and composting.
a) reduces b) reduction c) reducible
12. When we talk about energy recovery, we refer to several processes designed to _____ waste / residues into energy or energy products.
a) convert b) conversion c) convertible
13. The most common are the thermal processes and primarily direct _____ of waste.
a) combust b) combustion c) combustible
14. Other thermal processes (much less common as of today) include pyrolysis to produce a carbon-rich _____ material and / or bio-oil.
a) solidify b) solidification c) solid
15. Incineration of waste has been implemented worldwide with benefits including _____ of contaminants / pollutants.
a) remove b) removal c) removable

17. Fill in the blanks with the appropriate words from the list below. Use each word only once. You can also do it using the LearningApps platform at this [link](#)

treat
mechanical
animal
piles
carbon
chips
conditions
material
inorganic
landfill
practices
biodegradation
convert
fertilizer
pathogens

1) _____ disposal of wastes containing significant organic fractions is increasingly discouraged in many countries, including the United States. Such disposal 2) _____ are even prohibited in several European countries. Since landfilling does not provide an attractive management option, other techniques have been identified. One option is to 3) _____ waste so that biodegradable materials are degraded and the remaining 4) _____ waste fraction (known as residuals) can be subsequently disposed of or used for a beneficial purpose.

5) _____ of wastes can be accomplished by using aerobic composting, anaerobic digestion, or 6) _____ biological treatment (MBT) methods. If the organic fraction can be separated from inorganic 7) _____, aerobic composting or anaerobic digestion can be used to degrade the waste and 8) _____ it into usable compost. For example, organic wastes such as food waste, yard waste, and 9) _____ manure that consist of naturally degrading bacteria can be converted under controlled 10) _____ into compost, which can then be utilised as a natural 11) _____. Aerobic composting is accomplished by placing selected proportions of organic waste into 12) _____, rows, or vessels, either in open conditions or within closed buildings fitted with gas collection and treatment systems. During the process, bulking agents such as wood 13) _____ are added to the waste material to enhance the aerobic degradation of organic materials. Finally, the material is allowed to stabilise and mature

18. Complete the text by choosing the correct option (a, b, c, or d) to fill each gap.

Compost material may be used 1) _____ a variety 2) _____ applications. 3) _____ addition to its use as a soil amendment 4) _____ plant cultivation, compost can be used to remediate soils, groundwater, and storm water. Composting can be labor-intensive, and the quality of the compost is heavily dependent 5) _____ proper control of the composting process. Inadequate control of the operating conditions can result 6) _____ compost that is unsuitable 7) _____ beneficial applications. Nevertheless, composting is becoming increasingly popular; composting diverted

82 million tons of waste material away 8) _____ the landfill waste stream 9) _____ 2009, increasing from 15 million tons in 1980.

10) _____ some cases, aerobic processes are not feasible. As an alternative, anaerobic processes may be utilised. Anaerobic digestion consists 11) _____ degrading mixed or sorted organic wastes in vessels 12) _____ anaerobic conditions. The anaerobic degradation process produces a combination of methane and carbon dioxide (biogas) and residuals (biosolids). Biogas can be used 13) _____ heating and electricity production, while residuals can be used as fertilisers and soil amendments. Anaerobic digestion is a preferred degradation for wet wastes as compared 14) _____ the preference of composting for dry wastes. The advantage of anaerobic digestion is biogas collection; this collection and subsequent beneficial utilisation make it a preferred alternative to landfill disposal of wastes. Also, waste is degraded faster 15) _____ anaerobic digestion as compared to landfill disposal.

Borrowed and modified from:

<https://rvcc.pressbooks.pub/envstudies/chapter/solid-and-hazardous-waste/>

1	a)	for	b)	as	c)	from	d)	in
2	a)	of	b)	at	c)	on	d)	with
3	a)	At	b)	In	c)	To	d)	By
4	a)	from	b)	by	c)	for	d)	at
5	a)	into	b)	from	c)	to	d)	on
6	a)	at	b)	in	c)	for	d)	by
7	a)	for	b)	at	c)	in	d)	from
8	a)	on	b)	at	c)	from	d)	to
9	a)	by	b)	in	c)	out	d)	at
10	a)	With	b)	To	c)	For	d)	In
11	a)	from	b)	for	c)	of	d)	by
12	a)	under	b)	above	c)	for	d)	at
13	a)	at	b)	for	c)	of	d)	in
14	a)	on	b)	for	c)	in	d)	to
15	a)	out	b)	at	c)	through	d)	of

19. Complete the sentences with the missing words. Use the definitions to help you.

Combustion of waste and 1) _____ of energy in the form of electricity and 2) _____ is usually referred to as waste incineration or Waste-to-Energy (WtE). Incineration of waste has been implemented worldwide with benefits including reducing 3) _____ volume by up to 90 %, recovery of energy (heat and power), destruction of contaminants, 4) _____ of CH₄ emission (compared to landfills) and mitigation of 5) _____ and water contamination.

Carbon Capture and Storage and/or Use (CCUS) could also change WtE's role in a circular 6) _____ perspective. Biogas and biomethane production via anaerobic digestion (AD) is a multi-functional process for treatment of waste, protection of the environment, 7) _____ of low-value material to higher-value material, for the production of electricity, heat, gaseous biofuel and digestate. The digestate material re-maining after AD can be used as a fertiliser (providing that the 8) _____ regulated requirements are fulfilled), returning nutrients to the field in a circular way, thus keeping 9) _____ in use for a longer period. By prioritising 10) _____ waste management strategies, governments and industries can significantly mitigate envi-ronmental impacts, leading to healthier ecosystems and reduced contributions to climate change.

Borrowed and modified from:

https://www.ieabioenergy.com/wp-content/uploads/2025/04/IEA-Bioenergy-Task-36_Case-Study-Report-Env-Impacts-of-Waste-Management-Strategies.pdf

1 – the process of capturing and converting (energy) that would otherwise be wasted into a usable form, such as heat, electricity, or fuel;

2 – the quality of being hot or warm, or the temperature of something;

3 – hard or firm, keeping a clear shape;

4 – the practice of keeping away from particular situations, things, or people;

5 – the material on the surface of the ground in which plants grow;

6 – the system of trade and industry by which the wealth of a country or region is made and used;

7 – the process of changing (converting) something from one thing to another;

8 – from, existing in, serving, or responsible for a small area, especially of a country;

9 – the simplest units of a chemical substance, usually groups of two or more atoms;

10 – causing, or made in a way that causes little or no damage to the environment, and therefore able to continue for a long time.

PHRASAL VERBS and IDIOMS

20.1. Watch the video “*14 Stand Phrasal Verbs: Learn Phrasal Verbs with STAND to make your English Stand Out!*” and match the phrasal verbs with **STAND** and their definitions. Some phrasal verbs have more than one definition.

STAND BACK	1) to relax after being ready for action
	2) to defend yourself against a powerful person or organization when they treat you unfairly
STAND BY	3) to be distinctive or conspicuous
STAND DOWN	4) to represent something
STAND FOR	5) to continue to support or help someone who is in a difficult situation
	6) to move a short distance away from something or someone
STAND IN FOR SOMEONE	7) to support or accept particular principles or values
	8) to be waiting and ready to do something or to help
STAND OUT	9) to leave a job or position
STAND UP FOR	10) to support, side with, or defend
STAND UP TO	11) to do the job that another person was going to do or usually does, or to take that person's place at an event, because they cannot be there

20.2. Watch the video “*Phrasal Verbs with TAKE and Multiple Meanings*”, and match the phrasal verbs with **TAKE** and their definitions. Some phrasal verbs have more than one definition.

TAKE AFTER	1) to discuss something or deal with something
	2) to understand or remember something that you hear or read
TAKE DOWN	3) to obtain or secure (a licence, patent, etc.) from an authority
TAKE IN	4) to get control of a company by buying enough of the shares in it
	5) to allow somebody to stay in your home
TAKE OFF	6) to start doing a particular job or activity
TAKE ON	7) to go out with; escort
TAKE OUT	8) to be similar to an older member of your family in appearance or character
	9) to leave the ground and begin to fly
TAKE OVER	10) to record in writing
TAKE UP	11) to accept a particular job or responsibility
	12) to become successful or popular, especially suddenly

21.1. Complete the sentences with the correct prepositions to form phrasal verbs with STAND.

back by down in for out up to

1	In many developing regions, NGOs stand _____ local communities by providing support and resources when illegal hazardous waste dumping threatens public health and the environment.
2	When the lead environmental officer couldn't attend the annual waste compliance audit, a trained technician stood _____ her and conducted the site inspection with precision.
3	After confirming that the chemical spill at the treatment plant was successfully neutralized, the emergency response team was allowed to stand _____ and return to regular monitoring.
4	During the removal of hazardous chemical containers from the old storage facility, all personnel were instructed to stand _____ to avoid exposure to toxic fumes.
5	Local activists and students joined forces to stand _____ the industrial corporation planning to build a hazardous waste incinerator near a protected wetland.
6	Among several waste treatment facilities, the new zero-landfill plant stands _____ due to its innovative use of waste-to-energy technology and its strict control over hazardous by-products.

21.2. Complete the sentences with the correct prepositions to form phrasal verbs with TAKE.

after down in off on up

1	During the site inspection, the engineer took _____ detailed notes about the types of solid waste found in the landfill for further analysis.
2	After watching a documentary on ocean pollution, Tom took _____ the intricate practice of creating environmentally themed installations from recycled solid waste.
3	The drone used for monitoring illegal dumping sites took _____ early in the morning to capture aerial images of hazardous waste scattered along the riverbank.
4	The young environmental activist clearly takes _____ her mother, a renowned waste management expert, especially in her passion for reducing hazardous waste in urban areas.
5	The local eco-community decided to take _____ the challenge of educating factories about safe methods for disposing of industrial hazardous waste.
6	It was difficult to take _____ the extent of pollution caused by the improper disposal of hazardous chemical containers near the residential zone.



For more practice, go to **Practice file 7** on pages 314–316.

22. Replace the idioms in bold with their appropriate equivalents, as in the example. Then make your own sentences with the suggested idioms. If necessary, make some changes in the sentences. Appendix 4 has a list of relevant idioms.

Design engineers must never **throw caution to the wind** when selecting materials for chemical waste containment systems, as any structural failure can be catastrophic.

Design engineers must never **act without foresight** when selecting materials for chemical waste containment systems, as any structural failure could lead to catastrophic consequences.

1. The inspectors **caught the factory red-handed** dumping hazardous chemicals into the local river.

2. Environmental officers working in illegal waste zones are often **in the line of fire**, facing both physical danger and political pressure.

3. The decision to ignore proper hazardous waste disposal protocols may **come back to haunt** the company in the form of legal action.

4. Unregulated landfills near residential areas are **a ticking time bomb** for public health and groundwater contamination.

5. Instead of addressing the leaking barrels of toxic waste, the facility managers **swept the problem under the carpet** to avoid negative press.

6. The feasibility study for a closed-loop hazardous waste system is complete; **the ball is now in the client's court** to greenlight the implementation phase.

7. Consulting engineers working with multinational clients often **tread gently** when introducing stricter hazardous waste controls that conflict with local practices.

8. The outdated filtration unit caused thousands of liters of partially treated chemical effluent **to go to waste** during the plant's peak operating hours.

23. Choose the most appropriate idiom to complete the sentence.

1	When environmental inspectors arrived unannounced, they _____ several workers illegally discharging toxic sludge into a nearby drainage canal.	a) swept it under the carpet b) caught them red-handed c) tread lightly
2	The neglected chemical storage site is a _____; if not properly contained, it could release carcinogenic substances into the groundwater and surrounding soil.	a) ticking time bomb b) ball in their court c) throw caution to the wind
3	Environmental officers working near illegal landfills often find themselves _____, facing criticism from both companies and local authorities.	a) treading lightly b) in the line of fire c) catching someone red-handed
4	Despite increased recycling awareness campaigns, tons of valuable materials still _____ each year due to inefficient waste segregation and insufficient infrastructure.	a) sweep under the carpet b) come back to haunt policy-makers c) go to waste
5	After numerous official warnings, _____ for the recycling company to demonstrate its compliance with hazardous waste storage and treatment standards.	a) the ball is in their court b) it came back to haunt them c) they are on thin ice
6	The corporation's deliberate neglect of proper hazardous waste documentation a decade ago has now _____, resulting in legal penalties and public outrage.	a) come back to haunt them b) thrown caution to the wind c) gone to waste
7	Some private waste contractors _____ by transporting toxic solvents without proper labeling, containment, or safety permits, putting workers and nearby communities at risk.	a) tread lightly b) throw caution to the wind c) catch someone red-handed
8	Instead of addressing the growing e-waste problem, local authorities tried to _____ by falsifying reports and minimizing the recorded quantities.	a) go to waste b) throw caution to the wind c) sweep it under the carpet

Grammar Box

24. Watch the video about *Gerund and Infinitive*, and complete the rules (1–7) with the correct option. Then, match the rules with the sentences (A–G) that represent each of them.

1.	_____ is used after verbs expressing intention, desire, or plan; it shows a deliberate action aimed for the future.	A	The new filtration technology appears to be highly effective in removing heavy metals from industrial wastewater without generating _____ secondary pollutants.
2.	_____ expresses the purpose or intended outcome of an action.	B	Governments are investing heavily in renewable energy by installing solar panels on public buildings.
3.	_____ follows perception or tendency verbs to describe observed or expected states.	C	The international consortium plans to implement cutting-edge carbon capture technologies in coal-fired power plants to mitigate greenhouse gas emissions.
4.	_____ is used after verbs expressing likes, dislikes, feelings, or recommendations.	D	Coastal communities are working hard to prevent flooding caused by rising sea levels and extreme weather events.
5.	_____ follows verbs of prevention or avoidance, emphasizing the action to be prevented.	E	Citizens noticed polluting activities near the river and reported them to environmental authorities immediately.
6.	Following a preposition, a verb is always used in the _____ form.	F	Many environmental scientists recommend reducing single-use plastics to prevent marine pollution from microplastics accumulation.
7.	_____ follows verbs of perception when focusing on the activity itself rather than the result.	G	Governments are subsidizing electric vehicles to accelerate the transition from fossil fuels and curb urban air pollution.

25. Choose the correct verb form in brackets (gerund or infinitive) to complete the sentences.

1.	The government plans (to introduce / introducing) stricter controls on industrial effluent next year.
2.	Researchers succeeded in (developing / to develop) a low-cost method for (removing / to remove) arsenic from groundwater.
3.	We must avoid (to contaminate / contaminating) this sensitive wetland with runoff from the construction site.
4.	The manual is designed (to train / training) technicians in (maintaining / to maintain) the new filtration system.
5.	The community risked (losing / to lose) its only freshwater source by (locating / to locate) the waste so close to the aquifer.
6.	The company denied (to dump / dumping) toxic chemicals, despite the clear evidence in the water samples.
7.	It is essential (to upgrade / upgrading) the infrastructure now (to mitigate / mitigating) future water scarcity.
8.	The mayor mentioned (to launch / launching) a public campaign on water conservation in his speech.
9.	They spent months (to restore / restoring) the riverbank after the major oil spill.
10.	I would recommend (hiring / to hire) an independent lab (to test / testing) your well water annually.
11.	The new policy aims at (providing / to provide) incentives for industries (to recycle / recycling) water.
12.	The engineers finished (to construct / constructing) the desalination plant ahead of schedule.
13.	Farmers are considering (switching / to switch) to drought-resistant crops (to reduce / reducing) their reliance on irrigation.
14.	It's no use (complaining / to complain) about the polluted river if you aren't willing (to participate / participating) in the clean-up.
15.	The treaty commits both nations (to manage / managing) shared river resources equitably.

26. Choose the correct verb from the box below to complete the sentences with the gerund or the infinitive form.

think, promote, reuse, educate, convince, achieve, implement, cooperate, combine, change, produce, choose, reduce, save, change

Waste Prevention and Reduction

Modern environmental policies emphasise the importance of 1) _____ waste at its source rather than simply managing it after disposal. Many industries have started 2) _____ strategies aimed at minimizing material use and improving efficiency. Consumers are also encouraged 3) _____ their habits by 4) _____ products instead of throwing them away. For example, 5) _____ reusable packaging or refillable bottles significantly decreases plastic waste. Governments continue 6) _____ eco-friendly practices, such as recycling and composting, to make citizens more aware of the consequences of their choices.

Companies that avoid 7) _____ excessive packaging often manage 8) _____ both money and resources. However, it is not always easy 9) _____ people to adopt new habits. Some resist 10) _____ because they are used to convenience and single-use products. Yet, researchers agree that 11) _____ people about long-term benefits can lead to more sustainable behavior. Organisations have begun 12) _____ internationally to share technologies and methods that help reduce waste generation. By 13) _____ innovation with education, societies can expect 14) _____ measurable progress. Ultimately, preventing waste means 15) _____ differently about how we produce, consume, and dispose of materials.

LISTENING

27. Before watching the video, check if you know the meaning of the following words and phrases. Use the [dictionary](#) if necessary.

hazardous constituents	applicable	inherently	hazardous waste manifest
exempt	waste code	T-clip analysis	cradle
mutually exclusive	non-compliance violations	vendor	substitute for

28. Watch the video “**Hazardous waste determinations**”. Decide whether the following statements are true (T), false (F), or not mentioned (NM). Correct the wrong statements. Fill in the table with your answers.

	statements	T	F	NM
1	A hazardous waste determination is required only for businesses that produce large amounts of waste.			
2	Waste profiles provided by vendors can replace the need for a hazardous waste determination.			
3	RCRA regulations require hazardous waste to meet specific treatment standards before disposal.			
4	In addition to federal regulations under RCRA, many U.S. states have their own stricter hazardous waste determination requirements that generators must also follow.			
5	A waste can only be considered hazardous if it is listed in the Code of Federal Regulations.			
6	The first step in a hazardous waste determination is to identify and list all waste streams at the facility.			
7	Solid waste includes only materials in solid form.			
8	All solid wastes must be tested in a certified lab to determine if they are hazardous.			
9	Waste codes such as D001, F003, or U183 must be included in the final hazardous waste determination document if the waste is found to be hazardous.			
10	Failing to properly label hazardous waste containers can lead to cross-contamination, increased disposal costs, and serious regulatory penalties.			
11	One cost-saving strategy when analyzing unknown waste is to request a totals analysis with a hold for further testing.			
12	Routine employee training on hazardous waste identification and handling is essential to ensure compliance and reduce environmental risk at the facility.			

29. Watch the video again and complete the following sentences with missing information.

1	A hazardous waste determination is a _____ used to determine whether a waste is hazardous or not.
2	Determinations are important because RCRA, the Resource Conservation and Recovery Act, _____ different levels of generator storage requirements.
3	These treatment standards establish the type of _____ process or concentration-based criteria that must be met for each waste code.
4	Step two requires you to _____ to see if the waste meets the definition of a solid waste as found in the Code of Federal Regulations or the CFR.
5	Remember, all waste should be _____ at the point of generation.
6	In some cases, such as with regulated metal contaminants, an _____ test will be required to prove the waste is not a hazardous waste.
7	Step four involves preparing the document, which clearly _____ whether or not the waste is hazardous.
8	Generators can record hazardous waste determinations on the _____ form or in a different document or spreadsheet record.
9	These records may include SDSs, process flow diagrams, _____ laboratory results, and chemical reaction diagrams.
10	From the history, you can likely figure out how to document the determination and then prepare it for _____.
11	You can also use past hazardous waste manifests and records to help determine the _____.
12	As a hazardous waste generator, you are _____ for your waste from cradle to grave.

SPEAKING

30. You are a member of an environmental student club preparing a campaign to explain the importance of proper waste management. Look at the images showing different waste management methods (hazardous waste disposal, recycling, composting, open landfills, controlled incineration). Briefly describe what you see in the picture. Then compare the approaches and explain which one you think is the most environmentally friendly and which one is the least effective. Support your ideas with reasons.

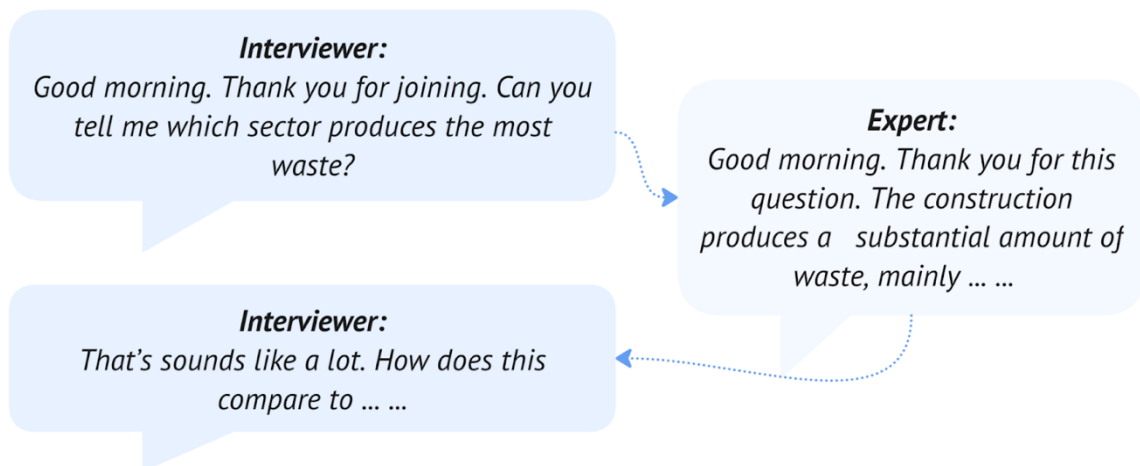
Useful phrases:

- *In this picture / image / photo, I can see*
- *This picture shows / illustrates*
- *The worst method / approach is*
- *Compared to ..., this approach is more*
- *In my opinion, the best option / method is*
- *I believe / think this approach is the best because*
- *To sum up / Overall*



Images taken from:
<https://unsplash.com/photos/a-large-pile-of-trash-sitting-on-top-of-a-dirt-field-lcsSOkgJwE8>

31. You are an invited expert on waste management, being interviewed on a local radio program. The interview will focus on identifying the sector (e.g., agriculture, construction, transportation, healthcare, energy production, military, fishing, household, etc.) that generates the highest amount of waste, the reasons behind this, and what practical steps can be taken to reduce its environmental impact. The list of questions and useful phrases provided below can help you to be well-prepared for the interview.



- 1. Which sector generates the most waste? Why?**
- 2. Which sphere generates the most hazardous waste? Why?**
- 3. What is the danger of medical waste?**
- 4. What is the environmental impact of agricultural waste?**
- 5. What strategies can be implemented to reduce waste?**
- 6. How can technology help in reducing waste?**
- 7. Which sphere is the most challenging in managing waste? Why?**

Useful phrases:

- *The biggest contributor to waste is*
- *The most dangerous type of waste is*
- *Compared to ... waste, ... waste is more / less*
- *... waste is less / more harmful than*
- *... waste can lead to*
- *One way to reduce ... waste is*
- *The best solution is*

32. You and your partner are environmental engineers consulting city authorities on sustainable development and waste treatment. You are to consider two different models (linear vs circular economy) presented in the image below. Discuss the pros and cons of each model, and decide which model is more suitable for the city's waste treatment and is more sustainable. Explain your choice.

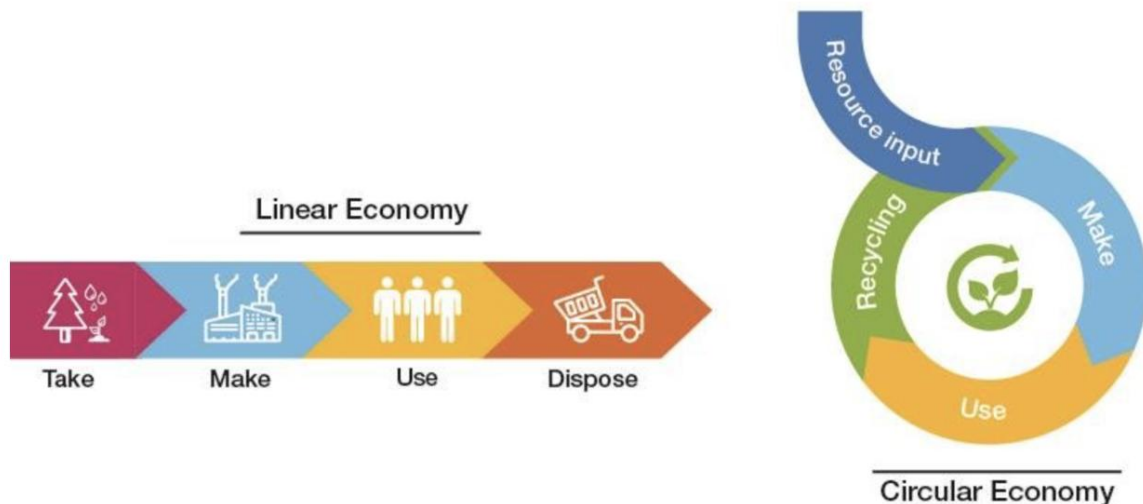


Image taken from:
https://www.researchgate.net/figure/The-model-of-linear-economy-and-circular-economy-Source-Authors-Synthesis-2021_fig1_356887454

Useful phrases:

- *In my opinion, circular / linear economy is*
- *Circular / linear economy is more / less sustainable*
- *One advantage of circular / linear economy is*
- *One main benefit of this model is*
- *That's a good point*
- *I see what you mean, however*
- *I believe the city should adapt / implement*

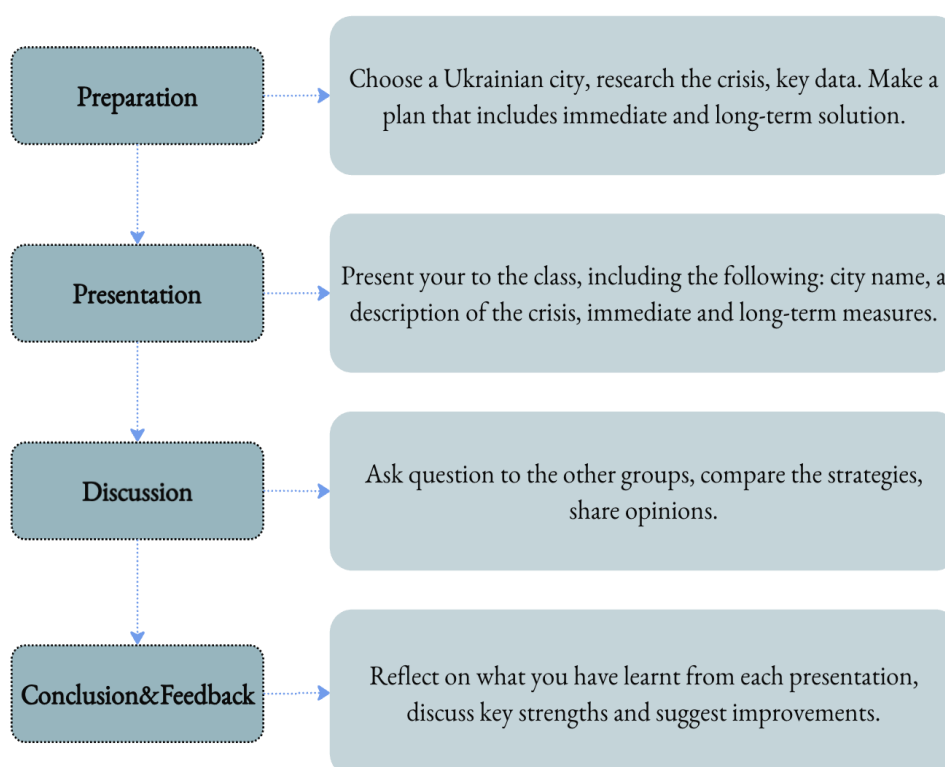
33. You are environmental advisors, and you're working to address a growing waste management crisis in Ukrainian cities. You've been invited to a city council meeting to present a plan with immediate and long-term action to address the issue. Work in groups. Each group selects a city, outlines the specific waste-related challenges it faces, and proposes a realistic action plan to resolve the crisis. Improve your presentation by following the outline, presentation requirements, and useful phrases provided below.

Presentation requirements:

- 1. Time limit: 2–3 minutes per presentation.**
- 2. Visuals: slides or pictures with keywords / bullet points, not full sentences.**
- 3. Structure: introduction – main part – conclusion.**
- 4. Speak in your own words; do not read.**

Useful phrases:

- *The main problem / issue in ... is ...*
- *The city is facing a waste crisis because ...*
- *We propose / suggest ...*
- *As an immediate / short term / urgent solution ...*
- *In the long term ...*
- *This approach / measure / action is necessary ...*
- *Overall / In conclusion ...*



WRITING

34. You are an environmental student, and in one of the courses, you've been assigned to write an essay explaining the risks of hazardous waste. Write an essay (160–180 words) outlining the impact of improper hazardous waste disposal on health and environmental consequences. Follow the outline provided below, including an introduction, a main part, and a conclusion. Pay attention to clarity, coherence, and accuracy in your writing.

***See Appendix 5 for a writing model.**

Useful phrases:

- *This essay will examine / look into*
- *Hazardous waste refers to*
- *Proper disposal of hazardous waste is crucial / critical / necessary*
- *One of the causes of improper waste disposal is*
- *Improper waste disposal can lead to / result in / cause*
- *To mitigate the effects, it is necessary to*
- *To sum up / In conclusion*

1. Introduction

- introduce the topic
- state the purpose of the essay
- state the importance of proper hazardous waste disposal

2. Main part

- explain the causes of improper disposal, for instance low awareness
- describe the impact on human health (e.g., diseases, poisoning risks, etc.)
- write about the effects on the environment, such as water contamination
- suggest solutions

3. Conclusion

- restate the importance of safe hazardous waste disposal
- summarize your main points

35. You are a member of a local eco club, currently launching an environmental initiative to dispose of electronic waste. Write a step-by-step guide (150–170 words) for proper disposal of e-waste (e.g., batteries, phones, chargers, etc.) Include the following elements: an introduction, explaining the importance of electronic waste disposal; a main part with numbered steps and clear instructions; and a closing with a call to action. Pay attention to clarity, coherence, and accuracy in your writing. Ensure your guide is clear and concise.

