

**НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ УКРАЇНИ
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ»**

Факультет лінгвістики

Кафедра англійської мови технічного спрямування №1

**АНГЛІЙСЬКА МОВА
ЗАГАЛЬНОТЕХНІЧНОГО СПРЯМУВАННЯ**

Практикум
для студентів II курсу
факультету електроенерготехніки та автоматики

Рекомендовано вченою радою факультету лінгвістики НТУУ «КПІ»

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Електронне навчальне видання

**Англійська мова
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Передмова

Практикум укладено відповідно до робочої програми кредитного модуля «Англійська мова загальнотехнічного спрямування», розробленої для студентів спеціальності 141 Електроенергетика, електротехніка та електромеханіка.

Розвиток вмінь читання автентичних матеріалів професійної тематики, використання лексико-граматичних структур в іншомовному мовленні, як діалогічному, так і монологічному, та формування навичок аудіювання і письма забезпечується логічною і послідовною структурою видання.

Практикум містить добірку адаптованих текстів на основі сучасних оригінальних підручників, технічних журналів, що виходять англійською мовою.

Практикум складається з чотирнадцяти розділів і чотирьох додатків. Кожний розділ включає сучасні автентичні тексти та комплекс вправ різного типу на розвиток мовних вмінь і формування мовленнєвих навичок у читанні, аудіюванні, говорінні, письмі та перекладі. Додатки містять граматичний довідник та додаткові тексти за фахом для читання англійською мовою.

У додаток увійшли вісім текстів за спеціальністю та граматичний довідник.

Інформаційно насичений пізнавальний матеріал та виконання різноманітних лексичних завдань сприятимуть підвищенню мотивації студентів до вивчення англійської мови як під час практичних занять, так і в процесі підготовки домашніх завдань.

Рекомендовано для аудиторної роботи на заняттях з англійської мови, а також для самостійної роботи студентів II-го курсу ФЕА.

UNIT I. SCIENCE IN UKRAINE

Task 1. Take a quiz for checking your general knowledge about Ukraine .

<p>1. The yellow and blue colors of the Ukrainian national flag are meant to invoke which of the following?</p> <p>a) The Black Sea and sandy Crimean beaches</p> <p>b) Clear sky and fields of grain</p> <p>c) Silver and gold metals</p> <p>d) Peace and prosperity</p>	<p>2. In 1710, the Cossack nobleman Pylyp Orlyk signed a pact in Ukraine that is often considered to have been the first document of its kind. What sort of document was it?</p> <p>a) A constitution</p> <p>b) A bill introducing national conscription</p> <p>c) A charter establishing fundamental human rights</p> <p>d) A legal decree that defined women as human beings instead of chattel</p>	<p>3. Ukraine is estimated to account for around one-fifth of the world's commercial-grade iron ore. It is also estimated to have one-quarter of the world's reserves of which mineral?</p> <p>a) Silver</p> <p>b) Magnesium</p> <p>c) Copper</p> <p>d) Manganese</p>
<p>4. Which disaster took place on 26th April 1984 near Pripyat in Ukraine?</p> <p>a) Goiania Accident</p> <p>b) Three Mile Island</p> <p>c) Windscale Fire</p> <p>d) Chernobyl Disaster</p>	<p>5. What is Ukraine's currency called?</p> <p>a) The hryvnya</p> <p>b) The Ukrainian ruble</p> <p>c) The thaler</p> <p>d) The Ukrainian zloty</p>	<p>6. The capital and largest city in Ukraine is ...</p> <p>a) Odessa</p> <p>b) Kyiv</p> <p>c) Rakhiv</p> <p>d) Pripjat</p>

<p>7. What is Kyiv's Arsenalaya subway station's unique claim to fame?</p> <p>a) It has the world's longest escalator</p> <p>b) It is the deepest subway station in the world.</p> <p>c) It was the first subway station in the world to be designed with easy access for the disabled.</p> <p>d) It is the only station in the world to be heated by an underground hot spring.</p>	<p>8. To the east and north of Ukraine which nation borders our country?</p> <p>a) Romania</p> <p>b) Moldova</p> <p>c) Russian Federation</p> <p>d) Poland</p>	<p>9. Which major river on which Kiev stands runs the length of central Ukraine?</p> <p>a) The Alma River</p> <p>b) The Danube River</p> <p>c) The Pripyat River</p> <p>d) Dnieper River</p>
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For more difficult challenge visit

<http://www.csmonitor.com/World/2013/1202/How-much-do-you-know-about-Ukraine-Take-our-quiz>

Task 2. Look at the picture and name the objects you see. How are the objects connected with science? Write 5 –6 sentences in different tenses expressing your ideas on the topic “Science”.



Task 3. Look at the vocabulary table and check dictionary for spelling and translation of the unknown words. Divide them into groups listed below.

Branches of science (Noun)	Characteristics (Adjective or Adverb+Adjective)	Action (Verb)	People (Noun)
-------------------------------	--	---------------	------------------

geochemistry	designer	eminent	discover
electrical welding	candidates of sciences	assure	experiment
bridge –building	materials science	high –tech	gain
cybernetics	pilot	mobile	researcher
technician	integrate	natural sciences	invent
cryobiology	humanities	mechanics	research
renowned	mitigate	portable	scientist
artificial	ecologically sound	remote	remain
inventor	comprise	controlled	technical
scholar	comply	scientific	increase
establish	directly related	beneficial	launch
microbiology	geologist	implement	produce
decline	enrich	affect	mutual
		elect	

Task 4. Before reading the text, try to guess what statements are true and what are false. Then read the text and correct the wrong ones.

1. At the beginning of the 21st century, scientific potential of Ukraine exceeded one and a half thousand scientific institutions and organizations.
2. The Ministry of Education and Science of Ukraine deals with the governmental management of scientific researches, school activities, etc.
3. Many Ukrainian scientific articles and periodicals are translated into foreign languages.
4. The National Academy of Sciences of Ukraine being the main establishment and millstone of Ukrainian science is headed by Academician Yevgen Paton.
5. For more than fifteen years the Ukrainian scholars have been trying to cope with the consequences of the Chornobyl Nuclear Power Plant disaster.

UKRAINE'S SCIENTIFIC POTENTIAL

Science is a major factor allowing Ukraine to be ranked among the world's advanced countries in the twenty –first century. Six state academies are leaders in Ukrainian science: the National Academy of Sciences of Ukraine, the Ukrainian Academy of Agricultural Science, the Academy of Medical Science, the Academy of Jurisprudence, the Academy of Pedagogical Sciences, and the Academy of Arts. The Ministry of Education and Science of Ukraine is responsible for the governmental management of scientific and scholarly activities.

A legal document for the creation of the Academy of Sciences of Ukraine was approved by the Council of Ministers and signed by the Hetman of Ukraine Pavlo Skoropadsky on November 14, 1918. The first academicians were appointed historians Dmytro Bahaliy and Orest Levytsky, linguist Stepan Smal –Stotsky, geologists Volodymyr Vernadsky and Pavlo Tutkovsky, biologist Mykola Kashchenko, mechanic Stepan Tymoshenko, lawyer Fedir Taranovsky. For the President of the Academy, Mykhailo Hrushevsky was invited, but he declined. The Constituent Assembly that took place on November 27, 1918 elected the President Academician Volodymyr Vernadsky, while Ahathanhel Krymsky became the permanent secretary.

Ukraine is proud to comply with world scientific standards in mathematics, mechanics, physics, computer science, materials science, and a number of other trends directly related to the manufacture of the high tech science –intensive products increasingly demanded by foreign scientific institutions and industrial firms. For instance, a unique pilot plant has been built, which simulates the effect of outer space on spacecraft. Germany and China have purchased this plant and the European Space Agency is using it for research purposes. Together with US aerospace firm the Institute of Electrical Welding is developing a procedure for producing new materials using the technique of high –speed electron –beam evaporation and condensation of matter in a vacuum. Researchers at the Institute for Cryobiology and Cryomedicine have arranged production of competitive biological preparations.

During the years of independence, a basic advance has been made by Ukraine in the social sciences and humanities. This is more than dozen years time that the Ukrainian scholars have been involved in studying the scientific, technological, economic, medical, and social aspects with the goal of mitigating the consequences of the Chornobyl Nuclear Power Plant disaster, turning the devastated Unit 4 into an ecologically sound system, and establishing an international test field within the affected area for investigating the impact of radiation on the environment.

Ukrainian science is making successful efforts to be integrated into the international scientific community. Each year dozens of monographs by Ukrainian scholars are published abroad. Many Ukrainian scientific journals are translated into foreign languages. The National Academy of Sciences of Ukraine headed by Academician Borys Paton, its world –renowned President, remains the stronghold of these research institutions.

Taken from: <http://hi-tech.org.ua/ukrainian-science/>

Task 5. Reread the text “Ukraine's Scientific Potential” and make a word chain of key words and phrases to retell.

Task 6. Divide into pairs or subgroups of three. Search the Internet to get information about the development of science in Ukraine on the following topics (see <http://ukraine.ui.ua/en/science>). Present the information you have found in the form of short statements (5–7 to each topic).

1. The science of Kyivan –Rus period
2. Science in the Cossack epoch
3. Science of the XVIIIth century in UA
4. Science of the 19th century in UA
5. Science of the 20th century in UA
6. The science in the period of Independence

Task 7. Find the synonyms and group them, then make up a short story about any scientific research using them.

aim, area, investigation, to get, field, purpose, to reach, to attain, sphere, to receive, branch, objective, to gain, target, research, to attain, goal, to achieve.

Task 8. Look at the words in bold and put the letters in the right order.

Notable alumni and world famous stcseisnit – the founders of scientific teaching hlooscs of NTUU"KPI"

NTUU"KPI" has a **hirc** and glorious **itosyhr**. Its fame was created by inspired, selfless work of **goatsnudtni** scholars and **htaersce** who have turned KPI into the **uuqine** educational and **ehacrser** institution and its **daaertugs** who have made outstanding **cntsoniibruto** to the development of science and **engohtcloy** in the twentieth century – both **antoianl** and international.

A large **nbnrue** of prominent people **orwekd** and studied at the KPI: E.O.Paton, the **iventrno** of electric **elwdngi**; M. I. Konovalov, a well –known **ecmshit**; I. P. Bardin, Ukraine's greatest **ealsrgtmluti**; A. M. Lyulka, USSR's premier **irgndese** of jet engines; **ercokt** scientist Sergey Korolyov; creator of Sikorsky Helicopters, the **elwl** –**wkonn** inventor Igor Sikorsky, well –known scientist in the **edlfi** of fuel combustion and protection of the **omaehtspre** from industrial pollution Isaak Sigal. **edrntPsie** of the First Exam **oBdar** in chemistry faculty was Dmitri Mendeleev.

Also must be mentioned: Stephen Timoshenko, reputed to be the father of **omnedr** engineering **nmicehcas**; Vladimir Chelomei, Soviet mechanics scientist and rocket **eienrnesg**; Oleg Tozoni, the head of the **pemaertDnt** of Electrodynamics at the **yetrCnbeisc** Institute of the **eAdcmay** of Science.

Taken from : http://en.wikipedia.org/wiki/Kyiv_Polytechnic_Institute

Task 9. Read the text and change sentences by omitting the construction “it is.../was... that/who” (see App. A)

It is Serhiy Korolyov who is the famous scientist and designer of space – rocket systems. It is he who was born in the city of Zhytomir in the family of a teacher.

It is he who is known to be an outstanding creator of the practical space engineering. From 1927 he worked in the aircraft industry. It was he who in 1930, without giving up his job, graduated from the Moscow Bauman Higher Technical School and left a flying school in Zhytomir the same year. It was Korolyov who was one of the founders of modern space –rocketry engineering. It was Korolyov who trained many scientists and engineers who are now leading the work in research institutes and design bureaus which specialize in the sphere of space – rocketry engineering.

In was in 1933 that the first experimental rockets were made and tested. It was Korolyov who took part in the work. Beginning with 1957 the first Earth sattelities in the world were put into orbit with the help of the systems he had designed. It was the spaceship in which man first flew into space that was made under his guidance. It is Serhiy Korolyov who is one of the most outstanding Ukrainians whose name will go down in history of the world civilization.

Task 10. Choose the correct translation.

1. Ukrainian scientists are working on the problems which include the world of elementary particles, controlled thermonuclear synthesis, the newest types of power generators and others.

a) Українські вчені працюють над проблемами, які включали світ елементарних часток, контрольованого термоядерного синтезу, найновіших типів генераторів тощо.

b) Українські вчені працюють над проблемами, що включають сферу елементарних часток, контрольованої термоядерної реакції, найновіших типів генераторів тощо.

c) Українські вчені працювали над проблемами, які включають світ елементарних часток, контрольованого термоядерного синтезу, найновіших типів генераторів тощо.

d) Українські вчені працюють над проблемами, які включають світ елементарних часток, контрольований термоядерний синтез, найновіші типи генераторів тощо.

2. The great minds are united under the Ukrainian Academy of Sciences set up in 1919.

a) Великі розуми об'єднались у складі Академії Наук України, заснованої у 1919 році.

b) Визначні люди об'єднані в Українській Академії Наук, заснованій в 1919 році.

c) Великі уми об'єднані Академією Наук України, заснованій в 1919 році.

d) Величні розуми об'єднують Академію Наук України, засновану у 1919 році.

3. It was the Ukrainian scientists that split the nucleus of an atom, built the first accelerator of elementary particles, discovered heavy water, heavy isotopes of oxygen and hydrogen, founded the world –known schools of mathematics, chemistry, physics, biology and physiology.

a) Це були українські вчені, які зробили поділ ядра атома, побудували перший прискорювач елементарних частинок, виявили важку воду, важкі ізотопи кисню і водню, заснували всесвітньо відомі школи математики, хімії, фізики, біології та фізіології.

b) Це саме українські вчені розділили ядро атома, побудували перший прискорювач елементарних частинок, виявили важку воду, важкі ізотопи кисню і водню, заснували всесвітньо відомі школи математики, хімії, фізики, біології та фізіології.

c) Українські вчені розділили ядро атома, побудували перший прискорювач елементарних частинок, виявили складну воду, важкі ізотопи кисню і водню, заснували всесвітні заклади математики, хімії, фізики, біології та фізіології.

d) Саме українські вчені розділили атом, побудували перший прискорювач елементарних частинок, виявили важку воду, важкі ізотопи кисню і водню, віждвідали всесвітньо відомі школи математики, хімії, фізики, біології та фізіології.

4. Nowadays the efforts of the Ukrainian scientists are aimed at solving the most complicated problem of curing people who suffered as a result of the accident at Chernobyl atomic power station.

a) У теперішній час зусилля українських вчених спрямовані на вирішення найбільш складної проблеми лікування людей, які постраждали в результаті аварії на Чорнобильській атомній електростанції.

b) У теперішній час зусилля українських вчених спрямовані на вирішення найбільшої проблеми лікування людей, які постраждали в результаті аварії на Чорнобильській атомній електростанції.

c) У теперішній час зусилля українських вчених спрямовані на вирішення найбільш складної проблеми допомоги людям, які постраждали в результаті аварії на Чорнобильській атомній електростанції.

d) У теперішній час зусилля українські вчені спрямовують на вирішення найбільш складної проблеми лікування людей, які постраждали в результаті аварії на Чорнобильській атомній електростанції.

5. Ukrainian science is making successful efforts to be integrated into the international scientific community.

a) Українська наука робить успішні кроки для інтеграції в міжнародну наукову спільноту.

b) Українські науковці роблять успішні зусилля для інтеграції в міжнародну наукову спільноту.

c) Українська наука робить певні зусилля для інтеграції в міжнародну наукову спільноту.

d) Українська наука зробить успішні зусилля для інтеграції в міжнародну наукову спільноту.



Task 11. Imagine that Ukraine could choose one sphere of science to develop in and get funding for (e.g., physics, space technology, genetics etc.).

What would it be? Give as many ideas and grounding for them

as you can. Do the task in written form or in form of debates in class.

Use the phrases from Appendix B.

Task 12. Watch the video “Ukrainian scientists develop technology of welding in surgeries” and fill in the columns describing the contribution of Ukrainian engineers to medicine as shown in the video fragment.

Who	What	When	Where	Why	How

Task 13. Imagine you are a young scientist who is helping Anatolii Makarov, Genadiy Marinsky or Boris Paton. Make up dialogues about science of Ukraine, medical development, electric welding in different branches of science etc. and dramatize them.

UNIT 2. ELECTRIC CURRENT

Task 1. Look at the picture and make up dialogues giving your ideas on what is depicted.



Task 2. Practise reading of the following words.

1. coulomb /ku:lm/	6. conductive /kən'dʌktɪv/
2. ampere /'æmpeə/	7. current /'kʌrənt/
3. charge /tʃɑ:dʒ/	8. voltage /'vɒltɪdʒ/
4. circuit /'sɜ:kɪt/	9. fluid /'flu:ɪd/
5. scientist /'saɪəntɪst/	10. ordinary /'ɔ:d(ə)nri/

Task 3. Link the words with their synonyms and their Ukrainian equivalents.

<i>English</i>	<i>Synonym</i>	<i>Ukrainian</i>
1. generate	a) common, usual, normal	I. потік
2. rate	b) cable, rod	II. звичайний
3. flow	c) number, quantity	III. змінювати
4. amount	d) velocity, speed, pace, frequency	IV. кількість
5. wire	e) produce, create, make, bring about	V. швидкість, частота
6. ordinary	f) change, shift	VI. виробляти
7. switch	g) flux, stream	VII. дріт

Task 4. Match the terms with their definitions.

1. electric current	a. a smooth uninterrupted movement of electricity
2. flow of charge	b. the force of an electrical current that is measured in volts
3. wire	c. a very small particle of matter that has a negative charge of electricity and that travels around the nucleus of an atom

4. fluid	d. a line for conducting electrical current
5. electron	e. a flow of electricity
6. electric circuit	f. a substance (as a liquid or gas) that is able to flow freely
7. conductive liquid	g. the complete path that an electric current travels along
8. voltage	h. to show the presence of (something hidden or difficult to see) : to make (something) known
9. ampere	i. not solid substance able to conduct electricity, heat etc.
10. discover	j. a unit for measuring the rate at which electric current flows

Task 5. Before reading the text continue the sentences with your own ideas

- What I think electricity is...
- What I would like to know about electricity...

Task 6. Read the text and decide whether the statements are True or False.

1. Electric current is the flow of charge.
2. The unit ampere is a shorter way of saying “coulomb per second.”
3. If the current in a wire is one ampere, one coulomb of charge passes by a point in the wire in one minute.
4. Gilbert first used the terms “positive” and “negative” to describe charge.
5. Benjamin Franklin thought positive objects had too little and negative objects had too much of the fluid.
6. According to Franklin’s theory, a positive object’s extra fluid naturally flowed toward a negative object.
7. Long after Franklin’s work, scientists discovered that current in wires is the flow of protons.
8. Because of Franklin’s work, the direction of electric current is defined as going from negative to positive.
9. In a conductive liquid such as salt water, both positive and negative charges can move to create current.

10. Benjamin Franklin believed electricity was a type of fluid.

ELECTRIC CURRENT. Part 1

Electric current is the flow of charge. If the current in a wire is one ampere, one coulomb of charge passes by a point in the wire in one second. The unit ampere is a shorter way of saying “coulomb per second.”

Benjamin Franklin first used the terms “positive” and “negative” to describe charge. He believed electricity to be a type of fluid. He thought positive objects had too much and negative objects had too little of such fluid. According to Franklin’s theory, a positive object’s extra fluid naturally flowed toward a negative object. The flow would stop when each object had the right amount of such fluid and became neutral.

Because of Franklin’s work, the direction of electric current is defined as going from positive to negative. Long after Franklin’s work, scientists discovered the direction in which electrons move in a circuit to be from negative to positive, opposite the way current was defined earlier.

We still define current as going from positive to negative. For ordinary electric circuits it does not matter that negative electrons are really moving the other way. In a conductive liquid such as salt water, both positive and negative charges can move to create current.

Taken from: <http://www.allaboutcircuits.com>

Task 7. Translate the words and their derivatives.

1) Electric – electricity – electron	9) To discover – discovery – discoverer
2) A charge – to charge – charged	10) To define – definition – definite
3) Conduct – conductor – conductive	11) Magnetism – magnetic – magnet – magnetisability
4) A flow – to flow – flowing	12) Current – currentless – currently
5) A move – movement – moving	13) To leak – leakage – leaking
6) A wire – to wire – wireless	14) To alternate – alternating – alternately – alternation
7) Science – scientific – scientist	
8) To direct – direction – directable	

Task 8. Change active sentences into passive and vice versa.

1. We use specific symbols to show current, voltage etc.
2. We show the proportional dependence of these two variables on the graph.
3. At the next step the computer is given orders.
4. A battery does not produce the same amount of current.
5. Engineer will discuss this problem with mechanics.
6. Franklin's work has inspired many other scientists and researchers.
7. The flow of current in the picture is shown with the arrows.
8. The object is being moved right now by the lever.

Task 9. Read the second part of the text "Electric current" and make a plan for its retelling.

ELECTRIC CURRENT. Part 2

Electric current is measured in units called amperes (A), or amps, for short. The unit is named in honor of Andre –Marie Ampere (1775 – 1836), a French physicist who studied electricity and magnetism.

A small battery –powered flashlight bulb uses about 1/2 amp of electric current. Examine a battery and you will find a positive and a negative end. The positive end on an AA, C, or D battery has a raised bump, and the negative end is flat. Electric current from a battery flows out of the positive end and returns back into the negative end. The amount of electric current coming out of the positive end of the battery must always be the same as the amount of current flowing into the negative end. You can picture this rule in your mind with steel balls flowing through a tube. When you push one in, one comes out. The rate at which the balls flow in equals the rate at which they flow out.

Electric current does not leak out of wires the way water sometimes leaks out of a hose or pipe. Electrical forces are so strong that current stops immediately if a circuit is broken.

The current from a battery is always in the same direction, from the positive to the negative end of the battery. This type of current is called direct current or DC.

Although the letters “DC” stand for “direct current” the abbreviation “DC” is used to describe both voltage and current. A DC voltage is one that stays the same sign over time. The terminal that is positive stays positive and the terminal that is negative stays negative.

The electrical system in your house uses alternating current or AC. Alternating current constantly switches direction. For large amounts of electricity, we use alternating current because it is easier to generate and to transmit over long distances. All the power lines you see overhead carry alternating current. Other countries also use alternating current. An AC current or voltage reverses sign, usually 50 times per second in Ukraine. In the electrical system used in the United States and others, the current reverses direction 60 times per second, so wall sockets are at a different voltage. When visiting Asia, Africa, or the USA, you need special adapters to use electrical appliances you bring with you from Ukraine.

Taken from: <http://www.cpo.com/pdf>

Task 10. Choose the right answer according to the text “Electric current”.

- 1.** Electric current from a battery flows out of
 - a. negative end
 - b. an arrow
 - c. positive end
- 2.** A DC current or voltage
 - a. keeps the same sign over time
 - b. reverses sign
 - c. reverses direction 60 times per second
- 3.** Alternating current is used in Ukraine because
 - a. there is no direct current in Ukraine
 - b. it is cheaper
 - c. it is easier to generate
- 4.** Electric current is measured in units called
 - a. volts
 - b. amperes

- c. ohms
- 5. In the United States the current reverses direction
 - a. 60 times per second
 - b. 10 times per second
 - c. 75 times per minute
- 6. The amount of electric current coming out of the positive end of the battery
 - a. does not depend on the amount of current flowing into the negative end
 - b. is equal to the amount of current flowing into the negative end
 - c. is proportional to the amount of current flowing into the negative end

Task 11. Fill in the blanks with suitable words or word combinations given.

wires, alternating, rate, circuit, same, transmit, negative/positive.

1. _____ current constantly switches direction. 2. Electric current from a battery flows out of the _____ end and returns back into the _____ end. 3. Electrical forces are so strong that current stops immediately if a _____ is broken. 4. The _____ at which the balls flow in equals the rate at which they flow out. 5. We use alternating current because it is easier to _____ over long distances. 6. Electric current does not leak out of _____. 7. A DC voltage is one that stays the _____ sign over time.

Task 12. Define Complex object and Complex subject structures in the sentences and translate them (see App. A).

- 1. The electrical engineers find such a methodology hard to accept.
- 2. Two major reasons seem to have been involved.
- 3. The work appears to be a collection of largely independent topics in search of an overall theory.
- 4. The answer appears to be positive.
- 5. I found this argument to be quite confusing.
- 6. This rule is believed to hold good for other cases as well.
- 7. Their development seems to have changed the way people think.
- 8. Franklin made others believe that lightning was more than a flash of light in the sky.

9. We proved this suggestion to be wrong.
10. Consider two examples which appear to be quite typical.

Task 13. Translate the following sentences into English using Complex Object/Subject.

1. Відомо, що електричний струм — направлений рух електрично заряджених частинок під впливом електричного поля.
2. Кажуть, струм характеризується силою струму і щільністю струму.
3. За напрям струму береться напрям, в якому переміщаються позитивно заряджені частинки, тобто напрям, протилежний переміщенню електронів.
4. Постійним називають струм, який може змінюватися по величині, але не змінює свого знаку скільки завгодно часу.
5. Дослідники припускали, що струм може протікати в обох напрямках.
6. Змінним називають струм, який періодично змінюється як по величині, так і по знаку.
7. Очевидно, що матеріал, в якому тече струм, називається провідником.
8. Припускають, що величина струму, що проходить через тіло людини, залежить від опору тіла та прикладеної напруги.
9. Багато спеціалістів припускають, що надпровідники посядуть надзвичайно важливу нішу промисловості у майбутньому.
10. Потрібно обов'язково пам'ятати, що людський організм вражає не напруга, а величина струму.