***See Appendix 5 for a writing model.**

Use phrases and keywords in the box below.

separate	collect	recycle	label	check
hazardous waste	cables	batteries	waste bin	safe disposal
sealed container	recycling facility	refurbishment	circular economy	green initiative

SELF-ASSESSMENT

36. *Explore the target vocabulary related to the topic “Solid and Hazardous Waste” using **flashcards** and then assess comprehension through a **Quizlet quiz**.*

37. *Check yourself and do the quiz.*

1. What is the meaning of “treatment” within the context of waste management?
 - A. *cure*
 - B. *dealing with*
 - C. *exploration*
 - D. *coverage*
2. Which of the following is not a waste management method?
 - A. *collection*
 - B. *recovery*
 - C. *disposal*
 - D. *manufacturing*
3. Which word below is a synonym of “residual”?
 - A. *leftover*
 - B. *by-product*
 - C. *undesirable*
 - D. *used*
4. Which of the following refers to relating to things in the environment that are not living?
 - A. *symbiotic*
 - B. *antibiotic*
 - C. *abiotic*
 - D. *biotic*
5. What does MSW stand for?
 - A. *mechanical system waste*
 - B. *municipal system waste*
 - C. *municipal solid waste*
 - D. *mineral solid waste*

6. In which state can solid wastes exist?
- A. *liquid*
 - B. *semi-solid*
 - C. *trapped gaseous substance*
 - D. *all of the above*
7. Which of the following is a type of hazardous waste?
- A. *manure*
 - B. *pesticides*
 - C. *batteries*
 - D. *medical waste*
8. Which word means “the ability to destroy solid materials by a chemical reaction”?
- A. *corrosivity*
 - B. *ignitability*
 - C. *reactivity*
 - D. *toxicity*
9. Which term refers to the rate of illness?
- A. *yielding*
 - B. *contamination*
 - C. *morbidity*
 - D. *disparity*
10. Which of the following is the best definition of “combustion”?
- A. *the act or process of burning*
 - B. *being on fire with no visible flames but often with much smoke*
 - C. *filled with much light*
 - D. *to make dry*

Check yourself, Appendix 8. Self-Assessment Keys.

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Unit 1

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Unit 2

Ecosystems. Biodiversity

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Unit 3

Water Resources and Their Characteristics.

Water Pollution and Treatment Strategies

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APPENDIX 1.

Vocabulary

Unit 1

Introduction to Environmental Engineering

1	advanced oxidation processes – <i>передові процеси окиснення</i> : chemical methods used to remove organic and inorganic pollutants through strong oxidants
2	adverse factors – <i>несприятливі чинники</i> : negative external conditions, influences, or variables that worsen a situation, such as those that compromise water quality, hinder treatment processes, or strain water supply systems
3	attain – <i>досягати</i> : to succeed in reaching or meeting a specific required standard, level, or goal, especially regarding water quality parameters or treatment efficiency targets
4	chemical resistance – <i>хімічна стійкість</i> : the ability of a material to resist damage or degradation caused by chemical exposure
5	circular economy – <i>круговий економічний цикл</i> : an economic system focused on minimizing waste and maximizing the reuse and recycling of resources
6	contaminant identification – <i>визначення забруднювачів</i> : the process of detecting and characterizing harmful substances in the environment
7	degradation process – <i>процес руйнування довкілля / деградації природи</i> : the breakdown or deterioration of environmental quality or natural resources
8	deleterious effect – <i>шкідлива дія / делетерний ефект</i> : a harmful, damaging, or toxic impact on living organisms, ecosystems, or human health caused by exposure to pollutants or adverse environmental conditions
9	density functional theory – <i>теорія функціоналу щільності</i> : a quantum mechanical method used to investigate the electronic structure of molecules and materials
10	ecosystem dynamics – <i>динаміка екосистем</i> : the study of changes and interactions among living organisms and their physical environment
11	embracing treatment – <i>впроваджувати методи очищення / обробки</i> : to adopt and apply advanced or sustainable cleaning or purification technologies
12	encompass global concern – <i>охоплювати глобальні проблеми</i> : to include or address worldwide environmental or social issues
13	environmental consequences – <i>наслідки для довкілля</i> : the effects or outcomes of human or natural activities on ecosystems and the biosphere
14	environmental contaminants – <i>забруднювачі навколишнього середовища</i> : substances that pollute air, water, or soil and pose risks to living organisms
15	environmental impact assessment – <i>оцінка впливу на довкілля</i> : a formal study predicting how a project or policy may affect the environment

16	environmental regulations – <i>екологічне регулювання</i> : laws and policies aimed at protecting the environment and controlling pollution
17	environmental sustainability – <i>екологічна сталість</i> : the responsible use of natural resources to maintain ecological balance for future generations
18	fate of pollutants – <i>доля забруднювачів</i> : the study and description of what ultimately happens to chemical pollutants after their release into the environment, including their transportation, transformation, and final resting place in air, water, soil, or living organisms
19	flocculants – <i>флокулянти</i> : chemical substances used in water treatment to cause fine particles to clump together into larger masses (flocs), making them heavy enough to settle out or be filtered from the water
20	green engineering – <i>зелена інженерія</i> : the design of products and processes that minimize environmental impact and enhance efficiency
21	green infrastructure – <i>зелена інфраструктура</i> : networks of natural and semi-natural areas that provide environmental, social, and economic benefits
22	interdisciplinary science – <i>мультидисциплінарна наука</i> : a scientific approach that combines methods and knowledge from multiple fields of study
23	molecular dynamics – <i>молекулярна динаміка</i> : computer simulations that model the movement and interactions of atoms and molecules
24	pollution prevention – <i>запобігання забрудненню</i> : actions or technologies aimed at reducing waste and emissions before they occur
25	pollution reduction methodology – <i>методики зменшення забруднення</i> : structured techniques designed to minimize contaminants in air, water, or soil
26	preserve – <i>зберігати / охороняти</i> : to protect natural resources, biodiversity, or cultural heritage from damage or destruction
27	privy vaults – <i>вигрібні ями / вбиральні колодязі (історично)</i> : underground pits or chambers, historically used as primitive toilets for human waste disposal, which often led to the contamination of nearby soil and groundwater
28	regulatory frameworks – <i>регуляторні рамки</i> : structured systems of laws, standards, and guidelines that govern environmental protection
29	remediation processes – <i>процеси очищення</i> : methods used to remove or neutralize pollutants from soil, water, or air
30	risk assessment – <i>оцінка ризиків</i> : the systematic evaluation of potential hazards and their likelihood of causing harm
31	socio-ecological considerations – <i>соціально-екологічні аспекти</i> : the integration of human, social, and ecological factors in environmental planning
32	solid and hazardous waste – <i>тверді й небезпечні відходи</i> : discarded materials that may pose risks to health or the environment
33	waste streams – <i>потоки відходів</i> : the flow of waste materials from their sources through collection, treatment, and disposal
34	waste valorization – <i>переробка відходів у цінні ресурси</i> : converting waste materials into valuable products, energy, or raw materials
35	water supply and treatment – <i>водопостачання і очищення води</i> : the process of providing clean, safe water for human and industrial use

Unit 2

Ecosystems. Biodiversity

1	abrupt transformations – <i>різкі перетворення</i> : sudden and significant environmental or ecological changes occurring over a short period of time
2	belowground ecosystems – <i>підґрунтові екосистеми</i> : ecological systems that exist beneath the soil surface, including roots, fungi, and microorganisms
3	biodiversity levels – <i>рівні біорізноманіття</i> : measures of the variety of life within species, between species, and across ecosystems
4	biodiversity-rich areas – <i>багаті на біорізноманіття райони</i> : regions that contain a high number of plant and animal species, often prioritized for conservation
5	biomes – <i>біоми</i> : large ecological regions defined by climate, vegetation, and dominant life forms, such as forests, deserts, and tundra
6	carbon storage – <i>накопичення вуглецю</i> : the process of capturing and holding carbon in plants, soil, or oceans to reduce atmospheric CO ₂
7	complex and interacting factors – <i>складні та взаємопов'язані фактори</i> : multiple environmental or biological variables that influence each other and shape ecosystem behavior
8	conservation strategies – <i>стратегії збереження</i> : planned actions designed to protect biodiversity, natural resources, and ecosystems
9	coral bleaching – <i>білення коралів</i> : when stressed corals lose their colorful algae, turning white, which can lead to their death if the stress continues
10	cropland expansion – <i>розширення сільськогосподарських угідь</i> : the increase of farmland area, often leading to habitat loss and deforestation
11	disturbances in ecosystems – <i>порушення в екосистемах</i> : disruptions caused by natural events (fires, floods) or human activities (logging, pollution)
12	ecosystem composition – <i>структура екосистеми</i> : the variety and abundance of species that make up an ecosystem
13	ecosystem recovery – <i>відновлення екосистем</i> : the process by which ecosystems regain structure and function after disturbance or degradation
14	energy flow through ecosystems – <i>потік енергії в екосистемах</i> : the transfer of energy from one organism to another through food chains and webs
15	food webs – <i>харчові ланцюги / мережі</i> : interconnected feeding relationships among species within an ecosystem
16	habitat destruction – <i>знищення місць існування</i> : the process of damaging or eliminating natural environments necessary for species survival
17	habitat fragmentation – <i>фрагментація середовища</i> : the breaking apart of large natural habitats into smaller, isolated patches, often by roads or farms, harming wildlife movement and survival
18	historical legacies – <i>історичні спадщини</i> : long-term environmental effects of past human or natural activities on ecosystems
19	indirect effects – <i>опосередковані ефекти</i> : consequences that occur as a result of secondary or chain reactions rather than direct causes
20	iterative refinement – <i>ітеративне вдосконалення</i> : a process of making small, repeated improvements to a plan or model based on testing and feedback.

21	land use change – <i>зміни землекористування</i> : the transformation of natural landscapes through agriculture, urbanization, or deforestation
22	long-term data – <i>довгострокові дані</i> : information collected over extended periods, essential for studying trends in ecology and climate
23	natural archives – <i>природні архіви</i> : environmental records such as tree rings, ice cores, and sediments that preserve past climate and ecosystem data
24	nutrient recycling – <i>переробка поживних речовин</i> : the process through which essential elements like nitrogen and phosphorus are reused in ecosystems
25	perturbations – <i>пертурбації / збурення</i> : a disturbance or temporary change in the normal state or function of an ecosystem, caused by natural events (e.g., storms, fires) or human activity, which may disrupt balance but not necessarily cause permanent damage.
26	pollination – <i>запилення</i> : the transfer of pollen between flowers, allowing plants to reproduce, often done by insects, birds, or the wind
27	protists – <i>протисти</i> : a large group of mostly microscopic, single-celled organisms (like algae and amoebas) that are key producers and consumers in water ecosystems.
28	sediment layers – <i>шари осаdів</i> : deposits of particles over time that record geological and environmental history
29	shrub – <i>чагарник / кущ</i> : a low, woody plant with multiple stems, like a bush, common in undergrowth and scrublands
30	soil microbial communities – <i>мікробні спільноти ґрунту</i> : populations of bacteria, fungi, and other microorganisms that contribute to soil health and nutrient cycling
31	temperate forests – <i>помірні ліси</i> : forests in regions with four distinct seasons, containing trees that lose their leaves in autumn (deciduous) and evergreen conifers
32	to alter rainfalls – <i>змінювати режим опадів</i> : to change the natural patterns, intensity, or frequency of precipitation in a region, often as a result of human-induced climate change, deforestation, or large-scale land use changes, leading to droughts or floods.
33	to destabilise an ecosystem – <i>дестабілізувати екосистему</i> : to disrupt the natural balance, structure, or function of an ecosystem, making it more vulnerable to collapse, species loss, or irreversible change, often due to external pressures like pollution, invasive species, or climate shifts
34	to weave ecosystems together – <i>з'єднувати екосистеми</i> : to create ecological connections (like wildlife corridors) between habitats, allowing species and processes to interact healthily
35	wrought – <i>викликаний, спричинений</i> : brought about or caused, as in the damage wrought by the storm

Unit 3

Water Resources and Their Characteristics.

Water Pollution and Treatment Strategies

1	acidic water – <i>кислотна вода</i> : water with a pH below 7, often resulting from acid rain or industrial pollution, which can corrode pipes and harm ecosystems
2	ambient temperatures – <i>температура навколишнього середовища</i> : the temperature of the surrounding air or environment in which processes or systems operate
3	aquifer recharge – <i>поповнення водоносного горизонту</i> : the process by which groundwater levels are replenished through the infiltration of rainwater or surface water
4	artificial lakes – <i>штучні озера</i> : man-made bodies of water created for purposes such as irrigation, hydroelectricity, or recreation
5	biogeochemical cycle – <i>біогеохімічний цикл</i> : the circulation of elements like carbon, nitrogen, and phosphorus through living organisms and the Earth's systems
6	climatic variables – <i>кліматичні змінні</i> : measurable factors such as temperature, humidity, and precipitation that influence weather and environmental processes
7	dissolved ions – <i>розчинені іони</i> : charged particles of minerals or salts present in water that affect its chemical composition and quality
8	drainage basins – <i>водозбірні басейни</i> : land areas from which all precipitation drains into a common outlet such as a river, lake, or ocean
9	effective leakage detection – <i>ефективне виявлення витоків</i> : techniques or systems used to identify and locate leaks in water distribution networks
10	efficacy – <i>ефективність / дієвість</i> : the ability or power to produce a desired or intended result effectively, often used to evaluate the success of a treatment, policy, or action
11	eutrophication – <i>евтрофікація</i> : the excessive enrichment of a water body with nutrients (like nitrogen and phosphorus), leading to dense plant growth, oxygen depletion, and the death of aquatic life
12	fresher water resources – <i>ресурси прісної води</i> : naturally occurring water with low salt concentration suitable for drinking, irrigation, and industrial use
13	global evaporation – <i>глобальне випаровування</i> : the total amount of water that turns into vapor from oceans, lakes, and land surfaces worldwide
14	groundwater resources – <i>підземні ресурси води</i> : water stored beneath the Earth's surface in soil or rock formations called aquifers
15	hydrological cycle – <i>гідрологічний цикл</i> : the continuous movement of water through evaporation, condensation, precipitation, and runoff on Earth
16	leakage assessment – <i>оцінка витоків</i> : the analysis of water loss from pipelines or systems to improve efficiency and reduce waste

17	overall water management – <i>комплексне управління водними ресурсами</i> : coordinated strategies for the sustainable use, distribution, and conservation of water
18	partitioning of the water – <i>розподіл води</i> : this refers to the act of dividing a body of water or a water supply into separate parts or shares
19	pipeline burst events – <i>прориви трубопроводів</i> : sudden failures in water distribution systems causing major water loss or damage
20	pore spaces – <i>поровий простір / пори (у ґрунті або гірських породах)</i> : tiny voids in soil or rock that can hold air or water, critical for aquifer storage
21	precipitation patterns – <i>характер опадів / схеми випадання опадів</i> : the distribution and frequency of rainfall or snowfall across time and regions
22	pressure relief valves – <i>кранпани зняття тиску</i> : devices that prevent excessive pressure buildup in pipelines or tanks by releasing water or air
23	recharge of aquifers – <i>регенерація водоносних горизонтів</i> : natural or artificial processes that restore groundwater supplies
24	river discharge – <i>стік річки</i> : the volume of water flowing through a river channel over a given period, typically measured in cubic meters per second
25	saltwater salinity – <i>солоність морської води</i> : the concentration of salts dissolved in seawater, usually measured in parts per thousand
26	smart irrigation – <i>розумне зрошення</i> : technology-based watering systems that adjust automatically according to soil moisture and weather data
27	smart water grid – <i>система “розумного” водопостачання</i> : digitally controlled water infrastructure that optimises distribution, reduces losses, and ensures quality
28	stormwater runoff – <i>зливові стічні води</i> : water from rain or melting snow that flows over surfaces and can carry pollutants into rivers and lakes
29	sublimation – <i>сублімація</i> : the process where water changes directly from solid (ice or snow) to vapor without becoming liquid
30	surface water resources – <i>ресурси поверхневих вод</i> : accessible bodies of water such as rivers, lakes, and reservoirs found on Earth’s surface
31	to purge – <i>очищати / промивати</i> : to remove unwanted substances, contaminants, or air from a system, such as flushing pollutants from soil or clearing air from a water pipeline
32	transient pressure analysis – <i>аналіз перехідного тиску</i> : the study of short-term pressure changes in pipelines to detect leaks or blockages
33	transpiration – <i>транспірація</i> : the process by which plants release water vapour into the atmosphere through their leaves, contributing to the water cycle and local humidity
34	tributaries – <i>притоки (річок)</i> : smaller streams or rivers that flow into a larger river or main water body
35	water quality assessment – <i>оцінка якості води</i> : the measurement and analysis of chemical, physical, and biological characteristics of water

Unit 4

Air Pollution. Acid Rain and Ozone Depletion

1	anthropogenic sources – <i>антропогенні джерела</i> : sources of pollution originating from human activities, such as industry, transportation, and agriculture
2	air quality monitoring – <i>моніторинг якості повітря</i> : the continuous measurement and collection of data on pollutant concentrations in the atmosphere
3	biomass burning – <i>спалювання біомаси</i> : the combustion of organic matter, such as wood, agricultural waste, or vegetation, often contributing to regional air pollution
4	carcinogenic radioactive gas – <i>канцерогенний радіоактивний газ</i> : a gas (e.g., radon) that causes cancer and emits ionizing radiation, often accumulating indoors
5	chemical compounds – <i>хімічні сполуки</i> : substances formed when two or more elements are chemically bonded together, often components of pollutants
6	chemical reactions – <i>хімічні реакції</i> : processes involving molecular or ionic rearrangement, leading to the formation of new substances or secondary pollutants
7	complex mixture – <i>складна суміш</i> : a combination of various chemical species and particulate matter present in polluted air
8	emission rates – <i>рівень викидів</i> : the quantity of a pollutant released into the atmosphere per unit of time from a source
9	emission reduction – <i>зниження викидів</i> : actions or technologies aimed at decreasing the amount of pollutants released from different sources
10	environmental phenomena – <i>природні явища</i> : natural events (e.g., volcanic eruptions, dust storms) that affect air quality but are not caused by human activity
11	fine sulfate particles – <i>дрібні сульфатні частинки</i> : tiny solid particles formed mainly from sulfur dioxide emissions, contributing to haze and health problems
12	ground-level ozone – <i>озон на рівні землі</i> : a harmful pollutant formed near the Earth's surface through chemical reactions involving sunlight
13	source identification – <i>ідентифікація джерел</i> : the process of determining the origin (e.g., factory, car, wildfire) of airborne pollutants
14	incentivize clean technologies – <i>стимулювати чисті технології</i> : to encourage the use of low- or zero-emission solutions through economic or regulatory benefits
15	multifaceted nature – <i>багатогранна природа</i> : complex quality of having many different aspects, features, or dimensions, which makes something difficult to understand or address from a single perspective.
16	nitrogen oxides (NO_x) – <i>оксиди азоту</i> : reactive gases (e.g., NO, NO ₂) produced mainly by fuel combustion, contributing to smog and acid rain
17	nitrate particles – <i>нітратні частинки</i> : fine aerosols formed from nitrogen oxides, reducing visibility and affecting air quality
18	ozone depletion – <i>руйнування озонowego шару</i> : the thinning of the stratospheric ozone layer that reduces protection from harmful solar radiation

19	point sources – <i>точкові джерела</i> : specific, identifiable locations that emit pollutants, such as factory chimneys or power plants
20	pollutant concentrations – <i>концентрація забруднювачів</i> : the amount of a pollutant in a specific volume of air, usually measured in ppm or $\mu\text{g}/\text{m}^3$
21	pollutant conversion – <i>перетворення забруднювачів</i> : the transformation of primary pollutants into secondary ones through chemical reactions in the atmosphere
22	pollution mitigation – <i>зменшення забруднення</i> : strategies or measures aimed at reducing the intensity or effects of environmental pollution
23	pollution sources – <i>джерела забруднення</i> : any activity, process, or object that releases contaminants into the air
24	power plant smokestacks – <i>димові труби електростанцій</i> : tall structures releasing emissions from energy generation facilities into the atmosphere
25	primary / secondary pollutants – <i>первинні / вторинні забруднювачі</i> : primary pollutants are emitted directly; secondary pollutants form in the atmosphere from chemical reactions
26	propellants – <i>реактивні речовини</i> : substances producing thrust or power, often releasing volatile organic compounds into the air
27	protective shield – <i>захисний щит</i> : the figurative role of the ozone layer in protecting Earth from harmful ultraviolet radiation
28	solar radiation – <i>сонячне випромінювання</i> : energy emitted by the sun that sustains life but also drives atmospheric chemical reactions
29	stringent regulations – <i>суворі норми</i> : strict governmental standards designed to control emissions and environmental behavior
30	suspended indoor particles – <i>завислі частинки у приміщенні</i> : fine airborne matter such as dust or smoke that affects indoor air quality
31	terrestrial burning – <i>наземне спалювання</i> : the combustion of vegetation or materials on land, including managed fires and wildfires
32	ventilation conditions – <i>умови вентиляції</i> : the movement of air through spaces, important for dispersing indoor or urban pollutants
33	vehicular emissions – <i>вихлопи транспорту</i> : pollutants released from motor vehicles, including NO _x , CO, and volatile organic compounds
34	visibility degradation – <i>погіршення видимості</i> : the reduction of clarity and distance of vision due to light scattering by particles and gases
35	volatile organic compounds (VOCs) – <i>леткі органічні сполуки</i> : organic chemicals that easily evaporate, contributing to smog formation and found in paints and fuels

Unit 5

Environment and Sustainability

1	aggregation level – <i>рівень агрегування</i> : the scale at which data is combined or summarised for analysis
2	carrying capacity – <i>ємність середовища</i> : the maximum population or activity an ecosystem can support without degradation
3	comprehensive environmental optimisation – <i>комплексна екологічна оптимізація</i> : strategies to maximise environmental efficiency across processes
4	conservation of natural habitats – <i>збереження природних середовищ</i> : protecting natural areas to maintain biodiversity
5	decarbonising – <i>декарбонізація</i> : reducing or eliminating carbon dioxide emissions
6	demographic pressures – <i>демографічний тиск</i> : stresses caused by population growth or distribution
7	depletion – <i>виснаження</i> : the reduction or exhaustion of a natural resource
8	ecological footprint (EF) – <i>екологічний слід</i> : a measure of human demand on natural resources
9	environmental accounting – <i>екологічний облік</i> : tracking and reporting environmental impacts in economic terms
10	environmental collapse – <i>екологічний колапс</i> : severe degradation leading to loss of biodiversity and ecosystem services
11	environmental degradation – <i>деградація довкілля</i> : deterioration of the environment due to resource loss or pollution
12	environmental resilience – <i>екологічна стійкість</i> : the ability of ecosystems to recover from disturbances
13	greenhouse gas reduction – <i>скорочення парникових газів</i> : measures to decrease emissions that trap heat
14	inadequately – <i>недостатньо ефективно</i> : failing to meet the required standard
15	integrated approach – <i>інтегрований підхід</i> : combining multiple strategies or fields to solve complex problems
16	jeopardising – <i>під загрозою</i> : putting something at risk of harm, loss, or failure
17	long-term perspective – <i>довгострокова перспектива</i> : consideration of effects over an extended time
18	measurability – <i>вимірюваність</i> : the ability to quantify a variable or phenomenon
19	negative impacts minimising – <i>мінімізація негативних впливів</i> : reducing harm to ecosystems and people
20	overexploitation thresholds – <i>межі надмірної експлуатації</i> : limits beyond which resource use becomes unsustainable
21	per capita – <i>на душу населення</i> : calculated or considered per person
22	quantitative methods – <i>кількісні методи</i> : approaches using numerical data and statistics

23	reduction of unsustainable exploitation – <i>скорочення нестійкої експлуатації</i> : decreasing overuse of natural resources
24	renewable energy share – <i>частка відновлюваної енергії</i> : proportion of energy from naturally replenishing sources
25	resource efficiency – <i>ефективність використання ресурсів</i> : using resources effectively to reduce waste
26	scalability – <i>масштабованість</i> : the ability of a system to be expanded to larger scales
27	social equity – <i>соціальна справедливість</i> : fairness in access to resources and opportunities
28	strategic decisions – <i>стратегічні рішення</i> : high-level choices that set direction and priorities
29	submerge – <i>затоплювати</i> : to put or sink below the surface of water or another liquid
30	sustainability indicators – <i>індикатори сталості</i> : metrics that measure progress toward sustainability goals
31	transparent data – <i>прозорі дані</i> : information that is open, understandable, and accessible
32	unanimous – <i>одностайний</i> : fully in agreement; when all members of a group share the same opinion or decision
33	urban growth patterns – <i>моделі міського зростання</i> : trends in expansion and development of urban areas
34	vivid representation – <i>наочне представлення</i> : clear and impactful depiction of information
35	vulnerability – <i>вразливість</i> : the quality or state of being exposed to the possibility of harm or damage

Unit 6

Conventional and Sustainable Energy

1	abundant energy – <i>енергія у великій кількості / невичерпна енергія</i> : energy available in large, sufficient quantities without risk of shortage
2	alternative energy sources – <i>альтернативні джерела енергії</i> : energy obtained from non-fossil fuel sources
3	anaerobic digestion – <i>анаеробне зброджування</i> : biological breakdown of organic matter without oxygen to produce biogas
4	artificial reservoirs – <i>штучні резервуари</i> : man-made water storage used for irrigation or power generation
5	bifacial solar modules – <i>двосторонні сонячні модулі</i> : solar panels that capture sunlight from both sides to increase output
6	biochar – <i>біовугілля</i> : carbon-rich material from biomass used for soil improvement and carbon storage
7	biomass feedstock – <i>біомаса сировини</i> : organic raw material used to produce bioenergy or biofuels
8	carbon-neutral process – <i>вуглецево-нейтральний процес</i> : a process that does not increase net CO ₂ emissions
9	combustion – <i>згоряння</i> : the process of burning a substance to produce heat or energy
10	conversion methods – <i>методи перетворення</i> : techniques to transform energy or materials into other forms
11	decentralised production – <i>децентралізоване виробництво</i> : energy generation near its point of use rather than centrally
12	direct-drive turbines – <i>турбіни прямого приводу</i> : turbines operating without a gearbox to reduce complexity and maintenance
13	dispatchable power generation – <i>керована генерація енергії</i> : energy production that can be adjusted to meet demand
14	energy density – <i>енергетична щільність</i> : amount of energy stored per unit of volume or mass
15	energy transformation – <i>перетворення енергії</i> : converting energy from one form to another
16	first-generation ethanol fuel – <i>етанол першого покоління</i> : ethanol made from food crops like corn or sugarcane
17	geothermal heat pumps (GHPs) – <i>геотермальні теплові насоси</i> : systems transferring heat between the ground and buildings
18	geothermal reservoirs – <i>геотермальні резервуари</i> : underground heat sources used for energy production
19	hydropower turbines – <i>гідроенергетичні турбіни</i> : machines converting water movement into electricity
20	intermittent energy source – <i>перервне джерело енергії</i> : energy source that is not continuously available due to variability
21	low-emission energy systems – <i>низьковикидні енергосистеми</i> : technologies that release minimal greenhouse gases

22	micro-scale hydropower – <i>маломасштабна гідроенергетична система</i> : small hydropower systems for local electricity
23	migratory patterns – <i>міграційні маршрути</i> : regular movement of animals affected by energy infrastructure
24	mitigate climate change – <i>пом'якшувати зміну клімату</i> : to reduce the severity or impact of climate change by limiting emissions or enhancing environmental protection
25	molten salt heat transfer systems – <i>системи теплопередачі на розплавлених солях</i> : systems storing / transferring solar heat using molten salts
26	off-grid communities – <i>автономні спільноти</i> : communities not connected to national grids, often using renewables
27	PERC technology – <i>технологія PERC</i> : solar cell design improving efficiency by reducing electron loss
28	photovoltaic cells – <i>фотоелектричні елементи</i> : devices converting sunlight directly into electricity
29	pyrolysis – <i>піроліз</i> : thermal decomposition of organic matter without oxygen
30	replenish – <i>поповнювати</i> : to restore or refill something to its previous level
31	second-generation ethanol fuel – <i>етанол другого покоління</i> : ethanol from non-food biomass like agricultural waste
32	system integration – <i>інтеграція систем</i> : combining multiple technologies to work effectively together
33	undergo – <i>зазнавати / проходити</i> : to experience or be subjected to a process, change, or treatment
34	waste management – <i>управління відходами</i> : collection, processing, and disposal of waste materials
35	wind speed ranges – <i>діапазони швидкостей вітру</i> : variations in wind velocity influencing energy potential

Unit 7

Solid and Hazardous Waste

1	abiotic waste – <i>абіотичні відходи</i> : waste material not originating from living organisms
2	aerobic composting – <i>аеробне компостування</i> : decomposition of organic waste using oxygen and microorganisms
3	anaerobic processes – <i>анаеробні процеси</i> : breakdown of organic matter without oxygen
4	anaerobic digestion (AD) – <i>анаеробне зброджування</i> : production of biogas and digestate from organic waste without oxygen
5	biosolids – <i>очищені та стабілізовані тверді залишки</i> : nutrient-rich material from treated sewage used as fertiliser
6	bulk waste – <i>грозміздки відходи</i> : large discarded items like furniture or appliances
7	circular economy – <i>циркулярна економіка</i> : a system that minimises waste and maximises resource use
8	construction and demolition (C&D) debris – <i>будівельні та демонтажні відходи</i> : waste from construction, renovation, or demolition
9	curing process – <i>процес витримки</i> : a stage in composting where organic materials stabilize and mature, allowing beneficial microbial activity to complete decomposition
10	digestate – <i>дигестат (залишковий матеріал)</i> : leftover material from anaerobic digestion used as fertiliser
11	disposal practices – <i>методи видалення відходів</i> : procedures for safe and legal waste disposal
12	environmental integrity – <i>екологічна цілісність</i> : maintaining healthy and balanced ecosystems
13	eutrophication – <i>евтрофікація</i> : the process by which water bodies become enriched with nutrients, often causing excessive algae growth and oxygen depletion
14	groundwater contamination – <i>забруднення підземних вод</i> : the presence of pollutants in groundwater caused by waste leakage, runoff, or industrial activities
15	inadequate sanitation infrastructure – <i>недостатня санітарна інфраструктура</i> : insufficient facilities for safe waste treatment
16	incineration – <i>спалювання відходів</i> : the controlled burning of waste to reduce its volume and potentially recover energy
17	inherently – <i>по своїй суті, властиво</i> : a quality or characteristic that is a natural, essential, or permanent part of something
18	landfilling – <i>захоронення відходів</i> : disposing of waste by burying it in designated sites
19	leachate infiltration – <i>просочування фільтрату</i> : the process by which liquid draining from waste penetrates the soil and may contaminate groundwater

20	manure – <i>гній</i> : organic material, typically animal dung, used as fertilizer to enrich soil nutrients
21	mechanical biological treatment (MBT) – <i>механіко-біологічна обробка</i> : combined processes reducing waste volume before disposal
22	morbidity – <i>захворюваність</i> : the incidence or prevalence of disease within a population
23	municipal solid waste (MSW) – <i>муніципальні тверді відходи</i> : household and community waste, including food, paper, and plastics
24	occupational hazards – <i>професійні ризики</i> : health risks associated with waste handling
25	organic fractions – <i>органічні фракції</i> : carbon-based, naturally degradable parts of waste
26	quarrying – <i>кар'єрна розробка / видобуток у кар'єрі</i> : the process of extracting stone, minerals, or other materials from the earth for industrial or construction purposes
27	residual waste – <i>залишкові відходи</i> : waste remaining after recycling or recovery
28	resource extraction – <i>видобуток ресурсів</i> : removal of raw materials, often generating waste
29	socioeconomic disparities – <i>соціально-економічні нерівності</i> : differences in income, access to resources, and living conditions among different social or economic groups
30	sorting / shredding / crushing – <i>сортування / подрібнення / дроблення</i> : mechanical processes preparing waste for recycling
31	syngas – <i>синтез-газ</i> : a mixture of carbon monoxide, hydrogen, and other gases produced by gasifying organic materials or waste, used as fuel or in chemical production
32	valorisation of waste – <i>валоризація відходів</i> : converting waste into valuable products or energy
33	vector-borne diseases – <i>хвороби, що передаються переносниками</i> : diseases spread by insects, often increased by poor waste management
34	waste hierarchy – <i>ієрархія відходів</i> : priority system of prevention, reuse, recycling, and disposal
35	waste-to-energy (WtE) – <i>утилізація відходів з отриманням енергії</i> : the process of producing energy from waste materials

APPENDIX 2.