Task 14. a) Before watching the video discuss the following questions with your neighbor.

1. Who was the first to discover current?
2. Which invention do you consider to be the most important?
3. What device operated by electric current can you name?

b) Draw a diagram on inventions and compare it with your partner's.

c) Pair work. Make up dialogue about the importance of electric current and dramatize it.

Task 15. Using the information after watching the video “Timeline electricity” and describe all inventions using the following terms:

kite experiment	metal rod
leaden jar	alternative current
static electricity	electric company
connected to	appliances
inventor of	light bulb
transistor invention	nuclear power plant
power consumption	electricity safety
war of the currents	substations

Task 16. Write the passage (120-180 words) about electricity and its uses (using the following expressions)

Electricity - coal, water or air - electrical energy - most useful form - appliances operated by electricity - to produce heat – light – sound - siren in a mill or a factory -operating pump sets - storing fruits and vegetables - moving conveyor belts - materials – radio – television – refrigerators - computers – medical equipment – do without – integral part.

UNIT 3. ELECTRIC CIRCUIT

Task 1. Listen to the song (without scrolling down to the text) and complete its lyrics with the right words from the box. There are odd ones.

<http://www.songsforteaching.com/science/professorboggs/electricity.htm>

A. Spark	B. Rings	C. South
D. Fire	E. Things	F. Piece
G. Wire	H. Insulator	I. Peace
J. Electron	K. Power	L. Distance
M. May	N. Cover	O. Turn
P. They	Q. Copper	R. Computer
S. Positive	T. Tower	U. Pixels
V. Balance	W. Poles	X. Malls

Where ya gonna see 1)... E –lectricity

Where ya gonna see the 2)...?

From a doorknob tickle on a winter's day

To the 3)... of lightning in the dark

Stack up some 4)..... on one side of a wall

5).... leave behind some 6).... holes

Plus and minus ions – they are always tryin'

To jump across and 7).... out the difference in the 8)...

Now electrons like to travel through conductive 9).....

An 10).... keeps them where they are

If you know which way they're flowin' you can get a circuit goin'

You can run a fan or 11)... an electric guitar...

If you spin a magnet near a 12).... wire

The electrons start to dancing back and forth

If you send electric power through a coil around a 13)...

You will find you have a magnet with a 14)... and north

Jiggle some electrons in a 15)... of copper wire

You'll be sending out a wave, you see

And over at a 16)..., something with a low resistance
 Will pick it up and 17)... it into electricity
 Look in your 18)...
 It's a million little switches
 Patterns of electrons like a
 Fabric and its stitches
 Pushin' those electrons through
 A maze that's never seen
 But finally it lights up all the
 19).... on your screen

Task 2. Practise reading of the following words.

1. Refrigerator / n'frɪdʒ(ə)reɪtə /	2. Socket /sa:kə/
3. Electricity /ɪ,lek'trɪsɪtɪ/	4. Hose /ho:z/
5. Routine /ru:ti:n/	6. Appliances /əplɪən(t)s/
7. Circuit /'sɜ:kɪt/	8. Muscles /'mʌs(ə)l/
9. Jolt /dʒəʊlt/	10. Fuse /fju:z/
11. Overload /,əʊvə'ləʊd/	12. Capacity /kə'pæsɪtɪ/

Task 3. Match the terms with their definitions.

- | | | |
|-----------------|-------------|------------------|
| 1. Refrigerator | 5. Jolt | 9. Convert |
| 2. Socket | 6. Overload | 10. Plug |
| 3. Hose | 7. Fuse | 11. Electric eel |
| 4. Appliance | 8. Capacity | 12. Fault |

- a. a device in a wall into which an electric cord can be plugged
- b. to change (something) into a different form or so that it can be used in a different way
- c. a sudden, rough movement
- d. a long, usually rubber tube that liquids or gases can flow through
- e. a machine (such as a stove, microwave, or dishwasher) that is powered by

- electricity and that is used in people's houses to perform a particular job
- f. something that is wrong with machine, system, design, which prevents it from working properly
 - g. a device or room that is used to keep things (such as food and drinks) cold
 - h. to put too much electricity through an electrical system or piece of equipment
 - i. a short thin piece of wire inside electrical equipment which prevents damage by an error especially in service in a net
 - j. the quantity of electricity that a battery can deliver under specified conditions
 - k. a part at the end of a wire or cable that is used to connect machines or devices
 - l. a long, thin South American fish that is able to give a severe electric shock

Task 4. Read and translate the text. Make a plan for its retelling.

ELECTRIC CIRCUITS. Part 1

An electric circuit is a complete path through which electricity travels. A good example of a circuit is the one in an electric toaster. Bread is toasted by heaters that convert electrical energy to heat. The circuit has a switch that turns on when the lever on the side of the toaster is pulled down. With the switch on, electric current enters through one side of the plug from the socket in the wall, and goes through the toaster and out the other side of the plug.

Wires in electric circuits are similar in some ways to pipes and hoses that carry water. Wires act like pipes for electric current. Current enters the house on the supply wire and leaves on the return wire. The big difference between wires and water pipes is that you cannot get electricity to leave a wire the way water leaves a pipe. If you cut a water pipe, the water flows out. If you cut a wire, the electric current stops immediately.

Circuits are not confined to appliances, wires, and devices built by people. The first experience humans had with electricity was in the natural world. These are some examples of natural circuits:

- The nerves in your body are an electrical circuit that carries messages from your brain to your muscles.

- The tail of an electric eel makes a circuit when it stuns a fish with a jolt of electricity.
- The Earth makes a gigantic circuit when lightning carries electric current between the clouds and the ground.

Taken from: <http://www.cpo.com/pdf>

Task 5. Fill in the correct preposition then choose any three phrases and make sentences using Complex Object/Subject.

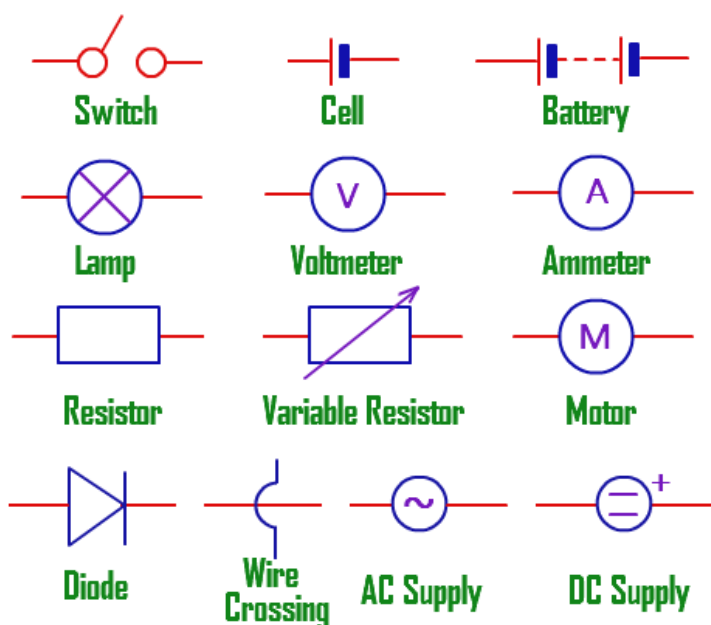
- | | |
|--|--|
| 1. To switch ... a light | 7. ... conditions that |
| 2. To be made ... wires | 8. To carry messages ... brain ... muscles |
| 3. To path ... the fuse | 9. The difference ... wires and water pipes |
| 4. To be similar | 10. To provide path ... the passage of current |
| 5. To be connected ... series | |
| 6. To convert electrical energy ... heat | |

Task 6. Find English words and word –combinations according to their Ukrainian equivalents (you can go across and down).

U	A	P	P	L	I	A	N	C	E	S	N	S	A	E	D	F	G	E	O
A	C	E	D	I	O	D	F	W	A	A	D	O	V	P	S	C	E	L	P
R	C	U	E	R	E	S	I	S	T	A	N	C	E	L	E	O	O	E	D
F	I	Q	L	A	Y	H	O	W	V	F	G	K	I	U	T	N	H	C	A
V	D	W	E	G	T	O	Y	I	J	E	A	E	J	G	Y	D	J	T	N
G	E	U	C	F	R	R	A	S	R	T	N	T	E	O	H	U	Q	R	G
H	N	K	T	H	E	T	O	H	G	F	L	E	D	I	G	C	T	O	E
I	T	O	R	N	D	C	I	R	C	U	I	T	C	N	F	T	U	L	R
O	A	Y	I	E	S	E	D	E	D	S	T	O	V	E	E	O	I	Y	K
Y	L	A	C	D	A	F	A	B	R	E	A	K	E	R	R	R	K	T	F
S	A	F	E	T	Y	V	D	E	V	I	C	E	P	O	V	A	S	E	A

1. коротке замикання	2. розетка (роз'єм)	3. безпека
4. провідник	5. електроліт	6. небезпека
7. побутове електрообладнання	8. електрична вилка	9. прилад
10. випадково	11. автоматичний вимикач	12. опір
13. вимикати (відключати)	14. «пробка» (плавкий запобіжник)	15. розетка

Task 7. Study the table. Then copy the symbols and practice their understanding in the game <http://www.tutorvista.com/physics/animations/electric> –circuit – symbols –animation. Draw a simple circuit using these symbols and describe it.



Task 8. Look through the text and find the odd word. Some lines are correct.

Electricity usually means the flow of electric current in a wires,	0	a
motors, light bulbs, and other the devices. Electric current is what	1	
makes an electric motor turn or an electric stove heat up. Electric	2	
current is almost an always invisible and comes from the motion of	3	
electrons or other charged particles. Electric current can to carry	4	
great deal of energy. For example, an electric saw can cut	5	
wood much faster than a hand saw. An electric motor the size	6	
of a basketball can may do as much work as five big horses	7	

or fifteen strong people. Electric current may also can be dangerous.	8	
Touching a live electric wire can result in serious injury.	9	
The more you know about electricity, the easier us it is to use it safely.	10	

Task 9. Translate the words and their derivatives.

- | | |
|---|---|
| 1. To convert – converted – converter – convertible | 6. Safety – safe – unsafe |
| 2. To carry – carrying – carrier | 7. To pass – passage – impassable |
| 3. To stun – stunned – stunning | 8. To overload – overloading – overloaded |
| 4. Fault – faulty – faultless | 9. Produce – production – productive |
| 5. To connect – connection – connected – disconnected | 10. Fuse – fused – diffuse – diffusion |

Task 10. Read the second part of text “Electric Circuit” and answer the questions below.

ELECTRIC CIRCUITS. Part 2

There are various kinds of electric circuits such as: open circuits, closed circuits, series circuits, parallel circuits and short circuits.

To understand the difference between the following circuit connections is not difficult at all. When electrical devices are connected so that the current flows from one device to another, they are said to be connected in series. Under such conditions the current flow is the same in all parts of the circuit, as there is only a single path along which it may flow. The electrical bell circuit is considered to be a typical example of a series circuit. The parallel circuit provides two or more paths for the passage of current. The circuit is divided in such a way that part of the current flows through one path, and part through another.

Appliances and electrical outlets in homes are connected in many parallel circuits. The lamps in your room and your house are generally connected in parallel. Each circuit has its own fuse or circuit breaker that stops the current if it exceeds the safe amount, usually 15 or 20 amps. If you turn on too many appliances in one circuit at the same time, the circuit breaker or fuse cuts off the current. To restore the

current, you must first disconnect some or all of the appliances. Then, either flip the tripped circuit breaker (in newer homes) or replace the blown fuse (in older homes). Fuses are also used in car electrical systems and in electrical devices such as televisions.

Now we shall turn our attention to the short circuit sometimes called "the short". The short circuit is produced when the current is allowed to return to the source of supply without control and without doing the work that we want it to do. The short circuit often results from cable fault or wire fault. Under certain conditions, the short circuit may cause fire because the current flows where it was not supposed to flow. If the current flow is too great a fuse is to be used as a safety device to stop the current flow.

The fuse must be placed in every circuit where there is a danger of overloading the line. Then all the current to be sent will pass through the fuse.

When a short circuit or an overload causes more current to flow than the carrying capacity of the wire, the wire becomes hot and sets fire to the insulation. If the flow of current is greater than the carrying capacity of the fuse, the fuse melts and opens the circuit.

Taken from: <http://www.cpo.com/pdf>

- 1) What is electric circuit?
- 2) Where might fuses be used?
- 3) What should you do to restore current in new buildings?
- 4) How are appliances and electrical outlets in homes connected?
- 5) What wires in electric circuits are similar to?
- 6) What is the difference between wires and water pipes?
- 7) Why does short circuit occur?
- 8) What might cause problems with wires?
- 9) How much amps equals current safe amount?
- 10) Why is short circuit dangerous?
- 11) What circuits are usually made of?
- 12) What happens when the lever on the side of the toaster is pulled down?

- 13) What happens if one cuts wire?
- 14) What natural circuits can you name?
- 15) What are the kinds of electric circuits?
- 16) What is the example of a series circuit?
- 17) Under which conditions the fuse must be placed in every circuit?

Task 11. Fill in the blanks with suitable words or word combinations given below.

Houses have electrical wiring carrying 1) _____ to run household 2) _____. These systems have 3)_____ to interrupt power if a dangerous 4) _____ occurs. Usually, this short circuit is in an appliance that is plugged into an electric 5) _____. Sometimes the short circuit is in the house wiring itself, which creates a fire hazard in the walls of the 6)_____.

circuit breakers, appliances, structure, short circuit, power, outlet.

Task 12. Choose the right variant of the verb.

1. A scientist tries to avoid to work / working overtime.
2. Did you manage to find out / finding out who was behind the decision not to hand in the laboratory project today?
3. The KPI graduates have already begun to understand / understanding how this organisation really works.
4. I can't imagine to work / working at home – I don't think I'd have the discipline.
5. My friend has asked to have / having an academic vacation in university.
6. They dislike to work/ working with such outdated equipment.
7. I don't know any body who likes to make / making calculations in Mathcad.
8. Some days I feel like to walk / walking out of my office and never to come / coming back.
9. Have you ever learnt to operate / operating a turbogenerator?
10. The students couldn't help to wonder / wondering who was the first to produce the first source of continuous current.

Task 13. Read the statements and define whether they are True or False.

1. Circuits are usually made of wires that carry electricity and devices that use electricity.
2. An electric circuit is a complete path through which electricity travels.
3. Bread is toasted by the converter that converts electrical energy to heat.
4. With the switch on, electric current enters through one side of the plug from the socket in the wall, and goes through the toaster and out the other side of the plug.
5. Current enters the house on the return wire and leaves on the supply wire.
6. If you cut a wire, the electric current doesn't stop.
7. The nerves in your body are an electrical circuit that carries messages from your brain to your muscles.
8. When electrical devices are connected so that the current flows from one device to another, they are said to be connected in series.
9. The parallel circuit provides two or more paths for the passage of current.
10. The lamps in your room and your house are generally connected in series.
11. If the flow of current is lower than the carrying capacity of the fuse, the fuse melts and opens the circuit.

Task 14. Translate the sentences paying attention to the Complex Object with the Participle.

1. We have already mentioned this connection as the most common one.
2. Bohr recognized the substance as having a high conductivity.
3. He conceived valence as being a property of atoms and to be a constant for each element.
4. We may think of this fault as being just the reason for the fire alarm switching on.
5. Franklin considered bodies had specific fluid being the conductor of electricity.
6. He regards this concept as being not a simple one.
7. Electrocardiogram seems to be the graph of measuring current flow in the body.

8. I had others consider my opinion.

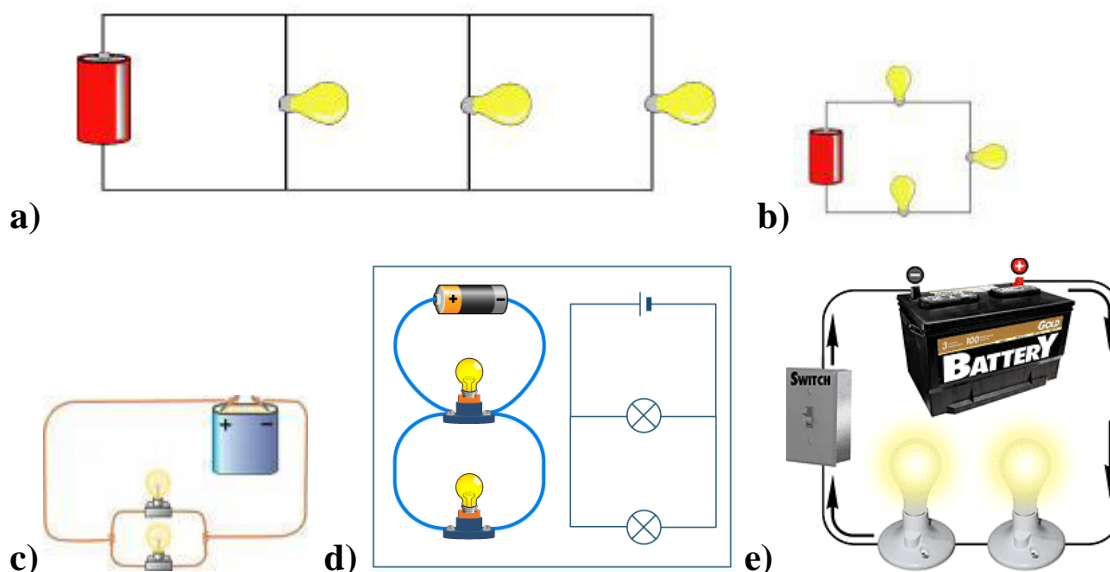
Task 15. What knowledge you get after reading the text. Writing (45–50 words).

- a) Describe the similarities and differences between an electric circuit and the human nervous system.
- b) Brain and nerve cells communicate through the movement of charged chemicals that create electrical currents. Some conditions, such as epilepsy, occur because these currents are sometimes present when they shouldn't be. Research electrical currents in the body and problems that occur when the body's circuits don't work properly.

Task 16. Draw circuits with the following characteristics and sign all the components.

- a) A series circuit with a battery, a switch and two bulbs.
- b) A parallel circuit with a battery, a switch and three resistors.
- c) A series circuit with a battery, a two –way switch, a bulb and a bell.
- d) A parallel circuit with a battery, a bell, a motor and a voltmeter.

Task 17. Decide what circuits are shown (series or parallel). Choose a circuit and describe it naming the components and type of connection without telling what figure you have chosen. Let your groupmates guess.



UNIT 4. CONDUCTORS AND INSULATORS

Task 1. Match the terms with their Ukrainian equivalents.

1. Semiconductor	a. Валентний
2. Charge carrier	b. Послідовне підключення
3. Valence	c. Носій заряду
4. Spark	d. Підстанція
5. Fuse	e. Розряд
6. Insulator	f. Перевантаження
7. Substation	g. Електростанція
8. Short circuit	h. Електричний струм
9. Series connection	i. Плавкий запобіжник
10. Current flow	j. Ізолятор
11. Grid	k. Енергосистема
12. Power station	l. Напівпровідник
13. Coil	m. Іскра
14. Discharge	n. Котушка
15. Overload	o. Коротке замикання

Task 2. Find the pairs of opposite notions.

1. Alternating current	a) Positive terminal
2. Conductor	b) Insulator
3. Live wire	c) Open circuit
4. Closed circuit	d) Direct current
5. Potential energy	e) Series connection
6. Parallel connection	f) Kinetic energy
7. Fluid	g) Neutral wire
8. Negative terminal	h) Solid

Task 3. Watch the presentation “Conductors and insulators”. Read the text to find out more about conductive/non –conductive materials.

CONDUCTORS AND INSULATORS

Current passes easily through some materials, such as copper, which are called conductors. A conductor can conduct, or carry, electric current. Most metals are good conductors. Other materials, such as rubber, glass, and wood, do not allow current to easily pass through them. These materials are called insulators, because they insulate against, or block, the flow of current. Some materials are in between conductors and insulators. These materials are called semiconductors because their ability to carry current is higher than an insulator but lower than a conductor. Computer chips, televisions, and portable radios are among the many devices that use semiconductors. You may have heard of a region in California called “Silicon Valley.” Silicon is a semiconductor commonly used in computer chips. An area south of San Francisco is called Silicon Valley because there are many semiconductor and computer companies located there.

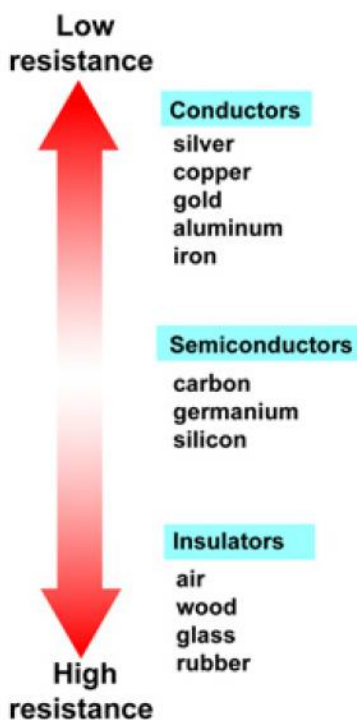
No material is a perfect conductor or insulator. Some amount of current will always flow in any material if a voltage is applied. Even copper (a good conductor)

has some resistance. Figure 1 shows how the resistances of various conductors, semiconductors, and insulators compare.

Applications of conductors and insulators

Both conductors and insulators are necessary materials in human technology. For example, a wire has one or more conductors on the inside and an insulator on the outside. An electrical cable may have twenty or more conductors, each separated from the others by a thin layer of insulator. The insulating layer prevents the other wires or other objects from being exposed to the current and voltage carried by the conducting core of the wire.

If an excess of charge is placed on an insulator, it will stay where it is put and there will be a concentration of charge in that area of the object. However, if an



excess of charge is placed on a conductor, the like charges will repel each other and spread out over the surface of the object.

When two conductors are made to touch, the total charge on them is shared between the two. If the two conductors are identical, then each conductor will be left with half of the total charge.

Taken from: <http://www.cpo.com/pdf>

Task 4. Read the text again and make a plan or picture formulating main ideas from the text.

Task 5. Answer the questions.

1. Which of these substances conducts electricity the best?

- a. Wood
- b. Brick
- c. Copper
- d. Plastic

2. The electrician in this picture is wearing rubber gloves for protection. The purpose of the rubber gloves is to ____.

- a. keep the electrician dry
- b. create an electrical circuit
- c. produce electricity
- d. insulate the electrician

3. What material would be safest to use as an insulator to cover electrical wires?

- a. Aluminum
- b. Tin
- c. Rubber
- d. Water

4. Copper wire is often wrapped in plastic. Plastic material is a good —

- a. electromagnet
- b. insulator
- c. circuit
- d. current

5. Many electrical wires are wrapped with a plastic coating because plastic is —

- a. less expensive than steel
- b. more dense than copper
- c. able to keep its shape
- d. a good insulator

6. Which of these groups contains items that could all conduct electricity to complete the circuit?

- a. Rubber ball, plastic comb, nail
- b. Paper clip, penny, screw
- c. Cork, dollar bill, tweezers
- d. Pencil, eraser, knife

Task 6. Choose the words that are most nearly the same in meaning to the bold ones and explain them:

- a) **transmit** – send, transfer, promote, support
- b) **invent** – create, devise, develop, find
- c) **powerful** – great, strong, effective, long
- d) **carry** – include, conduct, bring, occupy
- e) **store** – keep, follow, confirm, make
- f) **perfect** – good, past, ideal, super

Task 7. Choose the right translation of the nominative constructions in bold

1) A designer selects **construction materials**

- a) конструкції матеріалів
- b) конструкційний матеріал

c) матеріали для будівництва

2) New alloys have increased the **strength of steel**.

a) витримку сталі

b) силу сталі

c) сильну сталь

3) This **proton beam** is stronger than that one.

a) протонний напрямок

b) спрямований пучок протонів

c) пучок протонів

4) The assumptions were constructed on the **basis of experience**.

a) на основі експерименту

b) на базі знань

c) на основі досвіду

5) An old electrician used the **copper wires** in the built circuit.

a) дрiт iз мiдi

b) мiднi дроти

c) мiдь

6) A **flashlight bulb** uses about 1/2 amp of electric current.

a) лiхтарика лампочка

b) лiхтарик свiтиться

c) лампочка лiхтарика

7. **Salt water** is a conductive liquid.

a) сiль у водi

b) солонa вода

c) соляний розчин

Task 8. Read the remarks and put them in the right order to make a dialogue.

Dramatize it.

A.	This is because aluminium wires have lower tensile strength than that of copper.
B.	You see, it seems like their conductivity are almost the same. Aluminium resistivity is 2.8×10^{-8} ohm –m...
C.	Why is it so?
D.	Yes, it means that aluminium is lighter than copper. One more advantage of this metal... Should I mention melting point?
E.	Ok... Writing down “ 655°C ”. And as far as I know, copper can easily be drawn into thin wires too. But are these metals corrosion proof? I mean...
F.	Can you help me? I’m trying to write down advantages and disadvantages of aluminium and copper as a conductor of electricity...
G.	So, having compared these conductors, we can say they are almost identical and can substitute each other...
H.	Now I see... Thank you very much! Can I help you with your home task?
I.	Certainly! It’s important characteristic of conductors.
J.	Not at all. And if you wish, I’d be glad, because I have too many calculations to make...
K.	Of course I can. So what is the problem?
L.	No –no –no! They have some similar properties and characteristics, but for applications like winding of electrical machines and transformers, it is difficult to substitute aluminium for copper.
M.	And it’s about 1.6 times higher than copper resistivity, as I know. Next step, to my mind, is to mention the density of aluminium which is 2.68. Do you know what it means?
N.	I’ve got what you meant. Like copper, aluminium also forms an oxide layer over its surface when exposed to atmosphere and that layer prevents the material from further oxidation and acts as a resistance layer to corrosion.

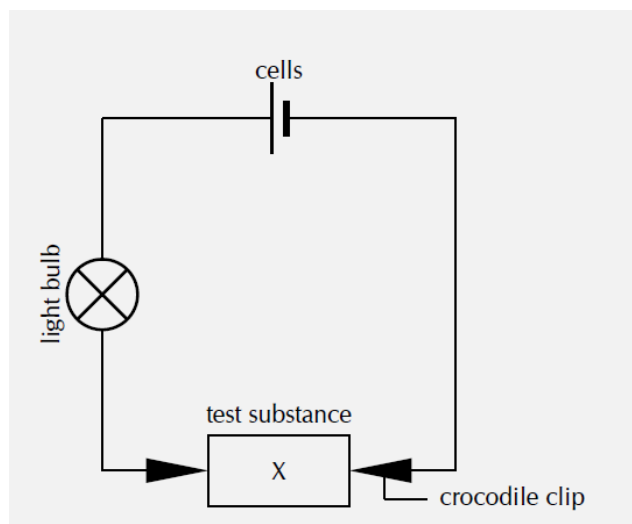
Task 9. Try to do the simple experiment. Before doing the experiment, translate all the steps and details of it.

General experiment: Electrical conductivity

Aim: To investigate the electrical conductivity of a number of substances

Apparatus:

- two or three cells
- light bulb
- crocodile clips
- wire leads
- a selection of test substances (e.g. a piece of plastic, aluminium can, metal pencil sharpener, magnet, wood, chalk, cloth).



Method:

1. Set up the circuit as shown above, so that the test substance is held between the two crocodile clips. The wire leads should be connected to the cells and the light bulb should also be connected into the circuit.
2. Place the test substances one by one between the crocodile clips and see what happens to the light bulb. If the light bulb shines it means that current is flowing and the substance you are testing is an electrical conductor.

Results:

Record your results in the table below:

Test substance	Metal/nonmetal	Does the light bulb glow?	Conductor or insulator

Agree or disagree with the conclusions:

1. In the substances that were tested, the metals and plastics were able to conduct electricity and the non –metals were not.
2. Metals are good electrical conductors and non –metals are not.

Task 10. Summarize all you have learnt about conductors and insulators and make a short report on the topic “Conductors and insulators are vital for electricity existence”.

Task 11. Make a research and write a letter (160words) to your friend in any English-speaking country telling about .

- a) advantages and disadvantages of china/rubber insulators;
- b) advantages and disadvantages of copper/aluminium conductors in domestic use.

UNIT 5. EMF AND RESISTANCE

Task 1. Translate the words and their derivatives.

1. To bond – bonded – bonding	6. Random – randomly – randomness – randomize
2. To connect – connection – connected – connectedness	7. To transfer – transference – transferable
3. To move – a move – moveable – movement – moving	8. To apply – applied – applicable – application – applicant
4. To attract – attraction – attractive – attracted	9. To conduct – conductor – conductivity
5. Volt – voltage – voltmeter	10. Molecule – molecular

Task 2. Match the terms with their definitions.

1. Repel	a) the smallest unit into which any substance can be divided without losing its own chemical nature, usually consisting of two or more atoms
2. To bounce	b) firm or hard : not having the form of a gas or liquid
3. Solid	c) to be joined together
4. To be bonded	d) a material or object that allows electricity or heat to move through it
5. Velocity	e) to move in one direction, hit a surface (such as a wall or the floor), and then quickly move in a different and usually opposite direction
6. Randomly	f) to pull to or draw toward oneself or itself
7. Conductor	g) to force (something) to move away or apart
8. To drift	h) quickness of motion
9. Attract	i) without definite aim, direction, rule, or method
10. Molecule	j) to move slowly especially over water or through the air

Task 3. Try to answer the following questions before reading the text. Then check yourself by reading the information about EMF.

1. Under which conditions do atoms bond together by sharing electrons?
2. How does solid piece of copper act in some ways?
3. In which case do the free electrons bounce around at high speed?
4. In which case are the free electrons attracted to the positive terminal and repelled by the negative terminal?
5. Why do electrons not move directly from one end of the wire to the other?
6. When do electrons bounce off the atoms?
7. What creates electric current?
8. What explains how wires heat up when current is passed through copper atoms?
9. What is a good conductor of heat and electricity?
10. Under which conditions do all the free electrons in the wire start drifting?

EMF AND RESISTANCE

Let us assume that there is a movement of electrons through the wire, say, from point A to point B. What does it mean? It means that there is an excess of electrons at point A. Unless there were a flow of electric current between A and B in any direction, it would mean that both the former and the latter were at the same potential. Of course, the greater the potential difference, the greater is the electron flow.

When you measure the potential difference across (or between) the terminals of a battery you are measuring the “electromotive force” (emf) of the battery. This is how much potential energy the battery has to make charges move through the circuit. This driving potential energy is equal to the total potential energy drops in the circuit. This means that the voltage across the battery is equal to the sum of the voltages in the circuit.

THE SOURCE OF CURRENT

When atoms of a metal (like copper) are together they all bond together by sharing electrons. In some ways a solid piece of copper acts like a single huge molecule. Some valence electrons can move freely anywhere within the copper. The

copper atoms with the remaining electrons are bonded together and stay fixed in place.

If a copper wire is not connected to a battery, the free electrons bounce around at high speeds. They have no average motion because as many are going one way as the other way. However, the free electrons move energy very effectively, so metals are good conductors of heat as well as electricity.

If a battery is connected across a copper wire, the free electrons are attracted to the positive terminal and repelled by the negative terminal. However, the electrons do not move directly from one end of the wire to the other because the copper atoms are in the way. Instead, the electrons bounce off the atoms while slowly making their way toward the positive end of the battery. The electric force created by the battery voltage creates a slow drift velocity in one direction on top of the electron's random bouncing. This slow drift velocity is what creates electrical current. The bouncing transfers some energy from the drift motion to the copper atoms. This explains how wires heat up when current is passed through them.

With a 1.5 volt battery the drift velocity is slower than a turtle, a few millimeters per second. So why does the bulb light up instantly? The electrons carrying current in a wire do not come from the battery. Current flows because the voltage from a battery makes electrons move that are already in the wire.

This is why a light bulb goes on as soon as you flip the switch. A copper wire contains many electrons bouncing randomly around. Without an applied voltage, as many electrons bounce one way as the other. There is no net flow of electrons and no electrical current. When a voltage is applied all the free electrons in the wire start drifting because of the electric force.

Taken from: <http://www.cpo.com/pd/>

Task 3. Fill in the correct words from the list below.

**bond, drift, repel, solid, conductor, bounce, velocity, randomly, molecule,
attract**

1. Heat was used to the sheets of plastic together.
2. Metal is a good of electricity.

3. The winner up and down with delight.
4. The chance to travel around the world me to a career as a flight attendant.
5. Magnets can both and attract one another.
6. The speedboat reached a of 120 mph.
7. The computer program generates a list of chosen numbers.
8. The clouds across the sky.
9. Concrete is a material.
10. The of oxygen gas contain just two atoms.

Task 4. Match the items from the two columns to make word combinations.

Then make sentences with these word combinations and the word *provided*

Ex.: Provided the silver were cheaper than copper, we would use silver wires to conduct electricity

1. Positive/negative	a. Bouncing
2. Random	b. Velocity
3. Battery	c. Bulb
4. Copper	d. Voltage
5. Drift	e. Terminal
6. Light	f. Molecule
7. Free/valence	g. Atom/wire
8. Electric	h. Force
9. Single/huge	i. Motion
10. Average	j. Electrons

Task 5. Fill in the correct preposition. Then choose any three items and make the sentences with Complex Subject.

to (x4)	with	like	within	off	at	from(x2)	by
---------	------	------	--------	-----	----	----------	----

1. To act a single molecule
2. To move freely the copper
3. To be bonded together

4. To be connected the battery
5. To bounce high speeds
6. To be attracted the terminal
7. To be repelled the terminal.
8. To move one end of the wire the other
9. To bounce the atoms
10. To transfer energy the drift motion the copper atoms

Task 6. Translate the following sentences into English.

1. У деяких випадках тверда частинка міді поводить ся як велика цілісна молекула.
2. Деякі валентні електрони можуть вільно рухатись у будь –якому напрямку в межах міді.
3. Якщо дріт міді не приєднаний до батареї, вільні електрони стрибають навколо на високій швидкості.
4. Метали є гарними провідниками тепла та електроенергії.
5. Вільні електрони дуже ефективно переміщують енергію.
6. Вільні електрони притягуються до позитивного полюса та відштовхуються від негативного.
7. Повільна дрейфова швидкість – це те, що створює електричний струм.
8. Електрони, які переносять електричний струм у проводі, не виходять з батареї.
9. У мідному дроті міститься багато електронів, які стрибають у хаотичному напрямку.
10. Електричний струм протікає внаслідок того, що напруга від батареї змушує електрони рухатись.

Task 7. Decide whether the following statements are true or false and correct them if necessary.

1. When atoms of a metal (like copper) are free, they all bond together by sharing electrons.

2. In some ways a solid piece of copper acts like a single huge molecule.
3. Some valence electrons cannot move freely anywhere within the copper.
4. If a copper wire is not connected to a battery, the free electrons bounce around at high speeds.
5. Metals are good conductors of heat as well as electricity.
6. The electrons bounce off the atoms while slowly making their way toward the negative end of the battery.
7. The slow drift velocity is what creates electrical current.
8. Current flows because the voltage from a battery makes electrons move that are already in the wire.
9. A copper wire contains many electrons bouncing randomly around.
10. When a voltage is applied, all the free electrons in the wire start drifting because of the slow velocity.

Task 8. Find the correct term for each definition.

1. A measure of the flow rate of "electrical current" that is available.
2. A measure of the potential difference across a conductor when a current of one ampere dissipates one watt of power.
3. A measure of the measure of electrical resistance, which also measures the heat that will be generated in a wire carrying a given current.
4. A measure of the amount of electricity being used – a rate of electrical power consumption.
5. A measure of either electrical energy produced, say by a power station, or the amount of electrical energy consumed.
6. The ratio of the real power flowing to the load to the apparent power.
7. The capacity of the circuit for performing work in a particular time.
8. The product of the current and voltage of the circuit that can be greater than real power.
9. Each complete change of current from zero to maximum to zero in one direction and then zero to maximum to zero in the opposite direction.

10. The capacity to do work is present, but not that work is necessarily being performed.

Task 9. Read and put the verbs in the correct form.

The resistance of electrical devices 1) ____ (range) from small ($0.001\ \Omega$) to large ($10 \times 10^6\ \Omega$). Every electrical device 2) _____ (design) with a resistance that 3) _____ (cause) the right amount of current to flow when the device is connected to the proper voltage. For example, a 60 watt light bulb 4) ____ (have) a resistance of 240 ohms. When connected to 120 volts from a wall socket, the current is 0.5 amps and the bulb 5) ____ (light).

If you 6) _____ (connect) the same light bulb to a 1.5 –volt battery it will not light because not enough current 7) _____ (flow). According to Ohm's law, the current is only 0.00625 amps when 1.5 volts 8) _____ (apply) to a resistance of $240\ \Omega$. This amount of current at 1.5 volts 9) _____ (not carry) enough power to make the bulb light. All electrical devices 10) ____ (design) to operate correctly at a certain voltage.

Task 10. Continue the text, putting the sentences in the right order.

Electrical outlets are dangerous because you can get a fatal shock by touching the wires inside...

- a) So why can you safely handle a 9 V battery?
- b) This is not enough current to be harmful.
- c) You can get a dangerous shock from 120 volts from a wall socket because that is enough voltage to force 0.0012 amps ($120\text{ V} \div 100,000\ \Omega$) through your skin, more than twice the amount you can feel.
- d) The reason is Ohm's law. Remember, current is what flows and carries power.
- e) The typical resistance of dry skin is 100,000 ohms or more.
- f) According to Ohm's law, $9\text{ V} \div 100,000\ \Omega$ is only 0.00009 amps.
- g) On average, nerves in the skin can feel a current of around 0.0005 amps.

Task 11. Watch the video “EMF and resistance”. Compare the information you have heard and read in the text above. Work in pairs to solve the following tasks.

- a) A motor in a toy car needs 2 amps of current to work properly. If the car runs on four 1.5 –volt batteries, what is the motor’s resistance?
- b) Why is it important that the filament of a light bulb have a much larger electrical resistance than the supporting wires that carry current to and from that filament?
- c) Which has the stronger electric field between its two terminals: a 1.5 –V AA battery or a standard 9 –V battery?
- d) You have 100 AA batteries. How should you connect those batteries to one another and then shape the resulting chain in order to make the strongest electric field?

Task 12. Open the brackets and identify the type.

1. If he had dropped the thermometer, it would have broken.
☐ Type I ☐ Type II ☐ Type III
2. If you have to do the laboratory work, I will help you.
☐ Type I ☐ Type II ☐ Type III
3. If I had a hammer, I'd hammer in the morning ... (song)
☐ Type I ☐ Type II ☐ Type III
4. I wouldn't run away if I saw a fire.
☐ Type I ☐ Type II ☐ Type III
5. The engineers would have started the operation of a new central power plant last month, if the government had sponsored the project.
☐ Type I ☐ Type II ☐ Type III
6. If students have kept to the instruction, the accident with that electrical device wouldn't have happened.
☐ Type I ☐ Type II ☐ Type III

7. If we don't get the multimeter for tomorrow's measurement, we'll have to postpone our meeting with lab assistant.

☐ Type I ☐ Type II ☐ Type III

Task 13. a) Look at the sentences and divide them into 4 columns according to the Conditional types.

b) Change active sentences into passive voice sentences and vice versa.

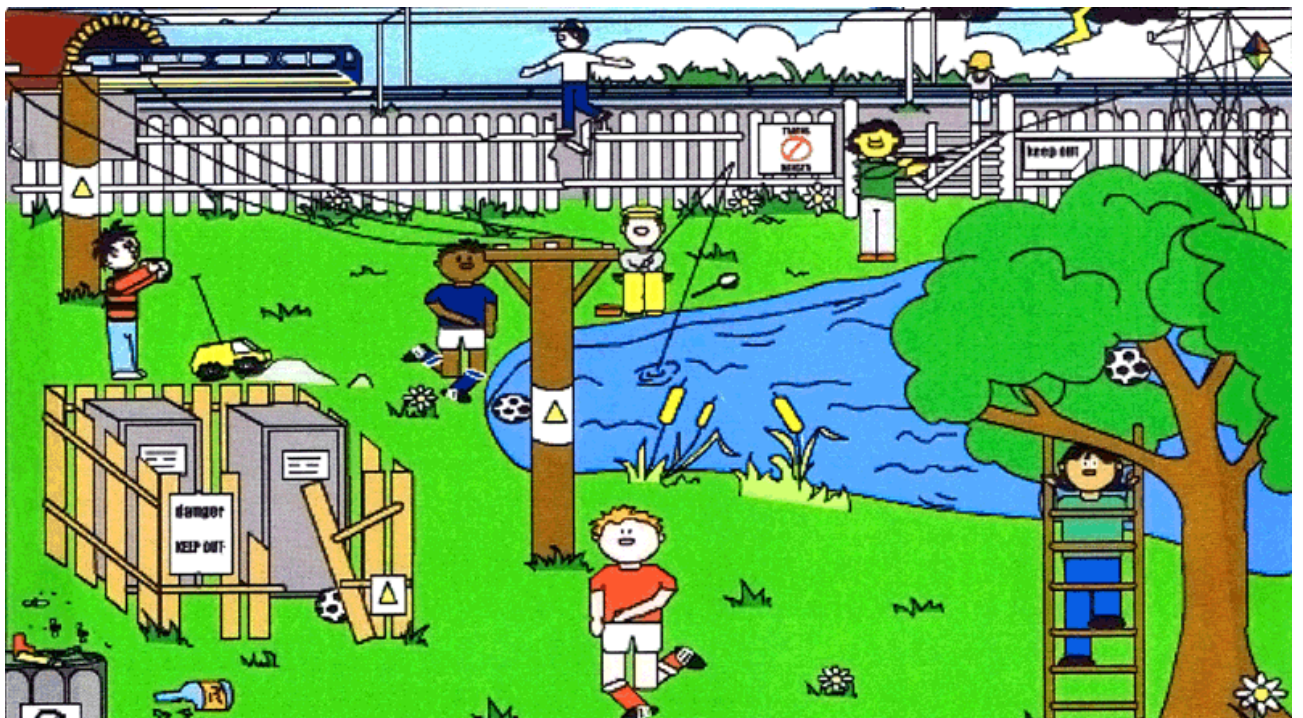
- 1) Had wet skin much higher resistance than dry skin, it would be safe to swim with any electrically operated device turned on.
- 2) If a voltage is applied in such a case, all the free electrons in the wire will start drifting because of the electric force.
- 3) Were your skin not wet, the same voltage would not cause more current to pass through your body because of the higher resistance.
- 4) If a battery is connected across a copper wire, the free electrons are attracted to the positive terminal and repelled by the negative terminal.
- 5) A light bulb's resistance increases if more current passes through the bulb.
- 6) If the bulb gets hotter, it can blow.
- 7) If the assistant had not increased the resistance of those materials, temperature would not have increased.

Task 14. Writing. Look at the pictures. Choose any of them. What dangers can you see? Make sentences using the 1st conditional.

e.g. *If someone opens the door, the woman will fall off the chair.*



A)



B)

UNIT 6. GENERATORS

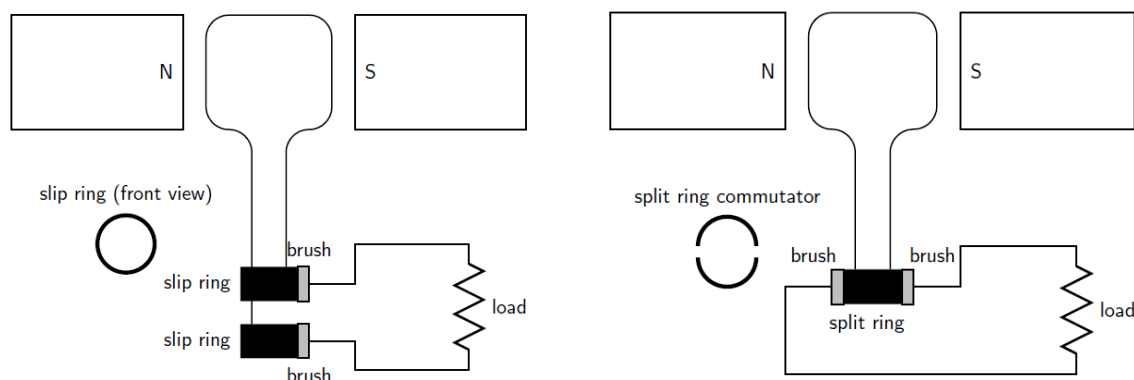
Task 1. Find the synonyms and translation to the words.

a) Rotating	1. outside	A. обертання
b) split	2. circle	B. вручну
c) external	3. change	C. приєднувати
d) loop	4. by hand	D. принцип
e) attach	5. rule	E. перетворювати
f) principle	6. revolving	F. зовнішній
g) manually	7. divide	G. коло
h) convert	8. connect	H. розділяти

Task 2. Find the definition to the term.

1. Conductor	a. A device for reversing the direction of a current.
2. Brush	b. A metal ring mounted on a rotating part of a machine.
3. Commutator	c. A material or an object that conducts heat, electricity, light, or sound.
4. Slip ring	d. A device or the resistance of a device to which power is delivered.
5. Load	e. An electric conductors, esp. made of carbon, that conveys current between stationary and rotating parts of a generator, motor, etc

Task 3. Skim the text and decide what picture is for AC generator and what is for DC generator. Then read and translate the text.



GENERATORS

The principle of rotating a conductor in a magnetic field is used in electricity generators. A generator converts mechanical energy into electrical energy. The conductor in the shape of a coil is connected to a ring. The conductor is then manually rotated in the magnetic field generating an alternating emf. The slip rings are connected to the load via brushes.

If a machine is constructed to rotate a magnetic field around a set of stationary wire coils with the turning of a shaft, AC voltage will be produced across the wire coils as that shaft is rotated, in accordance with Faraday's Law of electromagnetic induction. This is the basic operating principle of an AC generator.

In an AC generator the two ends of the coil are each attached to a slip ring that makes contact with brushes as the coil turns. The direction of the current changes with every half turn of the coil. As one side of the loop moves to the other pole of the magnetic field, the current in it changes direction. The two slip rings of the AC generator allow the current to change directions and become alternating current.

AC generators are also known as alternators. They are found in motor cars to charge the car battery.

A DC generator is constructed the same way as an AC generator except that there is one slip ring which is split into two pieces, called a commutator, so the current in the external circuit does not change direction. The split –ring commutator accommodates for the change in direction of the current in the loop, thus creating DC current going through the brushes and out to the circuit.

Taken from: <http://qatemplates.everythingscience.co.za>

Task 4. Learn more about generators. Fill in the gaps, choosing the right variant.

AC versus DC generators

The problems 1)_____ with making and breaking electrical contact with a 2)____ coil should be obvious (sparking and heat), especially if the shaft of the generator is revolving at high 3) _____. If the atmosphere surrounding the machine

contains flammable or 4)_____ vapors, the practical problems of spark –producing brush contacts are even greater.

An AC generator (alternator) does not 5)_____ brushes and commutators to work, and so is immune to these problems experienced by DC generators. The benefits of AC over DC with 6)_____ to generator design are also reflected in electric motors. While DC motors require the use of brushes to make electrical 7) _____ with moving coils of wire, AC motors 8)_____ not. In fact, AC and DC motor designs are very 9)_____ to their generator counterparts. The AC motor being dependent 10)_____ the reversing magnetic 11)_____ produced by alternating current through its stationary coils of wire to rotate the rotating magnet around on its shaft, and the DC motor being dependent on the brush contacts making and 12)_____ connections to reverse current through the rotating coil every 1/2 rotation (180 degrees).

Taken from: <http://www3.eng.cam.ac.uk>

1.	taken	involved	included	changed
2.	portable	changing	moving	running
3.	speed	velocity	race	temp
4.	exposed	explosion	explosive	exploded
5.	require	make	let	force
6.	order	charge	accordance	regard
7.	compare	contact	contrast	link
8.	did	done	does	do
9.	similar	same	some	equal
10.	in	upon	from	of
11.	field	sphere	niche	part
12.	broken	break	breaking	brake

Task 5. Work in pairs or small groups. Make a dialogue and present the answers to the following questions.

a) Explain the basic principle of an AC generator in which a coil is mechanically rotated in a magnetic field. Draw a diagram to support your answer.

b) Explain how a DC generator works. Draw a diagram to support your answer. Also, describe how a DC generator differs from an AC generator.

Task 6. Match the synonyms or antonyms. Then make up sentences about electricity and generators using comparative structures (See Appendix A).

1. available	a) non –substantial
2. frequently	a) original
3. single	b) transformation
4. reverse	c) difference
5. similarity	d) flow
6. essential	e) rarely
7. initial	f) obtainable
8. permanent	g) numerous
9. flux	h) constant
10. conversion	i) backward

Task 7. Choose the appropriate translation paying attention to the past participle.

1. The magnetic field of the dynamo or alternator can be provided by either electromagnets or permanent magnets mounted on either the rotor or the stator.

a) Магнітне поле генератора постійного або змінного струму може забезпечувати електромагніти або постійні магніти, що є вбудованими у ротор або статор.

b) Магнітне поле генератора постійного або змінного струму може забезпечуватись електромагнітмами або постійними магінатми, вбудованими у ротор або статор.

c) Магнітне поле динамо та альтернатора може забезпечуватись електромагнітмами або постійними магінатми, вбудованими у ротор або статор.

2. Before the connection between magnetism and electricity was discovered, electrostatic generators were invented that used electrostatic principles.

а) До того як зв'язок між магнетизмом і електрикою був відкритий, електростатичні генератори були винайдені, і вони використовували електростатичні принципи.

б) До відкриття зв'язку між магнетизмом і електрикою, люди використовували електростатичні генератори згідно електростатичних принципів.

с) До того як зв'язок між магнітами і електрикою був відкритий, електростатичні генератори були винайдені, і вони використовували електростатичні принципи.

3. Faraday's law of induction dates from the 1830s, and is a basic law of electromagnetism relating to the operating principles of transformers, inductors, and many types of electrical motors and generators.

а) Закон електромагнітної індукції Фарадея датується 1830 –ми, і є основним законом електромагнетизму, що стосується робочих принципів трансформаторів, індукційних котушок і багатьох інших типів електродвигунів та генераторів.

б) Закон електромагнітної індукції Фарадея датується від 1830 –х років, і це основний закон електромагнетизму, що стосується принципів роботи трансформерів, котушок індуктивності, і багатьох типів електричних двигунів і генераторів.

с) Закон електромагнітної індукції Фарадея датується 1830 роком, і це основний закон електромагнетизму, що стосується принципів роботи трансформаторів, котушок індуктивності, і багатьох типів електричних двигунів і генераторів.

4. The shaft that comes out of the turbine and is connected to the generator is being removed for the repair.

а) Вал, який під'єднаний до турбіни, з'єднаний з генератором, від'єднали для ремонту.