Phrasal Verbs

Unit 1

Introduction to Environmental Engineering

BREAK	break away = end a connection or relationship; become separate or independent from smth., often by force or deliberate choice break down = stop functioning or operating; to interrupt or cease an activity break in = force entry into a place break out = escape from a place (e.g., prison); start suddenly (e.g., a fire, a war, or a disease) break out of = escape from a situation, place, or condition - especially one that is confining, limiting, or difficult break up = end a relationship, partnership; (of schools) to close for a holiday break through = overcome an obstacle or achieve success after difficulty
BRING	bring about = cause to happen bring around = revive someone or restore them to consciousness; to persuade someone to change their opinion or agree with something bring back = return something; to revive a memory bring down = cause to fall; to decrease or weaken someone's power or authority bring in = introduce (e.g., law; rule) bring off = succeed in doing something difficult or challenging bring up = mention or raise (a topic); raise a child

Unit 2

Ecosystems. Biodiversity

CALL	call back = return a phone call to someone or a place; request that something be brought or sent back call for = require or justify a particular action or response; go and collect someone or something call in = make a phone call to get or provide information; request help or services from someone, especially in a professional or emergency context call off = stop or cancel something that was planned or arranged call out = speak or shout loudly so others can hear; openly criticize or challenge someone, especially in public call up = officially invite or order someone to serve in the military or on a team
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COME	come across = discover or meet someone or something by chance; seem or give a certain impression to others come along = go with someone who is leading or going somewhere; arrive or appear, often unexpectedly come down with = get sick come off = happen successfully or as intended come out = become known or made public come round = wake up or regain consciousness after fainting or being unconscious; eventually agree with someone else's point of view or decision come up with = think of or create an idea, plan, or solution
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Unit 3

Water Resources and Their Characteristics.

Water Pollution and Treatment Strategies

CUT	cut across = influence or involve various groups of people or things; travel across an area, usually taking a quicker or more direct route cut back on = reduce the amount of something you use, spend, or do cut down = cause something to fall by slicing it near its base cut in = suddenly interrupt someone while they are speaking or doing something cut off = break into or block a connection, such as a phone line; to isolate someone or something from what they are normally linked to cut out = exclude someone from participating or receiving a share of something cut through = to move swiftly and easily through air, water, or another medium; to deal with something complicated in a clear and efficient way
DRAW	draw away = surpass competitors or pull ahead in a competition; shift attention or focus away from a particular person or thing draw back = retreat or move away, often due to fear or surprise; withdraw from a decision or action, usually because it seems unwise or risky draw in = attract or encourage someone to join or become involved draw on = utilize knowledge, experience, or resources to assist in accomplishing something draw out = pull something out or remove it; prolong or lengthen something beyond the usual time draw up = create or compose a preliminary version of a document or plan; come to a stop or halt, especially regarding movement

Unit 4

Air Pollution. Acid Rain and Ozone Depletion

FALL	fall apart = to stop working effectively or become chaotic; to shatter or come undone emotionally or physically fall back on = to rely on something, such as money or help, when no other options are left fall behind = to lag in progress or fail to keep up with others or a schedule fall for = to be tricked or misled by something; to develop romantic feelings for someone fall into = to begin something by chance or without planning fall off = to detach and drop down accidentally; to reduce in amount, strength, or intensity fall out = to argue or have a falling-out with someone; to come loose and drop out (like hair or a tooth) fall through = to collapse or not succeed, often referring to plans or arrangements
GIVE	give away = to hand something over freely as a gift or reward; to accidentally reveal information or a secret give back = to return something to its rightful owner or original place give in = to stop resisting and finally accept someone's demands; to yield or surrender in a situation give off = to emit or release heat, light, a scent, or gas into the surroundings give out = to distribute or pass something to others; to stop working or become depleted give up = to quit doing something or trying to achieve something; to admit failure or stop making an effort give up on = to stop believing that someone or something will succeed, improve, or be worth supporting

Unit 5

Environment and Sustainability

KEEP	keep at = persist in doing something challenging or repetitive keep around = continue to have someone or something close by or within reach keep away = avoid going near someone or something; to stop using, touching, etc. keep off = stay off a surface (e.g., grass); avoid mentioning or discussing a topic keep on = carry on with an activity or task; continue employing someone keep up = not let something slow down or stop; remain informed keep up with = remain equal in progress or speed; stay current with developments or trends
MAKE	make after = chase after someone or something make for = head toward a place or thing make of something = understand or have an opinion about something make off = escape quickly, especially after doing something wrong make over = renovate or improve the appearance of something; officially give ownership to someone make out = manage to see, hear, or understand something that's not clear make up = create a story or excuse (often not true); prepare something by combining parts make up for = do something to balance or fix a mistake or loss make way = move aside or clear space for someone or something; make progress

Unit 6

Conventional and Sustainable Energy

RUN	run away from = leave secretly or suddenly; avoid facing a difficult person, place, or situation run down = gradually lose power or energy; speak negatively or unfairly about someone or something run into = unexpectedly meet someone you know; come across difficulties or problems run on = continue without stopping, especially for longer than expected run out of = have no more of something left or to exhaust a supply run over = hit and pass over something or someone with a vehicle; quickly go over or rehearse something
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PUT	put down = write something on paper or in a record; speak negatively or belittle someone put off = delay something to a later time; discourage or make someone lose interest put on = dress in clothes, shoes, or accessories; organize or present an event or performance put out = stop something from burning, like a fire or light; release or publish information for others to see put together = assemble different parts into a whole put up = attach something to a wall or upright surface; provide or contribute (e.g., money, effort, resistance) put up with = tolerate something unpleasant or someone difficult
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Unit 7

Solid and Hazardous Waste

STAND	stand back = move away a little from someone or something, often for safety or to give space stand by = be ready to act or assist when needed; continue to offer help or loyalty in hard times stand down = relax after being ready for action; leave a job or position stand for = symbolize or mean something; support certain beliefs or values stand in for someone = temporarily take another person's place at work or an event stand out = be easily noticed or clearly different from others stand up for = defend or support someone or something, especially when under pressure stand up to = resist or challenge someone powerful or unfair
TAKE	take after = resemble an older family member in looks or personality take down = write something to keep a record take in = absorb or grasp information; offer someone shelter or a place to stay take off = begin to fly into the air; quickly grow in success or popularity take on = agree to do a task or responsibility take out = accompany someone socially; receive formal approval or permission from an official body take over = assume control of a business, project, or position, especially by acquisition take up = begin a new hobby, activity, or duty; to discuss something or deal with something

APPENDIX 3.

PRACTICE FILES

Practice file 1.

1.1. Choose the correct synonym for phrasal verbs with BREAK. There are two extra synonyms you don't need to choose.

1.	Break away	A	disassemble
2.	Break down	B	occur with
3.	Break in (into)	C	intrude into
4.	Break off	D	penetrate
5.	Break out	E	separate from
6.	Break through	F	betray
7.	Break up	G	cease to function
		H	split up
		I	escape

1.2. Choose the correct synonym for phrasal verbs with BRING. There are two extra synonyms you don't need to choose.

1.	Bring about	A	achieve
2.	Bring around	B	withdraw
3.	Bring back	C	provoke
4.	Bring down	D	suppress
5.	Bring in	E	convince
6.	Bring off	F	decrease
7.	Bring up	G	address
		H	involve
		I	revitalise

2.1. Transform the second sentence using the correct phrasal verb with BREAK.

***Appendix 2 has a list of relevant phrasal verbs.**

1. Due to severe atmospheric disturbances caused by the storm, the air pollution monitoring system ceased to function, interrupting the collection of crucial environmental data.

Due to severe atmospheric disturbances caused by the storm, the air pollution monitoring system _____, interrupting the collection of crucial environmental data.

2. In response to the limitations of linear economic models, a new generation of environmental engineers is starting to abandon outdated waste management strategies and adopt circular economy principles.

In response to the limitations of linear economic models, a new generation of environmental engineers is starting to _____ from outdated waste management strategies in favor of circular economy principles.

3. Following extensive years of interdisciplinary research and technological experimentation, environmental scientists ultimately overcame longstanding limitations by developing an innovative water purification system capable of operating without electricity.

Following extensive years of interdisciplinary research and technological experimentation, environmental scientists ultimately _____ longstanding limitations by developing an innovative water purification system capable of operating without electricity.

4. Prior to the advent of modern environmental engineering, densely populated urban centers frequently experienced sudden cholera outbreaks as a consequence of severely inadequate sanitation and waste disposal systems.

In the pre-sanitation era that preceded modern environmental engineering, widespread cholera outbreaks would often _____ in densely populated urban centers due to inadequate waste disposal systems.

5. The laboratory, which houses critical environmental data and advanced analytical instruments used for monitoring pollution levels and assessing ecosystem health, was securely locked at all times to prevent from entry and gaining unauthorized access.

The laboratory, which houses critical environmental data and advanced analytical instruments used for monitoring pollution levels and assessing ecosystem health, was securely locked at all times to prevent anyone from attempting to _____ and gain unauthorized access.

6. In early environmental engineering lessons, the use of ultrasonic waves to disintegrate chemical aggregates in wastewater is explored as a method to enhance purification efficiency.

In early environmental engineering lessons, the use of ultrasonic waves to _____ chemical aggregates in wastewater is explored as a method to enhance purification efficiency.

2.2. Transform the second sentence using the correct phrasal verb with BRING.

***Appendix 2 has a list of relevant phrasal verbs.**

1. During the meeting, the lead environmental engineer introduced and elaborated on the pressing issue of plastic waste accumulation in urban environments, emphasizing its detrimental impact on local ecosystems and public health.

During the meeting, the lead environmental engineer _____ the pressing issue of plastic waste accumulation in urban environments, thoroughly discussing its detrimental impact on local ecosystems and public health.

2. The project manager decided to recruit specialized experts on water purification to enhance the existing treatment system, recognizing that their advanced knowledge and innovative techniques would be essential.

The project manager decided to _____ specialized experts on water purification to enhance the existing treatment system, recognizing that their advanced knowledge and innovative techniques would be essential.

3. The new environmental policies helped cause significant improvements in air quality by reducing harmful emissions and encouraging cleaner industrial practices.

The new environmental policies helped _____ significant improvements in air quality by reducing harmful emissions and encouraging cleaner industrial practices.

4. The engineers developed innovative methods to restore contaminated soil to a safe and usable condition, employing advanced bioremediation techniques that accelerate the natural breakdown of pollutants and revitalize the affected ecosystems.

The engineers developed innovative methods to _____ contaminated soil to a safe and usable condition, using cutting-edge bioremediation techniques that help accelerate the natural breakdown of harmful pollutants and restore the health of local ecosystems.

5. Advances in technology have helped reduce harmful emissions from factories by introducing more efficient filtration systems, adopting cleaner energy sources, and implementing stricter monitoring processes to ensure compliance with environmental standards.

Advances in technology have helped _____ harmful emissions from factories by introducing more efficient filtration systems, adopting cleaner energy sources, and implementing stricter monitoring processes to ensure compliance with environmental standards.

6. Despite the challenging site conditions, the team managed to successfully complete the construction of the wastewater treatment plant ahead of schedule.

Despite the challenging site conditions, the team managed to _____ the construction of the wastewater treatment plant ahead of schedule.

Practice file 2.

1.1. Choose the correct antonym for phrasal verbs with CALL. There are two extra antonyms you don't need to choose.

1.	Call back	A	support
2.	Call for	B	neglect
3.	Call in	C	reflect
4.	Call off	D	be in possession of
5.	Call out	E	alter
6.	Call up	F	initiate
		G	fail to recall
		H	resign

1.2. Choose the correct antonym for phrasal verbs with COME. There are two extra antonyms you don't need to choose.

1.	Come across	A	cease
2.	Come along	B	suppress
3.	Come off	C	disappear
4.	Come out	D	choose
5.	Come round	E	conceal
6.	Come up with	F	faint
		G	withstand
		H	withhold

2.1. Transform the second sentence using the correct phrasal verb with CALL.

***Appendix 2 has a list of relevant phrasal verbs.**

1. The increasing fragmentation of natural habitats requires coordinated action to establish ecological corridors and preserve species migration routes.

The increasing fragmentation of natural habitats _____ coordinated action to establish ecological corridors and preserve species migration routes.

2. Conservation NGOs charged the logging companies with contributing to unlawful deforestation in a critically important area for global biodiversity.

Conservation NGOs _____ the logging companies responsible for illegal deforestation in one of the world's richest biodiversity hotspots.

3. Following the submission of the initial environmental risk assessment, the ecological consultancy firm was asked to deliver additional information regarding native species.

After submitting the initial environmental risk assessment, the ecological consultancy firm was _____ to provide supplementary data on native species.

4. When indicators of ecosystem collapse emerged in the coral reef area, international marine specialists were invited to assess the extent of the damage.

When signs of ecosystem collapse appeared in the coral reef zone, international marine experts were _____ to evaluate the damage.

5. Because of the unexpected arrival of protected bird species in the research area, the drone-based habitat survey was cancelled.

Due to the unexpected migration of protected bird species into the research area, the drone-based habitat survey had to be _____.

6. As part of the national effort to defend endangered habitats, several conservation officers were commissioned to participate in the official environmental defense unit.

During the national emergency to protect endangered habitats, several conservation officers were _____ to join the official environmental defense unit.

2.2. Transform the second sentence using the correct phrasal verb with COME.

***Appendix 2 has a list of relevant phrasal verbs.**

1. Several migratory bird species appeared at the restored wetland site, indicating that the habitat had regained its ecological value.

Several migratory bird species _____ at the restored wetland site, indicating the habitat had regained its ecological value.

2. A team of ecologists developed a new model for balancing biodiversity conservation with agricultural development in buffer zones.

A team of ecologists _____ a new model for balancing biodiversity conservation with agricultural development in buffer zones.

3. The habitat restoration program was highly successful, leading to the return of several key pollinator species to the region.

The habitat restoration program _____ remarkably well, leading to the return of several key pollinator species to the region.

4. After collapsing from heat exhaustion during biodiversity fieldwork in a tropical rainforest ecosystem, the researcher regained consciousness within minutes thanks to timely first aid.

After collapsing from heat exhaustion during biodiversity research in a tropical rainforest ecosystem, the researcher _____ within minutes thanks to timely first aid.

5. During the international conference on biodiversity conservation, the ecologist seemed exceptionally well-informed and passionate, particularly when discussing the urgent need to protect fragile ecosystems from human-induced pressures.

During the international conference on biodiversity conservation, the ecologist _____ as exceptionally well-informed and passionate, particularly when discussing the urgent need to protect fragile ecosystems from human-induced pressures.

6. After handling contaminated soil in the conservation zone, one team member developed a persistent skin infection likely caused by harmful microbes.

After handling contaminated soil in the conservation zone, one team member _____ a persistent skin infection likely caused by harmful microbes.

Practice file 3.

1.1. Choose the correct synonym for phrasal verbs with CUT. There are two extra synonyms you don't need to choose.

1.	Cut across	A	interfere
2.	Cut back on	B	renounce
3.	Cut down	C	decrease
4.	Cut in	D	embark
5.	Cut off	E	chop
6.	Cut out	F	detach
7.	Cut through	G	penetrate
		H	intersect
		I	fight

1.2. Choose the correct synonym for phrasal verbs with DRAW. There are two extra synonyms you don't need to choose.

1.	Draw away	A	employ
2.	Draw back	B	detract
3.	Draw in	C	prolong
4.	Draw on	D	accuse
5.	Draw out	E	flinch
6.	Draw up	F	register
		G	formulate
		H	engage

2.1. Transform the second sentence using the correct phrasal verb with CUT.

***Appendix 2 has a list of relevant phrasal verbs.**

1. To install a new pipeline connecting the treatment facility to the reservoir, engineers proposed a route that crosses the wetland, raising concerns about potential ecological disruption.

To install a new pipeline connecting the treatment facility to the reservoir, engineers proposed a route that would _____ the wetland, raising concerns about potential ecological disruption.

2. Advanced underwater drones were deployed to navigate murky river conditions, allowing for accurate inspection and maintenance of submerged filtration systems essential to the region's water purification infrastructure.

Advanced underwater drones were deployed to efficiently _____ murky river conditions, enabling precise inspection and maintenance of submerged filtration systems critical to the region's water purification infrastructure.

3. To comply with new environmental regulations, the facility adopted advanced filtration technologies to reduce chemical discharge into nearby rivers.

To comply with new environmental regulations, the facility implemented advanced filtration technologies to _____ chemical discharge into nearby rivers.

4. The removal of large numbers of trees in watershed regions has intensified sediment buildup and reduced the efficiency of water treatment facilities.

Deforestation in watershed areas, where thousands of trees were _____, has worsened sedimentation and reduced the effectiveness of water treatment plants.

5. The chemical spill disrupted communication between the control center and the monitoring stations along the river, delaying the emergency response.

The chemical spill _____ communication between the control center and the monitoring stations along the river, delaying the emergency response.

6. In an effort to mitigate nutrient loading in nearby lake ecosystems, agricultural producers were advised to significantly reduce their reliance on chemical fertilizers in areas near the waterways.

To reduce nutrient input into nearby lake ecosystems, farmers were recommended to substantially _____ their use of chemical fertilizers in zones adjacent to waterways.

2.2. Transform the second sentence using the correct phrasal verb with DRAW.

***Appendix 2 has a list of relevant phrasal verbs.**

1. The industrial wastewater treatment plant utilizes a combination of chemical precipitation and coagulation to effectively extract heavy metals and other toxic substances, preventing their release into the environment.

The industrial wastewater treatment plant utilizes a combination of chemical precipitation and coagulation to effectively _____ heavy metals and other toxic substances, preventing their release into the environment.

2. The new public awareness campaign effectively engaged urban residents by leveraging smart metering data analytics and targeted digital communications to promote adaptive water conservation behaviors during drought periods.

The new public awareness campaign effectively _____ urban residents by leveraging smart metering data analytics and targeted digital communications to promote adaptive water conservation behaviors during drought periods.

3. Engineers used empirical data from previous river restoration efforts to refine sediment transport models for the new dam construction.

Engineers _____ empirical data from previous river restoration efforts to refine sediment transport models for the new dam construction.

4. Due to unexpected contamination levels, the municipality decided to withdraw from using the affected groundwater source until further testing is completed.

Due to unexpected contamination levels, the municipality decided to _____ from using the affected groundwater source until further testing is completed.

5. Our research team's modelling software outperformed competitors by providing more accurate predictions of groundwater flow under varying climatic conditions.

Our research team's modelling software _____ from competitors by providing more accurate predictions of groundwater flow under varying climatic conditions.

6. The maintenance crew's van arrived at the water treatment plant as the team prepared to perform routine servicing of pumps, valves, and filtration systems to maintain optimal operation and safety.

The maintenance crew's van _____ at the water treatment plant as the team prepared to perform routine servicing of pumps, valves, and filtration systems to maintain optimal operation and safety.

Practice file 4.

1.1. Choose the correct antonym for phrasal verbs with FALL. There are two extra antonyms you don't need to choose.

1.	Fall apart	A	agree
2.	Fall behind	B	disbelieve
3.	Fall for	C	emerge
4.	Fall off	D	overtake
5.	Fall out	E	follow
6.	Fall through	F	extend
		G	succeed
		H	come together

1.2. Choose the correct antonym for phrasal verbs with GIVE. There are two extra antonyms you don't need to choose.

1.	Give away	A	start up
2.	Give in	B	hold off
3.	Give off	C	endure
4.	Give out	D	conceal
5.	Give up	E	remain
6.	Give up on	F	continue
		G	expect
		H	absorb

2.1. Transform the second sentence using the correct phrasal verb with FALL.

***Appendix 2 has a list of relevant phrasal verbs.**

1. The prototype air monitoring device disintegrated due to harsh weather conditions, resulting in a complete shutdown of data logging.

The experimental air quality sensor _____ under extreme weather conditions, halting data collection.

2. While researching industrial automation, the team unintentionally began designing AI-driven air quality sensors after discovering deficiencies in real-time pollutant detection.

While researching industrial automation, the team _____ designing AI-driven air quality sensors after identifying gaps in real-time pollutant detection.

3. Due to limited funding, the regional monitoring network was delayed in deploying advanced sensors for real-time pollutant tracking.

Due to limited funding, the regional monitoring network _____ in deploying advanced sensors for real-time pollutant tracking.

4. When the primary filtration system failed during peak pollution, the plant had to rely on backup scrubbers to maintain air quality.

When the primary filtration system failed during peak pollution, the plant had to _____ on backup scrubbers to maintain air quality.

5. Emission levels experienced a significant decline following the integration of state-of-the-art catalytic converters within the factory's exhaust treatment system.

Emission levels _____ sharply after the factory installed state-of-the-art catalytic converters within the factory's exhaust treatment system.

6. Efforts to establish a regional clean air coalition failed due to conflicting regulatory standards among member states.

Efforts to establish a regional clean air coalition _____ because of conflicting regulatory standards among member states.

2.2. Transform the second sentence using the correct phrasal verb with GIVE.

***Appendix 2 has a list of relevant phrasal verbs.**

1. The emission control unit was engineered to discharge filtered air back into the atmosphere, ensuring compliance with air quality standards and supporting environmental sustainability.

The emission control unit was designed to _____ filtered air to the atmosphere, ensuring compliance with air quality standards and supporting environmental sustainability.

2. The neutralization chamber was found to emit sulfur-based gases, suggesting that chemical reactions were not fully completed.

The neutralization chamber was found to _____ sulfur-based gases, suggesting that chemical reactions were not fully completed.

3. During peak industrial operation, the secondary filtration unit malfunctioned, resulting in a temporary increase in airborne particulate levels.

During peak industrial operation, the secondary filtration unit _____, resulting in a temporary increase in airborne particulate levels.

4. Unintentionally, the researcher disclosed the lab's proprietary air purification method in a draft article prepared for peer review.

Unintentionally, the researcher _____ the lab's proprietary air purification method in a draft article prepared for peer review.

5. Many experts had abandoned conventional carbon filtration for air treatment, but innovative modifications have led to its renewed application in localized air-cleaning systems.

Many experts had _____ conventional carbon filtration for air treatment, but innovative modifications have led to its renewed application in localized air-cleaning systems.

6. Due to rising operational expenses, the government relinquished control of the air treatment facility and handed over management to a private entity.

Due to rising operational expenses, the government _____ control of the air treatment facility and handed over management to a private entity.

Practice file 5.

1.1. Choose the correct synonym for phrasal verbs with KEEP. There are two extra synonyms you don't need to choose.

1.	Keep at	A	possess
2.	Keep around	B	retain
3.	Keep away	C	maintain
4.	Keep off	D	activate
5.	Keep on	E	avoid
6.	Keep up	F	pursue
		G	hold back
		H	rule

1.2. Choose the correct synonym for phrasal verbs with MAKE. There are two extra synonyms you don't need to choose.

1.	Make after	A	rush
2.	Make for	B	compete
3.	Make off	C	head
4.	Make over	D	alter
5.	Make up	E	move aside
6.	Make away	F	follow
		G	impose
		H	devise

2.1. Transform the second sentence using the correct phrasal verb with KEEP.

***Appendix 2 has a list of relevant phrasal verbs.**

1. Due to their expertise in circular economy practices, the sustainability department retained two experienced materials engineers.

Due to their expertise in circular economy practices, the sustainability department _____ two experienced materials engineers.

2. Conservation teams maintain wildlife tracking devices on-site for emergency relocations during habitat disturbances.

Conservation teams _____ wildlife tracking devices _____ for emergency relocations during habitat disturbances.

3. During the interview, the CEO intentionally avoided addressing the company's poor track record on plastic waste reduction.

During the interview, the CEO deliberately _____ the company's poor track record on plastic waste reduction.

4. Conservation officers advised tourists not to go close to avian nesting habitats in order to prevent disruption of breeding behavior and support the preservation of endangered bird populations.

Conservation officers advised tourists to _____ from avian nesting habitats to prevent disruption of breeding behavior and to support the conservation of endangered bird populations.

5. To achieve established climate targets, we must maintain the current momentum of mitigation strategies focused on reducing greenhouse gas emissions.

To achieve established climate targets, we must _____ the current momentum of mitigation strategies focused on reducing greenhouse gas emissions.

6. Environmental scientists must continue refining carbon sequestration techniques to improve their efficiency and long-term impact on atmospheric CO₂ levels.

Environmental scientists must _____ refining carbon sequestration techniques to enhance their efficiency and long-term impact on atmospheric CO₂ reduction.

2.2. Transform the second sentence using the correct phrasal verb with MAKE.

***Appendix 2 has a list of relevant phrasal verbs.**

1. Advances in waste management technologies are rapidly enabling enhanced recycling initiatives that significantly mitigate landfill accumulation and reduce environmental contamination.

Advances in waste management technologies are rapidly _____ for enhanced recycling initiatives that significantly mitigate landfill accumulation and reduce environmental contamination.

2. In compliance with updated environmental regulations, lands formerly designated for industrial waste disposal have been officially converted into protected wetland reserves to facilitate biodiversity restoration and improve hydrological functions.

In compliance with updated environmental regulations, lands formerly designated for industrial waste disposal have been officially _____ into protected wetland reserves to facilitate biodiversity restoration and improve hydrological functions.

3. Upon detection of unauthorized logging activities within the conservation area, enforcement officers promptly pursued the perpetrators to prevent further degradation of critical forest ecosystems.

Upon detection of unauthorized logging activities within the conservation area, enforcement officers promptly _____ the perpetrators to prevent further degradation of critical forest ecosystems.

4. To bolster their environmental compliance claims, the corporation fabricated data purporting significant reductions in pollutant discharge, despite the absence of corroborating empirical evidence.

To bolster their environmental compliance claims, the corporation _____ data purporting significant reductions in pollutant discharge, despite the absence of corroborating empirical evidence.

5. Dense understory vegetation impeded researchers' ability to distinguish indications of endangered species presence, thereby complicating biodiversity assessment and monitoring protocols.

Dense understory vegetation impeded researchers' ability to _____ indications of endangered species presence, thereby complicating biodiversity assessment and monitoring protocols.

6. Ecologists were unable to interpret the observed decline in amphibian populations, as abiotic and biotic parameters within the habitat remained ostensibly stable and within expected thresholds.

Ecologists were unable to _____ the observed decline in amphibian populations, as abiotic and biotic parameters within the habitat remained ostensibly stable and within expected thresholds.

Practice file 6.

1.1. Choose the correct antonym for phrasal verbs with RUN. There are two extra antonyms you don't need to choose.

1.	Run away	A	miss
2.	Run down	B	check
3.	Run into	C	confront
4.	Run on	D	accumulate
5.	Run out of	E	restrict
6.	Run over	F	cease
		G	approve
		H	immerse

1.2. Choose the correct antonym for phrasal verbs with PUT. There are two extra antonyms you don't need to choose.

1.	Put down	A	prohibit
2.	Put off	B	accomplish
3.	Put on	C	damage
4.	Put out	D	remove
5.	Put together	E	demount
6.	Put up	F	support
		G	fluctuate
		H	enflame

2.1. Transform the second sentence using the correct phrasal verb with RUN.

***Appendix 2 has a list of relevant phrasal verbs.**

1. After operating for many years without interruption, the old diesel generator finally stopped working, causing a temporary blackout in the remote village.

After years of continuous operation, the old diesel generator finally _____, causing a temporary blackout in the remote village.

2. During the urgent pipeline repair at the oil refinery, a worker was almost hit by a maintenance vehicle.

In the rush to repair a broken pipeline at the oil refinery, a worker was almost _____ by a maintenance vehicle.

3. Following the explosion at the aging gas refinery, several workers had to quickly leave the site to avoid serious injury.

When the explosion occurred at the outdated gas refinery, several workers had to _____ from the site to avoid serious injury.

4. The sustainable technologies conference extended well beyond its planned end time due to extended discussions on recent advances in hydrogen storage.

The conference on sustainable technologies _____ past the scheduled time as engineers discussed new breakthroughs in hydrogen storage.

5. At the annual renewable energy summit, our team unexpectedly met a former partner who had recently shifted focus from oil infrastructure to wind farm development.

At the annual renewable energy summit, our team _____ a former partner who had recently shifted focus from oil infrastructure to wind farm development.