- b) Вал, який виходить з турбіни і з'єднаний з генератором, від'єднаний для ремонту.
- c) Вал, який виходить з турбіни та з'єднаний з генератором, від'єднують для ремонту.

5. AC generators also known as alternators are found in some cars to charge the car battery.

- a) Генератори постійного струму, також відомі як альтернатори, встановлюються в деяких автомобілях для зарядки акумулятора авто.
- b) Генератори змінного струму, також відомі як альтернатори, встановлені в деяких автомобілях для зарядки акумулятора авто.
- c) Генератори змінного струму, також відомі як альтернатори, встановлені в деяких автомобілях для зарядки авто.

6. Генератори розрізняються за типом виробленого електричного струму і по вигляду двигуна.

- a) Generators vary by the type of the electric current generated and the construction of the engine.
- b) Generators vary by the type of the electric current generated and the appearance of the engine.
- c) Generators vary by the type of the electric current consumed and the construction of the engine.

7. Електрика, що виробляється генераторами, має нижчу собівартість, ніж у стаціонарних мережах електропостачання.

- a) Electricity produced by generators, the cost is lower than the fixed power supply networks.
- b) Electricity produced by generators, has lower cost than the one in fixed power supply networks.
- c) Electricity produce by generators, the cost is lower than the fixed power supply networks.

8. Сьогодні ринок обладнання для дому пропонує великий вибір невеликих і нескладних в експлуатації електрогенераторів для застосування в домашньому господарстві.

- a) Today the market of equipment for domestic use offers a large selection of small and not simple in operation electrical generators for use in the house.
- b) Today the market of household appliances offers a large selection of small and simple electrical generators for use in the household.
- c) Today the equipment market for domestic use offers a large selection of small and simple to operate electrical generators for use in the house.

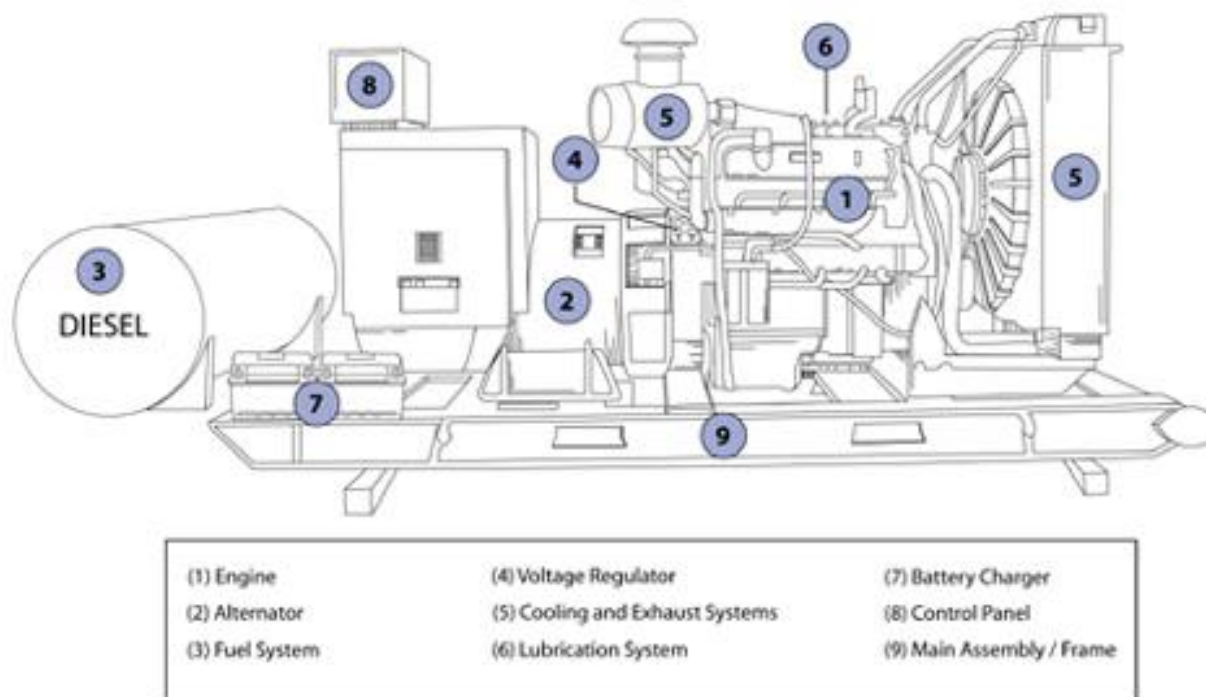
9. Для визначення необхідної потужності генератора доведеться з'ясувати споживану потужність всіх електроприладів, що використовуються в господарстві.

- a) To determine the required capacity of the generator it is necessary to find the power consumption of all electrical appliances used in the household.
- b) To determine the required capacity of the generator you will find the power consumption of all electrical appliances used in the household.
- c) To determine the required capacity of the generator you should find the power consumer of all electrical appliances used in the household.

10. Вибір виду генератора визначається виходячи з області його застосування та сумарної потужності споживачів, які підключаються до нього.

- a) The choice of the generator is determined due to the field of its application, and the total power consumers connecting to it.
- b) The choice of the generator is determined by the field of its application, and the total power consumers connecting to it.
- c) The choice of the generator is determined by the field of its application, and the total amount of consumers connected to it.

Task 8. Look at the illustration. You see the main components of the electric generator .



Taken from: <http://www.dieselserviceandsupply.com>

Now read the terms and connect them with their definitions.

(1) Engine	a)	It usually has sufficient capacity to keep the generator operational for 6 to 8 hours on an average.
(2) Alternator	b)	Since the generator comprises moving parts in its engine, it requires, for example, oil applying to ensure durability and smooth operations for a long period of time. You should also check for any leakages.
(3) Fuel System	c)	This is specific compound element, in which raw/fresh water and hydrogen are sometimes used as coolants. The pipes of this component are usually made of cast iron, wrought iron, or steel, they need to be freestanding and should not be supported by the engine of the generator.
(4) Voltage Regulator	d)	All generators, portable or stationary, have customized housings that provide a structural base support. It also allows for the generator to be earthed for safety.

(5) Cooling and Exhaust Systems	e)	It is the source of the input mechanical energy to the generator. Its size is directly proportional to the maximum power output the generator can supply.
(6) Lubrication System	f)	This component keeps the generator battery charged by supplying it with a precise 'float' voltage. It is usually made of stainless steel to prevent corrosion being also fully automatic.
(7) Battery Charger	g)	This component is also known as the 'genhead', being the part of the generator that produces the electrical output from the mechanical input supplied by the engine. It contains an assembly of stationary and moving parts that cause relative movement between the magnetic and electric fields, which in turn generates electricity.
(8) Control Panel	h)	This component regulates the output voltage of the generator.
(9) Main assembly/Frame	i)	This is the user interface of the generator and contains provisions for electrical outlets and controls.

Taken from: <http://www.dieselserviceandsupply.com>

Task 9. a) Watch the video “Generators” and decide what statements are true and what are false.

- 1) The speaker talks about large plant generator.
- 2) He uses 1 tesla magnet for showing Faraday's discovery.
- 3) A simple generator made of a plastic container with many turns of wire and magnet can produce voltage about 30 volts.
- 4) The voltage generated in the coil is dependent on the rate magnets move.
- 5) The meter connected to the generator first shows direct voltage.
- 6) The switch in the generator circuit changes the polarity of the pole.
- 7) The capacitor strengthens the voltage.
- 8) The generator on the table with thousands turns of wire can produce 5 volts of DC.
- 9) The generator shown can charge mobile phone or power radio.

10) A windmill is connected to a hand crank motor.

b) Give the extended answer to the question: Why does the speaker mention a clockwork mechanism?

Task 10. Choose the right variant from the words in brackets. Translate sentences paying attention to past participles.

1. At least 90% of electrical energy to be _____ (generated/converted) at present is AC.
2. The source of energy usually employed to produce current in the battery is _____ (chemical/mechanical).
3. Electrons flow from the negatively charged _____ (pole/terminal) of battery to the positively charged one.
4. The current flows when the _____ (fuse/switch) is in the closed position.
5. A fuse is a safety _____ (device/assembly) used in electric circuits.

Task 11. Write a semi-formal letter (appr. 150 words) to a youth magazine “Engineer’s site” (choose one of the topics) (see possible answers App.E)

- a) Asking for explanation of generator’s usage in everyday life.
- b) Sharing what you have learnt about generators.
- c) Comparing AC and DC generators in industrial and domestic use.

Task 12. As an engineer, you will have to read a lot of articles and sales literature to be aware of tendencies. Analyze the old advertisement (see App. E) in pairs and name as many details as you can (year of publishing, target audience, technical characteristics etc.) taking turns with your partner.

E.g. Student A: I see that the device was advertised in 1962. And in what city/town was the ad published?

Student B: It was Sydney. And there was a possibility to get more information for school project about this device.

UNIT 7. AN ENGINEERING STUDENT

Task 1. Group work. Divide into three groups, in 3 minutes each makes a sequence of as many words and phrases as you can think of to topic “Engineer”. Then compare it with the one made by other groups by crossing out the words you already have.

E.g. engineer – develop – discovery –

Task 2. Read the statements. Discuss in pairs and make dialogues as if you talk to a person who said it or as engineering students who have to choose the best one from the following quotes. Pay attention to the years they were said.

1. “Engineering is not only study of 45 subjects but it is moral studies of intellectual life.” Prakhar Srivastav, 2013
2. Engineering is not merely knowing and being knowledgeable, like a walking encyclopedia; engineering is not merely analysis; engineering is not merely the possession of the capacity to get elegant solutions to non –existent engineering problems; engineering is practicing the art of the organizing forces of technological change. Engineers operate at the interface between science and society. Gordon Stanley Brown, 1962
3. Engineering is the art of directing the great sources of power in nature for the use and convenience of man. Thomas Tredgold, 1828
4. Science can amuse and fascinate us all, but it is engineering that changes the world. Isaac Asimov, 1988
5. The story of civilization is, in a sense, the story of engineering—that long and arduous struggle to make the forces of nature work for man's good. Lyon Sprague DeCamp, 1963

Task 3. Watch the video “What is engineering?” with sound off. Write down a short review giving suggestions on what can be said. Now watch the video with sound on. Compare your review with the narrator’s story. Add/correct information you have missed or misunderstood the first time.

Task 4. Watch the video again and put the sentences in the right order as you have heard them in the video.

- A. One of the difficulties of building the Burj was trying to figure out how to set 45 000 cubic meters of reinforced concrete in such extreme weather.
- B. The alarm on your phone goes off at 7.03.
- C. And when they are, the idea is shared with the world to make all our lives better.
- D. A mechatronic engineer devises the controls.
- E. The bridge is a marvel of civil engineering.
- F. Problems are engineers' inspiration.
- G. Will we finally have affordable solar power?
- H. Before airplanes flying was quite a bit more challenging.

Task 5. Read and translate the text. Make a plan for its retelling.

ENGINEERING IN MODERN WORLD

Engineering **underpins human progress**. Engineering is about the practical delivery of scientifically informed solutions **for the great challenges and opportunities** in a rapidly evolving world.

Engineers **take scientific discoveries and apply them practically**. Their work literally creates the fabric of **society**, whether the buildings we live and work in, the energy that powers our world or the transport networks that we use every day.

Engineering is so diverse; it is sometimes hard **for the public** to see a **common thread between its feats**. At one end of the scale, engineers are responsible for the massive scale design and build of **the Large Hadron Collider** and, at the other, for the many applications **of nano –technology**. Engineering **creates** the breathtaking yet sustainable new buildings **on the skylines of the world's great cities** as well as bringing clean water and sanitation **to remote, impoverished villages**. Then there is the communications revolution, creating a growing sense of

world community, enabling **billions** of people to access information and services and forging **new business opportunities**.

Taken from: <http://www.engineeringthefuture.co.uk/matters/default.aspx>

Task 6. Ask questions to the parts of the sentences in bold.

Task 7. Match the term with its definitions.

1. Genetic engineering	a) is about designing, building, and looking after structures.
2. Mechanical engineering	b) is taking advantage of the sea and its potential.
3. Civil engineering	c) is about designing and making all the parts of machines and vehicles that move.
4. Electronic engineering	d) is about generating and supplying power.
5. Chemical engineering	e) is about making useful things from unprocessed materials.
6. Marine engineering	f) is the direct manipulation of an organism's genome using biotechnology.
7. Manufacturing engineering	g) is about designing and making machines using electric power.
8. Electrical engineering	h) is about using the processes of changing materials in a chemical or physical way.

Task 8. Make dialogues. Imagine you are giving an interview to a youth international magazine about students of engineering faculty.

- 1) Was becoming an engineer your childhood dream?
- 2) How old are you?
- 3) When did you enter this faculty?
- 4) What faculty / department do you study at?
- 5) How many people are there in your group?
- 6) How many classes do you have each week?

- 7) How long is the course?
- 8) How are the subjects assessed?
- 9) What happens if you fail the exam once?
- 10) What specialized subjects do you have?
- 11) What are you going to do after getting the Certificate the degree?
- 12) Have you ever dreamt to create any invention? What and why?
- 13) Do you like solving tasks?
- 14) Have you ever taken part in engineering project competitions? If no, why?
- 15) Is there anyone who inspires you as an engineering genius?

Task 9. Match the parts of the sentences to form descriptions of the greatest scientists ever.

Alan Turing Henry Ford Wilber and Orville Wright Archimedes
Leonardo da Vinci James Watt Nicolaus Otto Nikola Tesla

1. These engineers after several experiments using kites and gliders created a pulley system that altered the shape of the wing in mid –flight, increasing and decreasing the speeds.	A. Other inventions credited to him include the catapult, levers and pulleys, and the Archimedean Screw, a device used to raise water for irrigation or mining.
2. His inventions make him arguably the greatest electrical engineer of all time. He developed the AC –current generation system comprised of a motor and a transformer.	B. Modern engineers have proven that many of his designs, including bridges, hang –gliders, transmissions, parachutes, and more would have worked had they been built.
3. This man produced cars at a record –breaking rate forever changing the automobile industry.	C. This kind of engine worked in four steps; drawing in fuel and air, compressing the mixture, igniting it and expelling the exhaust.
4. Perhaps the biggest visionary of	D. He is credited for measuring the

all time, this prominent engineer foresaw everything from the helicopter to the tank to the submarine.	power of his steam engine: he determined that a “horsepower” was 550 foot –pounds per second, which resulted in one horsepower equaling 746 watts.
5. This man developed the binary architecture now used in all computers, as well as much of the theory behind computers.	E. His four principles: interchangeable parts, continuous flow, division of labor, and reducing wasted effort created in 1913 the first moving assembly line ever used for large –scale car manufacturing.
6. It was he who came up with the simple yet clever idea of determining an object’s volume by measuring the amount of water displaced by the object.	F. They were also the first to look at propeller design and aerodynamics, profoundly changing the world.
7. The unit of power is named after this man.	G. He is regarded by some as the father of computer science. He is also credited with breaking the German Enigma code during WWII.
8. He was a German inventor credited with developing the four – stroke or Otto –cycle engine which sparked the development of the motor care.	H. Within weeks of working for Edison, he indicated that he could improve the efficiency of the company’s generators by 25%.

Task 10. Work in pairs. Make a dialogue on one of the following topics and dramatize it.

- One of you is an inventor who has just retired and the other is an interviewer from a newspaper or engineering magazine.
- One of you is a businessman, the other – engineer. Discuss the idea who has a bigger impact on our lives – businessmen and politicians or engineers and inventors.
- You are two engineering students from 2075. Describe and discuss work, study and leisure you have at your faculty.

d) Speak about any future invention you can think of (satellite hotels, human cloning, built –in data storage in human brains etc.). One of you is a proponent of such an invention, the other is an opponent.

Task 11. Search the Internet, look through the Code of Ethics of Engineers in Australia. Write an essay answering the following questions:

- 1) What is ethics?
- 2) Why do engineers need the code of ethics?
- 3) What is the main idea of the code of engineering ethics?
- 4) What statements and rules do you agree to and what do you consider to be inappropriate?
- 5) Will you promote the idea of creating such a code for Ukrainian engineers? Why?

UNIT 8. MY FACULTY

Task 1. Look at the meaning of the word “faculty”. Translate the sentences and write down in your copybook the meaning of the word “faculty”.

- 1) The group of teachers in a school or college.
- 2) a) One of the powers of your mind or body b) a natural talent for doing something.
- 3) A department in a college or university.
- 4) After that he taught at Nanjing university as a faculty member.
- 5) After a faculty meeting we started working on a new project.
- 6) He has graduated from the Faculty of Economics of Belgrade University.
- 7) The interaction between the faculty and its students is encouraged.
- 8) A new laboratory assistant has a faculty for giving really good advice.
- 9) He became a member of the Engineering Faculty in 1937 and of the Architecture Faculty in 1940.
- 10) The faculty of doing this is not to be acquired all at once, but it is amazing of how much development it is capable.
- 11) She's a member of the Harvard faculty.
- 12) She is a full professor at the Faculty of Philology, the University of Belgrade, Serbia.
- 13) It was sad to see that his mental faculties had begun to fail.

Task 2. Make as many words as possible from the name of your faculty (Electric power engineering and automation).

Task 3. Look at the words and phrases and match them with their explanation.

1.Exchange Program	Money awarded to a student based on financial need and reasonable academic standing.
2.Academic year	At the beginning of a course the professor will give you a syllabus, or course outline, which will include information on what you will study, when assignments are due, and how

	grades will be assigned.
3.Faculty	The second degree obtained at a university after completion of a bachelor's degree in a particular discipline. The degree normally requires two years of full –time study and research.
4.Syllabus	A subject of study within an academic department such as, history or biochemistry.
5.Grade Point Average (GPA)	Opportunities for students to complete some of their studies at another institution, often in another country, but still as a registered student at your home college or institution.
6.Scholarship	Copying or reproducing other people's ideas or material and try to pass it off as your own as new and original work without crediting this source. Plagiarism is considered a serious academic offence.
7.Discipline	The Academic Year is made up of autumn and spring semesters.
8.Graduate Student	A numerical value given to letter grades used to rate academic performance.
9.Master's Degree	A student award based on academic merit or excellence.
10.Alumni	A group of related departments or schools such as the Faculty of Education or the Faculty of Arts.
11.Plagiarism	A student who has received a bachelor's degree or equivalent and who is enrolled in a program leading to a master's or doctoral degree.
12.Bursary	People who have graduated from an educational institution are called alumni.

Task 4. Choose an English word for the Ukrainian word in the text below.

1.long –distance	2. Master	3. working	4. webs
5. by correspondence	6. occupies	7. outstanding	8. distribution

9. popularization	10. popular	11. founded	12. Preparatory
13. present	14. needs	15. bring	16. networks
17. modern	18. drive	19. necessary	20. employees

The faculty is one of the oldest, 1) *заснований* in 1918) and largest in the University. At present about 1500 day –students and more than 300 students 2) *заочної форми* are studying here. During the period of last 10 years more than 300 foreign students from more than 64 countries have graduated from the faculty. The graduates of the faculty receive a Bachelor Degree (4 years of studying), Specialist (5.5 years) and 3) *магістра* (6 years) in the following majors:

- Electric power stations;
- Electric 4) *мережі* and systems
- High voltage engineering and electrophysics;
- Control systems of production and 5) *розповсюдження* of power electric energy;
- Electric machines and apparatus;
- Electromechanical systems of automation and electric 6) *привід*.
- Non –traditional sources of energy

The University provides advanced training postgraduate and doctorate studies.

More than 20 thousand engineers, among them 7) *видатні* specialists in the field of science, technique, education and industry have been trained on the faculty. Among them there is the President of the National Academy of Sciences B. E. Paton, Ukrainian Academicians A. K. Shidlovsky, I. M. Chizhenko, a member of the Russian Academy of Sciences B. M. Vul and others.

The conception of training specialists according to up –to –date 8) *номреб* of the scientific progress provides for the fundamental humanitarian, technical and special training of the students. Qualified professors, 9) *сучасний* computer equipment and laboratories provide education quality with the newest machinery.

The faculty includes 8 departments, applied and basic research laboratories. It settles down in two buildings and 10) *займає* the area of 18000 square meters. There is the 11) *Підготовчий* Department at the faculty. The laboratory base of faculty includes 64 educational laboratories.

Numerical structure of 12) *працівників* and students of faculty includes: professors; associate professors; senior lecturers; assistants; full –time students; correspondence students; postgraduates; foreign students and post –graduates.

The teaching staff of the faculty is sufficient for the international dialogue and scientific research information interchange. A number of teachers of faculty have good command of languages of the European Community and, first of all, English.

Task 5. Write down key phrases from the text (task 4) and try to retell the text using these phrases.

Task 6. Conduct a research. Using Microsoft office programs, prepare a diagram on numerical structure of your faculty, comparing the number of students and teaching staff.

Task 7. Decide in what cases we use "make" or "do". Make your own short sentences with make – or do.

<input type="text"/> progress	<input type="text"/> faces	<input type="text"/> the housework	<input type="text"/> a cake
<input type="text"/> an experiment	<input type="text"/> a choice	<input type="text"/> a speech	<input type="text"/> friends
<input type="text"/> trouble	<input type="text"/> an effort	<input type="text"/> a film	<input type="text"/> the shopping
<input type="text"/> business	<input type="text"/> the washing –up	<input type="text"/> a joke	<input type="text"/> one's homework

Task 8. Make nouns derived from the verbs.

To use –	To apply –	To measure –
To generate –	To create –	To discuss –
To observe –	To provide –	To equal –

Task 9. Before watching the video skim the text and answer the questions:

1. Is the text informative or entertaining?
2. Does it tell about power engineering and its theoretical use?
3. Are there any famous scientists mentioned?

Try to guess what word or words are missing. Speak to your partner to compare your ideas.

Now watch the video “RTU” about scientific research at Riga Technological University (Field of Power and Electrical Engineering). Write in the word or phrase missed.

In an age when there is a 1) _____ of energy resources the issue of alternative sources of energy is important for any countries 2) _____. Researchers at the institute of industrial electronics and electrical engineers work on various 3) _____ cell projects and the use of 4) _____ for the productions of energy.

One idea is to adapt the power 5) _____ of various electronic systems for use by various users, this will apply to everything from the 6) _____ household electronics to the power supply of electronic 7) _____ systems.

Equally important is solar energy and the use of energy from 8) _____ for household needs.

Efficient usage of energy resources is also 9) _____ in every sector of industry and the institute conducts 10) _____ here as well. Scientists are working on various aspects of the way in which electrical drive systems and 11) _____ automation are controlled and regulated. They are also working on 12) _____ type and direct frequency 13) _____.

A new laboratory in which specialists study manufacturing 14) _____ is the pride and joy of the Institute of Industrial Electronics and Electrical Engineering and it is invaluable in terms of its 15) _____ to methodological work.

Write down the typescript to the video from 2.13 to 2.50 and translate it.

Task 10. Make a research. Look through the information about studying engineering in different foreign higher educational institutions (see the links below) and make a comparison according to the table.

<http://www.ntnu.edu/elkraft/english>

<http://www.rtu.lv/en/content/view/881/1115/lang,en/>

<http://www.ee.pw.edu.pl/?lang=en>

<http://www.upb.ro/en/the-faculty-of-electrical-engineering.html>

Faculty	№1	№2	FEA
Country			
Year of establishment			
Number of specializations or branches			
Number of students			
Specific feature			

Task 11. Write a letter of request (150 words) to any of the above mentioned faculties and departments asking more details on their timetable, curriculum, requirements and possibilities for foreign students (see App.E)

Task 12. Read the text about your department (see App.C) and translate it. Then retell it.

Task 13. Read the text about one of the most popular engineering competitions. Translate it and write 10 questions to the text.

BEST, Board of European Students of Technology is a constantly growing non-profit and non-political organisation. Since 1989 we provide communication, co-operation and exchange possibilities for students all over Europe.

BEST strives to help European students of technology to become more internationally minded, by reaching a better understanding of European cultures and developing capacities to work on an international basis. Therefore we create opportunities for the students to meet and learn from one another through our academic and non –academic events and educational symposia. "Learning makes the master", but the final goal is a good working place, therefore we offer services like an international career centre to broaden the horizons for the choice on the job market.

Our priority is to offer high quality services for students all over Europe. Thus, we manage to bring all the partners in the "student – company – university" triangle closer.

European BEST Engineering Competition (EBEC) is the largest real –time based engineering competition conducted by Board of European Students of Technology (BEST) gathering best European students of engineering. With EBEC Project BEST aims to develop participants skills thus not only theoretical knowledge also their practical knowledge which will help them to tackle problems which humanity faces each day. Project brings together students, universities, companies and NGOs (Non –governmental organizations).

Students are offered to participate in these two categories:

Team design: is a category which competitors can use their practical skills to design. Competitors need to build a functional device regarding to a technical problem given in a limited amount of time and resources.

Case study: is the category about analytic and economic skills. CS category is more conceptual competition which consists of solving a theoretical, technical or a managerial problem occurring in real life or industry. Participants develop hypothetical solutions with no actual construction of any device or assembling of some materials, but using the given information.

Taken from: <http://www.best.eu.org/index.jsp>

Task 15. Write a semi-formal letter (150 words) to a member of the UK engineering organization that deals with your speciality. Tell about your studying and (choose one of the options, App. D):

1. ask questions about peculiarities of such specialty in UK;
2. share your experience of participation in competitions and contests for engineering students. If you have not done this, tell whether it is necessary to provide students with such activities;
3. give your ideas how to encourage students to participate in various events outside the study (like attending BEST organisation, taking part in engineering contests and competitions).