6. In the next twenty years, many areas reliant on oil are expected to deplete their easily reachable supplies, highlighting the pressing need to fund renewable energy sources.

Many oil-dependent regions are projected to _____ easily accessible reserves within the next two decades, emphasizing the urgent need for investment in sustainable alternatives.

2.2. Transform the second sentence using the correct phrasal verb with PUT.

***Appendix 2 has a list of relevant phrasal verbs.**

1. The Ministry of Energy documented the outcomes of the five-year transition to renewable energy in a formal report, outlining successes and areas needing further work.

The Ministry of Energy _____ all the results of the five-year renewable energy transition project in an official white paper, which highlighted both achievements and areas for improvement.

2. Due to high upfront costs and limited knowledge, many small enterprises are hesitant to adopt energy-saving technologies, despite their long-term benefits.

High initial costs and lack of awareness often _____ small businesses from investing in energy-efficient technologies, even though they save money in the long run.

3. Firefighters swiftly extinguished the blaze at a traditional oil processing facility, averting a potentially serious environmental crisis.

Emergency crews quickly _____ the fire that broke out at a conventional oil refinery, preventing what could have been a major ecological disaster.

4. An interdisciplinary team of researchers built an advanced solar generator tailored for isolated communities without access to the power grid.

A team of engineers and scientists from multiple universities _____ a highly efficient solar-powered generator designed for remote, off-grid communities.

5. Technicians installed a new power tower to link a distant settlement to the national energy system, drawing electricity from a local hydroelectric source.

Engineers _____ a new transmission tower to connect a remote village to the national grid using energy from a nearby hydroelectric plant.

6. Before starting underground repairs, the workers at the geothermal facility had to wear protective clothing and safety gear designed for extreme conditions.

Technicians working at the geothermal plant were required to _____ insulated suits and safety equipment before conducting maintenance deep underground.

Practice file 7.

1.1. Choose the correct synonym for phrasal verbs with STAND. There are two extra synonyms you don't need to choose.

1.	Stand back	A	reverse
2.	Stand by	B	relocate
3.	Stand down	C	be distinctive
4.	Stand for	D	be prepared
5.	Stand out	E	advocate
6.	Stand up for	F	rest
		G	convey
		H	indicate

1.2. Choose the correct synonym for phrasal verbs with TAKE. There are two extra synonyms you don't need to choose.

1.	Take after	A	rise
2.	Take down	B	pursue
3.	Take off	C	accept
4.	Take on	D	enroll
5.	Take over	E	resemble
6.	Take up	F	fight
		G	record
		H	manage

2.1. Transform the second sentence using the correct phrasal verb with STAND.

***Appendix 2 has a list of relevant phrasal verbs.**

1. A mobile cleanup crew remained ready throughout the toxic waste shipment to respond quickly in the event of a spill on the highway.

A mobile cleanup crew was _____ during the transport of toxic waste in case an accidental spill occurred on the highway.

2. After public backlash over the mismanagement of hazardous material storage, the head of the municipal waste authority decided to resign from his position.

Following public criticism regarding the poor handling of hazardous materials, the head of the municipal waste authority chose to _____

3. Modern environmental standards no longer tolerate outdated landfill methods that allow leachate to contaminate groundwater.

Modern environmental standards no longer _____ outdated landfill methods that allow leachate to contaminate groundwater.

4. When the waste compactor malfunctioned, engineers had to move away while the emergency shutoff system activated.

When the waste compactor malfunctioned, engineers had to _____ while the emergency shutoff system activated.

5. In the course of the waste management discussion, the professor supported implementing zero-waste strategies in cities to reduce the amount of solid waste being incinerated.

During the waste policy debate, the professor _____ adopting zero-waste principles in urban areas to minimize the volume of solid waste sent to incinerators.

6. An AI-based monitoring system was designed to temporarily replace human inspectors when analyzing segregated solid waste for recyclable materials.

An AI-based monitoring system was designed to _____ human inspectors when analyzing segregated solid waste for recyclable materials.

2.2. Transform the second sentence using the correct phrasal verb with TAKE.

***Appendix 2 has a list of relevant phrasal verbs.**

1. In the aftermath of the chemical spill and subsequent evacuations, a local family provided accommodation to two researchers conducting hazardous waste monitoring during emergency fieldwork.

Following the chemical spill and evacuations, a local family _____ two researchers monitoring hazardous waste, offering shelter as they continued their emergency fieldwork.

2. Prior to the transportation of biohazardous materials, the company was required to obtain a specialized disposal license to meet environmental and health compliance standards.

Before transporting biohazardous material, the company had to _____ a specialized disposal license to comply with environmental and health regulations.

3. Following multiple environmental violations, a certified waste management company assumed operational control of the facility, introducing more stringent hazardous waste management procedures.

After a series of environmental violations, a certified waste management firm _____ operations at the facility, implementing stricter protocols for hazardous waste handling and disposal.

4. Amid increasing concerns regarding hazardous waste mismanagement, the local government accepted responsibility for reforming the waste collection and treatment infrastructure to enhance environmental protection and regulatory adherence.

In response to growing concerns about hazardous waste mismanagement, the local government _____ the responsibility of overhauling the entire waste collection and treatment system to ensure environmental safety and regulatory compliance.

5. Despite being at an early stage in her professional journey, the young environmental analyst exhibits the same meticulousness and commitment to ecological stewardship as her late father, a trailblazer in hazardous waste regulation.

Although still early in her career, the young environmental analyst _____ her late father, a pioneer in hazardous waste regulation, in both precision and dedication to ecological integrity.

6. Public interest in composting organic waste increased significantly after residents observed a noticeable decline in landfill contributions, prompting widespread adoption as a viable household waste management strategy.

Interest in composting organic waste _____ after residents noticed a clear drop in landfill contributions, leading many to adopt it as an effective method of managing household waste.

APPENDIX 4.

Idioms

Unit 1

Introduction to Environmental Engineering

<i>break new ground</i>	to advance, innovate, or pioneer (something)
<i>change gear</i>	to move or switch from one thing (such as a task or topic) to another, often quickly
<i>drop in the ocean</i>	a tiny amount, especially when compared to a much larger one
<i>go the extra mile</i>	to go beyond what is necessary or expected in order to please someone, achieve something, or get something done correctly
<i>in the long run</i>	over a relatively long or extended length of time in the future
<i>make waves</i>	to do something innovative that draws a large amount of attention and makes a widespread impact on its society, industry, etc., often causing controversy in the process
<i>think outside the box</i>	to think creatively or differently
<i>tip of the iceberg</i>	a small evident part or aspect of something largely hidden
<i>wake-up call</i>	an event that triggers a sense of urgency or the motivation to make a change

Unit 2

Ecosystems. Biodiversity

<i>a canary in a / the coal mine</i>	someone or something that acts as an early warning of danger due to high sensitivity to the environment
<i>a voice in the wilderness</i>	someone who expresses an unpopular opinion or idea
<i>barking up the wrong tree</i>	taking the wrong direction in an activity
<i>every cloud has a silver lining</i>	it is usually possible for something good to come out of a bad situation
<i>gone to seed</i>	to look shabby, unhealthy, or unattractive due to a lack of care or attention
<i>in the same boat</i>	sharing a particular experience or circumstance with someone else
<i>out of the woods</i>	no longer in danger or dealing with a particular difficulty, though not entirely resolved
<i>the root of the problem</i>	the underlying cause or fundamental essence of some issue, problem, or difficulty at hand
<i>turn over a new leaf</i>	to begin again, fresh; to reform and begin again

Unit 3

Water Resources and Their Characteristics.

Water Pollution and Treatment Strategies

<i>blow the whistle (on)</i>	to expose wrongdoing or report illegal or unethical behavior
<i>come hell or high water</i>	no matter what, in spite of any obstacle
<i>face the music</i>	to experience negative consequences for one's actions
<i>fish out of water</i>	someone who feels uncomfortable or out of place in a particular situation
<i>go with the flow</i>	to accept a situation as it comes without resistance or trying to change it
<i>keep (one's) head above water</i>	to just manage to survive or cope, especially with difficulties or financial pressure
<i>like water off a duck's back</i>	without having any lasting or noticeable impact
<i>muddy the water(s)</i>	to make a situation or issue more confusing or unclear
<i>water down</i>	to weaken or make something less effective or forceful

Unit 4

Air Pollution. Acid Rain and Ozone Depletion

<i>(as) clean as a whistle</i>	completely clean or morally pure
<i>a clean slate</i>	a state in which you are starting an activity or process again, not considering what has happened in the past at all
<i>be up in the air</i>	to be uncertain or not yet decided
<i>blow hot and cold</i>	to frequently change one's attitude or opinion about something
<i>go up in smoke</i>	to be ruined, wasted, or fail completely
<i>on the right track</i>	to be making good progress or doing something correctly
<i>raise the bar</i>	to increase standards or expectations
<i>throw cold water on (something)</i>	to discourage enthusiasm or excitement about an idea or plan
<i>under the microscope</i>	being closely examined or scrutinized

Unit 5

Environment and Sustainability

<i>can't see the forest for the trees</i>	to be or become environmentally friendly; to adopt or pursue practices that promote or lead to ecological sustainability
<i>go green</i>	to have a proclivity for successfully growing plant life
<i>have a green thumb</i>	to do all that one can or use every available resource to complete a task
<i>leave no stone unturned</i>	precariously close to getting into trouble, difficulty, or danger
<i>on thin ice</i>	a situation in which the results or consequences of an action grow at an increasingly faster rate over time
<i>snowball effect</i>	to do something that ensures a certain outcome in the future, especially an unfortunate or tragic one
<i>sow the seeds of (something)</i>	to do something totally pointless, fruitless, or futile; to waste one's time doing something that will not or cannot come to pass
<i>spit in(to) the wind</i>	to walk carefully, so as not to disturb what is underfoot or nearby; also, to act cautiously or delicately in a sensitive situation
<i>tread lightly</i>	to be or become environmentally friendly; to adopt or pursue practices that promote or lead to ecological sustainability

Unit 6

Conventional and Sustainable Energy

<i>blow off (some) steam</i>	to release strong emotions or energy by engaging in some kind of enjoyable, vigorous, or relaxing activity
<i>double-edged sword</i>	something that has both positive and negative consequences
<i>flip a switch</i>	to suddenly change something or make it happen instantly (often used negatively to show something cannot be done easily)
<i>have the wind in (one's) sails</i>	to be in a position of success or good fortune, which builds confidence and momentum
<i>keep the lights on</i>	to make sure a business or system continues to operate, even if it makes no real progress
<i>off the grid</i>	not connected to public utilities; living independently or outside of conventional systems
<i>pull the plug (on someone/something)</i>	to discontinue or stop something, especially by withdrawing support or cutting power
<i>running on empty</i>	continuing with very little energy, motivation, or resources left
<i>the jury is (still) out</i>	a decision has not yet been made, or a conclusion has not yet been reached

Unit 7

Solid and Hazardous Waste

<i>a (ticking) time bomb</i>	a person, thing, or situation that may suddenly cause great damage or trouble
<i>catch someone red-handed</i>	to catch someone in the act of doing something wrong or illegal
<i>come back to haunt one</i>	for a past action or decision to cause problems in the present or future
<i>go to waste</i>	to be unused, wasted, or squandered
<i>in the line of fire</i>	in a position where one is likely to face criticism, blame, or danger
<i>sweep (something) under the carpet</i>	to hide or ignore something embarrassing or unpleasant
<i>the ball is in (one's) court</i>	it is now someone else's responsibility to make a decision or take action
<i>throw caution to the wind(s)</i>	to do something risky without thinking about the consequences
<i>tread carefully/gently/lightly</i>	to act or speak cautiously to avoid offending or upsetting someone

APPENDIX 5.

Writing Models

How to write an essay

Writing an essay involves several key elements, such as understanding the topic, creating a draft, reviewing, and improving your final version. The basic guidelines for forming and writing an essay are provided below:

- *Make sure you understand the task and topic of the essay.*
- *Research on the topic to get the relevant information as well as references for your main arguments.*
- *Use examples to build and support your central argument.*
- *Structure your essay coherently, including the main sections: introduction, main part, and conclusion.*
- *Provide the information in a manner that is understandable, clear, and concise.*
- *Use linking words and phrases to connect the ideas and the paragraphs.*
- *Introduce the central argument or statement in the introduction and give the background information.*
- *Write the main part of your essay, incorporating the main points, examples, numbers, and names, as well as quotations and citations from the various sources.*
- *Summarize the main points, restate your central argument, and write a concluding statement in conclusion.*
- *Review your essay for spelling, grammatical, lexical, and punctuation mistakes.*
- *Don't forget to cite the sources used properly.*

For more information, please visit

[Writing a great essay](#)



Writing example 1:

How environmental engineering connects with other scientific areas

The essay discusses how environmental engineering is closely interconnected with other various scientific fields. This area is deeply connected to many other sciences because protecting the environment involves understanding natural processes and technological solutions.

One important connection is with biology, as environmental engineers need knowledge of ecosystems, biodiversity and other biological processes. As an example, waste treatment relies on biological organisms to break down pollutants. Another strong connection is with chemistry, which helps engineers analyse contaminants and understand chemical reactions to create safe treatment methods. To illustrate this, air quality monitoring relies on chemical analysis of matter and gases. Environmental engineering is also associated with geology, because soil composition, groundwater and natural dangers directly impact engineering solutions.

It is worth noting that engineering, technology, and data science also play vital roles in environmental engineering. Modern projects use sensors, modelling tools, and software and data analytics to calculate risks and optimise performance.

In closing, environmental engineering connects multiple scientific areas to deal with real-life problems. This interdisciplinary approach is crucial for creating sustainable and feasible solutions.



Writing example 2:

*Which source of freshwater is more reliable,
groundwater or surface water?*

Nowadays, the question of freshwater supply is becoming increasingly important as many regions face droughts and rising water demand. Some think that groundwater is a more reliable long-term source of freshwater, while others disagree. The essay will explain why I agree with the statement that groundwater is more reliable compared to surface water.

Unlike surface water, groundwater is naturally filtered through layers of soil and rock, which makes it cleaner and of better quality. Moreover, it is less exposed to immediate climate changes. For example, during dry seasons, rivers and lakes can decrease quickly, but underground springs often remain accessible for much longer. Furthermore, groundwater is usually better protected from contamination, whereas surface water can be easily polluted by industrial and agricultural chemicals.

On the other hand, surface water is more accessible and cheaper to treat. However, its reliability decreases during periods of extreme weather, such as heatwaves or floods.

In conclusion, I believe groundwater is a more reliable long-term



Writing example 3:

Technology is a key to solving the issues of air pollution

Nowadays, the issue of air pollution is one of the most serious challenges impacting public health and the environment. Some believe that technology is the key to solving this issue, while others disagree. In my opinion, technology plays a critical role in reducing emissions and improving air quality. The essay will explain why I agree with the statement.

One of the most effective technologies in combating air pollution is the use of electric vehicles, which significantly reduce emissions from transport - one of the largest contributors to air pollution. Moreover, smart air-sensors and IoT monitoring systems help cities monitor air pollution in real time. This allows local authorities to respond quickly, for example by limiting traffic or adjusting industrial output. Additionally, AI-driven systems can analyse large amounts of data and predict pollution trends, which may help governments make better long-term environmental decisions.

In conclusion, I think that technology is vital for combating air pollution. Overall, innovative solutions like electric vehicles, AI sensors



Writing example 4:

The risks of improper hazardous waste disposal

Hazardous waste refers to any material that can harm the environment or health if not handled correctly. This essay will examine the consequences of improper hazardous waste disposal and emphasise why safe disposal is essential. Proper disposal of hazardous waste is necessary because it prevents damage to ecosystems and communities.

One of the causes of improper waste disposal is low public awareness. Many people are unaware of how hazardous chemicals, batteries, and medical waste can be. Improper waste management can lead to serious health issues, such as poisoning, respiratory diseases, and skin irritation. Moreover, hazardous waste can pollute soil and water, causing long-term ecosystem damage. For example, chemicals leaking into groundwater can affect drinking water supplies for years. To mitigate the effects, it is necessary to implement stricter regulations, improve waste collection systems, and educate people about safe disposal.

To sum up, proper hazardous waste management is important for protecting both people and the environment. Raising awareness, imposing regulations, and improving disposal methods can significantly reduce the threats associated with hazardous waste.

How to write a blog post

Writing a blog post requires the key elements, such as a catchy title, topic relevance, engagement, and flow. The general guidelines for structuring and writing a blog post are provided below:

- *Begin by creating an attention-grabbing title to engage your audience and give an idea of what the post is about.*
- *Clearly state the subject of the post and your point of view on it.*
- *Support your main points with evidence such as quotes, statistics, etc.*
- *Outline your content logically in order to guide your audience through your thoughts.*
- *Use a clear layout with headings and subheadings for easy navigation.*
- *Provide the information in a manner that is understandable, clear, and concise.*
- *Use linking words and phrases to connect the paragraphs.*
- *Review your writing for spelling, grammatical, and punctuation mistakes.*
- *Make sure to cite the sources used properly.*

For more information, please visit

[How to Write a Blog Post in 10 Steps](#)



Writing example:

EcoToday blog post on the main challenges of environmental engineering today

In this blog post, we'll look at some of the biggest challenges environmental engineering faces today. Nowadays, environmental engineering plays a critical role in protecting natural resources, reducing pollution, and supporting sustainable development. As the field continues to develop, several main issues demand urgent attention.

First of all, one significant challenge is water shortage. This is challenging because many regions experience droughts, pollution from industries and agriculture, and overuse of water. To deal with this problem, engineers develop infrastructure to reduce losses.

Another major issue is air pollution. Urbanisation and transportation emissions make it difficult to ensure fresh and clean air. Engineers work on clean technologies, such as electric vehicles and advanced filtration systems, in industries.

A third challenge is waste management. Growing amounts of hazardous, electronic and plastic waste pose environmental risks. To solve this problem, engineers create better recycling technologies and support circular economy practices.

To sum up, addressing these challenges is crucial for a healthy and sustainable future. Environmental engineers must keep on developing innovative ideas and solutions and society must support these efforts through responsible behaviour and awareness.

How to write an email

Writing an email includes key elements such as the subject line, greeting, body, closing, and signature. The general guidelines for structuring and writing an email are provided below:

- *Identify the purpose (ask for help or a piece of advice, etc.) and the recipient (formal / informal) of your email.*
- *Write your subject line to be informative and concise, clearly stating the purpose of your email*
- *Greet your recipient with a proper salutation. When writing formal emails, use the full name of the recipient and ‘Hello [Full name/Name]’ in informal or semiformal.*
- *Structure the body in a logical way, keeping paragraphs short. Include bullet points for clarity.*
- *Close your email with a sign-off and signature. Formal ‘Best regards’ / ‘Sincerely’. Informal ‘Thanks!’ / ‘Best’ / ‘Have a great day!’.* Include your full name, position, and affiliation (if necessary) in a formal email, and your first name in an informal email.
- *Review your writing for spelling, grammatical, and punctuation mistakes before sending.*
- *Make sure to include the attachment if mentioned.*

For more information, please visit

[*How To Write a Professional Email \(With Tips and Examples\)*](#)



Writing example 1:

Subject: Request for support to address pollution in the Riverside Nature Resort

To whom it may concern,

My name is Alex Friendly, and I am contacting you to bring your attention to the increasing pollution in the Riverside Nature Resort. Over the past months, large amounts of plastic waste have accumulated near the walking eco paths. This problem has a serious impact on local bird species and water quality, which makes the ecosystem extremely weak.

I would like to suggest a number of steps to improve the situation:

installing additional waste bins;

installing information signs;

organising regular clean-up events;

checking local businesses for compliance with regulations.

I kindly ask for your support in organising these actions and helping us protect one of the few natural areas remaining in our area. Your cooperation would greatly contribute to guarding local biodiversity.

Kind regards,

Alex Friendly



Writing example 2:

Subject: Request to raise awareness about air pollution from household generators

To whom it may concern,

My name is Alex Friendly, and I am contacting you to express my concern about the growing air pollution caused by the continuous use of household generators in our local community.

Due to the frequent power outages, more residents rely on gasoline generators, which produce harmful emissions, such as carbon dioxide. This problem has a serious impact on air quality and health, and the overall well-being of our neighbourhood.

I would like to suggest highlighting this problem in one of your upcoming news sections. Suggested points to include:

explaining the health risks of extended exposure to generator emissions;

encouraging locals to follow the safety rules and minimise usage where possible;

promoting alternative solutions, such as energy-saving practices.

Such coverage can help inform the residents and encourage discussion on more sustainable practices. I kindly ask for your support in raising awareness and motivating responsible behaviour in our community.

Kind regards,

Alex Friendly

How to write a guide with clear step-by-step instructions

Writing a step-by-step guide includes key components such as specific goals, a well-structured format, helpful visuals, engaging content, practical examples, and useful advice. The general suggestions for structuring and writing a step-by-step guide are provided below:

- *Make sure you understand the needs, interests, and the level of your target audience.*
- *Clearly state the goal. What do you expect your reader to learn or achieve by following the instructions.*
- *Maintain a clear and logical structure to increase readability and help your reader navigate through the content.*
- *Include useful visuals, such as charts, graphs, diagrams, screenshots, etc., to help explain the concepts and make the steps easier to follow.*
- *Include everyday examples to illustrate the applicability of the steps in real-world scenarios.*
- *Include helpful tips and insights that can be useful in preventing mistakes.*
- *Present the information in a manner that is easy to understand, clear, and concise.*
- *Use linking words and phrases to connect the ideas.*
- *Review your writing for spelling, grammatical, and punctuation mistakes.*
- *Make sure to cite the sources used properly.*

For more information, please visit

[*Writing Instructions*](#)



Writing example 1:

A step-by-step guide to monitoring biodiversity for protecting endangered species

The purpose of this guide is to help new volunteers understand how biodiversity monitoring contributes to the preservation of a local endangered species and its habitat.

Step 1. Identify the species and habitat

To start, find the protected area where the species lives. Take note of the key habitat features as well as any signs of deforestation or human interference.

Step 2. Set clear evaluation criteria

Choose what you will measure, for example, species population size, nesting places, or changes in the natural environment. Another way to track ecosystem health is by selecting indicator species.

Step 3. Conduct long-term evaluation

Make regular visits to the site. To record behaviour, movement patterns, and visible threats, like poaching or habitat loss, use a simple monitoring system.

Step 4. Conduct accurate data collection

Use GPS locations, photographs, or checklists to collect data. Consistent data gathering helps identify long-term patterns.

Step 5. Follow the reporting procedure

Send your findings to the conservation team. Clear reporting contributes to effective action plans and site-level preservation decisions.

By taking these actions, volunteers contribute to effective biodiversity monitoring and ensure the survival of endangered species in our



Writing example 2:

A guide to improving indoor air quality

Indoor air quality plays an important role in our well-being and health, since poor air can lead to headaches, respiratory irritation, and asthma attacks. This guide suggests simple steps to help you reduce indoor pollution and create a safer and cleaner environment.

Many indoor pollutants come from household chemicals, cleaning products, synthetic fragrances, and mold. One way to improve indoor air quality is to increase ventilation. Make sure to open windows regularly to allow fresh air circulation. Another effective solution is to use an air purifier to filter and remove dust. You should also try to minimize the use of strong synthetic fragrances and cleaning products, as they often release harmful chemicals and allergens. Finally, keep the humidity level balanced, because too much moisture results in mold growth.

In conclusion, small changes can make a big difference. By following these simple steps, you can create a healthier and safer indoor environment and protect yourself from harmful pollutants.



Writing example 3:

A guide to proper e-waste disposal

Proper electronic waste management and disposal is important because items like batteries, phones and chargers contain hazardous materials and can harm the environment. By following a clear process, you can ensure safe disposal and contribute to our local green initiative.

Step 1. Separate your e-waste.

Start by sorting old devices, chargers, and batteries. Keep them away from the bin for general waste.

Step 2. Collect and label items.

Put batteries in a sealed container and label them as hazardous waste. Collect all the cables and chargers in a separate box.

Step 3. Check local recycling points.

Find nearby e-waste collection points or a recycling facility. Many supermarkets accept batteries, and many centres accept devices for refurbishment.

Step 4. Recycle.

Take your labelled boxes to the drop-off points. Make sure there is a place of safe e-waste disposal.

Step 5. Avoid mixing waste.

Never throw electronic waste into the general rubbish to ensure proper recycling and avoid environmental risks.

To sum up, proper e-waste disposal is easy if you follow these steps, which will help protect the environment and inspire others to join your initiative. Make recycling a useful habit.

How to write a summary of an article

Writing a summary of an article usually sets the goal to give a clear and accurate description of the article's main ideas and content. The general recommendations for structuring and writing a summary of the article are provided below:

- *Read the whole article and take notes of important information and details, such as dates, examples, etc.*
- *Define the main ideas and area of interest.*
- *Divide the information into three sections: introduction, body, and conclusion.*
- *Take on the supporting evidence, such as data, facts, or other details that provide context for the main ideas.*
- *Write your summary, making sure to include the central idea, supporting details, and relevant events or people.*
- *Check your summary for spelling, grammatical, and punctuation mistakes, and make any necessary edits.*

For more information, please visit

[*How to Summarize an article*](#)



Writing example 1:

The article reviews recent research on rainwater harvesting and storage systems used for domestic supply in rural areas.

The article focuses mainly on how rainwater harvesting and storage systems can help manage water scarcity and offer an alternative water source where access to clean water is limited. According to the article, all efficient systems include four main components: a catchment area, gutters, pipes, and a storage system.

The article finds that the most common materials for catchment surfaces are galvanized metal, while concrete is often used for storage tanks.

The article emphasises the importance of water-quality monitoring: characteristics such as pH, lead, and nitrate levels. The findings suggest that, with proper design, maintenance, and regular treatment, harvested water can meet standards for domestic use in rural areas.

Overall, the article presents rainwater harvesting and storage systems as a low-cost and flexible solution to water deficiency in remote and rural areas. It also highlights the need for regular maintenance and quality checks to guarantee a safe water supply.



Writing example 2:

The article reviews the main technological progress in renewable energy over the past ten years, focusing mainly on solar, wind, and bioenergy technologies.

According to the source, innovations in photovoltaic materials and advances in solar thermal designs have greatly improved efficiency and lowered costs, making it more competitive. In the wind sector, the article highlights improvements in turbine blade design and new materials that improve energy capture and reliability.

In bioenergy, progress in biomass conversion technologies, such as gasification, biochemical processing, and advanced biofuels, has broadened the potential for sustainable fuel production beyond traditional sources. The article emphasises the importance of technological innovation and policy frameworks in driving adoption. The article suggests that these combined improvements can reduce greenhouse gas emissions and promote energy security by moving away from fossil fuels.

Overall, the source illustrates renewable energy technologies as a rapidly growing, cost-effective, and environmentally friendly alternative to conventional energy sources – provided that investment and international cooperation support this evolution.

How to write a report

Writing a report typically involves summarizing the main points, highlighting important findings or insights, and offering own analysis and point of view. The general recommendations for structuring and writing a report are provided below:

- *Structure information logically, including introduction – body – conclusion.*
- *Give the information in a simple, clear, and understandable manner.*
- *Use linking words and phrases to connect the paragraphs.*
- *Start by outlining the objective of your report and the relevance of the information.*
- *Write your central argument(s). Provide evidence and examples to support your key arguments.*
- *Highlight the main ideas and the key findings or insights.*
- *Check your writing for spelling, grammatical, and punctuation mistakes.*
- *Make sure to cite the examined sources properly.*

For more information, please visit

[10 Tips for Perfect Report Writing](#)



Writing example 1:

Report: Comparing the ecological footprints of Canada and Ukraine

The aim of this report is to compare the ecological footprints of two countries with different economic and environmental contexts. An ecological footprint refers to the amount of natural resources a population uses to sustain its lifestyle. This report focuses on two countries: Canada and Ukraine.

Canada has one of the highest ecological footprints per person due to its large energy consumption, transportation needs, and industries. In comparison to Ukraine, Canada heavily relies on private transport and has higher levels of waste production. Ukraine, on the other hand, has a smaller footprint because of lower consumption levels, a larger use of public transport, and simple lifestyles. However, Ukraine faces challenges with energy systems and limited waste-management facilities.

One of the main reasons for the difference is economic development: Canada has an advanced industrial sector greatly relying on resources. Another reason is the climate, as Canada demands more energy for heating. One common feature for both countries is the increasing need to improve recycling systems.

To sum up, Canada's footprint is significantly larger due to higher consumption of resources, while Ukraine's is limited by outdated environmental policies.



Writing example 2:

Report on the carbon footprint of various energy sources

This report aims to provide an overview of the carbon footprint associated with different energy sources and compare their environmental impacts. The aim of this report is to highlight how different technologies can help reduce global emissions.

Energy generated from fossil fuels, such as coal, gas, and petroleum, has the highest carbon footprint. These fuels produce large amounts of carbon dioxide during combustion and are highly energy-intensive. According to recent reports, fossil fuels significantly contribute to air pollution and global warming. In comparison to non-renewable sources, renewable sources release far fewer emissions.

Tidal energy, solar, and wind energy are considered clean technologies because they operate as zero-emission energy sources. In contrast to fossil fuels, they consume natural flows rather than depleting finite natural resources. Some low-carbon sources, such as nuclear power, emit minimal carbon; however, they create radioactive waste.

The data indicate that low-carbon solutions offer substantial and long-term environmental advantages. To conclude, the transition to renewable and low-carbon energy is crucial for reducing the global footprint.

APPENDIX 6.

Audioscripts

Unit 1

Introduction to Environmental Engineering

An Introduction to Environmental Engineering

Environmental engineering has changed how I think about my impact on the world, specifically in relation to the environment, but also to social structures and economic structures that we deal with. The main thing that kind of has drawn me to environmental engineering is the fact that I've spent a lot of my life in and around the outdoors, and that has kind of led me to have a super great appreciation for the natural spaces that surround us and a really big desire to protect them. A lot of the engineering disciplines, like civil engineering or chemical engineering, all of them are all moving towards more environmentally friendly practices, and environmental engineering just covers all of that.

My name is Chris, and I am a third-year environmental engineering student at UBC. The environmental engineering program is basically a combination of those courses within civil engineering and within chemical and biological engineering that focus on environmental issues and topics.

My name is Greg Lawrence. I'm a professor in the department of civil engineering here at UBC, and my specialty is in the field of environmental fluid mechanics. And together with Majid, I'm one of the co-directors of this program.