Task 16. You are a participant of Specialty Fair. Make up a slogan, and a short announcement and a collage about your specialty.

Task 17. You can be chosen as one to be taken into the special group flying to another planet for colonization. Prove that you are the most necessary specialist in power engineering and automatics.

UNIT 9. POWER TRASMISSION

Task 1. Match English words and word –combinations and their Ukrainian equivalents. Memorize them.

transmission	підсилення світла
light amplification	цінний
beam of light	місцезнаходження
consumer	примусове випромінювання
locality	тепловий промінь
to reflect	передача (електроенергії)
stimulated emission of radiation	розсіюватись
wavelength	відбивати
to scatter	споживач
heat ray	пучок світла
valuable	довжина хвилі

Task 2. Translate words and their derivatives.

Power – empower – powerful, transmit – transmission – transmissible, compare – comparable – comparison – comparatively, convert – convertibility – conversion, resistance – resistant – resist, employ – employing – employment – employer – employee, reduce – reduction – reducible, conduct – conduction – conductor.

Task 3. Match words with their definitions.

1) voltage	a) the way in which something is shared out among a group or spread over an area
2) loss	b) convert back to a former state
3) distribution	c) the rate at which energy is drawn from a source that produces a flow of electricity in a circuit; expressed in volts
4) source	d) an apparatus for reducing or increasing the voltage of an alternating current
5) reconvert	e) gradual decline in amount or activity

6) electricity	f) a body or process by which energy or a particular component enters a system
7) transformer	g) a form of energy resulting from the existence of charged particles (such as electrons or protons), either statically as an accumulation of charge or dynamically as a current

Task 4. Read the text and decide whether the following statements are true or false

- 1) Power always could be carried far away from its source.
- 2) Electrical energy converted into mechanical is transmitted over hundreds of kilometers.
- 3) Growth of the electrical power generation is connected with the use of transformers, generators and motors.
- 4) Electricity is valuable because it is rare.
- 5) Usually, large power plants are located in the backyards.
- 6) The transmission lines are used to supply homes and businesses with electricity.
- 7) Big electrical transmission lines operate at very high voltages.
- 8) The wires are supported high on towers because it is safer to transmit electricity this way.
- 9) At the moment electric energy is produced it is transmitted directly to the consumer.
- 10) The current in the transmission system might be reduced by employing transformers.

POWER TRANSMISSION

It is said that about a hundred years ago, power was never carried far away from its source. Later on, the range of transmission was expanded to a few miles. And now, in a comparatively short period of time, electrical engineering has achieved so much that it is quite possible, at will, to convert mechanical energy into electrical energy and transmit the latter over hundreds of kilometres and more in any direction required. Then in a suitable locality the electric energy can be reconverted into mechanical energy whenever it is desirable. It is not difficult to understand that the

above process has been made possible owing to generators, transformers and motors as well as to other necessary electrical equipment.

Electricity is a valuable form of energy because electrical power can be moved easily over large distances. You would not want a large power plant in your backyard! One large power plant converts millions of watts of chemical or nuclear energy into electricity. The transmission lines carry the electricity to homes and businesses, often hundreds of miles away.

Overhead power lines use a much higher voltage than 120V. That is because the losses due to the resistance of wires depend on the current. At 100,000 volts each amp of current carries 100,000 watts of power, compared to the 120 watts per amp of household electricity. Big electrical transmission lines operate at very high voltages for this reason. The wires are supported high on towers because voltages this high are very dangerous. Air can become a conductor over distances of a meter at high voltages.

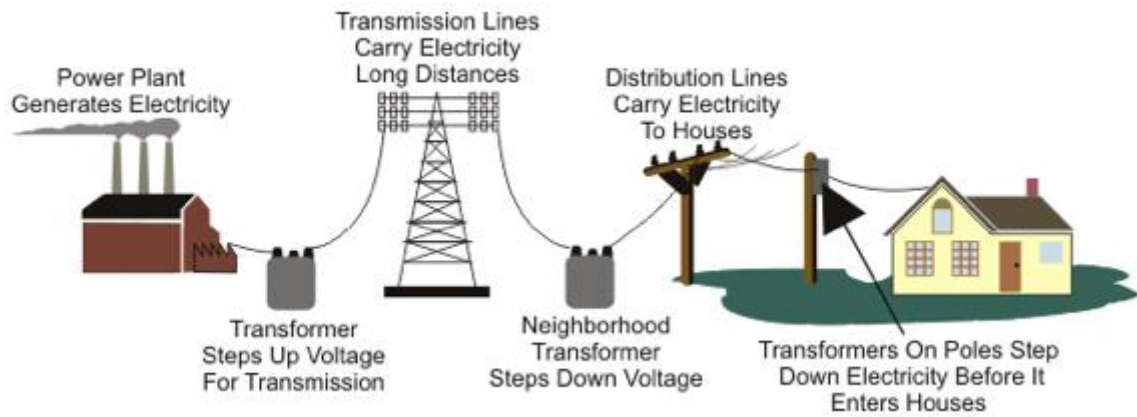
It goes without saying that as soon as the electric energy is produced at the power station, it is to be transmitted over wires to the substation and then to the consumer. However, the longer the wire, the greater is its resistance to current flow. On the other hand, the higher the offered resistance, the greater are the heating losses in electric wires. One can reduce these undesirable losses in two ways, namely, one can reduce either the resistance or the current.

It is easy for us to see how we can reduce resistance: it is necessary to make use of a better conducting material and as thick wires as possible. However, such wires are calculated to require too much material and, hence, they will be too expensive. Can the current be reduced? Yes, it is quite possible to reduce the current in the transmission system by employing transformers. In effect, the waste of useful energy has been greatly decreased due to high –voltage lines. It is well known that high voltage means low current, low current in its turn results in reduced heating losses in electrical wires. It is dangerous, however, to use power at very high voltages for anything but transmission and distribu –tion. For that reason, the voltage is always reduced again before the power is made use of.

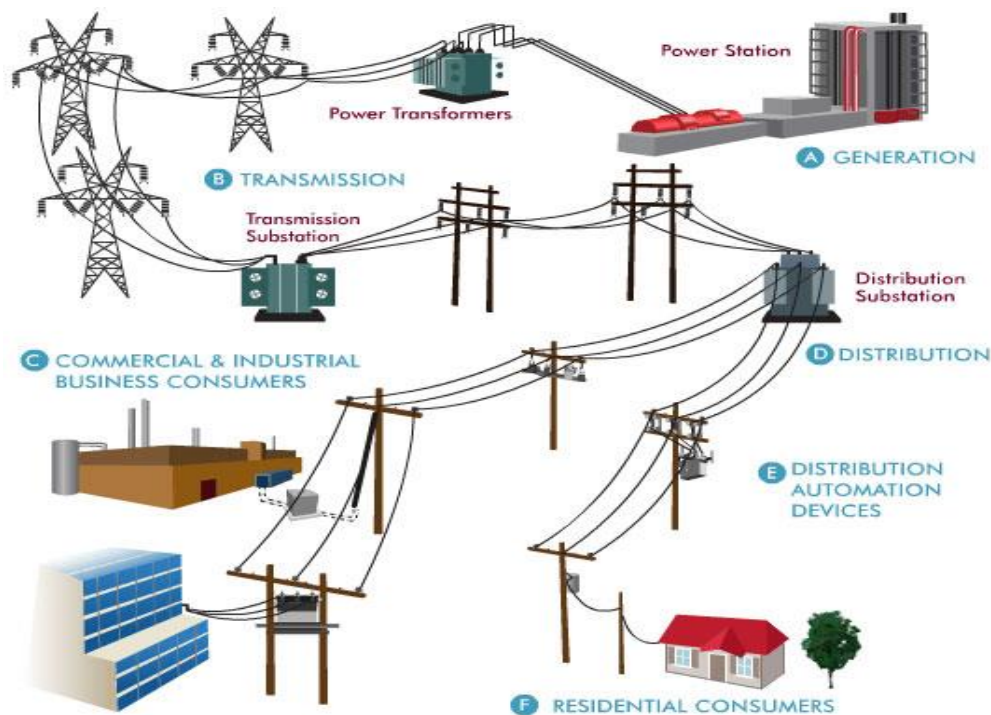
Task 5. Translate sentences from Ukrainian into English.

1. Майже у всіх випадках електростанція містить обертовий електричний генератор.
2. Як правило, фактичне споживання електроенергії обчислюється за показниками лічильника.
3. Діелектриками або ізоляторами називають такі тіла, через які електричні заряди не можуть переходити від зарядженого тіла до незарядженого.
4. Першу комерційну електропередачу розробив Томас Едісон наприкінці 19го століття.
5. Трифазною системою електричних ланцюгів називають систему, що складається з трьох кіл.
6. Кажуть, що багато видів енергії змінили обличчя планети: лампочки, машини, транзистори, резистори, мікропроцесорів, робототехніки та комп'ютери.
7. За даними World Power Consuming У 2005 році світове споживання енергії було 17300000 ГВт.
8. Ріст використання глобальної енергії призведе до інтенсивних інвестицій, спрямованих на будівництво нових електростанцій.
9. Трифазний струм широко використовується в системах промислового і побутового електропостачання.
10. Використання енергії прямо пропорційно залежить від чисельності населення: більше людей означає більше енергії.

Task 6. Divide into two groups. Each group describes the process of power generation and distribution according with the pictures below. Use the phrases from the table.



A)



B)

feed to substations, step up by a transformer to high voltages, distribute via the grid to supply points, domestic consumer, the switching compound to the grid, via overhead or underground cables.

Task 7. Make verbs from the following nouns.

Meaning –

Motion –

Emission –

Reflection –

Development –

Heat –

Direction –

Release –

Task 8. You will read the text about one more way of energy and power transmission. Try to answer the questions before reading. Then read and check yourself.

- a) What does a word “laser” mean?
- b) Can lasers travel long distances?
- c) Are lasers used for cutting materials?
- d) What hardest material in the world can be cut by the laser?
- e) What does a laser ray consist of?
- f) What can be used to create a laser beam?
- g) Can liquid, gas and solid be used as an active medium in the laser?
- h) Where are lasers used?

LASERS

Laser means “light amplification by stimulated emission of radiation”. A laser is an object that produces beams of light which can travel very long distances. Such beams are so powerful that they can cut through a diamond, the hardest material in the world.

The first lasers were developed in the 1950s by American and Russian scientists. However, the idea of creating beams of light that are very powerful had come up a century before – in stories of science fiction.

Normal light consists of many wavelengths and colors. Laser light, in contrast, does not scatter but moves in the same direction. It produces light in a single color and wavelength. When electrons move from a lower level to a higher level around an atom they emit a photon, a particle of light. After that they tend to fall back to their original orbit.

In order to make a laser beam you need a tube with mirrors on both ends. In it there is an active medium, which can be a liquid, gas or a solid. An energy source produces the light that you need to excite the electrons. Photons reflect off the mirrors, they travel back and forth, stimulate other electrons and, thus, produce colored light.

Lasers are used in many situations in different areas of life. They are used to record and store different kinds of information, for example music, videos or other

data. They also act as instruments, when exact measurements are needed. Therefore you can find lasers in various medical instruments in hospitals, at home in DVD players or in the laser printers of offices. Lasers can also produce 3 –D images called holograms.

In the world of communication lasers are used in telephone signals and in optical cables. Lasers are also used in the bar code scanners of supermarkets, where they transmit information to a cash register. Industry uses the heat produced by lasers to cut holes in objects or to make material stronger. Intelligent weapons use laser – guided systems to pinpoint a target. Because laser light can travel very long distances, astronomers use laser beams to measure the distance to the moon and other planets.

Taken from: <http://www.english-online.at/science/lasers>

Task 9. Choose a word due to its meaning

1. to make something stronger
 - a) Amplification
 - b) Amortization
 - c) Strength

2. An instrument that can read the code on products
 - a) Bar code scanner
 - b) Products body scanner
 - c) Products range meter

3. Information
 - a) Data
 - b) Date
 - c) Datum

4. A picture that does not look flat if you look at it from different sides.
 - a) Pictogram

- b) Hologram
- c) 2D image

5. A piece of glass that you can see yourself in.

- a) Miracle
- b) Myrtle
- c) Mirror

6. A line of light or energy.

- a) Ray
- b) Bay
- c) Pray

Task 10. Study the language box. Then complete impersonal sentences with a pair of verbs or a single verb.

One can inflate a tyre	using	a foot pump.
One inflates a tyre	by using	
	by means of	

Adjust, check/attach, clean/brush, loosen, measure/look, put/use, raise, tighten/use.

- 1) One tightens the wheel nuts using a box spanner.
- 2) One _____ the oil level by _____ at the dipstick.
- 3) One _____ the tyre pressure by _____ the airline to the tyre valve.
- 4) One _____ the carburetor by means of a screwdriver.
- 5) One _____ the spark plugs by _____ the electrodes with a wire brush.
- 6) One _____ the end of the car by means of a jack.
- 7) One _____ the wheel nuts by means of a wheel gun.
- 8) One _____ the gear lever into first gear _____ the gear lever.

Task 11. Decide whether you need to change adjectives in brackets into comparative or superlative degree depending on the meaning and grammar of the sentence. Translate the sentences orally.

1. 1) _____ (great) the deviation, the more difficult the solution.
2. The further he progresses, the 2) _____ (little) accurately does he know his position.
3. Some limitations are present, but are not as 3) _____ (severe) as those imposed on other rules.
4. Electricity is made at a power plant by 4) _____ (huge) generators.
5. The 5) _____ (many) words recalled, the more memory used to store the sentence.
6. The speed of light is million times as 6) _____ (great) as that of sound waves.
7. Curiously enough, as a principle of evaluation he proposed "the more, the 7) _____ (good)".
8. The greater is the rate of fall, the 8) _____ (small) is the maneuverability.
9. The possibility of releasing 9) _____ (large) amounts of energy was demonstrated as early as 1919 by Rutherford.
10. The more description one employs, the 10) _____ (particular) purposes may be inferred.

Task 12. Pay attention to the translation of the infinitive. Write your own definitions to the words in bold.

1. To know physics well is a great pleasure.
2. It is important to carry out this **experiment**.
3. To do this experiment we must get some new **equipment**.
4. To explain this **phenomenon** we must study it.
5. To convert heat directly into electricity is still a **problem**.
6. To obtain accurate results the **substance** must be pure.
7. To convert **heat** directly into electricity physicists must solve a number of problems.
8. To produce a **fusion** reaction will become possible.
9. To learn the light bulb one should have wire connection to the **mains**.

10. It is challenging to work on **harnessing** lightning.

Task 13. Watch the video “Power transmission” and answer the questions:

1. Where is electricity made?
2. What are basic sources to produce electricity from?
3. What is the most powerful force of electricity?
4. What is a transmission tower?
5. What are transmission towers made of?
6. What is porcelain used for on transmission lines?
7. Ground wires are safe to touch, aren't they?
8. Does electricity travel straight from the power station to your house?
9. What does it mean “to step down electricity”?
10. Are transmission wires insulated?

Task 14. H.G. Wells predicted future technology for that time – LASER – in his book “The War of the Worlds” in 1898. Imagine that it's the year 2118. What kind of technology do you think will exist? Write 5-8 sentences of your answer. Then share your ideas in groups of 3-4 students.

Task 15. Write a report on a type of laser that you can introduce at the conference on power transmission potential.

The paper should focus on one particular type of laser, and the practical applications of that laser. You should be focusing not on a general category of laser (i.e. “gas laser” or “semiconductor laser”, but rather on a particular laser using some specific gain medium (e.g. “InGaAs semiconductor laser” or “excimer laser”).

UNIT 10. TRANSFORMERS

Task 1. Match terms with their definitions

- | | |
|-----------------------------|--|
| 1. Three –phase transformer | a. An increase or advance in size or amount |
| | b. A decrease or reduction in size or amount |
| 2. To generate | c. A transformer used in a three –phase circuit, with three sets of primary and secondary windings on a single core. |
| 3. Step –down | |
| 4. Transmission | d. An amount of electrical power that is being produced |
| 5. Defective | e. An occasion when a machine or part of your body stops working properly |
| 6. To interrupt | |
| 7. Step –up | f. To produce (something) or cause (something) to be produced |
| 8. Capacity | |
| 9. Failure | g. The act or process of sending electrical signals to a radio, television, computer, etc. |
| 10. Load | h. Having a problem or fault that prevents something from working correctly : having a defect or flaw |
| | i. The facility or power to produce, perform, or deploy |
| | j. To cause (something) to stop happening for a time |

Task 2. Translate words with their derivatives

1. To generate – generation – generational
2. To transmit – transmission – transmitter
3. To transform – transformation – transformer
4. To rotate – rotation – rotational
5. Defect – defective – defection – defector
6. To interrupt – interruption – interruptive
7. To fail – failure
8. To distribute – distribution – distributive – distributor
9. To manufacture – manufacturer – manufacturing
10. To compare – comparative – comparatively – comparison

Task 3. Match items from the two columns to make word combinations and use them in sentences of your own.

1. Distribution	Power
2. Initial	Transformer
3. Network	Parts
4. Outdoor	Capacity
5. Medium	Size
6. Reduced	Substation
7. Rotating	Cost
8. Three –phase	Service
9. Electrical	Purposes
10. Utilization	Installation

Task 4. Read and translate the text. Find out more about transformers.

TRANSFORMERS

What is transformer? A transformer is an apparatus for converting electrical power in an ac system at one voltage or current into electrical power at some other voltage or current without the use of rotating parts. So as a matter of fact, it is used for increasing or decreasing voltage. A simple transformer is a kind of induction coil. It is well known that in its usual form it has no moving parts. On the whole, it requires very little maintenance provided it is not misused and is not damaged by lightning.

We may say that the principal parts of a transformer are two windings, that is coils, and an iron core. They call the coil which is supplied with current the “primary winding”, or just “primary”, for short. The winding from which they take the current is referred to as the “secondary winding” or “secondary”, for short. It is not new to you that the former is connected to the source of supply, the latter being connected to the load.

When the number of turns of wire of the secondary is the same as the number on primary, the secondary voltage is the same as the primary and we get what is

called a “one –to –one” trans –former. In case, however, the number of turns on the secondary winding is greater than those on the primary, the output voltage is larger than the input voltage and the transformer is called a step –up transformer. On the other hand, the secondary turns being fewer in number than the primary, the transformer is known as a step –down trans –former.

The generation of electric power is three –phase in nature and the generated voltage is 13.2 kV, 22 kV or higher. Transmission of power is carried out at high voltages like 132 kV or 400 kV. Before transmission, it is required to step –up the voltage and for this a three –phase step –up transformer is required. Similarly, at the distribution substation, the voltage must be stepped down and it is necessary to reduce the voltage level up to 6,600 V, 400 V, and 230 V and so on. Here, a three –phase step –down transformer is required. Therefore, it is economical to use three –phase transformers for transmission and utilization purposes.

Advantages of three –phase transformer:

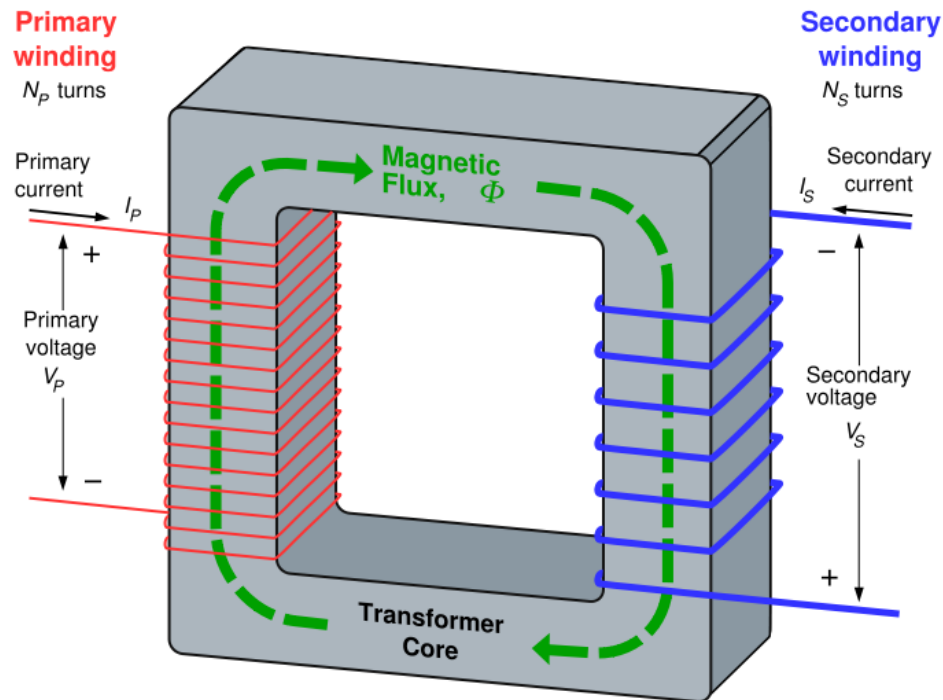
- It occupies less space for same rating, compared to a bank of three single –phase transformers.
- It weighs less.
- The cost is also less.
- Since only one unit is required to be handled, it is easy for the operator.
- It can be transported very easily.
- The core is of smaller size and hence less material is required.

Disadvantages of three –phase transformer

Three –phase transformer has got one shortcoming. This shortcoming is that if one of the phases becomes defective, then whole of transformer is to be replaced, but in case of three single –phase transformers, if one of the transformers becomes defective, the system can still be run open at reduced capacity or the defective transformer can be replaced by a single spare. Nevertheless, less weight, less cost and less space occupied by three phase transformer over weighs its disadvantages and so it is often used.

Taken from: <https://www.safaribooksonline.com/library/view/electrical –machines –2nd/9788131760901/>

Task 5. Look at the picture and describe the principle of transformer core construction and operation.



Task 6. Do a short research on the application of three –phase transformers. Discuss it with your groupmates in the form of reports or interviews with an engineer working with three phase transformers. Use the phrases from Appendix B. Try to use Complex object and Complex Subject sentences (see App.A).

Task 7. Answer the questions.

- 1) What is a transformer?
- 2) What is a transformer used for?
- 3) Can a transformer be damaged by lightning?
- 4) What are the principal parts of a transformer?
- 5) How many windings are there in a transformer?
- 6) What winding is connected to a load?
- 7) What is a purpose of a step –up transformer?
- 8) What is known as a step –down transformer?

- 9) Does a transformer work on d.c.?
- 10) Are transformers used both in industry and in our home?
- 11) Which kind of transformer is used for transmission and utilization purposes?
- 12) What are the advantages of three –phase transformers?
- 13) What are the disadvantages of three –phase transformers?
- 14) Where can three –phase transformers be applied?

Task 8. Define the following terms:

- A. a transformer is known to be a device which ...
- B. a dynamo is found to be a machine that ...
- C. a battery is considered to...
- D. a switch appears to be a device that ...
- E. an engine was discovered to be a machine...
- F. a thermometer is said to be created as a device which ...
- G. a motor is a device that ...
- H. a generator is a machine which

Task 9.Fill in the correct words from the list below:

failure, defective, utilize, transmission, interrupt, distribution, capacity, step up,
generate, installation

1. The health departmentefforts to reduce teenage smoking.
2. The accident was caused by engine
3. Wind turbine electricity for the local community.
4. The equipment is used for the of television signals.
5. The disease is caused by a gene.
6. The factory has been working at full
7. We this program to bring you a special announcement.
8. The company handles the of goods to stores nationwide.
9. The cable company offers lower prices and free

10. We must consider how best what resources we have.

Task 10. Decide whether the following statements are true or false and correct them if necessary.

1. Transmission of power is carried out at high voltages like 132 kV or 400 kV.
2. Before transmission, it is required to step –up the voltage and for this a single – phase step –up transformer is required.
3. It is economical to use single –phase transformers for transmission and utilization purposes.
4. Earlier it was common practice to use three suitable single –phase transformers rather than a single three –phase transformer bank.
5. Nowadays, a single three –phase transformer bank is popular due to improvement in its design and manufacture.
6. A three –phase transformer occupies more space for same rating, compared to a bank of three single –phase transformers.
7. A one –phase transformer costs more.
8. A three –phase transformer weighs less.
9. Three –phase distribution transformers are used extensively in underground city network service on account of the smaller space required by them in the manhole, their higher efficiency, and their lower initial cost.

Task 11. Fill in the correct prepositions. Then choose any three items and make sentences.

- | | |
|--|--------------------------------|
| 1. To carry power transmission | 6. To be installed sth |
| 2. To step/ the voltage | 7. To adaptsome services |
| 3. utilization purposes | 8. To be compared |
| 4. Due improvement | 9. account of sth |
| 5. To convert current electrical power | 10. connection with sth |

Task 12. Translate the following sentences into English.

1. На розподільчій підстанції напруга повинна знижуватись.
2. З економічної точки зору, трифазовий трансформатор доцільніше використовувати з метою передачі та утилізації.
3. Передача електроенергії відбувається під напругою від 132 кВ до 400 кВ.
4. Однією з переваг трифазового трансформатора є його менша вага та нижча ціна.
5. Трифазові розподільчі трансформатори широко використовуються в підземних службах мережі.
6. Однофазні трансформатори зазвичай призначені для інших послуг..
7. Значна кількість потужних центральних станцій в США широко використовує трифазні трансформатори для постачання електроенергії.
8. Перед передачею електроенергії необхідно збільшити напругу.
9. Для збільшення напруги необхідно використовувати трифазний трансформатор.

Task 13. Choose the right answer and translate sentences into Ukrainian.