My name is Majid Mosamir. I'm a professor here at the Department of Chemical and Biological Engineering. Many of our society's challenges have to do something with the environment – whether it's climate change, whether it's clean water and sanitation, whether it's air quality. So those require skill sets that our environmental engineers have. Now, of course, our students will have the opportunity to go through the co-op programs. Many of those employers of the co-op students are also the ones that are part of the advisory group for our program, so the relationship with industry is embedded within the program.

My name is Ben, and I'm a third-year environmental engineering student. For my co-op, I worked with Environment and Climate Change Canada, measuring the flow rates of rivers during the 2021 November floods in BC, which was very exciting. So I got to go to both Merit and Princeton and do some field work to try to determine what the flow rates were of the rivers that helped inform decision makers what they should do during the floods. That really gave me a good opportunity to expand my fieldwork skills and apply a lot of the knowledge I've learned in school.

I'm Abby Taylor. I'm in my third year of environmental engineering here at UBC. Last year I worked with a drone reforestation company, doing kind of plant science experiments and field work as well involved with that. I think it's super important to focus on things like that, that can be scaled and can have a big impact in terms of carbon emissions and carbon sequestration.

The small cohorts and a small class size allow the students to know each other quite well and work well with one another quite effectively, but also it helps them to build a community that is really to their advantage when they graduate. They all go through the program, and that sense of belonging and the community is one of the great features of the program.

My name is Victor Pham, and I am a third-year environmental engineering student at UBC. So, I really think that in order to be successful in this program, you have to get to know your teammates pretty well. So, group projects, things like that – not only are they your

teammates for the project, but they will be your people in industry as well. Twenty years down the road, you'll be working with the same people.

I really like the environmental engineering community. I think it's just through the nature of everyone having similar interests, it's easy to connect with people because everyone has such similar interests. And every group project I've done, I've had nothing but good experiences so far.

If someone has the aspiration has the desire to make a change in the world, environmental engineering gives them the opportunity to actually fulfill that dream.

Taken from: <https://www.youtube.com/watch?v=1DuMnzhwxAA>

Phrasal Verbs with BREAK

I want to break up. I don't think you're the one for me. I know she's terrific, but I have to break up with her. You're breaking up with me? So you broke up with her, and she didn't know it? Apparently. And you actually said I want to break up? No, of course not. Who says I want to break up? It's a horrible thing to say. Why did you break up? I don't know what he's been telling you, but I broke up with him. You broke up with him? Over a month ago. What happened? He broke up with me. He broke up with you? Oh my God, are you breaking up with me? You're breaking up with me. You can't break up with me. Also, Clara and I broke up. Who broke up with whom? She broke up with me. Well, you should know that she recently broke up with me. Breakdown. Definition. If a car or machine breaks down, it stops working. My car broke down on the way to work, so I was late. Our car broke down. We can't go anywhere until it gets fixed. Yash, can I help you? Hi, we're from out of town, and our car just broke down. My wife's in labor. Can we use your phone? So, the system kind of broke down, huh? My car broke down on the Ambassador Bridge. Excuse me, my car broke down. What if the bus broke down right now and you had to get off? Where would you be? It didn't break down, so it's fine. Our plane broke down. It was an emergency landing. Could it be the weapon broke down, right? My car broke down, and it's raining, and I wondered if I might spend the night. My car broke down. Breakout. Definition. To start suddenly. A fight broke out at the party after a misunderstanding. I was 19 years old when the war broke out. Another fight could break out like last night. We should make a plan. When she was 16, the war broke out, and she had to leave school. World War III breaks out. I'm on the list. Leslie and I feel terrible for war breaking out at your Model UN. Nobody can trust anybody. Fights broke out. I caught this kid looting after the fire broke out. Yeah, go ahead. Yeah, a fight broke out here and... Cal, I don't have time for this. War could break out any day. Break out of. Definition. To escape from a place or a situation. They caught him just after he broke out of jail. Are you insane? You broke me out of prison? I didn't break you out of anywhere. I have to come up with some way to break you out of the hospital. No, that's good. That's good. She's breaking out of her shell. He didn't break out, Natalie. He was released. What? We're not staying in here forever. We're getting out of here. How? We're breaking out. If we're gonna break out of here, we gotta get past these guards. I can't believe you're doing this. I broke you out of Arkham. You broke out of the hypnosis. Do you remember what you saw? Now I've got your stupid game. Tell me how to break out of here. You're not gonna break out of here. I broke you out of a mental institution. I am going to break out of here. Then I am going to snap you in half. Break in. Definition. To enter a building illegally in order to steal. Thieves broke into the office and stole computers. In 1995, I think I broke into your house and stole your TV. Wait, you just broke in and stole these guys? Aren't you worried about getting arrested? Lucifer, did you break in here? We're not breaking in anywhere. If you must know, I was robbed. Somebody broke into my house and stole my property. Somebody break in. No, I'm broken. He had full access to the building. He didn't break in. What? What happened? Did somebody break in? Oh, so we're breaking in. No. Is that not a key? The manager called the cops, and somebody broke in his office and stole some money. Break through. Definition. To force a way through something. The crowd broke through the fence at the concert. He's gonna break through the windshield. You gotta break through those walls. The sooner the better. They're breaking through the line.

There are too many, Gary. We'll never be able to break through. It looks like it's struggling to break through. Stand back. I'm gonna break through. Guys, I can't break through. I's not easy breaking through, but I'm trying. I break through all boundaries. Our job is to hold the line. So what happens if some break through? For that matter, they could break through that door any minute, ending all of this. We need an army to break through. Break even. Definition. To neither make a profit nor lose money. He needs to work extra hours to break even this month. The point is, we're not rich. In fact, we're struggling just to break even. I'm starting to think I might break even here. Breaking even is not so bad. In this economy, a lot of people would kill to break even. And after all that, we're only gonna break even. We're supposed to make money on this house. Well, if everything goes as planned, we're hoping to break even in the first year and turn a profit the second year. It's optimistic. But to actually break even, we need somebody to sponsor the show. We're barely breaking even here. What do you want from me? Oh, yeah, for sure. We can't fire her. We're barely breaking even with her. That's why we have to keep her. Break away. Definition. To escape from somebody or leave your home, family, or job. He decided to break away from his old circle of friends. But you're breaking away because you won't give up your title. It's all right. I'm holding him. He'll break away from you anytime he wants to. But I believe I have no option but to break away. It's where we belong. It's what we are. I mean, maybe you can break away from it, but I don't want to. I have congressmen I want to break away. Breaking away from the pirate ship ruptured the entire filtering system. I tried to break away. The cow brought me back. You can't break away. You never want to. Looking back, it was one of the first acts of them breaking away from the institution.

Taken from: <https://youtu.be/aE0GxPFp-nE>

Phrasal Verbs with BRING: Mastering the Many Meanings of 'Bring' in English

Hi, welcome back to Phoenix English. In today's video, we are gonna look at phrasal verbs using the verb bring. Once again, phrasal verbs, a verb and a preposition that together have a very different meaning than the words by themselves. Sometimes more than one meaning, as you're gonna see here. So we are gonna look at bring up, bring about, bring around, bring back, bring down, bring in, bring on, bring off, and bring to. These are the ones we are gonna look at today. So bring up. A few meanings to this one. The most commonly used one is to bring up something, means to raise, but not raise like physically. Raise in terms of conversation. We are gonna have a conversation, and I want to talk about something specific. I'm gonna find an opportunity to bring it up in conversation. So I'm gonna raise that topic, and we are gonna talk about it, and it's gonna be the focus of the conversation. So if you're going to a meeting with your boss and you're thinking, oh, it's time for my promotion. Somehow, you'll find a way to bring it up in the conversation and eventually talk about it. You can also bring up a child. So you can raise a child. That's the verb most people use about children. You raise children. But you also bring them up. Now, it doesn't mean that you physically lift them. It means you educate them, you feed them, you teach them about life, you prepare them for the world they're gonna live in. Another thing sometimes people use bring up is to throw up, puke, vomit. So today I had a really bad lunch. I hope I don't bring it up all over this video. So, bring up is sometimes used as vomit. Bring about. Two meanings for this one. One is to cause to happen. So, one situation exists that will likely bring about this result. If we talk about military spending, the government has decided to go to war in this part of the world. But the major economists are warning that this war will bring about the destruction of our country economically. Okay, the war will bring about economic hardships to this country. We can't afford it. Okay, another meaning for bring about. If you have ever been on a ship and you need to turn that ship and bring it back to the port, then you have to bring it about. Basically means turn around, but we use it mostly with ships. Okay, bring around. A few meanings to this as well. Bring around basically means to revive someone. So somebody's passed out, they fainted, or whatever happened. They're lying on

the ground. They look like asleep. You're trying to bring them around, means they recover consciousness. Bring around means also bring a friend over to meet other friends, like a casual visit. And the most common use, if you have a very set opinion about something, and I have a very different opinion. I will do my best to bring you around to my opinion. So I want to persuade you. I want to make you change your mind and bring you around to view the situation from the way I view it, from my perspective. That's the most common use of bringing around. Bring back. So again, there is the literal bring back. So you bought something from a store, you took it home, like a shirt. You tried it on, you realize, you know what? I don't like it. So you bring it back to the store. Now, sometimes people, especially celebrities, they try to bring back something that used to be very popular. So if I started wearing fur coats and everybody thinks, oh, this guy is so cool and so popular. Then everybody starts to wear fur coats. So I brought back the fur coat. So, try to make something old popular again. Bring down. A few meanings here. First of all, we're going to talk about collapse. Now, it can be a physical thing. It can be a person. So if you bring down a building, it means you may blow it up, and the whole building comes down. So you bring it down. You blow it up. You can also bring down a person. So if you create a scandal, let's say, especially politicians, celebrities, they're in a very high position. If you tell them, oh, this man cheated on his wife with 20 women. You're bringing him down. You're destroying his reputation and his possessions. Bring down also means to depress. So we're all having a good time. I'm with my friends. We're at a bar and somebody starts talking about politics. We say, oh, you're bringing us down. Leave it alone. We're here to have a good time, not to be too serious. Okay. Bring in. A few meanings here as well. So my friend is outside, or my dog is outside, and he's really cold. So I bring him inside. Bring in can also mean arrest. So the police are chasing the suspect. Somebody committed murder. The police chase him, and they want to bring him in. It means they want to arrest this person. Another meaning of bring in. I work at a very good company, and my friend just lost his job. So I want to bring him in. It means I want to bring him into my company and get him a job at the same company as me. Bring on. Now, this can also mean the same as bringing in. Means introducing someone into the company. You can bring someone on board. So I'm the boss. I can just take my friend and bring him on board. It means I give him a job. I introduce him to the company, and that's how he gets employed. Now, bring it on. It's a common expression. Means basically, I'm not afraid of you. Bring whatever challenge you want to me, and I will face it. Okay, bring it on. Quite often, people will just say bring it. Bring it means bring it on. Means challenge me. I will fight you. I will win. I'm the best. Because that's how they think. Bring off. To bring something off means to do it successfully. So I hired my friend again to organize my party, and she really brought it off. The party was amazing. Everybody loved it. And a few of my friends asked me for her number so they can plan their party as well. So she really brought it off. She did something successfully. Now, you can also talk about, like, when somebody's dressed. So, like let's say Lady Gaga. I think everybody knows Lady Gaga. Sometimes her clothes are a little bit, you know, crazy, but somehow she's able to bring it off. Means she's able to wear it, so it actually looks good, and people think she did a very good job of it. Okay, so now we are gonna look at bring to. Bring to mostly is used with other words. By itself, bring to means to try to revive someone. So again, somebody passed out. They're lying there, fainted. So you're trying to make them up, regain consciousness. More commonly, we use bring to with other words. So, for example, bring to mind. Means you're trying to get an idea into someone's head. You want them to start thinking about it. So you bring it to mind, or you remind them, or you hint at it. Or something brings something to your mind. Means it makes you remember or makes you think about something you haven't thought about in a long time. We also have another expression, bring to light. If you bring something to light, it means that it was in the darkness. It means nobody knew about it. It was hidden. If you bring it to light, you reveal it. You expose it. You make everybody aware. So a newspaper journalist, for example, their job is really to bring secrets to light. They want people to see what's going on. And one more expression, if you bring someone to his knees or some people to their knees, means that you dominate them. You beat them. So if you have a

contest and you bring someone to their knees, like they're down, they're weak. So you weaken them at the end of the day. Okay, I hope these were clear. Please subscribe to my YouTube channel and see us again soon. Bye.

Taken from: <https://youtu.be/iqMjwQQuZKc?si=yry1YmKKTf4OeCQ1>

Introduction to Environmental Engineering: Sustainability and Impact

Imagine waking up one day to find that the air you breathe is toxic, the water you drink is undrinkable, and the land you live on is covered in waste. Sounds like a dystopian nightmare, right? But here's the twist: that's the reality we're racing toward if we don't change course. Enter environmental engineering, the science and art of designing solutions to protect our planet and make sure that nightmare never becomes reality. If you're ready to discover how we can build a sustainable future and make a real impact, stick around, because this is where the magic happens. Let's get straight to the heart of it: what is environmental engineering? At its core, environmental engineering is all about solving problems that affect our environment, such as air pollution, water contamination, waste management, and more. It's about using science, technology, and creativity to design systems that keep our planet healthy while also supporting human life. In other words, it's the field where you get to be a superhero, but instead of capes, you're armed with knowledge, innovation, and a deep sense of responsibility. First up, let's talk about sustainability. This is the buzzword you've probably heard a million times, but what does it really mean? In the world of environmental engineering, sustainability is all about creating solutions that meet today's needs without compromising the ability of future generations to meet theirs. It's like playing the game of Jenga; you have to keep the tower stable while carefully removing pieces. But here's the twist: instead of just keeping the tower from falling, you're also making sure it can keep growing, supporting more lives without collapsing. Now, let's dive into one of the biggest challenges environmental engineers tackle: water treatment and management. Water is life, literally. But with growing populations and increasing pollution, ensuring access to clean, safe water is becoming more difficult. Environmental engineers design and implement systems to purify water, manage wastewater, and even recycle water for reuse. Think of it as turning dirty water into liquid gold. These systems range from massive treatment plants serving entire cities to small, portable units providing clean water in disaster zones. It's all about making sure that every drop counts. But water isn't the only element on the environmental engineer's radar. Let's talk about air quality. Imagine a world where every breath you take could harm you. Unfortunately, that's a reality for millions of people living in areas with severe air pollution. Environmental engineers work on the front lines to design systems that reduce emissions, filter out harmful particles, and monitor air quality in real time. Whether it's creating cleaner energy sources, developing technologies to capture carbon emissions, or designing green spaces that naturally filter air, these engineers are the unsung heroes keeping our skies clear. And then there's the issue of waste management. We live in a world that's producing more waste than ever before, from plastic bottles to electronic gadgets to food scraps. Environmental engineers are the masterminds behind the systems that manage all this waste in a way that minimizes harm to the planet. This includes designing efficient recycling processes, developing biodegradable materials, and even finding ways to convert waste into energy. It's like turning trash into treasure, all while reducing our impact on the environment. But here's where things get really interesting. Climate change. This is the big one, the challenge of our generation. Environmental engineers are at the forefront of the fight against climate change, working on everything from renewable energy solutions to carbon capture technologies to sustainable urban planning. They're the ones designing wind farms, solar power plants, and smart grids that reduce our reliance on fossil fuels. They're also creating systems to protect vulnerable communities from rising sea levels, extreme weather, and other impacts of a warming climate. In short, they're the architects of a sustainable future. So why should you care about environmental engineering? Because the work these engineers do affects every aspect of our lives, from the water we drink to the air we breathe to the very ground we stand on. Environmental engineering isn't just about fixing problems; it's about creating a world where we can all fly,

both now and in the future. It's about making choices that benefit both people and the planet, ensuring that we leave the world better than we found it. And here's the best part. Environmental engineering is a field where you can make a real difference. Whether you're passionate about clean energy, water conservation, waste reduction, or climate action, there's a place for you in this exciting and impactful field. It's a chance to use your skills and creativity to tackle some of the biggest challenges of our time and to be part of the solution to the world's most pressing environmental issues. So, the next time you see a wind turbine turning, a solar panel soaking up the sun, or a recycling bin on the street, remember that behind these innovations are environmental engineers working tirelessly to create a sustainable future. And now that you've got a glimpse into their world, who knows? You might just be inspired to join them in making an impact.

Taken from: <https://youtu.be/swKWYATNb9w>

Unit 2

Ecosystems. Biodiversity

Interactions Between Living and Non-Living Things | **[Abiotic & Biotic Factors]**

Did you know that living organisms interact with each other and with non-living things in an ecosystem? An ecosystem is made up of both living and non-living things, or what biologists refer to as biotic and abiotic factors.

Some examples of living things, or biotic factors, include polar bears, penguins, wolves, foxes, and mosses. Some examples of abiotic factors include rocks, soil, snow, air, temperature, and water.

Living organisms interact with other living organisms in an ecosystem. For example, a caterpillar might interact with a leaf or another insect in its environment. A fox might interact with a plant or another animal in its environment.

Living things also interact with non-living things in their environment. For example, organisms interact with water, sunlight, air, soil, and rocks.

The interaction and dependence that exist between living and non-living things are what make up an ecosystem.

Taken from: <https://www.youtube.com/watch?v=OHW3xbGiDfM>

Phrasal Verbs - Expressions with “CALL”

Hello everyone, and welcome to Maple Leaf ESL. My name is Andrew, and thank you for joining me here today. For today's lesson, I want to take a look at phrasal verbs that use the expression call. And for this lesson, I've chosen about seven different phrasal verbs, and as always, we're going to look at definitions and many examples. Okay, so let's see if we can start the lesson here. So it says the first one, call for, and we've got two definitions. The first one says to require or demand, and to make necessary. Okay, think about this situation. Imagine I'm sitting with my friends, and one of my friends says, I have some big news, I'm getting married. Okay, alright, so my response to this might be, okay, well, this calls for a celebration, or this calls for a bottle of champagne. Okay, so what that means is, this situation now demands that we celebrate, or it demands that we get a bottle of champagne, right? So if you say, this calls for a celebration, or this calls for a toast, right? Remember, a toast means a speech to somebody, usually at a wedding or at a party, right? If you make a toast, you're making a nice speech about somebody. So if I say, this calls for a toast, that means this situation demands that I make a speech, right, that I make a toast, right? So commonly you say, this calls for a celebration, or this calls for, again, something nice. The second definition there says to summon or request someone, right? Remember, summon means that you want somebody to come to you, right? Okay, so maybe if I'm at a party, and I'm a little drunk, I might call for a taxi, right? Or if I'm really sick or injured, I might call for an ambulance, right? If I'm wealthy, and I have my own driver, right, this person drives my car for me, we can call that a chauffeur. I might call for my chauffeur, okay? A boss or a manager in a company might call for a meeting, right, or call everyone for a meeting. Again, that means they're going to request everyone come to the meeting, or summon everyone to the meeting. So, call everyone for the meeting, right? Okay, next one there says call back, and it says to return a phone call. Okay, that one's pretty simple. If somebody calls me, and I miss the phone call, then later I will call that person back, right? Or maybe I do get the phone call, but I'm busy. So I might say, sorry, I'm busy, can I call you back later, right? So that one's pretty easy. Okay, the second definition for this one says to recall a damaged product for repair. Okay, think about this situation. Imagine a car company that produces many cars. Okay, let's imagine they produced 100,000 cars for this one model. Okay, but actually, there was some damage to this product. Okay, let's say the brakes were damaged on all of these cars, right, all 100,000 of

these cars. So now the car company must call back 100,000 cars. So again, that means they have to recall or get back all of these cars because they're damaged, and they need to repair them, or they need to fix them. So they've called back 100,000 cars, or something like that. Okay, next one says call off, and the definition is to cancel something. Okay, this one's also pretty simple. Okay, if I call off the meeting, that means I'm canceling the meeting. If I call off my vacation, then I'm canceling my vacation. Okay, imagine two people are getting married, but then they fight, and now they've canceled the wedding. So we can say the wedding has been called off, right? So anytime something's canceled, we can say it's been called off, right? Imagine there's a sports game, but it's raining, so they can't play the game. So the game has been called off. Okay, next one says call in. We've got two definitions. The first one says to report or inform by phone. Okay, the best example, think about a reporter. Okay, maybe a reporter works for a TV station. Okay, and this reporter is out doing research, right? Now, they want to call their boss and sort of maybe give an update to their boss. So they might call in to the TV station and give an update, right? Because again, when you call in, you're going to report to somebody or inform somebody of something by phone. So if the reporter calls into the station, this means she's going to make a report or inform her boss, so something like that. So anytime you call into your company, you're calling in with a reason, right? To give an update or to inform somebody of something. Okay, the next one says to summon for consultation or help. Okay, imagine this. Imagine the police have a murder. Okay, there's a big murder scene. Okay, but they realize this is actually a really important murder scene. They can't deal with it. This is actually a murder for the FBI to deal with because maybe it's an international thing or it's a big thing. So the police will call in the FBI, right? Because they need help from the FBI. They can't do it. Okay, or imagine somebody has a problem, but they can't deal with the problem. They need a lawyer. So they will call in the lawyer to help with this. Okay, or again, one more example. Imagine a company they have a problem with its electricity, right? The electricity is not working. Okay, and nobody is trained to do this in the company, right? And also, it's a little dangerous. So they're going to call in an electrician, right? That's a professional, right? They need to call in a professional. Okay, a few more here. The next one says to call someone up, and it says to contact someone by phone. Okay, this is simple. This is just the same as calling somebody. If I'm going to call my friend Dave, I can say, I'm going to call up my friend Dave, right? Or if I'm going to order a pizza, I might say, let's call up the pizza place. You know, that's the same thing as let's call the pizza place, right? So that one's pretty easy. Okay, another definition there says to be brought up to a higher level. Okay, when I think of this meaning of to call someone up, I think of two different situations. I can think of sports, and I think of the military. Okay, if someone is called up to the military, that means they've been called into service for the military. So now they're going to be working for the military, right? Okay, same thing in sports. If you are called up, it means you're going to be brought up to the next highest level, right? So in North America, if there's a baseball player, and he's playing in the minor leagues, right? Remember, the minor leagues are below the major leagues, right? Major League Baseball is the highest level. So if he's playing in the minor leagues, and he's been called up, this means he's being brought up to the next level, right? To the major leagues. So if somebody says, I was called up to the big leagues, this means they're being brought up to a higher level in that professional sport. Okay. All right, next one says call out. And the definition is to shout or speak in a loud voice. Okay, if I yell out, John, John, right? I'm calling out John's name, right? So in this case, I'm just shouting out his name or yelling his name, right? So if you call out something, it just means you're shouting something or you're yelling something in a loud voice. Okay, so that one's pretty easy. Okay, the last one here says to call someone out. Okay, and this is a slang expression, but it's very common. It says to challenge someone or to criticize someone's behavior or actions. Okay, all right. If we think about social media like Facebook or Twitter, it's really easy to call someone out. Okay, think about a famous person who has made some negative comments. Maybe they're racist comments or sexist comments. Then, many people they go to social media and they call that person out. Okay, that means they criticize this person for their opinion or for their action or for their behavior, right? So they're calling that person out. Okay, this also is it

says there to challenge someone. If I call someone out, that could also mean that I've challenged to fight this person, right? If somebody, let's say, there's somebody and he's maybe causing trouble with my girlfriend or with my wife. Okay, and if I call this person, I say, hey buddy, I'm calling you out. That means I'm ready to fight you, right? I want to punch you or something like that. Okay, so to call somebody out is to challenge somebody, or again to criticize their actions or their opinions or their behavior. Okay. All right. I want to see if we can erase the whiteboard, and let's take a look at some written examples using each of these phrasal verbs. Okay, let's look at this first example. So it says that you're having a baby. This calls for a celebration, right? So remember that means this situation demands a celebration. Okay, next one. I'm tired. I think we should call for a taxi, right? So I think we should summon a taxi or request a taxi. Okay, next. I'm at work. Can you call me back later, right? Can you return my phone call later? Okay, next one. The IT company has to call back 10,000 defective products, right? So they have to recall 10,000. Remember, just defective just means like damaged or broken products. Okay, next one. If the rain doesn't stop, we might have to call off the wedding, right? Cancel the wedding. Okay, I need to call in and talk to my boss, right? So again, if we call in, we're sort of reporting to someone or sort of, you know, checking in with someone. Okay, next. There are too many insects. We need to call in the exterminator, right? Remember, the exterminator is a professional who kills bugs or who kills insects, right? So we can't do it. So we need to call in someone else, right? Call in the exterminator. Okay, let's call up Jamie. See if he wants to hang out, right? So remember, that's just the same. Let's call Jamie. Let's call up Jamie. Okay, next one. Did you hear Tim got called up to the big leagues, right? So Tim is moving up to a higher professional level, right? So he got called up to the big leagues, right? Okay, next one. Did someone just call out my name, right? Maybe I heard my name. Somebody shouted it. Somebody yelled it. Okay, and last one here. Many people are calling out the president for his negative comments about gay marriage, right? So maybe the president he made negative comments, right? So now people are criticizing him, right? Or they're challenging him because he made these negative comments, and they are not happy about it. Okay? All right, that is the end of today's lesson. I hope all of my examples were clear and easy to follow. Thank you so much for joining me here at Maple Leaf ESL. And I look forward to seeing you again next time.

Taken from: <https://youtu.be/tyaRsC18pJ4>

12 Phrasal Verbs with COME

Come with me on a journey to the world of phrasal verbs with come. Come with me. I'm going to show you the 12 phrasal verbs with come that you need to know for your B2 first exam. Hi, and welcome to Teacher Phil, where I help people like you pass their Cambridge exam. If you haven't watched the first video in the series, then I highly recommend doing so, because there you can learn the basics of how phrasal verbs work. I also have a challenge for you. Write one sentence for each phrasal verb from this video in the comment section below, and let's see who is an expert. But without me boring you anymore, let's get started with our 12 phrasal verbs with come. Come across is a phrasal verb that can have multiple meanings. For example, it can mean to seem. As in the sentence, when I met her for the first time, she came across as shy. Or a second meaning is to become clear. As in the sentence, the character's emotions definitely come across in this film. With an object, come across is inseparable, and it means to discover something by chance or without planning to. As in the sentence, when I was on holiday, I came across this beautiful little cafe. Come along is not used with an object, and it can also have two different meanings. First of all, come along can mean to arrive, appear, or start to exist. As in the sentence, when my first child came along, my life changed a lot. The second possible meaning is to go somewhere with someone. As in, we're all going out tonight, you should come along. Remember that come along doesn't take an object. Come down, once again, is a phrasal verb without any object and has two different meanings. The first meaning is to break and fall down. As in the sentence, the whole roof of the building came down because of the fire. Secondly, come down can also mean to become lower. As in the sentence, the president's approval ratings came down after the latest scandal. Come down with, on the other hand, is always followed by an object, and it means to get an illness.

For example, we can use it like this. After falling into the frozen lake, he came down with severe bronchitis. Also, come down with cannot be separated by the object, so the object always follows the phrasal verb. Come off means to happen successfully and is not used with an object, so we always use it by itself. For example, we can use it in a sentence like the magician's tricks came off perfectly, leaving the audience in awe. Another example would be the charity fundraiser that came off without a problem, raising a significant amount of money for the cause. Come on is also used without an object and can have two different meanings. Its first meaning is to start to happen or to start to work. As in the sentence, the TV came on immediately after the repair. The second possible meaning is to make progress. As in the example sentence, my project at work is coming on really well. We've already reached the first milestone, and just like that, we are already halfway done. If you feel that you are taking away some useful information here, consider giving the video a thumbs up, and let's continue with the second half of our phrasal verbs with come. Come out is another phrasal verb without an object, but it is very versatile and can have a variety of meanings. So let's have a look at the most important ones. Firstly, come out means to become available, to become known or to appear, as in their new album came out and immediately went to the top of the charts, or even though it was mostly cloudy all day, the sun came out a couple of times and warmed us up. Secondly, it can mean to go somewhere with someone for a social event, as in the sentence, do you want to come out with us tonight? We're going to have something to eat. Thirdly, we can use come out to talk about the result of something. For example, we can say, how did the cake come out? Did your family enjoy it? Come out can also mean to be removed, especially when we talk about things like dirt or stains, as in the sentence, red wine stains don't come out easily. The next meaning is about how something is said, as in, I wanted to apologize, but what I said came out all wrong, and he got even angrier. Last but not least, come out is used in the specific context of someone who is not heterosexual telling other people about their orientation for the first time, as in, she came out as bisexual to her parents when she was 16 years old. Come round also doesn't take any object, but it can also have a variety of meanings. The first meaning is to visit someone at their house, as in the sentence, you should come round for dinner, it's my birthday today. Come round can also mean to change your opinion or to agree with someone after you had a different opinion, as in, I know she's upset right now after what you've done, but I'm sure she'll come round. Thirdly, we can use come round to talk about a repeated event that is happening or is going to happen soon. For example, I can't believe Christmas has come round already. Lastly, come round can mean to become conscious again, as in the sentence, he came round after a few seconds, after fainting so suddenly. Come to has the same meaning as come round earlier, in the sense that means to become conscious again, especially after surgery or an accident. As in the sentence, doctor has he come to yet? Come up means that something appears, for example, a topic or problem. One sentence could be the company's financial issues came up during the meeting, or the information came up on the screen as soon as he hit search. It can also mean to move upwards or to rise, as in the sun will come up at 6.30 a.m. tomorrow. Come up against does use an object, but it cannot be separated from this object. And it means to have to face difficulty or resistance, as in, she came up against a lot of racist bias when she moved from Japan to Europe, or despite their best effort, they came up against a formidable opponent in the championship game. The last phrasal verb on today's list is come up with, which means to think of a plan, an idea, or a solution to a problem. It is always followed by an object, but once again cannot be separated from it. We can use come up with in a sentence like, she struggled to come up with a creative idea for her art project, but eventually she did well. Thank you so much for watching the video until the end. I hope you were able to take away a couple of phrasal verbs for your own vocabulary. They can definitely be really helpful in your exam, even though there is no guarantee that all of them, or in fact any of them, will be part of your specific test. But I think it is still good to know them anyway, if you want more help with your English or your exam preparation. I can also be your teacher. I offer online classes and writing feedback. And make sure to follow me on my other social media to always get the latest content. All the links are in the description box below. And I see you in the next video.