1. At the distribution substation, the voltage _____ down and it is necessary to reduce the voltage to 6,600 V, 400 V, and 230 V and so on.
a) must be stepped b) must step c) must have stepped
2. Earlier it _____ common practice to use three suitable single –phase transformers rather than a single three –phase transformer bank.
a) has been b) was c) is
3. Three –phase transformers _____ less space for same rating, compared to a bank of three single –phase transformers.
a) occupy b) occupies c) is occupied
4. The core is of smaller size and hence less material _____.
a) requires b) has required c) is required
5. The shortcoming of three –phase transformers is that if one of the phases _____ defective, then the whole transformer is to be replaced.
a) is become b) became c) becomes

6. The three –phase transformer _____ for a particular size and type of load.
a) has purchased b) purchased c) is purchased
7. The three –phase transformers _____ less to install, and the connections are simpler.
a) cost b) are cost c) costs
8. The single –phase transformer _____ to a high degree of perfection and is manufactured in much larger quantities.
a) has been carried b) carries c) will carry
9. Less weight, less cost and less space occupied by three phase transformers _____ its disadvantages and so it is often used.
a) overweighs b) is overweighed c) has overweighed
10. Three –phase distribution transformers _____ extensively in underground city network service.
a) used b) will use c) are used

Task 13. Look through the presentation “Types of transformers” and write a short summary on the topic “Transformers”.

UNIT 11. ELECTRIC MOTORS

Task 1. Identify the examples of motors in use at your home or school. Make a dialogue about how the motor impacts the machine it is used in. For example, without a cooler in your laptop the machine would be overheated etc.

Task 2. Match the terms with their translations.

- | | |
|------------------------------|--|
| 1. starting torque | пусковий струм |
| 2. shunt winding | застосовувати |
| 3. starting current | паралельна обмотка |
| 4. armature | обмотка |
| 5. brush | перетворювати |
| 6. running conditions | (електрична) щітка |
| 7. to transform = to convert | перемикач, комутатор |
| 8. series winding | швидкість руху |
| 9. winding | пусковий момент |
| 10. to employ = to utilize | якір |
| 11. commutator | послідовна обмотка |
| 12. innumerable | незліченний, численний |
| 13. magnetic coil | соленоїд, обмотка/катушка електромагніту |
| 14. rate of motion | умови експлуатації, робочий режим |

Task 3. Match the terms with their definitions.

- | | |
|---------------------|--|
| | a. progression to a higher stage of development |
| | b. a machine that produces motion or power for doing work |
| 1. Motor | c. something (such as power, energy, or information) that |
| 2. Output | is produced by a machine or system |
| 3. Advancement | d. a single unit of a galvanic battery, consisting usually of |
| 4. Galvanic element | two plates of different metals immersed in a liquid (usually an acid) |
| 5. Generator | e. an engine that works by steam power |
| 6. To diminish | f. a machine that produces electricity |

- | | |
|-----------------|--|
| 7. License | g. to become or to cause (something) to become less in |
| 8. To invent | size, importance, etc. |
| 9. Steam engine | h. to create or produce (something useful) for the first |
| 10. Substantial | time |
| | i. large in amount, size, or number |
| | j. an official document, card, etc., that gives you |
| | permission to do, use, or have something |

Task 4. Read a short text on the history of electric motors and continue the following sentences.

- A. By building the first electric motor...
- B. On working with motors...
- C. For creating a model of electric motor...
- D. After introducing the AC motor...

Most people would say that they don't see an electric motor every day, like they do a light bulb or a telephone. That is because electric motors aren't like that. They are simpler things that are found within many appliances. A motor's purpose is to turn electrical energy into mechanical energy. It takes electricity and turns it into energy that can be used by us.

An electric motor uses magnetism and electric currents to work. There are two different kinds of motors, Alternate Current (AC) and Direct Current.(DC) Motors. These kinds of motors use the same parts as a basic electric motor, only using two different kinds of current.

Motors began with electromagnets. In 1831, Michael Faraday succeeded in building the first electric motor. Joseph Henry was working with motors at that time. Henry and Faraday are both credited with building the first experimental electric motors. In 1837, Charles Grafton Page worked on improving the electric motor and created a model of his own. In 1887, Nikola Tesla introduced the Alternate Current (AC) motor. All other motors up to that time had been using direct current. Now, alternate current motors are easier to use than direct current ones.

Today, motors are used everywhere. They are used in cars and many household appliances. Even though many people don't recognize what all it does, the electric motor has become a very useful invention.

Taken from: <http://targetstudy.com/knowledge/invention>

Task 5. Choose a suitable word for each gap to find out more about AC and DC motors.

batteries, inside, rotor, supply, combustion, induced, field, winding, direct, electric, applications, torque, permanent, conductor, rotating.

An AC motor is an (1) _____ motor driven by an alternating current. It commonly consists of two basic parts, an outside stationary stator having coils supplied with alternating current to produce a rotating magnetic (2) _____, and an (3) _____ rotor attached to the output shaft that is given a torque by the rotating field.

There are two main types of AC motors, depending on the type of (4) _____ used. The first type is the induction motor, which runs slightly slower than the supply frequency. The magnetic field on the rotor of this motor is created by an (5) _____ current. The second type is the synchronous motor, which does not rely on induction and as a result, can rotate exactly at the (6) _____ frequency or a sub –multiple of the supply frequency. The magnetic field on the rotor is either generated by current delivered through slip rings or by a (7) _____ magnet. Other types of motors include eddy current motors, and also AC/DC mechanically commutated machines in which speed is dependent on voltage and (8) _____ connection.

A DC motor is an electric motor that runs on (9) _____ current (DC) electricity. DC motors were used to run machinery, often eliminating the need for a local steam engine or internal (10) _____ engine. DC motors can operate directly from rechargeable (11) _____, providing the motive power for the first electric vehicles. Today DC motors are still found in (12) _____ as small as toys and disk drives, or in large sizes to operate steel rolling mills and paper machines. Modern DC motors are nearly always operated in conjunction with power electronic devices.

The brushed DC electric motor generates torque directly from DC power supplied to the motor by using internal commutation, stationary magnets (permanent or electromagnets), and (13) _____ electrical magnets.

Like all electric motors or generators, (14) _____ is produced by the principle of Lorentz force. It states that any current –carrying (15) _____ placed within an external magnetic field experiences a torque or force known as Lorentz force.

Taken from: <http://techinventory.blogspot.com/2014/01>

Task 6. Match the items from two columns to make word combinations.

Make questions to which these word combinations are answers.

E.g. In other words, how do we call the usage of a device or thing in practice? – Practical application.

- | | |
|-----------------|----------------|
| 1. Electric | a) Engine |
| 2. Undisputed | b) Element |
| 3. Practical | c) Features |
| 4. Output | d) Influence |
| 5. Historical | e) Design |
| 6. Contemporary | f) Improvement |
| 7. Substantial | g) Context |
| 8. Design | h) Power |
| 9. Significant | i) Application |
| 10. Galvanic | j) Motor |
| 11. Steam | k) Fact |

Task 7. Fill in the correct forms of the words from the list below:

improve, founder, advance, substantially, generate, diminishment, invent, licensial, motorical, decision
--

1. The device was equipped with a small electrical to make the gears spin.
2. The program supports economic in rural areas.
3. produce the electric power required for automobiles, aircraft, ships, and trains.

4. The strength of the army was greatly by outbreaks of disease.
5. The light bulb was one of the most important of the 19th century.
6. The restaurant's owner applied for a to sell liquor.
7. Only the buildings that were constructed of more materials survived the earthquake.
8. We will take steps towards political union with Europe.
9. Doctors were amazed by the sudden in her medical condition.
10. The British parliamentary system is on debate and opposition.

Task 8. Watch the video “Motor and Generator” and fill in the table for comparing motors and generators.

	Generator	Motor
Year of creation		
Inventor		
Parts		
Principle of work		
Usage		

Task 9. Work in pairs.

Student A is a seller of generators and Student B is a seller of motors. Students should present their products in the best way possible using information they found out in the unit.

Task 10. Translate the following sentences into English.

1. Влітку 1834 року Моріц Якобі презентував двигун, який був втричі потужнішим, ніж вдосконалений двигун Девенпорта.
2. Двигун, який мав вихідну потужність 300 В, міг керувати човном з 14 пасажирями.
3. Конструкція двигуна Давенпорта не була значним покращенням інших тогочасних моделей.
4. Впродовж років Давенпорт виготовив значну кількість машин.

5. На відміну від Нікола Тесли, Томас Давенпорт не міг ні продати, ні запатентувати свої моделі.
6. Давенпорт не отримав патент на електродвигун, однак лише на деякі деталі конструкції.
7. З самого початку, існувало змагання між зворотно –поступальними та ротаційними механізмами.
8. Пізніше зворотно –поступальні механізми повністю зникли з поля зору.
9. Навіть за найкращих умов, електроенергія у 25 разів витратніша, ніж паровий двигун.

Task 11. Fill in the table with possible parts of speech of the words given. Translate the words with their derivatives. Make sentences using the Gerund of the verbs from the table.

NOUN	NOUN (doer)	VERB	ADJECTIVE	ADVERB
invention	inventor			
			disputable	
				valuably
usage		use		
advancement			advanced	
decision			decisive	
			remarkable	remarkably
		improve		
	founder			
rotation			rotary	
		galvanize	galvanic	

Task 12. Read again the text Electric Motors and write a letter of request (see App. E) to the Technical Library of the KPI asking for more details on any type of motor or more information on the history of motors (160 words).

UNIT 12. MAGNETOHYDRODYNAMIC GENERATORS

Task 1. Match the words with the translation and sentences they can be used in.

1. Expansion	A. тепло	<p>I. The working fluid in this cycle MHD is circulated in a closed _____.</p> <p>II. During the _____ of the gas at high temperature, the positive and negative ions move to the electrodes and thus constitute an electric current.</p> <p>II. The principal parts of a transformer are two _____, that is coils, and an iron core.</p> <p>V. Where u is the fluid _____, B is the magnetic flux _____.</p> <p>V. AC generators are also known as _____.</p> <p>VI. _____ provided by the _____ material need not be too high.</p>
2. Windings	B. швидкість	
3. Inverter	C. щільність	
4. Conversion	D. петля	
5. Velocity	E. зовнішній	
6. Alternator	F. спалювання	
7. Heat	G. інвертор	
8. External	H. розширення	
9. Density	I. обмотки	
10. Conductivity	J. генератор	
11. Combustion	K. провідність	
12. Loop	L. перетворення	

Task 2. Translate the words and their derivatives.

1. to convert – converted – conversion
2. to conduct – conductor – conduction
3. to cycle – cycling – recycle
4. exhaust – exhauster – exhaustibility
5. atmosphere – atmospheric – atmospherically
6. to pressurize – pressurized – pressurizing

Task 3. Arrange the following words in the pairs of synonyms:

- a) 1. feasible; 2. flux; 3. to transform; 4. liquid; 5. to investigate; 6. speed; 7. to build; 8. wire; 9. change; 10. conventional.
- b) 1. velocity; 2. to construct; 3. possible; 4. to research; 5. conductor; 6. transformation; 7. usual; 8. to convert; 9. fluid; 10. flow.

Task 4. Read the short text about the history of MHD generation and put the correct prepositions.

Michael Faraday introduced the concept 1) ____ MHD power generation 2) ____ the very first time 3) ____ the year 1832 in his Bakerian lecture to the Royal Society. He 4) ____ fact carried out an experiment 5) ____ the Waterloo Bridge in Great Britain 6) ____ measuring the current, from the flow of the river Thames in earth's magnetic field. This experiment in a way outlined the basic concept behind MHD generation 7) ____ the years then, several research work had been conducted 8) ____ this topic, and later 9) ____ August 13, 1940 this concept 10) ____ magneto hydro dynamic power generation, was imbibed as the most widely accepted process 11) ____ the conversion of heat energy directly 12) ____ electrical energy without a mechanical sub –link.

Task 5. Read the text about MHD generation and make a plan for retelling.

MHD GENERATION OR MAGNETO HYDRO DYNAMIC POWER GENERATION

The MHD generation or, also known as magneto hydrodynamic power generation is a direct energy conversion system, which converts the heat energy directly into electrical energy, without any intermediate mechanical energy conversion, as opposed to the case in all other power –generating plants. Therefore, in this process, substantial fuel economy can be achieved due to the elimination of the link process of producing mechanical energy and then again converting it to electrical energy.

The principal of MHD power generation is very simple and is based on Faraday's law of electromagnetic induction, which states that when a conductor and a magnetic field moves relative to each other, then voltage is induced in the conductor, which results in flow of current across the terminals. As the name implies, the magneto hydro dynamics generator is concerned with the flow of a conducting fluid in the presence of magnetic and electric fields. In conventional generator or alternator, the conductor consists of copper windings, strips while in an MHD

generator the hot ionized gas, or conducting fluid replaces the solid conductor. A pressurized, electrically conducting fluid flows through a transverse magnetic field in a channel or duct. Pair of electrodes are located on the channel walls at right angle to the magnetic field and connected through an external circuit to deliver power to a load connected to it. Electrodes in the MHD generator perform the same function as brushes in a conventional DC generator. The MHD generator develops DC power and the conversion to AC is done using an inverter.

The power generated per unit length by the MHD generator is approximately given by $P = \frac{\sigma u B^2}{P}$. Where u is the fluid velocity, B is the magnetic flux density, σ is the electrical conductivity of conducting fluid and P is the density of fluid.

It is evident from the equation above that for the higher power density of an MHD generator there must be a strong magnetic field of 4 –5 tesla and high flow velocity of conducting fluid besides adequate conductivity.

The MHD cycles can be of two types, namely open cycle MHD and closed cycle MHD.

Taken from: <http://electrical4u.com/mhd>

Task 6. Answer the questions to the text.

1. What is the principle of MHD power generation?
2. What functions does an MHD generator combine?
3. What is the MHD generator?
4. Who introduced the concept of MHD?
5. What does a conventional MHD generator consist of?
6. What does the formula $P = \frac{\sigma u B^2}{P}$ mean?
7. What function do the electrodes in the MHD generator perform?
8. What type of energy is converted into electrical by the MHD generator?
9. How strong must be a magnetic field for higher power density of an MHD generator?
10. What MHD cycles are there?

Task 7. Look at the sentences, put the phrases in right order.

Advantages of MHD Generation

- 1) is circulated there are, and no moving working fluid mechanical parts Here only. This makes the operation reduces to nil and the mechanical losses more dependable.
- 2) is maintained working fluid the walls of MHD The temperature of.
- 3) It has full power level the ability almost directly to reach.
- 4) MHD generators is much lower The price of conventional generators than.
- 5) the other conventional MHD than most of efficiency, which or non –conventional very high is higher method of generation has.

Task 8. Read the description of the two cycles and choose a right title for each paragraph. Discuss these two cycle types and decide which one is more promising.

Open Cycle MHD System

Closed Cycle MHD System

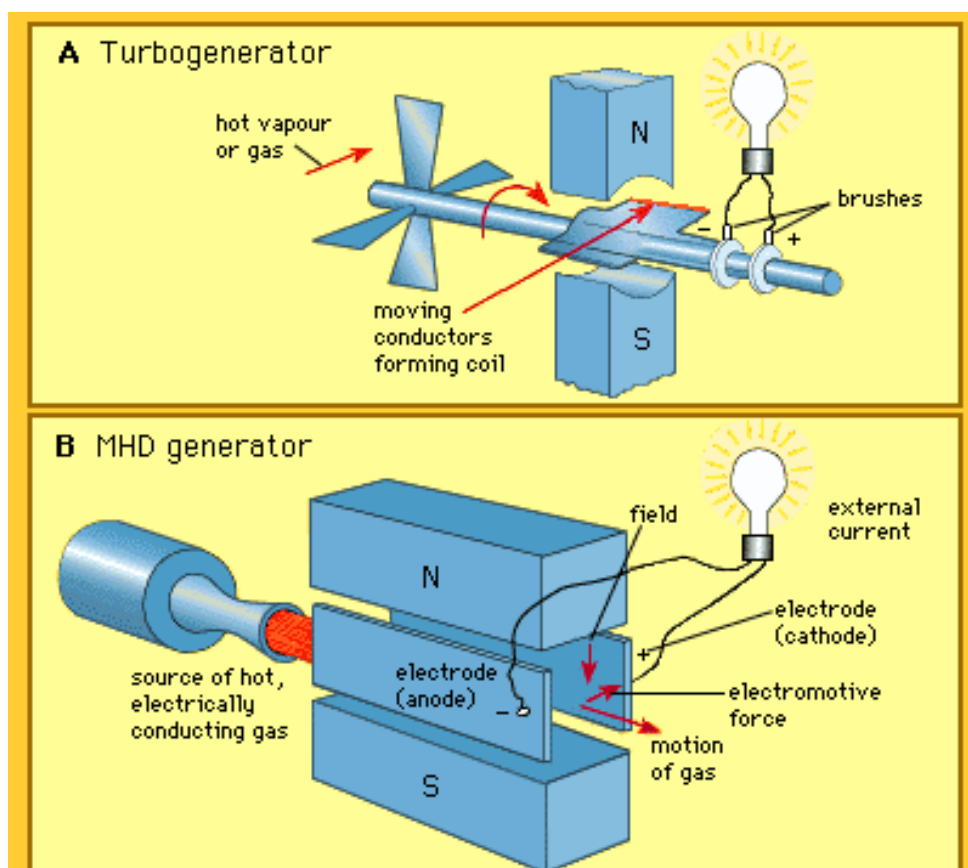
A) The working fluid in this cycle MHD is circulated in a closed loop. Hence, in this case inert gas or liquid metal is used as the working fluid to transfer the heat. The liquid metal has typically the advantage of high electrical conductivity, hence the heat provided by the combustion material need not be too high. Contrary to the open loop system there is no inlet and outlet for the atmospheric air.

B) In this cycle of MHD system, atmospheric air at very high temperature and pressure is passed through the strong magnetic field. Coal is first processed and burnt in the combustor at a high temperature of about 2700°C and pressure about 12 atm with pre –heated air from the plasma. Then a seeding material such as potassium carbonate is injected to the plasma to increase the electrical conductivity. The resulting mixture having an electrical conductivity of about 10 Siemens/m is expanded through a nozzle, so as to have a high velocity and then passed through the magnetic field of the MHD generator. During the expansion of the gas at high temperature, the positive and negative ions move to the electrodes and thus constitute

an electric current. The gas is then made to exhaust through the generator. Since the same air cannot be reused again hence it forms an open cycle and thus is named as open cycle MHD.

Taken from: <http://electrical4u.com/>

Task 9. Look at the picture and try to explain the difference between these two kinds of generators.



Task 10. Complete the sentences with the right word combination. Translate the sentences.

with the result as a result results resulted in the results resulted from

1. We have discussed ... obtained. 2. When the electric current flows along the conductor, heat 3. Faraday's experiments ... a great discovery. 4. Almost all bodies expand ... of heating. 5. Faraday carried on different experiments with coils, wire and magnetic needles with varying 6. In a cell the potential difference is maintained by the chemical action; copper is at a higher potential than zinc ... that a current of

positive electricity flows from the copper to the zinc. 7. The possibility of designing first MHD power plants ... the investigation of MHD energy conversion.

Task 11. Look at the table and describe two types of MHD generation. Use information from task 8.

Gaseous MHD power generating system features

	Open Cycle	Closed Cycle
Heat Source	coal manufactured gas natural gas H ₂ fuel oil	gas-cooled nuclear reactor coal natural gas fuel oil
Working Fluid	potassium-seeded combustion products	cesium-seeded helium
Temperature	~2500°C	~1400°C
Magnetic Field Source	DC superconducting magnets, 4–6 T	DC superconducting magnets, 4–6 T

Taken from: <http://electrical4u.com/>

Task 12. Translate the following sentences into English.

- 1) Фарадей був першим, хто представив концепт МГД –генератора в 1832 році.
- 2) Закон Фарадея стверджує, що для будь –якого закритого контуру індукована електрорухома сила рівна швидкості зміни магнітного потоку.
- 3) Ціна на МГД –генератор набагато нижча, чим ціна звичайного генератора.
- 4) У МГД –генераторі відбувається пряме перетворення механічної енергії рухомого середовища в електричну енергію.
- 5) Принцип роботи МГД –генератора заснований на явищі електромагнітної індукції.
- 6) Перші МГД –генератори використовували в якості робочого тіла електропровідні рідини (електроліти).

- 7) Потужність МГД –генератора пропорційна провідності робочого тіла, квадрату його швидкості і квадрату напруженості магнітного поля.
- 8) Теоретично, існують чотири напрямки промислового застосування МГД – генераторів: теплові електростанції, атомні електростанції, термоядерні електростанції, цикли з МГД –генератором на рідкому металі.

Task 13. Imagine you are taking on-line course at SRM University. As a part of your studying you download PowerPoint presentations, but this time there has been some damage to the ppt-file. Look through the presentation “MHD” and write a request letter to Prof. Mc.Antrold for a copy of the presentation (see App. E).

UNIT 13. NUCLEAR POWER PLANTS

Task 1. Spend one minute writing down all of the different words you associate with nuclear power. Share your words with your partner(s) and talk about them. Together, put the words into different categories (Positive/Negative/Neutral).

Task 2. Look at the two columns. Some words from the first column can be combined with the words from the second more than once, but some are not to be combined at all. Write down the list of all possible words and word – combinations and use the dictionary to translate them.

atomic (nuclear)	
core	mass
heavy	reactor
cold	energy
critical	waste
pressurized water	fusion
meltdown	water
radioactive	reaction
nuclear	power
thermonuclear	fission
chain	

Task 3. Watch the presentation “Nuclear power” (press Play to watch the animation) and do the task on Slide 4. Copy sentences in your copybook and define the parts of speech in each sentence.

Task 4. Before you read the text agree or disagree to the statements below. Read the text to get the right answers.

1. Nuclear energy evokes both hopes and fears in people.
2. There are generators and motors at a nuclear power plant.

3. It was impossible to control temperature level at Fukushima because of water leakage.
4. In 2009, atomic energy accounted for 41 percent of the world's electrical production.
5. There are over one hundred nuclear plants in the US.
6. The difference between the nuclear and coal –burning plant is the method of heating the water.
7. Uranium is a very uncommon element on Earth.
8. When an operator wants the uranium core to produce more heat, the control rods are submerged into the uranium bundle.
9. A uranium bundle acts as a very profound energy source of heat.
10. People used steam for hundreds of years.

NUCLEAR POWER

Nuclear power is energy contained in atoms. This energy can be released as heat from a chain reaction in a radioactive element such as uranium. Nuclear power stations use this heat to produce steam, which drives turbines to generate electricity.

Nuclear fuel is, by far, the most energy –dense of all these natural resources, meaning we can extract more heat and electricity from a given amount of it than from an equivalent amount of anything else. As an example, consider a chunk of coal and chunk of natural (unenriched) uranium, both weighing the same (1 kg) and both mined and isolated straight out of the earth. If we could suck all the energy out of the coal, it would run a 100W light –bulb for about 4 days. With the uranium, we could run the bulb for about 180 years. This kind of energy density could solve such problems as huge coal mines, massive gas and oil fields, trainloads of fuel shipments, and expansive wind or solar farms. Also nuclear reactors do this all without releasing any pollutants into the environment.

But why do we still use coal, or anything else for that matter?

The reactors that we have designed and built so far to split atoms and release the energy are mostly large, complicated, and expensive. Once built, reactor operation costs very little (buying a few tonnes of uranium every 4 years is much

cheaper than buying weekly trainloads of coal). Several facilities involved in the nuclear fuel cycle can be used to produce materials that could be used in nuclear weapons. Recycling plants separate plutonium from nuclear waste, which can be stolen and used in bombs. This fact complicates progress in advanced nuclear technology, politically.

The relatively small amount of nuclear fuel that goes into reactors becomes radioactive nuclear waste when it comes out. The nature of radioactive waste is terrifying to all – – you can't see it, smell it, or taste it, but it can be invisible killer. This waste is not released to the environment, and nuclear scientists know ways to turn this waste into something that decays to harmlessness in several centuries (rather than hundreds of millennia), but the processes developed so far are expensive and challenging.

Nuclear power is perceived as dangerous because of the accidents at Fukushima, Chernobyl, and Three Mile Island. These high –profile accidents were media sensations, but the number of casualties pales in insignificance compared to those associated with coal and gas. However, where coal and gas usually only kill or injure coal miners and gas refinery workers, nuclear accidents are indiscriminate.