Taken from: <https://youtu.be/4QI7QBI9H9g>

BIODIVERSITY & Calculating INDEX of DIVERSITY. Human Impact and Definitions for A-Level Biology

Hi everyone, and welcome to Learn A-Level Biology for Free with Miss Esterick. In this video, I'm going to be going through biodiversity and calculating the index of diversity for A-Level biology. If you do find this video helpful today, please give it a thumbs up and make sure you click the subscribe button to keep up to date with all the latest videos during self-isolation. So, just have a look at some of the key terms first of all, so what we mean by biodiversity. There are three different measures for biodiversity. Species diversity which is the number of different species and individuals within each species in a community. Genetic diversity which is the variety of genes amongst all the individuals in a population of just one species. Or ecosystem diversity, and this is the range of different habitats, which could be a measurement on a small scale, or it could be considered the entire Earth. Now, AQA A-Level biology only focuses on species diversity, and in particular, species richness and which is the number of different species in a particular area at a particular time. So why is it important, then, to know about biodiversity? So we can use this biodiversity to describe a range of habitats and as I'll say and that could be local small habitats or on the entire earth and if a habitat does have a low biodiversity that's not necessarily a cause for concern because some habitats if you think about in the arctic or in the desert in those ecosystems you wouldn't be surprised that there was a low biodiversity because the abiotic factors are so harsh meaning that it might be incredibly cold incredibly dry so it's hard for organisms to survive there. What is a cause for concern, though, is if a biodiversity that was once high starts to decrease. So that's why biodiversity is an important measure is so we can measure changes, and sadly is often caused by human activity. Now, the human activity that we focus on in AQA biology is farming practices, and some common farming practices that reduce biodiversity are these five here. So destruction of hedgerows what that means is the parameter of a field sometimes has hedges instead of fences and those hedges provide a habitat for lots of insects more birds more mammals but they're in the way of farmers being able to go up and down their fields really easily in a tractor so those are often taken out. Selective breeding, now this is when plants or could be animals that are displaying desirable characteristics are constantly selected to reproduce to make sure you always see these desirable characteristics in future generations, but in doing that, you're narrowing down the gene pool and you don't have as much diversity. Monocultures is what we can actually see in this photo here and that is when you're only growing one plant species an entire field and if you've only got one plant species straight away that is a low diversity but also it's only going to attract the same insects that can feed on that and therefore you're going to have a much lower diversity. Overgrazing, so if animals are left to overgraze and then you're reducing the plants too much, that's a knock-on effect on the food web, and sometimes it might be that ponds are filled in or wetlands are drained to provide space for farming. So what needs to be focused on is compromises because farming does have to exist to provide food for humans, especially as the population is increasing, so we have to have a compromise to make sure we are conserving the biodiversity to an extent and enabling farming. So you could get questions linked to that, so often it might be that instead of destroying the hedgerows, there might be an agreement that you can remove two but not all of them. Selective breeding, it might be that you can only do that in a particular area or for a particular species. Monocultures sometimes they'll have crop rotations, meaning that you have to rotate each year which crop you have, or even have sections or rows within the field of different species. So there's a range of different compromises. So the last thing you need to know in this topic is how you can measure biodiversity, and then monitor whether it is decreasing, and this is done using the index of diversity. Now this is different from species richness which we said at the start was just the number of species because index of diversity also takes into account the number of individuals within each species and that is an incredibly common question to be asked what is the difference between species richness and index of diversity and that's it there that sentence. So we use Simpson's index of diversity to calculate this. Here's the formula, and you do not have to remember that formula for the A-level exam;

however, what AQA won't give you is what all of the components of the formula stand for, so that's what you need to remember, not the formula itself. So, capital N is the total number of organisms of all the species present. Lowercase n is the population size of one species, so the total number of organisms of one species. You won't get a value lower than one, so one is the lowest value you can get, and the larger the value, the greater the species diversity, and typically it falls between one and ten; most of the time it's actually between three and six. So, if we have a go at an example here the species I've just called A, B, C, and D, and we're told here the number of individuals that there are in species A, B, C, and D and then I've got the bottom part of the formula. So then, if we calculate capital N, that is the total number of all of the living things here we have the denominator here, so the n brackets n minus one, but it's the lowercase n, so that would be six times five, which is 30. Then this symbol here is the sum of so if we add up all of those, it comes to 180. So now we can input that into the formula, so the top row would be 25 times 24, it's 25 minus one, the bottom row we've already worked out is 180. So 25 times 24 divided by 180, and it comes to 3.3. So that again has come up, I think pretty much every year, on the new spec being asked to calculate this either on the AS paper or on paper one or paper two, sorry, paper three of the A-level papers. So it's definitely worth practicing that, and I've got some questions on misseric.com, so you can head over there if you do want to have a go at some of those questions. So if you have found it helpful today, please give it a thumbs up if you want any more resources, head over to Twitter the wordpress, or Instagram, and then subscribe to keep up to date on all of the latest videos.

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Unit 3

Water Resources and Their Characteristics. **Water Pollution and Treatment Strategies**

How Water Gets to Your Home and Back to the River

Every day, hundreds of dedicated EPCOR employees work to keep your lights on and your water flowing, and this is how they do it.

Water's journey to your tap starts further back than you may expect. It begins in the heart of the Canadian Rockies. Glaciers, upper basin snowpack, and groundwater are the primary water sources for the North Saskatchewan River. Our river travels through forests, foothills, and farmland before finally reaching Edmonton and EPCOR's El Smith and Rosssdale water treatment plants.

Water is brought into the treatment plant by pipes located deep in the river that are specially designed to protect fish. The water enters the treatment process, where it is clarified, filtered, and disinfected, making it safe for you and your family to use. Throughout this process, EPCOR employees are testing the water quality. In fact, our water quality specialists conduct over 100,000 tests a year.

After about 7 to 15 hours of treatment, the safe and clean water is stored in reservoirs where it's ready to travel through thousands of kilometers of underground pipes so it's there when you turn on your tap, flush your toilet, or take a bath.

The water we treat is used for many things in our communities, not just in your home. It's used to water your garden, to fill your local pools, produce the food you eat, and protect you in case of a fire. Providing clean water is what keeps our communities happy and healthy, and summer, fall, winter, and spring, we're working to ensure you always have clean, safe, and great-tasting water.

But our job doesn't end at your tap. Every time you take a shower or flush the toilet, you send wastewater to EPCOR's Gold Bar wastewater treatment plant. This innovative plant collects and treats both your wastewater and nature's stormwater, making sure it's safe to return back to the river.

The wastewater passes through various treatment steps, including removing debris and contaminants, and clarification. It's disinfected using high-intensity ultraviolet light, and then the cleaned water is returned to the river to re-enter the water cycle. It's important that the water we return is safe for us and the environment, so we can use it today and others can use it in the future.

Providing water to our communities is a big job, and it's one we're proud of because it's not just about cool drinks and hot showers. It's about the people who enjoy them—people like you. EPCOR, providing more.

Taken from: <https://www.youtube.com/watch?v=Msqu4cAQ76U>

CUT Phrasal Verbs

Hey everybody, and welcome back to the channel today. I'm bringing you cut phrasal verbs so you aren't going to miss this one, are you? well, I'm telling you this because I know how important they are they are so Frequently used in spoken English in daily life English that you Don't want to miss this for sure So with this said let's get going but not before you hit my subscribe button down below if this is your first time here and Welcome a warm welcome good, so just in case you've never heard of phrasal verbs before and you don't know how this grammar point works in English Well, this is to help you out a playlist with phrasal verbs Videos made by me in order to Get the gist of it, you know to understand how they work and what it's all about in English So we're ready to go. The number one cut phrasal verb is to cut in to cut in. This one has three different meanings. So let's go over the three of them. Well, the first one is to go before somebody else while standing in line. I hate

people cutting in for no reason. That's so rude. Meaning number two to drive in front of another car without warning so the car just caught us in and nearly threw us off the road and The last meaning for cut in is to interrupt somebody talking. Next time she cuts me in, I'll tell her straight in the face. That's so cheeky. The next one is to cut out. Cut out very well said, also mind the linking part, as we've you know, kept doing all through our videos. Well, cut out has only two meanings, so let's see the first one is to remove something from something else, like, for example, a drawing from a picture. Yeah, so now children, be sure to cut out the horse from the picture and stick it onto the panel. Good, and the second meaning is to stop or seize. The two boys were having a fight. So the teacher told them to cut it out or else they'd get punished. The next phrasal verb is to cut off. Cut off very good pronunciation. Let's go then, and please know that this one has got four meanings attached to it. So the number one meaning is to remove, cutting, remove something by cutting. Mom cut off all the dry twigs on our orchids and cleaned them up. They now look so pretty good, the second one for cut off is just as for a cut in to interrupt somebody talking, and an example here is she cuts me off, seeing that I had to end my speech. We're running out of time meaning number three is to end abruptly and abruptly and the example for this is we got cut off before we could even say our goodbyes and the last meaning number four is to isolate or make something inaccessible due to weather conditions bad weather conditions like in our following example, which is due to last night's have a snowfall lots of roads were blocked and our village has been cut off so we couldn't go to school anymore hmm. What a sad situation, isn't it? But that's nature, you can put up with it. Now, let's just take a moment to validate your efforts to show up for my English lessons right here on my channel each and every time I truly congratulate you for your consistent efforts. Good job. And now let's move on to the next phrasal verb, which is cut up. Cut up, which means to cut into big pieces. For example, um, can you please cut up those carrots for me, please? The next one is to cut down with its two meanings. The first one is to bring down by cutting, as is the case with the trees. The trees of the forest, which you know more and more, and this is so saddening, and the next meaning is to reduce the amount of something. So, why don't we just cut down the amount of paper we use so that it'll last us until the end of the week? Cut back on to cut back on means to spend less or consume less of something, for example, I think you are having more and more sugar with all your meals the doctor recommended cutting back on it little by little, so The doctor recommended cutting back on it consuming less of it. Next, you've got to cut through. Nothing to worry about, believe me, and we've got two meanings to this one. The first one is to understand something that isn't easy to understand, and the example for you is he cut through the lengthy report, trying to give the others a quick summary. The next one is to deal with something quickly. So, the example is that there was no time for explaining, so he cut through the process. He cut through the process. Yeah, you just did it all very fast, very quickly, hope you got it. All right, and now it's time for you to put it into practice. But now, before we go over the last one, which is to cut across. Sit with me, please. Yes. Good, this one has no more than two meanings, and the first one is to make a shorter route. Make a shorter route, and my example for you is if we cut across the park. We'll get there and have the normal time. The second meaning is to affect people of different classes or backgrounds, like, for example, the word bullying issue cuts across various backgrounds for sure, which is so sad. With this said, we are done. If you think this video has been useful to you, please. Be sure to give it a thumbs up and follow for more. Please feel free to browse through all of my videos across the channel, and I'm sure you'll find something to your taste. There is something for everyone's taste on my channel. That's what I like to believe, and I'll see you again next time as well.

Taken from: <https://youtu.be/7aIJFc6T7K8>

6 Phrasal Verbs with DRAW! English Lesson!

Hey guys, how's it going? And I'm Ben from Talk Speak English. Now in today's lesson, we are going to learn six phrasal verbs with the verb draw. I just want to give a very quick shout-out to Barry B for suggesting this video idea. I couldn't make these videos without you guys and without your ideas and your support. So with that being said, if you have any questions or suggestions for future videos, let me know in the comment section. Now I'm sure you know all about phrasal verbs by now and how frustrating they can be. The fact is that phrasal verbs are everywhere, and being able to understand and recognise them is important when it comes to improving your English. Phrasal verbs are made with a verb and either a preposition or an adverb. But when do you use them, and why are some common and others not? It's all about taking small steps. As I like to say, learning English is not so much a sprint but a marathon. You make small steps every single day, and eventually you'll reach your English goals. In today's video, we're going to look at some common phrasal verbs with the verb draw. Are you ready? Let's jump straight in. So I'm sure many of you guys know the first meaning of the verb draw, as in to draw a picture. Well, did you know that draw is also used to mean move or pull, like in the first example, to draw back. We use draw back in two ways. One is transitive, which means that it requires an object, and the other is intransitive, which means it doesn't require an object. Now, the transitive version means to pull something apart to an open position. If you draw back the curtains, you are pulling them apart to see what's on the outside or to see what the weather is like. You can also separate the verb draw and the adverb back here and put the objects in the middle. We could say, for example, I draw the curtains back every morning when I wake up. The intransitive version, the one without an object, means to move away from something or someone when you are surprised or scared. She drew back after the dog tried to bite her. The phrasal verb focuses on the movement, moving it away from the danger. I was walking home the other day, and I saw a man acting suspiciously in front of me. I drew back when he stopped in the middle of the path. So in this example, we can see that it's saying I moved out of the way of the danger so that I felt safe. So we can use the phrasal verb draw back here to again have this idea of movement, the idea of pulling away from something or pulling it apart. So this is what I want you to think. Draw equals movement. With that being said, what do you think the next phrasal verb draw in could mean? To draw in or to be drawn in means to attract or to be attracted to something or someone. We have this motion that we are being pulled towards something, and it's almost opposite to the first example. Hey, how are you? I'm good, thanks. There was a street performer on the way home, and he was awesome. He really drew in a big crowd there. I stopped to have a look. There were probably about 100 people watching this guy. So in this example, because the street entertainer was interesting, it's this idea that he drew in or attracted a lot of people. You can also be drawn towards something or someone, and it has a very similar meaning here again. This idea of attraction or being attracted towards something. The passive voice is used here because we're focusing on the person or object that experiences the action. The boy was drawn towards the chocolate in the shop. Moths are always drawn towards light. In both these examples, we are focused on who receives the action. Draw out means to withdraw. If I draw out money from the cash machine, I take it out. I withdraw it. The same thing goes if I draw something out of my pocket. For example, if I draw out my wallet, I take it out of my pocket. Draw out has another common meaning when something goes on for longer than expected. You might have heard the phrasal verb drag out being used the same here as well. If I say that the boss drew out or dragged out the weekly meeting, it means that it went on for longer than expected. I know we can all relate to boring weekly meetings. Ugh. Moving on, draw up means to prepare an agreement or a contract. Now this one is separable, so you could say the company drew up a contract for existing members of staff, or simply the company drew up a contract. Used without an object, the intransitive version of draw up means to come to a stop. So if a train draws up at the station, it means it comes to a stop at the station. You can also use draw up beside something, which means to stop next to something. Finally, draw away means to pull something away. Draw away is often used when we want to distract someone or

something and move the attention away from a certain topic. After the recent scandal in the government, the prime minister was eager to draw attention away from it by promoting his new policies. In other words, the prime minister doesn't want to focus on the scandal. He wants to move the attention away from it. So there we are. Great work, guys. I know that phrasal verbs can be a little overwhelming, but I hope you can now understand that with phrasal verbs, it's all about spotting those patterns and recognising when to use them. So what did we learn today? Well, just remember that draw is often used when we want to express an idea of movement, either moving towards or away from something. Practice writing an example in the comment section down below, and I'll be happy to help you. Once again, guys, thank you so much for watching. Thank you so much for your support, and I will see you next time.

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Water Treatment Technologies for Green Hydrogen Electrolysis

Welcome to ReneEnergy.com on YouTube, the hub for all things renewable energy and sustainability. Our channel is dedicated to bringing you the latest innovations and insights in green energy, including cutting-edge developments like green hydrogen. Whether you're a sustainability veteran or just beginning your journey, we have something for everyone. Join us on this channel to explore inspiring projects for a sustainable tomorrow. We bring you the latest in renewable energy, sustainability, and cutting-edge technologies. And don't forget, for more in-depth information and resources, visit our website and subscribe to our newsletter for the latest updates and exclusive content. Water treatment is a critical component of green hydrogen production through electrolysis. While the process of splitting water into hydrogen and oxygen is powered by renewable electricity, the quality of the water used is just as important as the source of energy. Electrolyzers, the devices that perform electrolysis, require ultra-pure water to function efficiently and avoid damage over time. Impurities such as salts, minerals, and even trace organic compounds can reduce the efficiency of the electrolyzer, shorten its lifespan, and increase maintenance costs. For this reason, water treatment technologies are a cornerstone of green hydrogen production, ensuring that water meets the stringent quality standards required for this advanced process. Producing green hydrogen typically requires water with a resistivity of more than 1 mega-ohm per centimeter, mega-ohm-middle.cm, indicating extremely low levels of ionic impurities. To meet this benchmark, water undergoes several treatment steps, including pretreatment, primary treatment, and final polishing. These stages remove contaminants ranging from suspended solids to dissolved salts and trace organics. Given the scale of water demand, approximately 9 liters of water are required to produce just 1 kilogram of hydrogen. Effective water treatment systems are vital for the economic and environmental sustainability of green hydrogen projects. The journey of water treatment begins with pretreatment processes designed to remove visible and large-scale contaminants. Filtration systems are widely used at this stage, with companies like Paul Corporation and Eaton providing robust solutions for industrial applications. Filtration removes suspended solids, debris, and particulates that could clog downstream systems or interfere with subsequent treatment steps. Activated carbon filters, offered by brands like Hydronautics, target organic compounds, chlorine, and chloramines, which can corrode the sensitive components of electrolyzers. Together, these pretreatment technologies prepare the water for the more advanced purification processes that follow. Primary treatment is where water undergoes significant purification to meet the high standards required for electrolysis. Reverse osmosis, Rho, is one of the most effective technologies in this phase, capable of removing up to 99 % of dissolved salts and impurities. Rho systems rely on semipermeable membranes to separate water molecules from contaminants, producing water with extremely low levels of total dissolved solids, TDS. Dow Water and Process Solutions, now part of DuPont, is a leader in the Rho industry, offering its film-tech membranes known for their efficiency and reliability in demanding industrial settings. Complementing Rho systems, ultrafiltration, UF, is often used to remove colloidal particles, bacteria, and viruses. Suez Water Technologies and

Solutions provides cutting-edge UF systems under its ZWE brand, ensuring a high level of water purity. For the final polishing step, advanced technologies like deionization, DI, and electrodeionization, EDI, come into play. These methods are designed to remove the remaining ionic impurities, ensuring that the water achieves the ultra-pure quality needed for electrolysis. DI systems use ion-exchange resins to extract ions from the water, while EDI combines ion-exchange with electricity to continuously remove ions without the need for chemical regenerants. Evopool Water Technologies offers modular DI systems tailored to industrial applications, while IonPure, a division of Suez, specializes in EDI solutions that are highly efficient and scalable. Additionally, advanced oxidation processes, AOP, such as ozone treatment and UV photolysis, are used to remove trace organic compounds and ensure that the final water product is of the highest purity. Companies like Xylem and Aquionics are leaders in UP technologies, offering innovative solutions for green hydrogen projects. Given the critical role of water treatment in green hydrogen production, several brands have emerged as leaders in this space. Suez Water Technologies and Solutions is a global leader, providing end-to-end water treatment solutions for hydrogen projects. Their portfolio includes ultrafiltration membranes, EDI modules, and advanced monitoring systems that ensure consistent water quality. Dow Water and Process Solutions, under the DuPont brand, offers FilmTech membranes that are widely recognized for their high performance and durability. These membranes are a cornerstone of many green hydrogen projects around the world. Evopool Water Technologies is another major player in the industry, specializing in DI systems that deliver the ultra-pure water required for electrolyzers. Their systems are modular and can be customized to meet the specific needs of hydrogen plants. Hall Corporation, known for its advanced filtration solutions, ensures that pretreatment processes are robust and effective, protecting downstream systems from damage. Hydronautics, part of the Nitto Group, provides Rho membranes and activated carbon filters that are tailored to the unique demands of green hydrogen production. Veolia Water Technologies, with its comprehensive water management expertise, offers integrated solutions that include Rho, EDI, and wastewater recovery systems. The role of water treatment technologies is becoming increasingly important as the scale of green hydrogen production grows. Large-scale hydrogen projects often face challenges related to water scarcity, particularly in regions where freshwater resources are limited. To address this, companies like Xylem are developing desalination technologies that convert seawater into ultra-pure water, ensuring a consistent supply for electrolysis. Kizenkrupp Utochlorine Engineers and Nell Hydrogen are also exploring seawater electrolysis, which integrates desalination with hydrogen production to reduce reliance on freshwater sources. Another emerging trend in water treatment is the integration of digital monitoring and automation. Companies like Endress Plus Hauser and ABB are incorporating IoT and AI technologies into water treatment systems, enabling real-time quality control and process optimization. These advancements not only improve the efficiency of water treatment but also reduce operational costs and downtime. Additionally, there is growing interest in combining water treatment plants with renewable energy systems, such as solar and wind, to further reduce the carbon footprint of green hydrogen production. Despite these advancements, challenges remain. Water scarcity in arid regions poses a significant barrier to scaling up green hydrogen projects, emphasizing the need for innovative solutions like wastewater recycling and desalination. Cost is another challenge, particularly for smaller hydrogen projects that may not have the resources to invest in advanced water treatment systems. To overcome these obstacles, water treatment companies are focusing on developing cost-effective and scalable solutions that can meet the needs of both large and small projects. Water treatment is not just a technical requirement, but a cornerstone of sustainable green hydrogen production. It ensures that electrolyzers operate efficiently and reliably, minimizing costs and environmental impact. Companies like Suez, DuPont, Evoqua, and Veolia are leading the way with innovative technologies and solutions that align with the goals of the hydrogen economy. At ReneEnergy.com, we are committed to providing insights and resources to support the adoption of these technologies, empowering stakeholders to embrace a cleaner, greener future powered by hydrogen. The future of green hydrogen

depends on reliable and sustainable water treatment systems, and through innovation and collaboration, the industry is well-positioned to meet this challenge. Thanks for tuning into the ReneEnergy.com YouTube channel. We trust you found this episode enlightening and motivating. There's a world of innovation and opportunity in sustainable energy, and we're delighted to share this journey with you. Stay in the loop with the latest on renewable energy and sustainability by visiting our website and subscribing to our newsletter. Your support is immensely appreciated; it's truly invaluable to us. Don't miss our next video on New Trends in Renewable Energy. Follow us on social media for the latest updates. Enjoy the video? Like, subscribe, and share for more green insights. Thanks for watching.

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Unit 4

Air Pollution. Acid Rain and Ozone Depletion

WHO: Breathe Life – How Air Pollution Impacts your Body

Air pollution it lurks all around us, preying on the young and old. It slips unnoticed past your defenses and assaults your lungs, heart, and brain. Its deadliest weapons are invisible, poisonous particles that can be as small as a molecule. With every breath, they break through your lungs' protective barriers. There, they trigger inflammation as your system tries desperately to fight back. But these tiny intruders penetrate those defenses, lodging toxic compounds even deeper, sowing the seeds of cancer. They slide straight into your bloodstream, sabotaging your entire body. They inflame and constrict your blood vessels, increasing blood pressure until one day causing a stroke. The particle prowlers dislodge fatty plaque that may have built up from your diet. They weave clots that can be deadly blockers of blood flow to your heart or brain. With each new case of heart attack, stroke, lung disease, or cancer, air pollution adds another life to its hit list. Let's stop this invisible killer.

Taken from: <https://www.youtube.com/watch?v=GVBey1jSG9Y>

SUPER USEFUL PHRASAL VERBS with FALL: Build Your Vocabulary

Let's talk about fall phrasal verbs. And I'm not really talking about the fall season, I'm talking about phrasal verbs that all have the word fall. And phrasal verbs can be confusing for a couple of different reasons. You have the verb followed by a preposition, and when that preposition changes, well, the meaning is likely going to change. And phrasal verbs, many of them have multiple meanings as well. And as we go through the lesson, I will talk to you about that. And the one thing that I will really try to do as I teach you these different phrasal verbs is to give you some context and talk about, well, how you might often hear people use these phrasal verbs or how you can use them if you're having a conversation with someone else. Let me quickly introduce myself in case this is your first time here. My name is Wes, and the channel is Interactive English. It's all about trying to help you reach your fluency goals. If that is what you would like to do, please subscribe, turn on notifications so that you will learn about future lessons. Let's start with our first phrasal verb, our first fall phrasal verb, which is to fall apart. And if you say that something falls apart, it's really, it just means it's breaking into many pieces, or you could use it to refer to something that's breaking in general. So maybe you build something. It breaks into many pieces, you could say, well, it fell apart. Or if I have something like maybe a table, somebody could say, well, yeah, this table, it's really old. It's falling apart. It's not literally breaking into all these different pieces. You're really just saying it's kind of breaking down in general. It's not, it's not working very well. You need a new table because this one is falling apart. Well, we could use the extra money, and this house is falling apart. Then we have fallen behind. And this means that you fail to do something fast enough or on time, or even that you're just able to maintain some level. So I think people often use this with work, and maybe they have a project, and they have other things that they need to do. And you could say, yeah, I'm falling behind with my work. Or in the context of education, especially when you're talking about trying to maintain a certain level. If you're having difficulty in a class and you feel like all the other students are getting ahead of you, then you could say, well, the class is so difficult. I think I'm starting to fall behind, and I'm not able to maintain a certain level. Fall behind. Spring session should... You'd be expected to tutor so he doesn't fall behind. In that respect, your classroom experience may actually be of use. Fall through. This phrasal verb means that something is just not going to happen. And I think quite often we use this to talk about plans. We have things that we want to do. We hope that they happen. But if they don't, then you could say, this weekend my plans just fell through, and it's not going to happen. That was great. What are you doing here? Something fell through, so I was able to come back a few days early. Then I have a three-word phrasal verb for you which is to fall back on. And what this means is that you use something, especially in the form of financial

support, when everything else has failed. And you might say that, well, I can't find a job right now, and that's okay because I can always fall back on my savings. And I have that financial support that I can fall back on. What's your financial situation like? Do you have savings to fall back on? Do you come from wealth? No, no, no. And then I have a very common phrasal verb, which is to fall down. It means to just fall to the ground or floor. And you could use this to talk about a person or a thing. Now, it is a little similar but also different from falling over, which really means in that case that something is, well, falling on its side when it was vertical. So if I were to use them, maybe interchangeably, I could say, I tripped and fell down. It's the same as, well, I tripped and fell over because I'm no longer standing, and I'm on my side. If I were to say something like, I hung a painting and yesterday it fell down. Because it's probably falling to the ground or floor, you're not going to use fall over in that case. And because of that, I think it's so much more common to use fall down. Fall down an elevator shaft? What the hell does this mean? Fall down an elevator shaft? I don't know. I just bring the scripts. Still, it's good to be a little more specific depending on the context. If you want to say something is on its side, it's not vertical anymore; it fell over. What are you doing down there? I fell over. What do you fall over for? I didn't do it on purpose. Well, come on then. And then we have fall off, which has a couple of different meanings. So the first one is that something becomes detached or separated from something else. I hung a painting, and then the next day it fell off the wall. And often I think people will say what this thing is falling from. You could say the leaves are going to fall off the tree. What do we do when we fall off the horse? We get back on. The next meaning of fall off is when the rate or quality of something is becoming slower or smaller. And often I think you may use it in this context when talking about business, and you could say that sales are starting to fall off, it's becoming slower, or maybe new memberships have been falling off recently, and hi. So you can use the fall off in that context of business. Do you have anything you want to add? The next phrasal verb is fall out. It also has a couple of different meanings that I want to teach you. The first one is that to come out of something by falling. You could say that something falls out the window. The second meaning of fall out is to become loose and separate from your head or mouth. So think about it this way. You could say that somebody's hair is falling out. Or maybe you have a tooth. It's a little loose, and then it falls out. So in this case, when talking about hair or teeth, you're not going to use fall off. You will use fall out. Then we have fall for. Also, two meanings. The first one is that you develop romantic feelings for someone. If somebody were to say I'm falling for him or I'm falling for her. They're talking about developing those romantic feelings. The second meaning is to be tricked or fooled by something. I think a common expression you might hear in a TV show or movie is, like I fell for the oldest trick in the book. And that just means that you were tricked or deceived by something that you should have known better, because it happens quite often. And then there's fall into. Also a couple of different meanings. The first one is that you go into something like somebody falls into the pool, or you could also say that you suddenly have a condition, and you might fall into a coma. And then there are some useful idioms that have this phrasal verb. You could say that something falls into place. That things happen in a satisfactory way without any problems, and things just fall into place. It was like everything was finally falling into place. You know, like it was fate. You could also use the idiom to fall in someone's lap and when something falls into your lap it really refers to well something happens in an unexpected way that you were not planning for you weren't trying to get this it just falls into your lap and you're often referring to something that's positive, something desirable Maybe you could say well I wasn't looking for a new job but this opportunity just fell into my lap. It's up to you to make the best of it. It's not like opportunity is just going to fall into your lap. I hope that you found this lesson useful. I hope you learned something new and that you can well now go out there and try to use some of these phrasal verbs in everyday conversation. They are pretty common, they are very useful, and I hope that you understand it a bit better by talking about some of the contexts in which we use these different phrasal verbs. If you enjoyed the lesson, please hit that like button as always. Thank you so much for watching, and I will see you next time. So long.

Taken from: youtu.be/XUa637ZuDh0

Phrasal Verbs with “Give”

Hey there! Welcome back to another English lesson. Today, we’re diving deep into phrasal verbs with give. Now, these are super common in everyday speech, and mastering them will definitely help you sound more natural and fluent. So, let’s jump right in. We’ll start with giving up. You probably hear this one all the time. It simply means to stop trying to do something or to quit a habit. Imagine someone struggling to learn how to play the piano. They keep practicing, but eventually say, you know what? I give up. They’ve decided to quit. Or, think about someone who’s been trying to quit smoking for years. Finally, after a lot of effort, they managed to give up smoking. They’ve successfully quit the habit. Now, moving on to give in. This one is about surrendering or reluctantly agreeing to something. Picture two people arguing, let’s say a mother and her teenage son. After hours of back and forth, the mother sighs and finally gives in, letting him stay up late to finish his project. She didn’t really want to, but she gave in. Or, in a different situation, imagine a sports team fighting hard against a stronger opponent, but refusing to give in. They just keep pushing forward. Next, we have give away. This one’s interesting because it has two different meanings. The first is about revealing a secret. For example, if someone tries to hide their emotions, but the look on their face gives them away, it means their true feelings were revealed. The other meaning is to give something for free. Think of a charity drive where people are giving away old clothes or toys to those in need. No payment, just kindness. Alright, let’s talk about give out. This one can mean to distribute something or to stop working. Picture a teacher giving out test papers to a classroom full of students. She’s distributing them, handing them out. But give out can also describe something that stops working, like when your phone battery suddenly dies. You’re mid-conversation, and poof, your phone just gives out. Moving on to give off. This one’s all about producing something like heat, light, or even a smell. Imagine sitting by a warm, cozy fire. The fire gives off heat, making you feel comfortable. Or, think of a garden full of flowers. They give off a beautiful fragrance, filling the air with a sweet scent. Now, here’s one you might hear less often. Give over. It’s a bit old-fashioned, but still useful. It can mean to dedicate or hand something over to someone else. Picture someone handing over the keys to their house to a friend while they’re away. They give the keys over for safekeeping. And sometimes, it’s used informally to mean stop doing something, like when someone’s being really dramatic, and you hear, oh, give over. It’s like saying, cut it out. And then we have give up on. This is when you lose hope or stop believing in something or someone. Imagine someone pursuing a difficult dream, like becoming a professional artist. Even when things get tough, they tell themselves, I’ll never give up on my dreams. Or, on a sadder note, someone might feel like their friends have given up on them. They feel abandoned, like others have stopped believing in them. There’s also give into. It’s similar to give in, but often emphasizes pressure or temptation. Like when someone tries to avoid eating sweets, but eventually gives into the temptation of a delicious slice of cake. They just can’t resist. Or maybe someone gives into peer pressure, even though they know it’s not the right choice. Next is give oneself up. This one’s dramatic. It means to surrender, especially to the authorities. Imagine a fugitive who’s been hiding for years, but finally decides to give himself up to the police, or someone who just can’t keep running from their problems and decides to face them head-on. And finally, give back. This one’s all about returning something or contributing positively. When you borrow a book from a friend and return it, you’re giving it back. But it’s also used in a more abstract sense, like when someone volunteers or does charity work. They’re giving back to the community. So, there you have it. Phrasal verbs with give are super versatile and really important to know. And the best way to master them is to hear them in context and practice using them yourself. Thanks.

Taken from: <https://www.youtube.com/watch?v=GqaL-6ouh4Q>

Air Quality and Healthy Ecosystems: Applying Critical Loads

Air pollution refers to the release of chemicals into the air that are harmful to human health and the planet. The World Health Organization estimates that 92 % of people live in places with harmful levels of air pollution and that air pollution is the leading cause of early mortality worldwide. Air pollution is also a major threat to our ecosystems and the many living things within them. Nitrogen and sulfur pollution affect ecosystems across the United States and their ability to provide people with fresh air, clean water, food, and shelter. As nitrogen and sulfur deposition increase and permeate the ecosystem, more organisms and processes within an ecosystem are harmed. In the United States, the Environmental Protection Agency and state governments have the authority to regulate nitrogen and sulfur-containing pollutants to protect human health and ecosystems. Land management agencies like the USDA Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service, and National Park Service also have management responsibilities to protect sensitive species and ecosystems. One concept they use to do this is critical loads. As you recall from the other videos, a critical load is the level of deposition at which an ecosystem begins to experience harm. Let's take a closer look at how land managers are currently using critical loads. Air specialists may use critical loads when reviewing Clean Air Act permit applications. They use critical loads to decide whether new developments near protected preserves will increase air pollution to detrimental levels. Wilderness managers use critical loads to assess trends in wilderness character. They may use critical loads to interpret monitoring data and predict where and how nitrogen and sulfur levels will impact sensitive plants and animals. Forest and park managers use critical loads in planning. They compare critical loads to current or projected future deposition in order to prioritize restoration projects, build deposition reduction partnerships, and manage habitat for sensitive species. For many ecosystems, land managers consider multiple critical loads when assessing the effects of air pollution and planning for mitigation measures. For example, in Rocky Mountain National Park, there are critical loads that protect sensitive diatom communities in high elevation lakes, critical loads that protect the iconic herb communities of the high alpine meadows, critical loads that protect lichen diversity, critical loads that protect tree growth and survival, and critical loads that protect soil and watershed integrity. When considered together, these critical loads show that as deposition increases, nitrogen affects a greater proportion of the ecosystem, including organisms and non-living components like soil and water. To mitigate these effects, Rocky Mountain National Park managers are working with local partners to reduce their nitrogen emissions on days when the wind blows pollutants into the park. However, it's important to consider that even a single critical load can provide protection for many species within an ecosystem because biological diversity sustains the network of interactions between living organisms. Let's examine a specific case to better illustrate how a single critical load can protect other species. Mycorrhizal fungi live in the soil and form partnerships with tree roots. These fungi help trees absorb nutrients and water from the soil. They also facilitate the exchange of nutrients between trees. If nitrogen deposition exceeds the critical load for mycorrhizal fungi, it reduces the growth of the more sensitive fungi and diminishes the fungi's partnerships with tree roots. As a result, the trees are less able to absorb nutrients and water from the soil and more vulnerable to drought or insects. The stressed trees may grow more slowly, producing fewer leaves and seeds. These trees then provide less food and habitat for wildlife. Therefore, if land managers use critical loads to protect mycorrhizal fungi in an area, they will also be protecting the trees and animals connected to them. By preserving this biodiversity with critical loads, land managers will also be making ecosystems more resilient against other environmental changes, such as climate change or invasive species. We hope this series of videos has illustrated the significance of air quality in maintaining healthy ecosystems. We also hope it showed how land managers use critical loads to predict and mitigate harm to ecosystems. For more information, visit the National Atmospheric Deposition Program's Critical Loads of Atmospheric Deposition Science Committee webpage. On this site, you can learn about status and trends in deposition, critical loads, and critical load exceedances. And finally, remember, we can all do our part to help reduce air pollution by increasing energy efficiency, reducing the waste of energy, food, and goods, transitioning to clean fuels, making environmentally friendly consumer choices, eating a more plant-centered diet, and recycling and reusing more.

Taken from: <https://youtu.be/-dqM-fnWbpI>

Unit 5

Environment and Sustainability

Sustainability in Everyday Life | Sustainability

In our day-to-day life, we face small actions that can make a big difference for the environment and for our pocket. For example, when choosing lighting for the home, did you know that LED bulbs can be a great saving over conventional bulbs? They consume less, so having them turned on for the same length of time means less spending at the end of the month. This way, we can save almost \$220 a year while we contribute to energy savings.

For short trips, the bicycle is a better option than the car. Aside from saving money on gas, the bicycle is a zero-emissions vehicle, while the car's consumption increases as you go, emitting up to 1.7 kg of carbon dioxide every 10 km.

In the kitchen, we can also reduce costs. A simple action like covering the pot while cooking saves 25 %, or even 50 % if we use the pressure cooker. This way, we can save money by covering the pot and using the pressure cooker.

We continue taking care in the kitchen. Recycling used oil prevents severe environmental damage. Did you know that 1 liter of oil pollutes 1,000 liters of water? Furthermore, the recycled oil can be used to make soap, fertilizer, or fuel.

When shopping, we can contribute to sustainability. Always look at clothing labels and buy fair trade products, which guarantee respect for biodiversity and the workers who have made the garment.

Taken from: <https://youtu.be/kZlrIQDf1nQ?si=jbfm8LlrCVOYpApi>

Keep: Phrasal Verbs

Keep up, meaning, continue, continue with, go on with, carry on. Similar words, bear up, carry on, continue. You have done a good job. Keep it up. I can't continue working like this. If I keep it up much longer, I'll get totally burned out. Great work. Keep it up. You are doing better in math. Keep it up. Keep up, meaning, move or progress at the same rate as someone or something else. Similar words, balance, compete, and go on. She was glowing and talking so fast. Jackson could barely keep up. Somehow, she managed to keep up with him. Has he been keeping up with other kids in the class? You have to work hard to keep up with others. You're walking too fast. I can't keep up with you. Keep something around, meaning, to keep something near you. Similar words: conserve, control, hold, maintain, possess, preserve, carry, deal in, deposit. He is never seen without his bag. He always keeps it around. I would recommend as a cheap flashlight to keep around when you need some light. I plan to buy many more of these to keep around the house. I got Cliff Kid organic twisted fruits to keep around for my grandchildren. I would buy this to keep around for when I need a quick meal. Keep off, meaning, do not touch something. Similar words: keep away from, avoid, stay off. It was raining very hard and he had a very large umbrella to keep off the raindrops. I am afraid of dogs. Keep your dog off to me. You should keep pencils off from your eyes. The explorers made a campfire to keep off wild animals. He fixed a net to keep the mosquitoes off. Keep out, meaning to stop from entering, to prevent someone from doing something. Similar words: defend, resist, keep away, keep off, hold off. I prefer to keep out of arguments about money. Building work in progress. Keep out. Try to keep a wet umbrella out of my home. Keep your muddy shoes out of the house. Cars should be kept out of the city center. Keep away, meaning, make someone stay away. Similar words, prevent, stay away, avoid, keep clear, restrict, hinder, defend one from, and keep off. I've told him to keep away, but he won't listen. You should keep away from fried foods. You can't keep the kids away from the mobile. Just keep away from the bad boys. Keep away from the dog.

Taken from: <https://youtu.be/XxnkqAQGGP4>

Phrasal Verbs con MAKE

Hi, let's create a connection and enjoy the ride. Come join us here at Open Minds. Hi everybody, welcome back to another Open Minds video lesson. I am teacher Morgan, and in this lesson, we are going to be looking at some phrasal verbs with the verb to make. So have a look at the first slide. We can see make and all of the different phrasal verbs that we're focusing on in this video. We have make up, make way, make for, make up for, make out, make off, and make over. Let's have a look at the first phrasal verb. Make up. Now this is to invent something like a story or a lie. For example, look at Pinocchio. Don't make up a story, don't invent a story, tell the truth. Okay, let's have a look at the next one. Make way. Now, make way to create space or an opportunity for someone or something. Let's have a look at the example. Make way for the ambulance. So move and create space to let the ambulance pass. Make way. Okay, the next one. Make for. So this means to go or move towards something. Let's look at the example. School's out. School's finished. Let's make for the bus. Let's go to, go towards the bus. Okay, the next one. Make up for. This is to compensate. For example, I'm sorry, let me make up for breaking your PC. Here is some money. I will make up for it. Okay, let's have a look at the next phrasal verb. Make out. Now, make out means to manage with difficulty to see or hear something. Something that's difficult to see or difficult to hear. For example, I can barely make out this writing. This writing is very difficult to read. I can barely make it out. Okay, the next one. Make off. This is to run away, to escape. Let's look at the example. The thief made off with the money. He ran away with the money. He made off. Okay, the next one. Make over. This is to renovate or to renew something. For example, I made over my house. I renovated my house. It was old and now it is new. I made over my house. Okay, have a look at the last slide and see if you can remember all of the different phrasal verbs with make. Okay, guys, that's all for today's lesson. I hope you enjoyed speaking about phrasal verbs with make, and I hope I will see you guys in another lesson. Bye!

Taken from: <https://youtu.be/sWFrN8M0eEo>

Sustainability & Reduction of Carbon Footprint

It is a simple yet profound truth that the health of our planet is inextricably linked to the health of our own endeavors. Here, on this remarkable world, every enterprise, large or small, draws its resources from nature and its success from the society it serves. Today, on the 16th of July 2025, the call to operate in harmony with the natural world has never been more urgent. For businesses across the United Kingdom, embracing sustainability is no longer a peripheral concern but a central pillar of survival and prosperity. The rising costs of energy and raw materials, driven by a changing climate and resource scarcity, present a clear economic imperative. To ignore this is to risk being left behind, vulnerable to the very real shocks of an unstable world. The modern consumer, more informed and connected than ever before, is now a powerful force for change. People are increasingly choosing to spend their money with businesses that reflect their own values, and a commitment to the planet is paramount among these. Studies consistently show that customers are not only willing to choose sustainable brands but are often prepared to pay a premium for their products and services. This shift in preference is a quiet revolution, a clear signal that a company's environmental credentials are now as vital as its price point or quality. A strong sustainability strategy therefore, becomes a powerful tool for building brand loyalty and attracting a new generation of conscious consumers who see their purchasing power as a vote for a better future. Beyond the immediate pressures of cost and consumer demand lies the immense opportunity for longterm resilience and innovation.

Businesses that proactively reduce their carbon footprint often discover remarkable efficiencies they never knew existed. The process of examining every aspect of an operation, from the light bulbs in the ceiling to the supply chains stretching across the country, can uncover waste and spark new, more intelligent ways of working. This journey towards sustainability is not simply about reduction, it is about reinvention.

It fosters a culture of forward thinking, making a business more adaptable, more robust and ultimately more prepared for the challenges and opportunities of the decades to come. Consider the example of a small British brewery that transitioned to renewable energy and sourced its barley from local regenerative farms. Initially the investments seemed significant, yet within a few years their energy bills plummeted, their supply chain became more secure and they developed a compelling story that resonated deeply with their local community. They did not just reduce their impact, they strengthened their identity and secured their place in the market. Their success illustrates a fundamental principle. What is good for our planet is invariably good for business.

It is a symbiotic relationship waiting for us to nurture it. The first step on any great journey is to understand precisely where you are starting from. For a business seeking a sustainable future this means measuring its carbon footprint.

This is not as daunting a task as it may sound. It is simply an accounting of the greenhouse gas emissions produced by your activities from the electricity that powers your computers to the fuel used in your delivery vans. Establishing this initial baseline is absolutely crucial.

It provides a clear factual starting point, transforming a vague aspiration into a tangible goal. Without this data efforts can be misguided and progress impossible to track. It is the compass that will guide every subsequent decision on your path to reducing your environmental impact.

Once you have this baseline the journey can begin with simple yet remarkably effective steps to conserve energy. Look up. The lights in your office, workshop or store are a perfect place to start.

Switching from traditional incandescent or fluorescent bulbs to modern energy efficient LEDs can reduce lighting related energy consumption by up to 80 percent. This one change delivers immediate and significant cost savings. We can go further by installing smart sensors that automatically turn lights off in empty rooms or motion-activated lighting in less frequented areas like corridors and storage spaces.

It is a simple intelligent adaptation much like a creature that conserves its energy, acting only when necessary. Then consider the very air within your workspace. The systems that heat and cool our buildings are enormous consumers of energy, often operating inefficiently through sheer neglect.

A thorough review and regular maintenance of your heating, ventilation and air conditioning systems can yield substantial savings. Upgrading to a modern energy efficient system or even installing a smart thermostat that learns your daily patterns prevents the needless waste of heating or cooling an empty building. It is a logical step that reduces both your carbon emissions and your overheads, proving that ecological responsibility and fiscal prudence can and should walk hand in hand.

These initial actions measuring your footprint and tackling energy use create powerful momentum. They provide what we call quick wins, tangible successes that demonstrate the value of the sustainability journey to your entire team. When staff can see the electricity bill shrinking and hear about the tons of carbon saved, the mission becomes real.

It builds confidence and enthusiasm for the more ambitious steps that lie ahead. Much like a small seed that germinates and pushes the first green shoot above the soil, these early efforts are a visible sign of the profound and positive transformation that is underway within your organisation. A business does not exist in isolation, it is part of a complex interconnected web of suppliers, partners and distributors.

To truly embrace sustainability we must look beyond our own four walls and examine the entire length of our supply chain. This means asking critical questions about where our materials come from. Are we sourcing from local producers to reduce the food miles and support our regional economy? UK companies like Riverford Organic Farmers have built their entire model on this principle, creating a robust local network that benefits both the environment and the community. Choosing suppliers who hold recognised certifications such as Fairtrade or Forest Stewardship Council provides assurance that your partners share your

commitment to ethical and environmental standards. The movement of goods is another critical area for consideration. Our reliance on fossil-fuelled vehicles for transport is a major contributor to national emissions.

The transition to a greener fleet is now more accessible than ever. Encouraging the use of electric vehicles for deliveries or company cars, supported by government grants and a growing charging infrastructure is a powerful statement. For smaller local journeys, subsidising cycle-to-work schemes can improve employee well-being while cutting carbon.

Furthermore, intelligent route planning software can optimise delivery schedules, reducing mileage, fuel consumption and driver time. It is a simple case of using technology not to conquer nature but to work more intelligently within its limits. We must also confront the waste we produce. In the natural world, there is no such thing as waste. Every by-product of one organism becomes a resource for another in a perfect closed loop. Our industrial and commercial systems must strive to emulate this incredible efficiency.

This begins with a thorough waste audit to understand what you're throwing away and why. Simple measures such as providing clearly labelled recycling bins are a start but we can go further. Can you partner with organisations that specialise in upcycling, turning your waste materials into new, valuable products? Could you redesign your packaging to eliminate single-use plastics, opting instead for compostable or reusable alternatives? The goal is to move from a linear take-make-dispose model to a circular one where resources are kept in use for as long as possible.

Consider the success of companies that now offer refillable options for their products, from cleaning supplies to coffee. They have not only slashed their packaging waste but have also cultivated a loyal customer base that appreciates the convenience and the reduced environmental impact. Every piece of plastic avoided, every item diverted from landfill is a small victory. When these actions are multiplied across thousands of businesses they become a powerful force for collective change. It is about seeing waste not as a problem to be disposed of but as an opportunity for innovation and a resource to be valued, honouring the finite and precious materials our planet provides. True, lasting change is not achieved through technology or policy alone.

It is born from the shared passion and commitment of people. A business's greatest asset in its sustainability journey is its staff. To succeed you must cultivate a vibrant green culture where every employee feels empowered to contribute.

This can be fostered through engaging initiatives like staff pledges where teams commit to specific actions or friendly competitions, between departments using apps to track energy savings or recycling rates. Regular training and workshops can demystify sustainability, explaining the why behind the new policies and providing practical tips for both the workplace and home. When your team is knowledgeable and inspired they become your most powerful advocate.

This dedication to nature can extend beyond the office walls and into the local community. A business can become a steward of its immediate environment. This could be as simple as creating a small green space for employees, planting a wildflower meadow to support pollinators or installing a bug hotel on the premises.

Participating in local conservation projects or helping to restore a nearby habitat strengthens community ties and demonstrates a tangible commitment. By aligning these local actions with broader global frameworks such as the United Nations Sustainable Development Goals, a business can show that it is part of a worldwide movement contributing its unique part to the collective effort of healing our planet. Of course to maintain momentum and credibility it is essential to track your progress and to be open about your journey. This is where the baseline measurements you established at the start becomes invaluable. Set clear measurable targets, for instance a goal to reduce carbon emissions by 20 % within three years or to achieve zero waste and landfill status. Regularly report on your progress against these targets, sharing both the successes and the challenges. This transparency is fundamental to building trust. Publishing a simple annual sustainability report on your website allows customers, investors and employees to see the tangible results of your efforts, transforming your claims into verifiable facts. In the

end, a deep and authentic commitment to sustainability is one of the most powerful strategies for building a resilient and successful business in 2025 and beyond. It reduces costs, attracts talent and inspires customer loyalty, but more than that it builds trust, the most valuable currency of all. A business that openly demonstrates its care for the planet and its people earns a level of respect that cannot be bought. It secures its social license to operate and builds a legacy of which everyone involved can be proud. It is a declaration that you are not just in business for profit, but for a purpose to contribute positively to the only home we have.

Taken from: <https://youtu.be/7YwDMeEDY74>

Unit 6

Conventional and Sustainable Energy

Renewable Energy 101

Renewable energy. Renewable energy is a term used to describe a group of energy technologies derived from sources that do not deplete, or that can be replenished within a human's lifetime.

The most common renewable energy sources are: solar, which harnesses the Sun for energy; wind, which utilizes the motion of wind to create electricity; hydropower, which uses moving water to generate power; biomass, which refers to a large, large group of technologies that use living or recently living organisms and waste to create energy; tidal, uses the rise and fall of the tides to create electricity; geothermal, which uses the internal heat from the Earth for energy.

Nuclear energy is not considered a renewable energy source. It is considered an alternative energy source. While renewable energy accounts for a minority share of the world's energy supply, it is also the fastest-growing energy supply on the planet.

Renewable energy is sought after because it is a clean source of energy, meaning that it does not directly produce greenhouse gas emissions or air pollutants. While renewable energy sources are better for the environment, they also face several challenges – the main ones being low efficiencies, high capital costs, and intermittency. That's renewable energy.

Taken from: <https://youtu.be/T4xKThjcKaE?si=Yzl5YAUwhFy9Zb3x>

Phrasal Verbs - 4 - Run - Part 1

Hello, students, and welcome back to my channel. I'm Julie. And tonight in this lesson, we're going to be working on more phrasal verbs, but this time with run. And because there were so many of them, I decided to cut the lesson in half, split them up to make it more manageable for you guys. So let's get started. If you have already watched phrasal verbs one, two, and three, you already know this part, but we'll go over it again. Phrasal verbs are used everywhere in English with all verb tenses and in all types of communications, including daily conversations, emails, movies, books, news, social media, business, and academic settings. Phrasal verbs are essential for achieving natural fluency in English, and your vocabulary will be very limited without them. Learning all these phrasal verbs can be challenging at times, because sometimes the phrasal verb carries a meaning that is much different from the verb alone. There are many phrasal verbs in English, and to become fluent, you must learn all of them to master your comprehension and speaking ability in order to have more expressive and natural conversations. But don't worry, because in this lesson, I'm going to give you lots of examples so that you will be able to use these words correctly and with confidence. So let's get started with phrasal verbs with run part one. Run into, to meet someone unexpectedly or to collide with something, to encounter a problem or difficulty, or to reach a large number. He was texting while driving, and he ran into a tree on the side of the road. We ran into some problems with the new software, and the IT department is still working on it. Her medical bills could easily run into the tens of thousands of dollars. Our biggest project ran into delays because of budgeting issues. You'll never guess who I ran into at the event last night. That's right, your handsome brother. Oh, and there he is, the handsome brother. So nice to see him again. She looks so happy. Run out of, to have no more of something left, or to use up the available supply of something. I ran out of gas on my way to work this morning. She tried to explain it to him several times, but then she just ran out of patience. If you keep spending like that, you will quickly run out of money. We're running out of time. I'm afraid we won't meet the deadline. I don't know what to do. I've run out of ideas. Can you go to the store for me? I ran out of butter, and I'm making cookies, so I need it now. Oh, she's making those kinds of cookies. Those are my favorites. Go get the butter. Run over, to hit or drive over someone or something with a vehicle, or to quickly practice or review something, or to overflow like a

liquid. I'm so sorry. I accidentally ran over your bike in the driveway. Let's run over this one more time before the presentation. You forgot to turn off the water, and now the bathtub is running over. I feel terrible. I ran over a cat, but miraculously, it survived with only minor injuries. She ran over a nail on the road and now her tire is flat. There is a squirrel on the road. Drive slowly, or you will run over it. Don't run over that cute little squirrel. Run away, to leave a place, location, or situation, usually to escape responsibility, control, or danger. You can't always run away from your problems. He ran away from home when he was 18 and joined the army, and he never regretted it. She said that sometimes she feels like running away from all her responsibilities. Someone left the gate open, and my dog ran away. Oh no, and there we found him on the beach, running on the beach. What a smart dog. He ran away from home and ran to the beach. Run by, to share or express an idea or thought with someone, usually to get feedback and opinion, or approval. We, no, you have to run that by our legal team before you go public with it. I ran the new budget by my boss, and she approved it. Be sure to run it by the finance department first in case they have any suggestions. I need to be prepared for my presentation tonight. Can you run it by me again so that I really understand your plan? Yes, of course. Here's my plan. It's so easy. Run off, to leave quickly, suddenly, or secretly, or to reproduce or print copies. The thieves ran off with a lot of jewelry before the police arrived. She ran off with her boyfriend when she was 20 years old and got married in Las Vegas. We have more people than expected in the meeting today. Can you run off a few more copies of these documents, please? The dog grabbed the meat that was cooking on the barbecue and ran off with it. Oh no, bad dog. He took the meat off the barbecue. Oh well, at least he got a little treat. It's okay, there's more. Run on, to continue for longer than planned or necessary, or to talk too much or unnecessarily. His acceptance speech ran on forever. I thought it would never end. I don't know why I had to attend that meeting. It ran on for three hours, and now I'm really behind in my work. If she starts talking, she will just run on for hours about nothing. The movie ran on unnecessarily, and I got bored, lost interest, and fell asleep on the couch. It happens to all of us sometimes. Run down, to hit someone or something with a vehicle or to criticize or to lose power or energy or to list, itemize, or explain things or to go through or summarize something. You are working so much these days. Be careful not to run yourself down. You will create a toxic work environment if you constantly run down your co-workers. Can you run down the list of things we need for the trip? I don't want to forget anything. He didn't look both ways when crossing the street, and he was almost run down by a bus. And look at him now, he's saying, yes, I didn't get run down by the bus. I survived another day in this big city. Keep going. Run over to make a brief visit to a location, usually to obtain something. Can you run over to Stella's house to pick up the chairs for the party tonight? She just ran over to the post office to get some stamps. I will run over to the bakery to get some desserts for our guests tonight. Great job. We're done with that. That was phrasal verbs with run part one. Okay, great. So, if that video helped you, if you liked it, you can put a like on the video, you can subscribe to the channel, or just leave a comment down below. If you need help with your English and you want to improve quickly, you can get yourself a copy of Basic English. This is the fourth edition. We know that because it's written right up here at the top. This workbook is published and distributed everywhere in the world by McGraw-Hill. If you guys decide to get a copy of this workbook, which I think you should, you can start on the first page and complete every page right through to the end of the workbook. The answer key is at the back to support you while you are learning. It's available everywhere in bookstores and online, and you will find it very easily on Amazon. If you guys are having difficulty with your verb tenses, you can get yourselves a copy of English Verb Tenses. If you get a copy, I want you to start on the first page, complete every page right through to the end of the workbook. The answer key is at the back to support you while you are learning. Available everywhere, including online stores, bookstores, and very easily on Amazon. So that's great. So now I'm going to get ready to put up number two for you guys so that you'll really know all your phrasal verbs with run. So for now, I'm going to say goodbye for now. I'll see you in the next lesson. Bye.

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Put Phrasal Verbs: 9 Phrasal Verbs using 'Put' with Multiple Meanings!

Hi everyone, would you like to improve your English skills and learn a variety of phrasal verbs using the verb put? Welcome to Jen's Studio. My name is Jen, and today I'm going to teach you nine different phrasal verbs all using the verb put. Some of these phrasal verbs have more than one meaning, so you're going to learn a lot of useful phrasal verbs today. Before we begin, we need to talk about what a phrasal verb is. A phrasal verb is when you take a verb, an action word, and you add a preposition. A preposition is a word like in, on, at, from, to, and you put the verb and the preposition together to create a new, unique, specific expression in English. Today, we're specifically going to be taking a look at phrasal verbs that all use the same verb, put. We will put different prepositions together with put to create different phrasal verbs. Our first phrasal verb for today is put on. The first meaning of put on is to wear an item of clothing. I put on a hat. Oh, I'm getting cold. I think I should put on this sweater. You can also use it not just for clothes, but for makeup as well. I am putting on some lip gloss. The opposite of put on is the phrasal verb take off. Whew, I'm getting hot. Let me take off this jacket. I will take off my hat. Put on also means to add or to gain some weight. I was on a diet, but somehow I still put on two kilos. I gained two kilograms. I put on two kilograms. My favorite meaning of put on is to perform or to produce something. This is used a lot in theater. I love to put on shows with my favorite theater company, Stage Center. Mirvish Productions always puts on great performances. The fourth meaning of put on is to put someone on. If you put someone on, it means that you are purposely misleading them for fun, for your own amusement. Someone has said to me in the past, I can't believe you thought I was serious. I was just putting you on, meaning the thing that I thought was true, they had told me as a joke, wanting me to believe it so that later they could make fun of me. They were putting me on. Phrasal verb number two is put off. The most common way this phrasal verb is used is to postpone something, meaning to delay doing something until a later time. I have a toothache over here, and I know I need to go to the dentist, but I keep putting it off. I keep saying, I'll do it later, I'll do it later. But now my tooth is starting to really hurt, so I think I won't be able to put off going to the dentist for much longer. Another meaning for put off is to make somebody not like something or to discourage someone. I do not like it when people chew with their mouths open. When you're eating, you should be polite and keep your mouth closed. So if someone's eating like that, it really puts me off. I feel discouraged from interacting with that person, and I do not like the situation. It puts me off. Number three is to put out. The first example for this phrasal verb is to leave something in a place that others can easily notice it so that they are able to use it. If I'm having a party, I will put out snacks for my guests, meaning I will arrange snacks around the place I'm having the party so that my party guests can easily find and use the snacks. At Christmas time, children will put out milk and cookies for Santa. Another meaning of put out is to make something stop burning, so to extinguish something. The firefighters put out the really big apartment fire. Before I go to bed, I have to make sure I put out this candle. A third meaning for put out is for someone to publish a book or a magazine or for a CD or movie to be released to the public. My favorite author has recently put out a new novel. That band just put out a new track. A fourth meaning for this phrasal verb is a very rude expression, so please try not to use it, although you might hear it. Another meaning of put out means to have sex, so you might hear some guy talking about his girlfriend and say, oh, it was awesome, man. She totally put out last night, meaning she had sex with him. Our fourth phrasal verb with put is put down. Maybe the most common way of using this expression is to insult someone or to criticize them harshly and make them feel bad about themselves. At my last job, my coworker was always putting me down in front of my boss, so I decided I should quit. You could say it about yourself or about someone else as well. Hey, stop putting yourself down. You're a very intelligent person, and I'm sure everything will work out for you, so don't put yourself down. Another way that we use to put down is to write something on paper. I like to put down my ideas in this notebook, or I put my name down on the petition. A sad meaning for put down is to euthanize an animal. So euthanize means to kill an animal because they are in pain and they are suffering. My dog is really sick and kind of old, so unfortunately, we need to go to the vet and put him down next week. Another meaning of put down means to assign a

task or an obligation to someone. If I volunteer to do something at a fundraiser, bake sale maybe, someone might say to me, oh, good, Jen, you volunteered, so I put you down to bake some cookies for the fundraiser, or I put you down to collect the donations at the door. Phrasal verb number five is put through. One way we can use this phrasal verb is on the phone. If I'm calling an area where maybe there's a secretary or lots of different possible people I could speak to, I might say to the person who answers the phone, hi, could you please put me through to your manager? Meaning, can you please connect me to your manager? Put through, put me through. We can also use this in a bad situation. Oftentimes, we have the expression put someone through hell or put someone through a tough time. Oh, I can't believe what that person did to me. All of the terrible things, they're totally putting me through hell, and I can't take it anymore. Put me through hell, to put someone through hell, to cause difficulties for that person. We can also use this expression to put someone through school. If you put someone through school, it means that you are paying for them to attend college or university. Some people work really hard to put themselves through school because their parents are not rich enough to put them through school. So, put someone through school, pay for them to attend higher education. Phrasal verb number six is put up. One meaning of this phrasal verb is to build or to erect something. Oh, they put up a new statue at city hall. We also use this phrasal verb with to put someone up. This means to allow someone to stay at your house overnight for a temporary period of time. If any of my friends are in town, I will gladly put them up for the night, meaning allow them to stay at my apartment. Phrasal verb number seven is put up with. If you put up with something, it means that you have to tolerate and you have to endure it. So it's something very difficult that you don't want to have to deal with, but unfortunately, you do. So if you make a mistake and something bad happens, you need to put up with the consequences. You need to deal with those bad consequences. Or if someone is annoying me, I shouldn't, but I might yell at them and say, Stop, I can't put up with your garbage anymore. Just stop annoying me. I can't put up with it. Phrasal verb number eight has two phrasal verbs with the same meaning. They are to put something back or put something away. When I'm finished using the scissors, I need to put them away, return them to the spot where I found them. I need to put them back, not leave them sitting wherever. Put something back or put something away, return it to the spot that it belongs once you have finished with it. It is important to teach children to put away their toys once they have finished playing. Phrasal verb number nine is to put something together. The most common and probably obvious meaning of this phrasal verb is to join different things together to create a whole. I recently put together a puzzle. Or when you buy some new furniture from Ikea, you need to put it together. You need to build it, construct it, and join all the pieces. Another meaning for putting something together is to plan and organize some kind of event. So you're bringing many different people and different elements together to create an event. Before my wedding, my best friend put together a surprise stegan dough party. So today you learned nine different phrasal verbs all using the verb put, plus you learned several different meanings for many of the phrasal verbs in today's lesson. I hope that you'll be able to use these phrasal verbs to increase your English fluency. And now it's time for the question of the day. Today's question is, what is something that you have been putting off that you should stop putting off? Let me know in the comments below. Thank you so much for watching this lesson. If you found it useful, please subscribe to Jen's Studio and give this video a thumbs up. Good luck with your English studies, everyone, and I'll see you in the next lesson.