Taken from: <http://www.edfenergy.com/energyfuture>

Task 5. Solve the crossword:

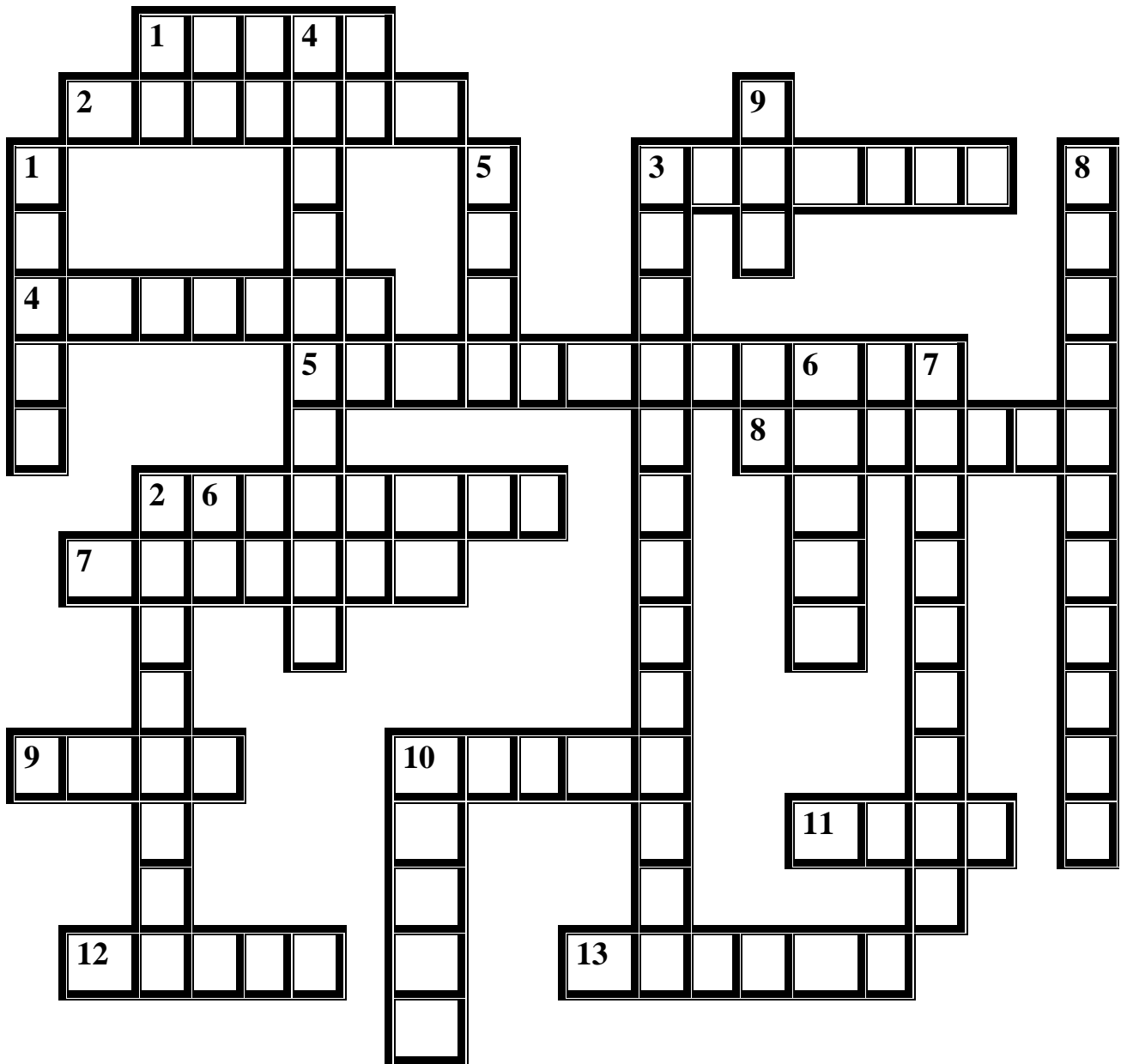
ACROSS

1. Penetrating rays that are best stopped or shielded by dense material.
2. Splitting of atoms into smaller pieces.
3. Becoming greater in quantity, size, extent, or intensity.
4. An uncharged elementary particle with a mass slightly greater than that of the proton, and found in the nucleus of every atom heavier than hydrogen.
5. (two words) this part of nuclear power plant removes excess heat from the reactor's circulating water system.
6. A rotary engine made with a series of curved vanes on a rotating shaft, usually turned by water or steam.

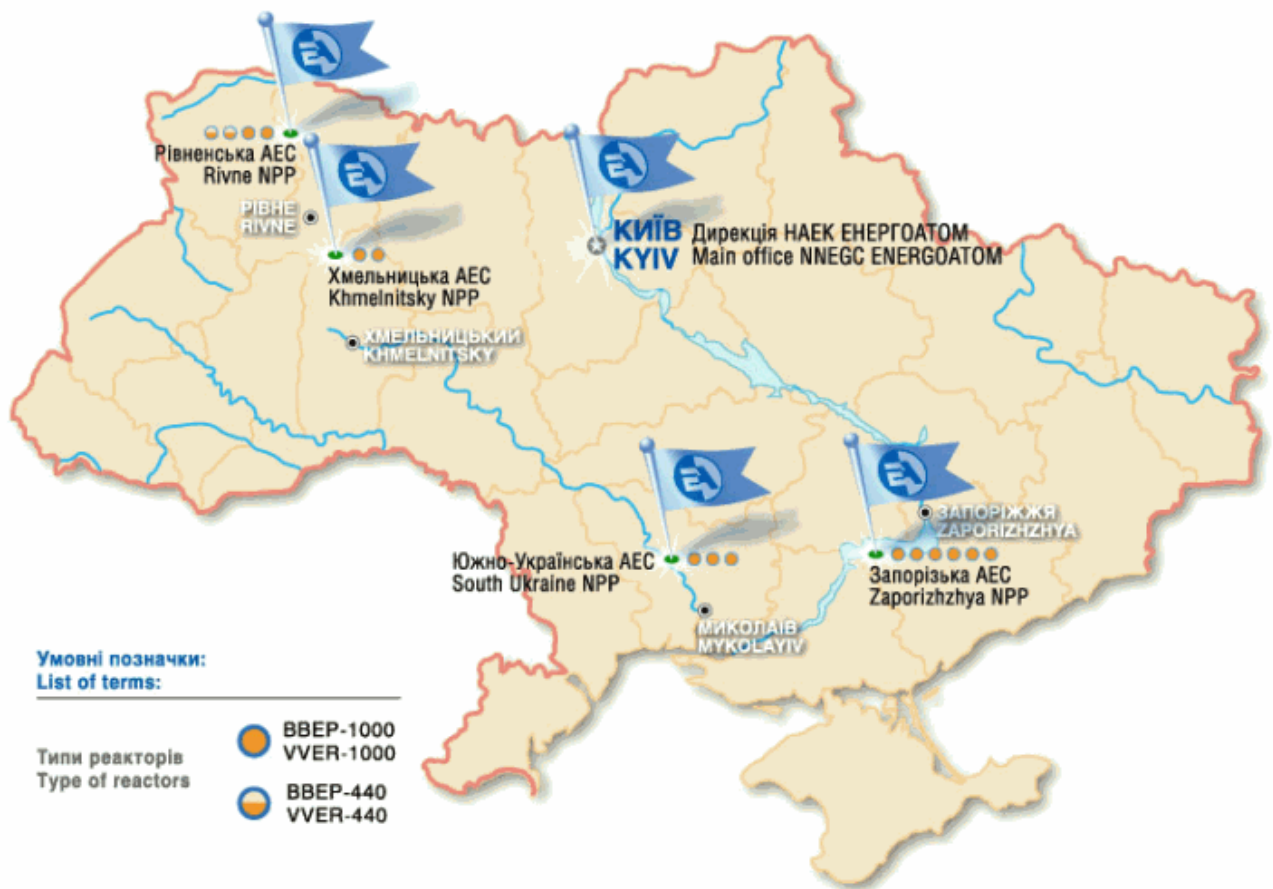
7. A radioactive element that is used to make nuclear energy and nuclear weapons.
8. A possible source of danger.
9. Heavily shielded container used to store and/or ship radioactive materials.
10. A self –sustaining reaction in which the fission of nuclei of one generation of nuclei produces particles that cause the fission of at least an equal number of nuclei of the succeeding generation.
11. The smallest particle of an element that cannot be divided or broken up by chemical means.
12. The decrease in the amount of radioactive material with the passage of time.
13. An elementary nuclear particle with a positive electric charge located in the nucleus of an atom.

DOWN

1. having a high mass per unit volume.
2. the weight or force that is produced when something presses or pushes against something else.
3. A radiation detection and measuring instrument.
4. One millionth of a curie.
5. Spent fuel that is stored inside a nuclear power plant goes in this.
6. One of the main concerns about nuclear powerplants is what to do with the ____.
7. A type of dangerous and powerful energy that is produced by radioactive substances and nuclear reactions.
8. A repeating series of events or actions.
9. Control ____ of a neutron –absorbing material (such as boron carbide) is used to regulate the rate of nuclear fission in a reactor.
10. The point at which a nuclear reaction is self –sustaining.



Task 6. Pair work. Take turns comparing the types of reactors in Ukrainian nuclear power plants.



Task 7. Watch the first minute (till 1.01) of “Nuclear energy” video fragment. Choose the right variant for the gap.

- Nuclear power plants generate electricity in ____ all around the world.
 - 13
 - 300
 - 30
- Nuclear energy generation is ____ to the way fossil fuels plants generate electricity.
 - same
 - similar
 - simple
- Nuclear power plants provide ____, safe electricity 24 hours a day.
 - clean
 - steam

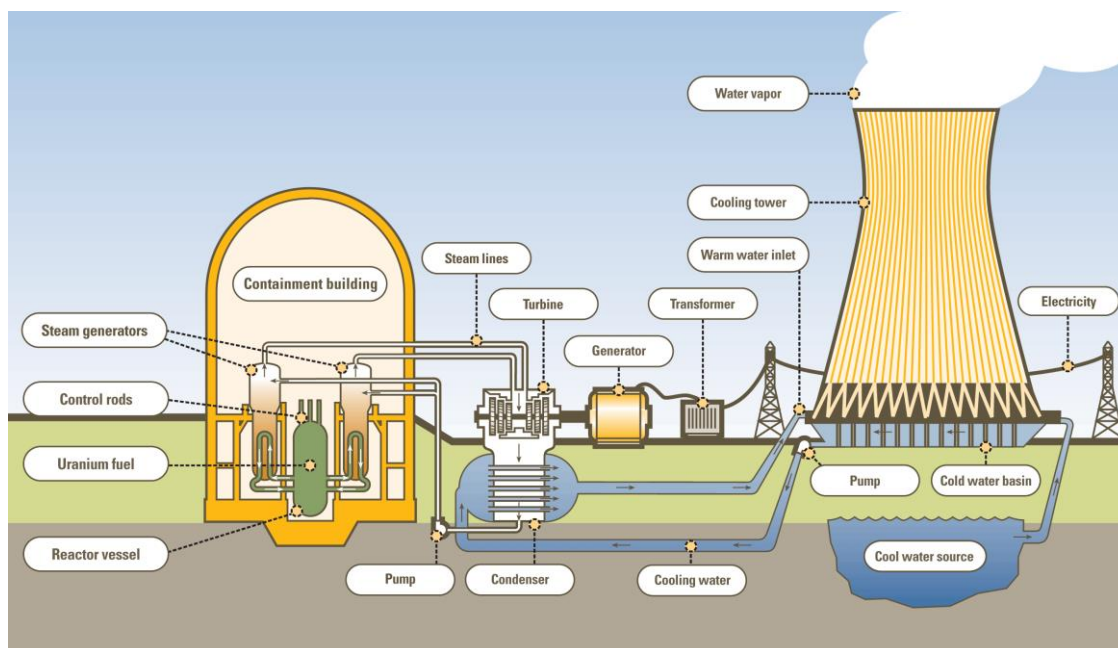
- c) clean
4. In most generating plants some form of energy is used to ____ water into steam.
- a) heat
b) hit
c) knit
5. The turbine turned by the steam produce is coupled to ____.
- a) elector magnet
b) electron magnate
c) electromagnet
6. While the ____ is the same there is a key difference between nuclear energy ____ and other electricity generating plants.
- a) mode, facilities
b) model, faculties
c) model, facilities

Task 8. Watch and listen carefully to the whole video and tick the words and phrases you have heard.

1) Discuss	2) Rich high temperatures	3) Top priority
4) Carbon –free	5) To prevent under heating	6) Heat production
7) Feature few redundant layers	8) Condenser	9) Metal rods
10) Fuel assembling	11) Absorbs all atomic particles	12) Electricity consuming equipment
13) Key difference	14) Accident	15) Slightly difference
16) Run off	17) Clean, safe, unsecure energy	18) Liquid water
19) Chain reaction	20) Stop fishing process	21) Reactor core
22) Escaping	23) Fossil fuels	24) Programming
25) Right future	26) Form of motion	27) Models for use

Task 9. After watching the video for the third time write a plan for its retelling that should include some key phrases from task 7. Present it to the classmates in form of rhetorical/tag questions or monologue.

Task 10. Work in pairs. Look at the picture and ask each other questions about the nuclear power plant structure.



Task 11. You are going to role play TV show debates on nuclear power issue. Choose the roles: nuclear scientist, young engineer, nuclear power plant official, nuclear power plant workers, citizens, environmental scientists, Greenpeace activists, show presenter. Think of pros and cons of nuclear power and discuss it from different points of view. Use Appendix B.

Task 12. There are lines that have a mistake (wrong verb form or odd word). Write these words in the box and explain your choice.

Uranium is used to produce electricity at nuclear power stations.
It is found in the minerals of igneous rocks that formed millions of
years past ago. Although uranium is considered non –renewable it is not
limited in supply like fossil fuels. This is from because the spent or used
uranium can be recycled until 80% or more of the energy from the

original uranium has been being used. Uranium is a very efficient source
of energy to use for generating electricity because it only takes a
small amount of uranium to produce lots of energy. Unfortunately
the by –product of processing uranium is toxic radioactive waste which
who
takes millions of years to break down.

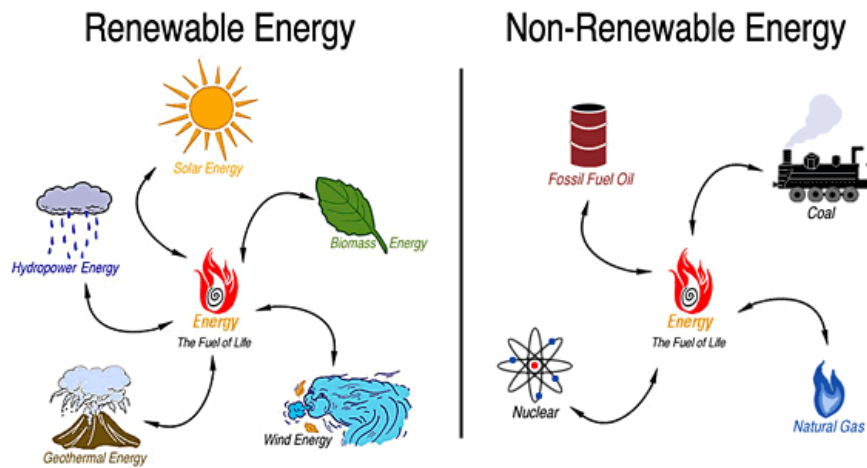
Taken from: <http://www.sustainableschools.sa.edu.au/files/>

Task 13. Translate the sentences into English, discuss the statements and put them into two columns “Advantages” and ”Disadvantages” of nuclear power.

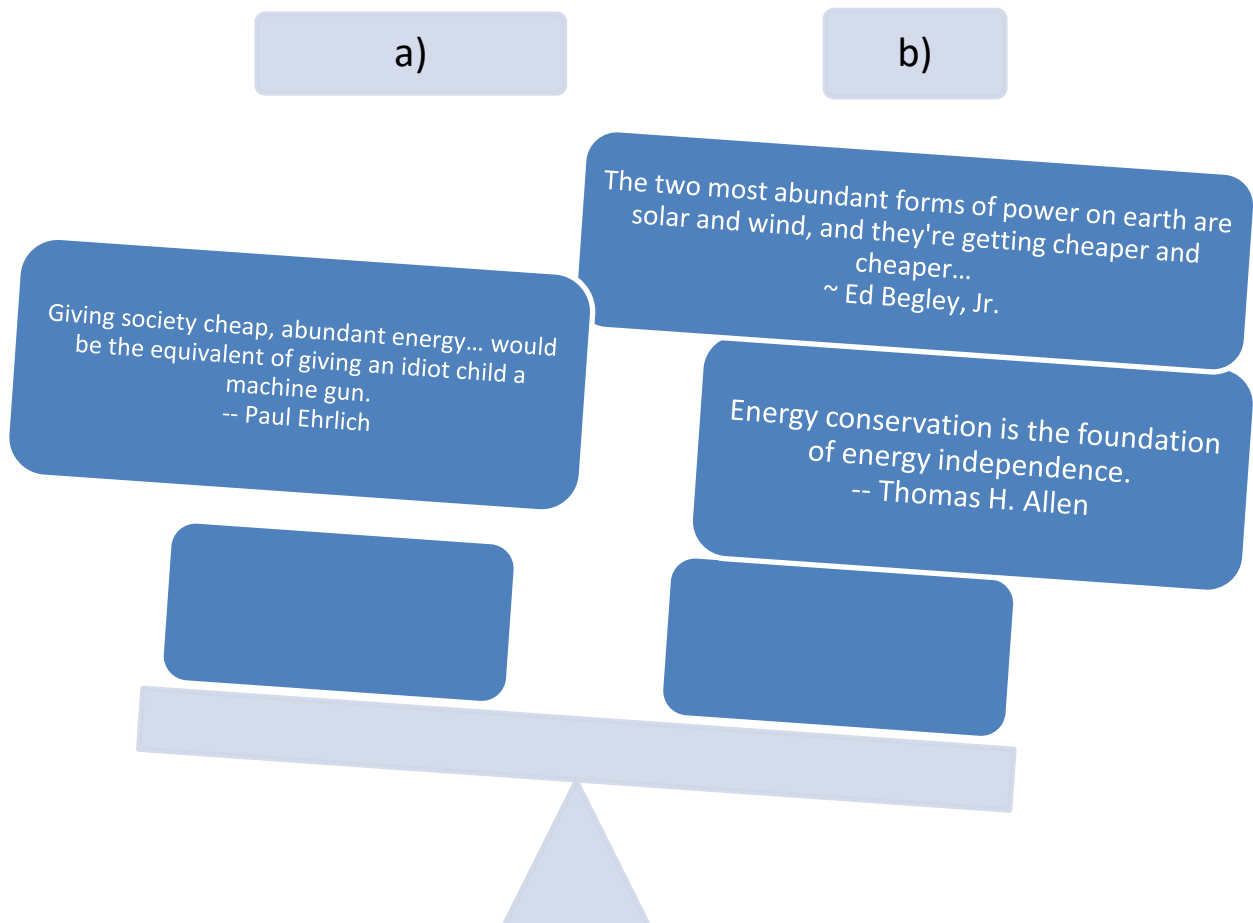
1. Аварія на Чорнобильській АЕС (Україна) в 1986 році, призвело до негайної смерті 30 людей, і більше 100 000 чоловік були евакуйовані, тисячі досі борються з наслідками аварії.
2. Деякі з відходів залишаються радіоактивними (небезпечними) протягом тисяч років, і в даний час повинні зберігатися в таких місцях, як глибокі печери і шахти.
3. Зберігання та контроль радіоактивних відходів протягом тисяч років має високу вартість.
4. Ядерні реактори можуть бути виготовлені у досить малих формах, які можна використовувати для живлення кораблів і підводних човнів, таким чином кількість морських судин, що спалюють нафту як паливо, буде знижена і, отже, забруднення навколишнього середовища зменшиться також.
5. Багато урядів бояться, що нестабільні країни, які розвивають ядерну енергетику, можуть також розробити ядерну зброю, і навіть використовувати її.
6. Атомні електростанції не спалюють викопне паливо для виробництва електроенергії і, отже, вони не виробляють шкідливих речовин, що забруднюють навколишнє середовище.
7. Багато розвинених країн, такі як США і Великобританії більше не хочуть покладатися на нафту і газ, що імпортовані з країн Близького Сходу, політично нестабільної частини світу.

UNIT 14. FUTURE SOURCES OF ENERGY

Task 1. Look at the picture. What is the difference between renewable and non – renewable energy sources? Why is it so important to develop renewable energy sources?



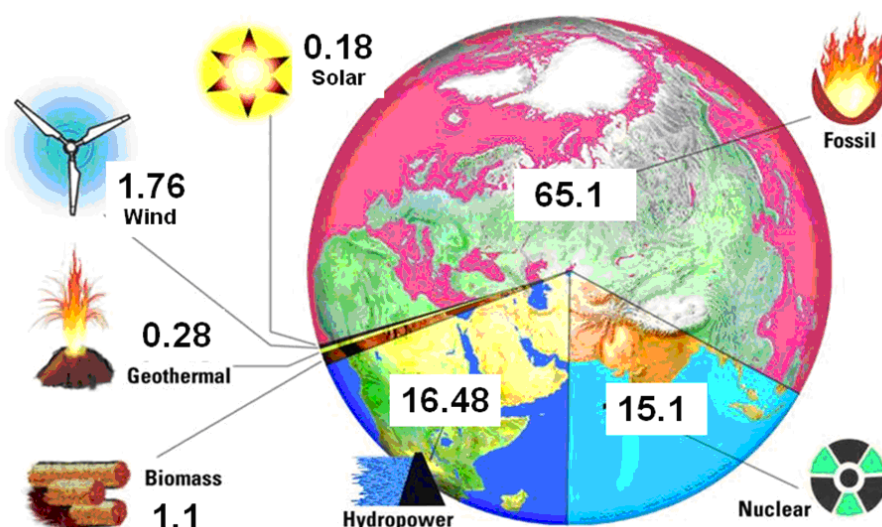
Task 2. Read the statements. Give the titles to two “scales” and search for phrases to add to the scales. Comment on the quotes.



Task 3. Match words with their translation.

1. impact	А. буйок
2. tidal	В. транспортні засоби
3. capture	С. берег
4. desalination	Д. величезний, значний
5. buoy	Е. житловий
6. shore	Ф. відходи
7. tremendous	Г. припливний
8. vehicles	Н. зловити, захопити
9. residential	І. опріснення
10.waste	Ж. вплив

Task4. Describe the diagram. Use comparative structures and passive voice.



This is the diagram of Power Generation by Type 17,530 GWh in 2005. Think what changes have happened since that time.

Task 5. Read the text, translate it and match the titles to each paragraph.

Hydrogen Hydroelectricity Tidal Power Wind Power Solar Power
Wave Power

1. This energy can be generated by tidal stream generators or by barrage generation. The power created through tidal generators is generally more

environmentally friendly and causes less impact on established ecosystems. Similar to a wind turbine, many tidal stream generators rotate underwater and are driven by the swiftly moving dense water.

2. Such kind of power is the transport of energy by ocean surface waves, and the capture of that energy to do useful work — for example for electricity generation, water desalination, or the pumping of water (into reservoirs). Wave power is distinct from the tidal power and the steady gyre of ocean currents. The rising and falling of the waves moves the buoy –like structure creating mechanical energy which is converted into electricity and transmitted to shore over a submerged transmission line.

3. It has tremendous potential as a fuel and energy source, but the technology needed to realize that potential is still in the early stages. Hydrogen is the most common element on Earth—for example, water is two –thirds hydrogen—but in nature it is always found in combination with other elements. Once separated from other elements, hydrogen can be used to power vehicles, replace natural gas for heating and cooking, and to generate electricity.

4. Photovoltaic (PV) Solar power is harnessing the sun's energy to produce electricity. Solar installations in recent years have also largely begun to expand into residential areas, with governments offering incentive programs to make “green” energy.

5. This power is the conversion of wind energy by wind turbines into a useful form, such as electricity or mechanical energy. Large –scale wind farms are typically connected to the local power transmission network with small turbines used to provide electricity to isolated areas. Wind farms installed on agricultural land or grazing areas, have one of the lowest environmental impacts of all energy sources.

6. Hydroelectricity is electricity generated by hydropower, i.e., the production of power through use of the gravitational force of falling or flowing water. It is the most widely used form of renewable energy. Once a hydroelectric complex is constructed, the project produces no direct waste. While many hydroelectric projects supply public electricity networks, some are created to serve specific industrial enterprises.

Taken from: <http://listverse.com/2009/05/01/>

Task 6. Match the term with its definition.

1. biofuel	A. made or produced in the home country
2. wind energy	B. the process by which the nucleus of a heavy atom splits into two or more fragments; the process releases neutrons and energy
3. nonrenewable energy	C. the process by which nuclei of small atoms combine to form new, more massive nuclei; the process releases energy
4. conservation	D. the energy received by Earth from the sun in the form of radiation
5. nuclear fission	E. plant material, manure, or any other organic matter that is used as an energy source
6. nuclear fusion	F. energy created from the movement of air over Earth's surface when air pressure differences are caused by the sun's uneven heating of Earth's surface
7. biomass	G. fuel made from living organisms
8. renewable resource	H. electrical energy produced by the flow of water
9. domestic	I. energy using renewable resources
10. hydroelectric energy	J. a natural resource that can be replaced at the same rate at which the resource is consumed
11. solar energy	K. energy using nonrenewable resources
12. renewable energy	L. the preservation and wise use of natural resources

Taken from: <http://quizlet.com/108673/>

Task 7. Read the second part of the text “Future sources of energy” and answer the questions below.**FUTURE SOURCES OF ENERGY. PART 1.**

Radiant energy is the energy of electromagnetic waves. The Methernitha Community in Switzerland currently has 5 or 6 working models of fuelless, self –

running devices that tap this energy. Nikola Tesla's magnifying transmitter, T. Henry Moray's radiant energy device, Edwin Gray's EMA motor, and Paul Baumann's Testatika machine all run on radiant energy. This natural energy form can be gathered directly from the environment or extracted from ordinary electricity by the method called fractionation.

Geothermal energy is a very powerful and efficient way to extract a renewable energy from the earth through natural processes. Geothermal power is cost effective, reliable, and environmentally friendly, but has previously been geographically limited to areas near tectonic plate boundaries. Recent technological advances have dramatically expanded the range and size of viable resources, especially for direct applications such as home heating. Geothermal power offers a degree of scalability: a large geothermal plant can power entire cities while smaller power plants can supply rural villages or heat individual homes.