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Environmental Impacts of Renewable Energy. The Full Picture

Our planet faces a challenge. Climate change, driven by human activity, threatens the delicate balance of our natural world. We must find new ways to power our lives, ways that reduce our reliance on fossil fuels. Renewable energy sources offer a promising solution. Solar, wind, hydro, biomass, and geothermal. These sources hold the key to a cleaner future, but we must proceed with caution, carefully considering both the benefits and potential drawbacks of each technology. This essay will explore the diverse world of renewable energy, examining its environmental impacts with a balanced perspective. We will delve into the advantages these technologies offer in our fight against climate change. We will also shed light on the challenges they present, from land use and habitat disruption to potential impacts on wildlife. Our journey through the world of renewable energy will highlight the importance of sustainable practices. Technological advancements, thoughtful policies, and increased public awareness are crucial. By understanding the full picture, we can harness the power of renewable energy while safeguarding the health of our planet. Our future depends on it. Renewable energy sources offer hope for a sustainable future. Unlike fossil fuels, renewables provide a cleaner alternative. Solar, wind, and hydro generate electricity with lower carbon emissions. They are crucial in combating climate change. Benefits extend beyond climate change mitigation. Reducing fossil fuels improves air quality. Renewable projects create jobs and boost economies. Many renewable sources are inexhaustible. Transitioning to renewables leads to energy independence. Countries can reduce dependence on fossil fuels. This leads to greater stability and resilience. Solar energy converts sunlight into electricity, offering a clean solution to our energy needs. PV panels use semiconductor materials to directly convert sunlight into electricity. Solar thermal plants use mirrors to concentrate sunlight, generating steam for turbines. Both technologies reduce reliance on fossil fuels. However, solar farms can impact ecosystems and wildlife habitats. Careful planning is crucial to minimize environmental impact. Using rooftops or degraded land can reduce land-use conflicts. Responsible manufacturing and recycling address waste concerns. Embracing innovation and sustainable practices harnesses the sun's power while minimizing our footprint. Wind energy harnesses the kinetic energy of wind through turbines, emerging as a leading renewable source. Vast wind farms generate clean electricity with minimal emissions. Advances in technology make turbines more efficient, producing more power with less impact. However, wind energy poses risks to birds and bats. Proper siting of wind farms is crucial to minimize these risks. Technological advancements are mitigating noise pollution. Community engagement and addressing concerns are essential for fostering support. Section 5, hydropower, the power of water, the price of change. Hydropower, harnessing the energy of moving water through dams and turbines, has long been a cornerstone of renewable energy production. Large-scale hydroelectric dams generate significant electricity, often providing baseload power to entire regions. Run-of- river hydropower, utilizing the natural flow of rivers, offers a less impactful alternative. However, large-scale hydroelectric dams come with significant environmental consequences. Damming rivers alters natural flow regimes, impacting downstream ecosystems and fish migration patterns. Reservoirs created by dams inundate vast areas of land, potentially displacing communities and flooding valuable habitats. Water quality can also be affected by dams. Reservoirs can trap sediments, reducing downstream sediment flow and impacting aquatic life. Changes in water temperature and oxygen levels can further disrupt delicate ecosystems. Careful consideration of these impacts is crucial when planning and operating hydroelectric dams. Sustainable hydropower development requires minimizing negative environmental and social consequences. Choosing appropriate locations for dams, implementing fish passage systems, and optimizing water flow management can mitigate impacts on ecosystems. Engaging with local communities and addressing their concerns is essential for responsible hydropower development. Section 6, biomass energy burning for a better future. Biomass energy derived from organic matter offers a renewable alternative to fossil fuels. Burning biomass can reduce reliance on carbon-intensive sources. Sustainable practices can create a closed-loop system. Environmental impacts depend on biomass sources and methods. Unsustainable practices can lead to habitat loss and soil degradation. Air quality

is a concern with biomass combustion. Emissions can release particulate matter and pollutants. Efficient technologies and control measures are crucial. Sustainability hinges on responsible sourcing and production. Utilizing residues and waste can minimize impacts.

Section 7, geothermal energy. Tapping into Earth's heat, tread carefully. Geothermal energy, harnessing the Earth's internal heat for electricity generation and heating, offers a renewable and consistent energy source. Geothermal power plants tap into underground reservoirs of hot water or steam to drive turbines. Geothermal heat pumps utilize shallow ground temperatures for heating and cooling buildings. While geothermal energy offers significant advantages, it is not without potential environmental impacts. One concern is the potential for induced seismicity or earthquakes triggered by human activity. Injecting fluids into geothermal reservoirs can alter underground pressures, increasing the risk of seismic events. Land-use changes associated with geothermal power plants can also impact local ecosystems. Construction of power plants and drilling operations require land clearing, potentially affecting wildlife habitats. Careful site selection and mitigation measures can minimize these impacts. The sustainability of geothermal energy depends on responsible resource management. Monitoring geothermal reservoirs, managing fluid injection rates, and implementing seismic monitoring systems can mitigate the risk of induced seismicity. Minimizing land disturbance, restoring disturbed areas, and engaging with local communities are crucial for sustainable geothermal energy development.

Section 8, Striking a Balance Toward Sustainable Renewable Energy. As we've explored the diverse world of renewable energy, it's clear that each source presents a unique set of benefits and challenges. While offering a cleaner alternative to fossil fuels, renewable energy technologies can have environmental impacts that must be carefully considered and mitigated. Striking a balance between maximizing renewable energy production and minimizing environmental harm is crucial. Sustainable renewable energy development requires a multifaceted approach. Careful planning and site selection are paramount. Ensuring that renewable energy projects are located in areas that minimize impacts on ecosystems, wildlife, and communities. Technological advancements play a crucial role in reducing the environmental footprint of renewable energy technologies. Implementing robust environmental regulations and policies is essential for guiding responsible development. Governments and regulatory bodies must establish clear guidelines, set environmental standards, and enforce compliance to ensure the long-term sustainability of renewable energy projects. Public engagement and stakeholder involvement are crucial throughout the entire process. Open communication, transparency, and addressing concerns raised by local communities can foster trust and ensure that renewable energy projects benefit both people and the planet.

Section 9, Public Awareness, the Key to Responsible Development. Public awareness and understanding are essential for the successful transition to a renewable energy future. Educating the public about the benefits, challenges, and trade-offs associated with different renewable energy technologies is crucial for informed decision-making. By fostering a greater understanding of renewable energy, we can encourage responsible development and minimize potential conflicts. Transparency is key. Openly communicating the environmental impacts of renewable energy projects, both positive and negative, can help build trust with local communities. Engaging stakeholders in the planning and decision-making process can address concerns and ensure that projects align with community values. Promoting energy literacy, empowering individuals and communities to make informed choices about their energy consumption, is essential. Educational programs, public outreach campaigns, and interactive tools can help people understand the complexities of energy production and consumption. By fostering a culture of awareness and engagement, we can ensure that the transition to a renewable energy future is both environmentally sustainable and socially equitable. Public participation is not just desirable, it's essential for navigating the complexities of renewable energy development and maximizing its benefits for all.

Section 10, The Future of Energy, a Shared Responsibility. The future of energy lies in our collective hands. Transitioning to sustainable energy requires a global effort. Embracing renewable energy creates a just and equitable future. Investing in research drives innovation in renewable energy. Efficient solar panels and quieter wind turbines reduce environmental impact. Policymakers

accelerate the renewable energy transition. Carbon pricing and incentives encourage clean energy investment. Success depends on our collective will to act. Embracing shared responsibility ensures a sustainable future. Embracing a sustainable future. The journey towards a sustainable energy future begins with each of us. By understanding renewable energy, we can shape a brighter future. We can all make a difference. Reduce your energy consumption. Support policies that promote renewable energy. The transition to renewable energy is a journey. Let us embark on this journey together.

Taken from: <https://youtu.be/0Q1rPT9KX0I>

Unit 7

Solid and Hazardous Waste

Hazardous Waste - English

Some of the waste that we produce every day can be hazardous to our health or to the environment. It's not always easy to understand how much domestic waste can be hazardous and why. While some waste can be easily identifiable by symbols such as corrosive, toxic, flammable, or explosive, there are other items that are harmless when used but hazardous when disposed of.

Batteries, paint thinners, disinfectants, pesticides, glues, and expired medicines emit hazardous chemicals as they deteriorate. Some chemicals, when touched or inhaled, can cause respiratory problems or irritation to the eyes and skin. It's important to note that medicines, oil, and other chemicals should never be disposed of in the sewage system.

Other items are toxic if they are dispersed into the ground through the sewage system or otherwise – they can poison the soil or water and eventually end up in our food. Items such as syringes, thermometers, light bulbs, and tubes contain hazardous chemicals. If they are put with other items, they can be very dangerous both to you and the waste handlers.

All these types of waste should not be disposed of in the black bag or the recycling. They should be taken to a civic amenity site and disposed of as directed. Batteries can also be taken to specific collection points.

If disposed of correctly, all hazardous materials that cannot be recycled will be disposed of in a controlled manner. With a little effort, together we can reduce the amount of hazardous waste that ends up in the environment. But it's not just better for the environment – it's better for our health too.

Don't waste. Do your bit.

Taken from: <https://www.youtube.com/watch?v=lnTHEmavvgM>

14 Stand Phrasal Verbs: Learn Phrasal Verbs with STAND to make your English Stand Out!

And darling, darling, stand by me. Oh, stand by me. Stand by is a great phrasal verb. Hi, welcome to Jen's Jugo. My name is Jen, and today we're going to take a look at 14 phrasal verbs using the verb stand. A phrasal verb is a verb, an action word, plus a preposition, words like in, on, at, from, or to. And the verb and the preposition come together to create a new, unique meaning in English. For example, our first phrasal verb for today is stand by. Stand is the verb, and by is the preposition. Stand by can have several different meanings in English. The first meaning of stand by that was part of the song, stand by me, is to support someone and to be loyal to that person. No matter what happens, my husband always stands by me. He stood by his mother as she battled cancer. Our second stand phrasal verb is also stand by. Stand by can also have the meaning of to be ready for something, to be prepared to take action. The police were standing by in case the protests became violent. The pilot told the cabin crew to stand by for takeoff. Our third phrasal verb is also stand by, because stand by could also mean to maintain or to keep committed to some kind of decision that you have made. Although Sally faced financial difficulties, she stood by her decision to homeschool her children. Despite his wife's objections, he stood by his choice. Our fourth phrasal verb for today is also stand by. A final meaning of stand by means to remain uninvolved in something, to continue to be inactive, not take action. We often use this sense of stand by in a negative way. Do something. We can't stand by and let this happen. I can't believe she just stood by and simply said nothing while her son blatantly lied to the police. Our fifth phrasal verb with stand is stand out. To stand out means to be very noticeable or conspicuous. When I was a high school student, one of my best friends stood out because she was taller than all of our classmates. It was really crowded, so I wore this hat to stand out. Phrasal verb number six is stand down. To stand down means to

withdraw or to relax after being ready to do something. Although they were ready for combat, the troops were told to stand down. Due to recent events, many people want the politician to stand down. Phrasal verb number seven with stand is stand for. Stand for means to represent or to symbolize something. EMS stands for emergency medical services. It's written on many ambulances. A triangle pointing towards the right usually stands for play. Phrasal verb number eight is also stand for, but with a different meaning. Another meaning of stand for is to tolerate or to accept something. We often use stand for this way with the word not. Stop it. I won't stand for that kind of negative behavior. I hope the boss doesn't find out what you did because she won't stand for it. Phrasal verb number nine is stand up for. If you stand up for someone or something, it means that you defend it or you support it. Stand up for what you believe in. Stand up for yourself and don't let others take advantage of you. Her older brother always stood up for her when their father yelled. Phrasal verb number 10 is stand up to. To stand up to someone means that you defend against their attack. You try and eliminate their negative behavior by being strong. Her older brother always stood up to their father when he yelled. She finally got enough strength and stood up to the bullies at school. Phrasal verb number 11 is stand up with. Although sometimes people will say stand up for when they mean stand up with. To stand up with someone means to be their wedding attendant, to be a maid of honor or a groomsman, a best man, or a maid of honor. At my wedding, I was thrilled when my best friend stood up with me. He was delighted when his older brother agreed to stand up with him when he tied the knot. Phrasal verb number 12 is stand up. If you stand somebody up, it means that even though you have arranged to meet them, usually for a date, you do not attend your meeting. You don't go to the date, and you also don't give the person any warning that you're not going to show up. Tom waited three hours at the restaurant before he finally realized that his date had stood him up. Ellen was upset because her date stood her up. Phrasal verb number 13 is stand back. If you stand back, it means that you stay at a safe distance away from something. Oftentimes, you hear this as a command when someone wants you to move out of the way. Stand back, I'm coming through. Stand back, it's an emergency. Please stand back and let the paramedics through. She stood back from the fire so she wouldn't get burned. Phrasal verb number 14 is stand in for. If you stand in for someone, it means that you substitute for them. You take their place temporarily. The understudy stood in for the actress when she was ill. Pam stood in for Sarah at work when she went on vacation. Today, you have learned 14 phrasal verbs all using the word stand. 14 stand phrasal verbs to improve your English fluency. Now, it's time for the question of the day. For today's question of the day, in the comments below, please tell me who is a person you will always stand by or what is a decision you'll always stand by? Let me know in the comments below. Thank you so much for watching this lesson. If you found it useful, please subscribe to Jenn's Jugo and give this video a thumbs up. Good luck with your English lessons. Stand by for more lessons coming soon.

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Phrasal Verbs with TAKE and Multiple Meanings

Today, we're going to be looking at phrasal verbs and specifically phrasal verbs with take. We're going to look at my top 10 phrasal verbs that I think we use regularly. Now don't forget we've got lots more lessons on phrasal verbs, so you can find some links at the end of this lesson to phrasal verbs with get and our top 10 phrasal verbs in English. For now, let's look at 10 phrasal verbs with take. Before we start the lesson, please find us on Facebook, Twitter, Instagram, and of course, Snapchat. So take is one of the most common verbs in the English language. It's no wonder we have so many phrasal verbs with take. At number one take after. This is a great phrasal verb and possibly my favorite of the 10. To take after somebody means that you are similar to them, you have similar characteristics, and you have inherited some characteristics, whether that's personality or physical appearance. We would usually take after our mother or father, or we could take after a grandparent, or even an aunt or uncle. It's an older relative. So, for example, I take after my grandmother. I look a little bit like her, and we both like sweets and cakes. Not a great thing to take after. Next phrasal verb: take out. Now, take out can literally mean to have somebody with you, take them outside, but it's

not just take outside, it's take them to a restaurant, the cinema. You usually take somebody out and pay them. So he took me out to the cinema. Nice. Take out can also mean remove or withdraw. So, for example, when you need money from a cash machine, ATM, you could say I took out some money. Now the other, more sinister, darker meaning of take out is something you won't hear very often, I hope, only when you're watching perhaps a gangster movie. So, take out can actually mean to kill somebody. So if you're watching a mafia movie, they might say we're gonna take him out. Probably doesn't mean they're taking him to the cinema, more likely they're gonna kill him. Okay, let's move on to a nicer phrasal verb. Number three take in. This is lovely because it can actually mean to kind of welcome somebody into your home, literally bring them in. It could also mean to adopt, often with animals. So you might find a stray dog, meaning a dog without a home, and you could take him in, you could adopt him and welcome him, and make him part of your family. That's a nice phrasal verb, much better than take out. Now take in, another meaning, which can also refer to making your clothes smaller. So if you have baggy clothes, this is supposed to be loose, then you might ask your tailor or seamstress to take them in, to sew them so that they are smaller and fit better. Less common but still useful to know. Now take up, hopefully you already know this phrasal verb because it is so common. If you take something up, then it means you start a new hobby, that could be taking up football, taking up yoga, taking up learning English on YouTube. Pay attention there, after a preposition, so particularly in the case of phrasal verbs, you would often have a verb follow it. When you do take up learning we have the gerund. Okay, so after prepositions, you would have a gerund, the noun form of the verb. Now you could also take something up with somebody, that's a long one. That means that you are going to raise an issue or a concern with them. It might be that you are not getting paid enough at work, so you might say, I'm going to take it up with my boss. It being the fact that you don't think you get paid enough, take it up with him. Number five, take down. Now, this is not so much a phrasal verb; it's quite literal. So if you put something up on the wall, for example, a picture, let's put it up. If I want to remove it, I would take it down. Now, the non-literal meaning of take down would be to kind of, to win, to succeed over somebody. So in a fight, you might say that the boxer took him down. So it means to win, to battle, and to win. Okay, number six, to take to. Take to something or somebody. So if you take to something, it means that you are a natural at it. You enjoy what you are doing and you're good at it. So he took to his new job very quickly. Similarly, to take to a person, to take to somebody, means that you kind of almost instantly like them. I took to him really quickly means I started to like him from the beginning. Number seven, we're nearly there, to take over. This is a particularly useful phrasal verb when we are referring to business English as well. In a normal context, to take over means to control, to dominate. So if you're having a conversation in a group of friends, there might be one friend who dominates the conversation, who controls the topic of what everybody is talking about. In a business context, to take over can be used as a noun, a takeover, but it can also mean the company took over another one. So they would buy that company and control it. It's their company, then. Now, to take on. Take on could also be used in a business context. You can take somebody on, meaning that you hire them for your business, that you employ them. Take on can also mean to challenge somebody. Now, it's quite aggressive. So a good example might be with football. Manchester United took on Arsenal. So they challenged them to win the match. Now, taking on something implies that you are, that you are adding to the responsibility that you have. So I took on more work, meaning more work was my responsibility. I accepted it. Right. What have we got next? Let's have a look. We've got take off. A nice, easy one. You should, if you've flown recently, know that take off means when a plane goes basically up in the air. We don't have take down as the opposite. We'd say land. No phrasal verb for that, really. So you take off means to go up into the air. It can also refer to a company. Lots of these phrasal verbs have business meanings. So if a company is taking off, it means that it's doing exceptionally well. We often use this when we are talking about small companies, new companies taking off, suddenly doing exceptionally well, making a lot of money. Now, take off can also mean to remove, take off your shoes, take off your clothes. So that's nice and simple. But did you know it can also mean leave? Usually quite suddenly, unexpectedly, just

leave. So it was the middle of the party, and he just took off. Very strange. Okay, finally, our last phrasal verb, to take back. Take back is a nice, simple one to end with. To take back simply means to return something. It could be an item of clothing. I bought a top, but it was too big, so I took it back to the shops. But it could also refer to something that you have said and regretted. So I told her she looked fat in that dress. Boyfriends, I hope you haven't done that. And I took it back. So I retracted what I had said. I regretted it very quickly. Okay, that brings us to the end of our phrasal verbs with take. There were a lot of them. Let's just recap. Take after, take out, take in, take up, take down, take to, take over, take on. I'm reading, you have to see. Take off, take back. There we go. So why not try and make some sentences with those phrasal verbs about yourself? This is the best way to learn. Go down in the comments box below on YouTube and type them there. We'll have a look and if they're wrong, we'll let you know. Now, don't forget to subscribe to us on Love English. Subscribers are going crazy at the moment. So thank you very much to all of you who are already subscribed. Thank you so much for watching. I'm gonna take off. See you.

Taken from: <https://www.youtube.com/watch?v=EeGkZMYqEng>

Hazardous Waste Determinations

What is a hazardous waste determination? How do you document one? What if a waste is unknown? These are three questions we're going to answer for you in this video today, being brought to you by the Kansas Small Business Environmental Assistance Program, paid for in part by the Kansas Department of Health and Environment. Hello, my name is Nancy Larson. I'm the director of the Pollution Prevention Institute at K-State. It should be noted that failure to document your hazardous waste determination is one of the most common non-compliance violations that KDHE cites. First things first, what is a hazardous waste determination, and why is it important? A hazardous waste determination is a procedure used to determine whether a waste is hazardous or not. Any business, government agency, institution, or other entity that generates solid waste is responsible for making and documenting a hazardous waste determination. Please note that waste profiles provided by your vendor can be used to make a determination, but are not a substitute for a hazardous waste determination. Determinations are important because the RCRA, the Resource Conservation and Recovery Act, establishes different levels of generator storage requirements based on the amount of hazardous waste generated at a facility. In addition, RCRA also requires that all hazardous waste must meet certain treatment standards prior to disposal. These are documented in land disposal restrictions or LDRs. These treatment standards establish the type of mechanical process or concentration-based criteria that must be met for each waste code and its associated underlying hazardous constituents before hazardous waste can be considered safe for disposal. Identifying and communicating the correct waste codes to whomever is involved in the storage, transportation, treatment, or disposal of hazardous waste helps all involved understand what must be done in order to protect public health and the environment. How should a hazardous waste determination be documented? The Bureau of Waste Management recommends a four-step method. The first step when making a waste determination is simply to list all of your waste streams generated at the facility, list which process is associated with the waste, and how many pounds of each waste are generated each month. You cannot use an average. Step two requires you to check to see if the waste meets the definition of a solid waste as found in the Code of Federal Regulations, or the CFR, that's 40 CFR 261.2. Waste is considered a solid waste if it is a solid, liquid, or in some cases a gas that is discarded, abandoned, recycled, or considered inherently waste-like and is not otherwise exempt from the definition of a solid waste under the 40 CFR 261.4a. Step three, for each waste that meets the definition of solid waste, check to see if the waste meets the definition of hazardous waste as found in 40 CFR 261.3. This can be done in two ways. Use the Safety Data Sheet, or SDS, and knowledge of how the waste was generated, we call this process knowledge, and or have the waste analyzed at a KDHE certified laboratory. Remember, all waste should be evaluated at the point of generation. Some waste may need to be evaluated using both process knowledge and analysis, while others can be evaluated using one or the other. In some cases, such as with regulated metal contaminants, an

analytical test will be required to prove the waste is not a hazardous waste. From here, hazardous waste is divided into two broad categories, listed waste and characteristic waste, though they are not mutually exclusive. A hazardous waste can be both listed and characteristic. In fact, some hazardous wastes are only listed because of their characteristics. For more details on the listed and characteristic hazardous waste and how to determine waste codes, please refer to the technical guidance document, Characteristic and Listed Hazardous Waste. Finally, step four involves preparing the document, which clearly states whether or not the waste is hazardous. If it is hazardous, it is also a good idea also to list the applicable waste code, such as D001 for ignitability, F003, U183, for example. Waste codes are explained in the technical guidance I just mentioned and can be found in the back of the generator handbook. This is a very important final step in the hazardous waste determination process. Generators can record hazardous waste determinations on the template form or in a different document or spreadsheet record. Then, you must maintain the record used to make the determination in a specific hazardous waste file, either electronic or hard copy. In addition to the determination document itself, records used to make the determination must be attached or included. These records may include SDSs, process flow diagrams, certified laboratory results, and chemical reaction diagrams. So, how do you make a determination on a waste that's unknown? Let's turn to our regulatory expert for guidance, Brian Burback of KDHE. Brian, let's say I find an unlabeled container or drum that's got waste in it. What should I do? Well, first of all, let me tell you that it is important to address these unknowns in a timely manner so that they don't get pushed to the back corner of a facility and forgotten about until the next time one of our inspectors shows up at your facility. Here are a few options to consider. First, ask around. Find out if someone working in the area knows the history of the drum and what might have been put into it. From the history, you can likely figure out how to document the determination and then prepare it for disposal. Second, try to estimate how old the drum or container is. This may help you understand the process that generated the waste. You can also use past hazardous waste manifests and records to help determine the contents. And finally, as a last resort and sometimes costly step, have the waste tested by a KDHE-certified lab, trying to limit the type of tests ordered based on knowledge of the contents. One option to explore for cost savings is to request a total analysis on the samples with a hold for further testing. This can give you an idea of what kind of T-clip analysis or toxicity characteristic leaching procedure to order instead of a full-spectrum T-clip analysis. As a hazardous waste generator, you are responsible for your waste from cradle to grave. Documenting hazardous waste determinations is an important first step to ensuring you properly identify, classify, manage, and dispose of your hazardous waste. If you still have questions, feel free to contact your inspector, KDHE, or the Small Business Environmental Assistance Program.

Taken from: <https://youtu.be/low2V-Fi-h8>

APPENDIX 7.

Reflection

Choose the option that best represents your skills, comprehension, and involvement after finishing this unit to help you evaluate your learning experiences, highlight areas for improvement, and set goals for further improvement in your language skills.

Areas	Statements	Choose the option
Participation	<i>I actively participated in class discussions and activities.</i>	Yes / No / Partially
Comprehension	<i>All the materials, ideas, and concepts were easy to understand.</i>	Yes / No / Partially
Reading	<i>The text was easy to read and comprehend. Now, I can read texts on relevant topics.</i>	Yes / No / Partially
Listening	<i>The listening task did not cause any difficulties. Everything was clear.</i>	Yes / No / Partially
Use of English	<i>I properly used terms and concepts to talk about the topic. I learned new words and word combinations and used them actively during the lessons.</i>	Yes / No / Partially
Speaking	<i>I did not have any challenges or hesitations in expressing myself. The topic is easy, and now I can discuss relevant ones.</i>	Yes / No / Partially
Collaboration	<i>In speaking activities or discussions, I effectively and actively cooperated with my peers.</i>	Yes / No / Partially
Writing	<i>My writing skills have improved; it was not a challenge for me to express my thoughts in a written way.</i>	Yes / No / Partially
Learning experience	<i>I think understanding the topic introduced in the lesson improved my learning experience and contributed to my understanding of the topic.</i>	Yes / No / Partially

You didn't choose "Yes" for each statement? Don't worry! Turn Reflection into Action! Review the areas where you chose "No" or "Partially" and follow this guide to take action based on your thoughtful reflections.

<i>Areas for improvement</i>	<i>Action plan</i>
<i>Participation</i>	Try to invest in class discussions by asking questions and sharing your thoughts. If you don't feel confident enough to discuss the suggested topic, you can always ask your teacher about ways of improving your work during the lesson.
<i>Comprehension</i>	If it was difficult to understand the material in the unit, try to analyse what exactly was complicated; maybe you just need to translate some words or expressions. You can look it up in the vocabulary appendix or try one of the following strategies: use flashcards with translation or definition, write down new vocabulary, learn through media, or learn from the context. You can visit https://youglish.com/ , an excellent resource that provides you with fast, unbiased answers about how English is spoken by real people and in context.
<i>Reading</i>	Split the text into smaller parts and try to understand each one. Make a list of unknown words and expressions.
<i>Listening</i>	Focus on improving your listening comprehension by watching English-language media.
<i>Use of English</i>	Practice using new vocabulary in everyday conversation or writing. Look up the unknown words or phrases in the vocabulary appendix.
<i>Speaking</i>	Don't be afraid to make mistakes while speaking. Feel free to express your opinion even if you think it doesn't correlate with the opinions of others.
<i>Collaboration</i>	Aim to participate more actively in group work while working with the next unit. Form a study group with classmates to review concepts and support each other.
<i>Writing</i>	Write a plan for your writing piece. Make a list of words and phrases that you can use in your composition. Write a few ideas and try to elaborate on them.
<i>Learning experience</i>	Develop strategies to enhance your learning experience. Regularly revisit your learning goals and adapt your strategies as needed. Don't hesitate to ask for help from your teacher or classmates if you encounter difficulties.

APPENDIX 8.

Self-Assessment Keys

Unit 1.

1	2	3	4	5	6	7	8	9	10
C	D	A	B	D	A	C	A	C	D

Unit 2.

1	2	3	4	5	6	7	8	9	10
A	A	D	A	D	D	A	B	A	C

Unit 3.

1	2	3	4	5	6	7	8	9	10
D	A	B	A	B	D	C	D	A	B

Unit 4.

1	2	3	4	5	6	7	8	9	10
A	A	C	D	D	C	D	A	D	B

Unit 5.

1	2	3	4	5	6	7	8	9	10
D	A	D	B	D	C	A	D	B	D

Unit 6.

1	2	3	4	5	6	7	8	9	10
D	C	A	A	B	A	C	A	D	D

Unit 7.

1	2	3	4	5	6	7	8	9	10
B	D	A	C	C	D	A	A	C	A

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