Biomass, as a renewable energy source, refers to biological material that can be used as fuel or for industrial production. In this context, biomass refers to plant matter grown to generate electricity or produce for example trash such as dead trees and branches, yard clippings and wood chips biofuel, and it also includes plant or animal matter used for production of fibers, chemicals or heat. Biomass may also include biodegradable wastes that can be burnt as fuel. Industrial biomass can be grown from numerous types of plants, including miscanthus, switchgrass, hemp, corn, poplar, willow, sorghum, sugarcane, and a variety of tree species, ranging from eucalyptus to oil palm (palm oil).

Taken from: <http://listverse.com>

1. What devices work on radiant energy?
2. What is a degree of scalability?
3. Which community has successfully used radiant energy?
4. What are the sources of biomass?
5. What kind of energy has previously been geographically limited to areas near tectonic plate boundaries?

Task 8. Choose any source of energy. Do not name it but answer “yes” or” no” to your classmates questions. Students should try to guess what you have chosen. Take turns.

Possible questions: Does it depend on geographical position? Is that renewable/nonrenewable source? Does it need large areas of land?

Task 9. Search the Internet and make a list of resources that deal with future energy sources. Write down their slogans and main ideas/solutions. Share your findings with classmates in form of presentation.

Task 10. Translate the sentences, define whether they contain Gerund, Participle or Infinitive.

1. Plants are useful sources of energy thanks to their storing the sun’s radiation in chemical form.
2. Increasing the price of uranium would have little effect on the overall cost of nuclear power; a doubling in the cost of natural uranium would increase the total cost of nuclear power by 5 percent.
3. Increasing the cross –section of the wire, we reduce the resistance to current flow.
4. In spite of their speaking of the current as flowing from plus to minus, electricians know of the electrons flowing from minus to plus.
5. To prove that lightning is atmospheric electricity required systematic observations and experiments.
6. The voltage being increased the field becomes strong causing the electrons to produce additional ions by collision.
7. Having measured the potential difference, the students compared the results obtained.
8. Electricians consider silver and copper to be the best conductors of electricity.
9. Vegetation and wood can be burned directly to generate energy, like fossil fuels, or processed to form alcohols.
10. Metals are the best conductors of electricity, minerals being rather poor

conductors.

11. There are many good conductors of electricity, silver and copper being the best of all.
12. The machine designed proved to be a very efficient generator.
13. Two parallel conductors forming an electric circuit have relatively small self – induction because the flux connected with them is small.
14. Variations of current flowing in one part of the transistor circuit are known to cause corresponding changes in the other part of the circuit.
15. Efficient energy use, sometimes simply called energy efficiency, is the goal of efforts to reduce the amount of energy required to provide products and services.
16. When decomposed, garbage produces the methane captured in pipes and later burned to produce electricity.

Task 11. Use the links below to play games on renewable energy sources. Write a short review on each of the games (whether it is informative, practical etc.).

<http://www.planitgreenlive.com>

http://www.connectenergyed.org/media/richmedia/0/213/project/index.html?page=intro&ar_a=1

<http://www.hydroquebec.com/learning/durable/jeux/jeu2.html>

<http://www.electrocity.co.nz/>

Task 12. Write an essay on one of the statements:

- A. I know that nuclear is better than fossil fuels when it comes to carbon dioxide, but nuclear energy is by no means clean. We don't know what to do with the waste we already have and it seems like a bad idea to me to make more when we have so many cleaner options such as wind and solar. – *Sheryl Crow*
- B. Hydrogen is the most common element in the universe, and has the potential to become an inexpensive source of energy for neighborhoods, light and heavy duty vehicles, and industry. – *Charlie Dent*

APPENDIX A. GRAMMAR GUIDE

TENSES

Active & Passive Voices

Verb tense	Active	Passive
<i>Present Simple</i>	V –1 (s), Do, does + V1 An engineer invents new devices.	am, is, are + V –3 New devices are invented.
<i>Past Simple</i>	V –2, Did+V –1 An engineer invented new devices.	was, were + V –3 New devices were invented.
<i>Future Simple</i>	will, shall + V –1 An engineer will invent new devices.	will, shall be + V –3 New devices will be invented.
<i>Present Continuous</i>	am, is, are + V –ing An engineer is inventing new devices.	is, are + being+ V –3 New devices are being invented.
<i>Past Continuous</i>	was, were + V –ing An engineer was inventing new devices.	was, were + being +V –3 New devices were being invented.
<i>Future Continuous</i>	will, shall + be+V –ing An engineer will be inventing new devices.	
<i>Present Perfect</i>	has, have + V –3 An engineer has invented new devices	has, have + been + V –3 New devices have been invented.

<i>Past Perfect</i>	had + V –3 An engineer had invented new devices	had been + V –3 New devices had been invented.
<i>Future Perfect</i>	will have + V –3 An engineer will have invented new devices	will have been V –3 New devices will have been invented.
<i>Present Perfect – Continuous</i>	has, have been V –ing An engineer has been inventing new devices.	
<i>Past Perfect – Continuous</i>	had been V –ing An engineer had been inventing new devices.	
<i>Future Perfect – Continuous</i>	will have been V –ing An engineer will have been inventing new devices.	
<i>Modal verb</i>	can, must +V –1 An engineer can invent new devices.	can, must be +V –3 New devices can be invented.

IT IS/WAS..... THAT

Сполучення it is ... that, it is, which, it is ... who можуть виділяти будь – який член речення між компонентами цього поєднання, крім присудка. Додатковий акцент на слові чи групі слів (емфаза) українською мовою мові передається або словом **same**, або порядком слів: те, що виділяється конструкцією it is ... that, ставиться в кінець речення:

It is these properties of crystals that are the most important. Same ці властивості кристалів найбільш важливі. Найбільш важливі ці властивості кристалів.

Ознакою того, що *that* – частина емпатичного звороту, є можливість прибрати рамкову конструкцію *it is ... that* без спотворення сенсу пропозиції, лише прибравши емфазу:

These properties of crystals are the most important. Ці властивості кристалів найбільш важливі.

Одним з варіантів емпатичної конструкції з поєднанням *it is .. that* є виділення обставини часу, якому передуює емпатичній конструкції *not until*. Поєднання *it was not until ... that* не перекладається, а перед обставиною часу додаються слова тільки, тільки після, тільки тоді, коли:

It was not until 1953 that this book was published. Ця книга була опублікована лише в 1953 році.

It was not until Reontgen discovered X-rays that scientists began to take interest in this subject.

Тільки тоді, коли Рентген відкрив X-промені, вчені почали цікавитися цим питанням.

COMPLEX OBJECT/SUBJECT CONSTRUCTIONS

Complex Object

Конструкція виконує в реченні функцію доповнення і складається з займенника в об'єктивному відмінку або іменника й інфінітива.

My teacher wanted me to make a project on engines. – Мій викладач хотів, щоб я підготував проект про двигуни.

Would you like me to repeat the question? – Ви хочете, щоб я повторив питання?

We know Mr. Stanton to be a good PR specialist. – Ми знаємо, що містер Стентон хороший фахівець із зв'язків з громадськістю.

Частка *to* перед інфінітивом в даній конструкції не вживається після присудка, вираженого дієсловами сприйняття (*see, hear, feel* і т. д.) і дієсловами *let* і *make*.
I heard somebody mention my name. – Я почув, що хтось згадав моє ім'я.

The teacher made the student repeat the sentence. – Викладач змусив студента повторити речення.

Let me help you with the bags. – Дозвольте допомогти вам з сумками. (Давайте я допоможу вам з сумками).

Complex Object вживається

1. Після дієслів, що виражають бажання: to want, to wish, to desire, would like;
 2. Після дієслів, що виражають припущення: to expect, to believe, to think, to suppose, to consider, to find;
 3. Після дієслів, що виражають наказ, прохання: to command, to order, to ask, to allow;
 4. Після дієслів, що виражають чуттєве сприйняття: to see, to hear, to notice, to feel, to watch, to observe;
 5. Після дієслів, що виражають спонукання: to make, to force, to have, to let.
- У двох останніх випадках частинка to перед інфінітивом не ставиться.

Суб'єктна конструкція з інфінітивом (Complex Subject)

Конструкція складається з займенника в називному відмінку або іменника і інфінітива з часткою *to*. У реченні виконує функцію підмета. Дієслово – присудок, як правило, виражений пасивним станом.

He is said to know several foreign languages. – Кажуть , він знає кілька іноземних мов.

He seems not to approve of your idea. – Здається , він не схвалює ваш план.

Використання Complex Subject

У реченнях зі складним підметом у більшості випадків використовується пасивний стан. Дієслова, з якими використовується Complex Subject, можна розділити на 4 групи:

1. Дієслова, що висловлюють знання, твердження:

to think – думати to state – заявляти to report – повідомляти

to know – знати to say – говорити to announce – оголошувати та ін.

Приклади:

He is known to work as an engineer in London. – Відомо, що він працює інженером в Лондоні.

She was thought to be checking the device. – Думали, що вона перевіряє прилад.

2. Дієслова, що висловлюють припущення:

to expect – розраховувати to suppose – припускати

to believe – вірити to consider – розглядати та ін.

Приклади:

The inventor is expected to be famous. – Розраховують, що винахідник буде відомим.

The train was believed to come in time. – Вірили, що поїзд прийде вчасно.

3. Дієслова, що передають сприйняття:

to see – бачити to hear – чути to notice – помічати та ін.

Приклади:

He was seen to enter the laboratory. – Бачили, як він увійшов до лабораторії.

The maintenance workers were heard to leave the town. – Чули, як працівники техпідтримки полишають місто.

4. Також Complex Subject вживається після таких дієслів:

to be likely – скоріше за все to be certain – неодмінно

to be unlikely – маловірогідно to be sure – обов'язково

Приклади:

He is unlikely to succeed. – Маловірогідно, що він досягне успіху.

Активний стан у реченнях зі складним підметом вживається лише з словами:

to appear – з'являтися to seem – вбачатися, здаватися

to happen – траплятися to prove – доводити to turn out – виявлятися

Приклади:

The experiment turned out to be uninteresting. – Сталося так, що експеримент виявився нецікавим.

FORMS OF INFINITIVE

<u>Form of infinitive</u>	<u>Active</u>	<u>Passive</u>
<u>Indefinite</u>	<u>to create</u> <u>to come</u>	<u>to be created</u>
<u>Continuous</u>	<u>to be writing</u> <u>to be coming</u>	_____
<u>Perfect</u>	<u>to have created</u> <u>to have come</u>	<u>to have been created</u>
<u>Perfect Continuous</u>	to have been solving to have been coming	_____

INFINITIVE OR –ING FORM

Verb + –ing :

stop, delay, fancy, consider, admit, miss, involve, finish, postpone, imagine, avoid, deny, risk, practise, enjoy, suggest, mind, give up, put off, carry on, go on, keep on, can't help /laughing/, dislike, can't stand.

verb + to:

offer, decide, hope, deserve, attempt, promise, agree, plan, aim, afford, manage, threaten, refuse, arrange, learn, forget, fail, seem, appear, tend, pretend, claim, decide, dare, want, ask, help, expect, beg, tell, remind, force, enable, teach, order, warn, invite, persuade, make, let.

both –ing + infinitive:

begin, start, intend, continue, bother, love, like, hate, can't bear /no difference in meaning

difference in meaning:

advise, recommend, encourage, allow, permit, forbid:

verb + –ing /without an object/

verb + object + to:

I recommend waiting

I recommend **you** to wait

remember + –ing = I did it and now I remember /I remember posting the letter/

remember – to...= not to forget or to realise /please remember to post the letter/

regret + –ing = I am sorry about what I did /I regret saying it/

regret + to...= I'm sorry that I have to.../We regret to inform you.../

go on + –ing = continue /He went on talking/

go on + to.. = do or say something new /After discussing it he went on to talk about economy/

try + –ing = testing /try pressing the button

try + to.. = attempt, effort /I tried to move the table/

need + –ing = something needs to be done /the floor needs cleaning/

need + to.. = it is necessary /I need to take more exercise/

NOTE: would is followed by infinitive: I would like to go.

I would like to have done something= I regret I couldn't do it

CONDITIONALS – SUBJUNCTIVE MOOD

Zero Conditional	First Conditional
If + Present Simple, Present Simple 1. General truths e.g. If/Whenever ice <u>melts</u> , it <u>becomes</u> water. 2. Rules e.g. If you <u>wave</u> a red flag, it <u>means</u> danger.	If + Present Simple, will/can + infinitive e.g. If I <u>win</u> the lottery, I <u>will travel</u> around the world. Unless I <u>win</u> the lottery, I <u>will not/ won't travel</u> around the world. <i>(I don't know if I win but there is a possibility)</i>
Second Conditional	Third Conditional
If + Past Simple, would/could + infinitive e.g. If I <u>won</u> the lottery, I <u>would travel</u> around the world. <i>(But I didn't win the lottery, and it's very unlikely that I will win)</i>	If + Past Perfect, would/could + have + PP e.g. If Christopher Columbus <u>hadn't discovered</u> America, the history of the world <u>would have been</u> different. <i>(But he had discovered America and it's impossible to change)</i>

Mixed conditionals

	If clause	Main clause	
Type 2	If he <i>was doing his laboratory work</i> all day,	he <i>will get</i> good mark tomorrow.	Type 1
Type 2	If I <i>were</i> rich,	I <i>would have bought</i> a new computer.	Type 3
Type 3	If an engineer <i>had been asked to participate</i>	he <i>would go</i> to that competition tonight.	Type 2

WISHES

	Form	Use
I wish (if only) (<i>wish/regret about the present</i>)	+ Past Tense	wish/regret about the present situation we want to be different
I wish I were in another place now (It's a pity I am not)		
I wish (If only) (<i>wish/regret about the present</i>)	+ could + bare infinitive	wish/regret in the present concerning lack of ability
I wish I could speak fluent English. (but I can't)		
<u>I wish (if only)</u> (<i>Regret about the past</i>)	+ Past Perfect	regret that something happened or didn't happen in the past.
I wish I had prepared my homework. (but I didn't)		

TENSE CHANGE – IN – INDIRECT SPEECH

DIRECT SPEECH	INDIRECT SPEECH
PRESENT TENSE	
PRESENT SIMPLE changes into PAST SIMPLE	
She said, “He goes to school daily”	He said that she went to school daily.
They said, “We love our country”	They said that they loved their country
He said, “He does not like computer”	He said that he did not like computer.
PRESENT CONTINUOUS changes into PAST CONTINUOUS	
He said, “He is listening to the music.”	He said that he was listening to the music.
She said, “I am washing my clothes.”	She said that she was washing her clothes.
PRESENT PERFECT changes into PAST PERFECT	
She said, “He has finished his work”.	She said that he had finished his work.
He said, “I have started a job.”	He said that he had started a job.
I said, “she have eaten the meal.”	I said that she had eaten the meal.
They said, “We have not gone to New York.”	They said that they had not gone to New York.
PRESENT PERFECT CONTINUOUS changes into PAST PERFECT CONTINUOUS	
He said, “I have been studying since 3 o’clock”	He said that he had been studying since 3 o’clock.
She said, “It has been raining for three days.”	She said that it had been raining for three days.
I said, “She has been working in this office since 2007.”	I said that she had been working in this office since 2007.

PAST TENSE	
PAST SIMPLE <i>changes into</i> PAST PERFECT	
<p>He said to me, “You answered correctly.”</p> <p>John said, “They went to cinema.”</p> <p>He said, “I made a table.”</p> <p>She said, “I didn’t buy a car.”</p>	<p>He told me that I had answered correctly.</p> <p>John said that they had gone to cinema.</p> <p>He said that he had made a table.</p> <p>She said that she had not bought a car.</p>
PAST CONTINUOUS <i>changes into</i> PAST PERFECT CONTINUOUS	
<p>They said, “We were enjoying the weather.”</p> <p>He said to me, “ I was waiting for you.”</p> <p>I said, “It was raining.”</p> <p>She said, “I was not laughing.”</p>	<p>They said that they had been enjoying.</p> <p>He said to me that he had been waiting for me.</p> <p>I said that it had been raining.</p> <p>She said that she not been laughing.</p>
PAST PERFECT <i>changes into</i> PAST PERFECT (tense does not change)	
<p>She said, “She had visited a doctor.”</p> <p>He said, “I had started a business.”</p> <p>I said, “she had eaten the meal.”</p> <p>They said, “We had not gone to New York. ”</p>	<p>She said that she had visited a doctor.</p> <p>He said that he had started a business.</p> <p>I said that she had eaten the meal.</p> <p>They said they had not gone to New York.</p>
FUTURE TENSE	
<p style="text-align: center;">FUTURE SIMPLE TENSE</p> <p style="text-align: center;">WILL <i>changes into</i> WOULD</p>	
<p>He said, “I will study the book.”</p> <p>She said, “I will buy a computer.”</p> <p>They said to me, “We will send you gifts.”</p> <p>I said, “I will not take the exam.”</p>	<p>He said that he would study the book.</p> <p>She said that she would buy a computer.</p> <p>They said they would send you gifts.</p> <p>I said that I would not take the exam.</p>

FUTURE CONTINUOUS TENSE WILL BE changes into WOULD BE	
<p>I said to him, “ I will be waiting for him.”</p> <p>She said,” I will be shifting to new home.”</p> <p>He said, “I will be working hard.”</p> <p>He said, “He will not be flying kite.”</p>	<p>I said to him that I would be waiting for him.</p> <p>She said that she would be shifting to a new home.</p> <p>He said that he would be working hard.</p> <p>She said that he would not be flying kites.</p>
FUTURE PERFECT TENSE WILL HAVE changes into WOULD HAVE	
<p>He said, “I will have finished the work.”</p> <p>She said, “They will have passed the examination.”</p> <p>He said, “I will have gone.”</p>	<p>He said that he would have finished the work.</p> <p>She said that they would have passed the examination.</p> <p>He said that he would have gone.</p>

Note: The tense of reported speech may not change if reported speech is a universal truth though its reporting verb belongs to past tense.

Examples

Direct speech: An engineer said, “The device is broken.”

Indirect Speech: An engineer said that the device was broken.

Direct speech: A lab assistant said, “Water boils at 100⁰ Centigrade.”

Indirect Speech: Lab assistant said that water boils at 100⁰ Centigrade.

(Tense didn’t change because reported speech is a universal truth though its reporting verb belongs to past tense)

INDIRECT SPEECH FOR SENTENCES WITH MODALS “CAN, MAY, MUST”

Present modals are changed to past modals

Direct Speech	Indirect Speech
Indirect speech for sentences having MODALS: “can, may, must, should, ought to”	
CAN changes into COULD	
He said, “I can drive a car”	He said that he could drive a car.
She said, “He can repair the pump.”	She said that he could repair the pump.
They said, “We can climb on a hill”	They said that they can climb on a hill.
MAY changes into MIGHT	
He said, “I may buy a computer.”	He said that he might buy a computer.
She said, “He may visit a doctor.”	She said that he might visit a doctor.
They said, “They may go to zoo.”	They said that they might go to zoo.
MUST changes into HAD TO	
He said, “I must work hard.”	He said that he had to work hard.
She said, “They must carry on their experiment.”	She said that they had to carry on their experiment.
I said to him, “You must learn the test – taking strategies.”	I said that he had to learn the test –taking strategies.

INDIRECT SPEECH FOR SENTENCES HAVING MODALS “SHOULD, OUGHT TO, MIGHT, WOULD, AND COULD”

The modal will not change in indirect speech

Direct Speech	Indirect Speech
Would	
They said, “We would apply for a visa.”	They said that they would apply for visa.
He said, “I would start a business.”	He said that he would start a business.

She said, "I would appear in exam."	She said that she would appear in the exam.
Could	
She said, "My brother could turn on the meter." They said, "We couldn't learn the lesson." He said, "I could run faster."	She said that his brother could turn on the meter. They said they couldn't learn the lesson. He said that he could run faster.
Might	
He said, "Students might come." She said, "It might rain." John said, "I might meet him."	He said that students might come. She said that it might rain. John said that he might meet him.
Should	
He said, "I should manage with it." She said, "I should see him." They said, "We should take the exam."	He said that he should manage with that. She said that she should see him. They said that they should take the exam.
Ought to	
He said to me, "You ought to check him." She said, "I ought to learn physics." They said "We ought to attend our classes."	He said that I ought to check him. She said that she ought to learn physics. They said that they ought to attend their classes.

EXCLAMATORY AND IMPERATIVE SENTENCES IN INDIRECT SPEECH

Imperative sentences in indirect speech.

A sentence which expresses command, request, advice or suggestion is called the *imperative sentence*.

For example • Open the door. Please help me. • Learn your lesson.

To change such sentences into indirect speech, the word "ordered" or "requested" or

“advised” or “suggested” or “forbade” or “not to do” is added to reporting verb depending upon the nature of the imperative sentence in reported speech.

Examples

Direct speech: She said to him, “You should work hard for exam”

Indirect Speech: He *suggested* working hard for exam.

Direct speech: They said to him, “Do not tell a lie.”

Indirect Speech: They told him *not to* tell a lie.

Direct speech: The teacher said to the students, “Do not waste time.”

Indirect Speech: The teacher *advised* the students not to waste time.

Exclamatory sentences, in indirect speech

Sentence which expresses the state of joy, sorrow or wonder is called the exclamatory sentence.

For example Hurrah! We won the match. Alas! I failed the test.

To change such sentences, the words “exclaimed with joy”, “exclaimed with sorrow” or “exclaimed with wonder” are added in the reporting verb depending upon the nature of the exclamatory sentence in indirect speech.

Examples.

Direct speech: He said, “Hurrah! I won a prize.”

Indirect Speech: He *exclaimed with joy* that he had won a prize.

Direct speech: She said, “Alas! I failed in exam.”

Indirect Speech: She *exclaimed with sorrow* that she failed in the exam.

Direct speech: He *said*, “Oh no! I missed the train.”

Indirect Speech: He *exclaimed with sorrow* that he had missed the train.

MAKE OR DO

<p>Work, Jobs and Tasks</p> <p>do the housework</p> <p>do your homework</p> <p>do a good job</p> <p>do your chores</p>	<p>Speaking and Sounds</p> <p>make a noise</p> <p>make a comment</p> <p>make a speech</p> <p>make a suggestment</p>
<p>Solo sports and tasks</p> <p>do homework; do an exercise; do exercises; do math; do a sum; do sums; do crossword puzzles; do morning gymnastics; do morning exercises; do push-ups; do aerobics; do athletics; do something; do nothing; do anything; do everything</p>	<p>Produce a reaction</p> <p>make your eyes water</p> <p>make you happy</p> <p>make you smile</p>
<p>Non-specific Activities</p> <p>do something</p> <p>do nothing</p> <p>do everything</p> <p>do anything</p>	<p>Plans and Decisions</p> <p>make a decision</p> <p>make a plan</p> <p>mae a choise</p> <p>make arrangments</p>
<p>to do some studying</p> <p>to do some writing</p> <p>to do the accounts</p> <p>to do the cleaning</p> <p>to do the dishes</p> <p>to do the ironing</p> <p>to do the laundry</p> <p>to do the math</p>	<p>to make a call</p> <p>to make a deal</p> <p>to make a fire</p> <p>to make a fortune</p> <p>to make a presentation</p> <p>to make a threat</p> <p>to make believe</p> <p>to make friends</p>

<p>to do the maximum</p> <p>to do the minimum</p> <p>to do the paperwork</p> <p>to do the shopping</p> <p>to do the vacuuming</p> <p>to do time</p> <p>to do work</p> <p>to do your best</p> <p>to do your duty</p> <p>to do your hair</p>	<p>to make fun</p> <p>to make changes</p> <p>to make progress</p> <p>to make sense</p> <p>to make time</p> <p>to make a mess</p> <p>to make a mistake</p> <p>to make the bed</p> <p>to make sure</p>
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THE COMPARISON OF ADJECTIVES

Monosyllabic adjectives are compared with –er, –est.

positive	comparative	superlative
strong	stronger	strongest
late	later	latest
big	bigger	biggest
thin	thinner	thinnest

Disyllabic adjectives ending with y, er, ow, le are compared with –er, –est.

positive	comparative	superlative
easy	easier	easiest
happy	happier	happiest
narrow	narrower	narrowest

All the other adjectives are compared with more, most.

positive	comparative	superlative
careful	more careful	most careful
difficult	more difficult	most difficult
tired	more tired	most tired
terrible	more terrible	most terrible

Special adjectives can be compared with –er, –est or more, most.

positive	comparative	superlative
common	commoner / more common	commonest / most common
likely	likelier / more likely	likeliest / most likely
pleasant	pleasanter / more pleasant	pleasantest / most pleasant
polite	politer / more polite	politest / most polite

quiet	quieter / more quiet	quietest / most quiet
sure	surer / more sure	surest / most sure
subtle	subter / more subtle	subtlest / most subtle
simple	simpler / more simple	simplest / most simple

Irregular forms

positive	comparative	superlative
good	better	best
bad	worse	worst
much	more	most
many	more	most
little	less	least

Comparative structures

If a big difference exists

far + comparative + than
 nowhere near as + adjective + as
 considerably + comparative + than
 not nearly as + adjective + as
 a great deal + comparative + than
 twice/ten times as + adjective + as
 get more and more + adjective

If a small difference exists

almost as + adjective + as
 nearly as + adjective + as
 slightly + comparative + than
 not quite as + adjective + as

If no difference exists

as + adjective + as
 not any + comparative + than
 no + comparative + than

Double comparatives

Double comparatives are used to say that something is changing.

Note the structures:

...er and ...er
 more and more

APPENDIX B. USEFUL PHRASES FOR DISCUSSION, COMPOSITION AND REPORT MAKING

- 1) Introducing a point
 - First of all I'd like to point out ...
 - The main problem is ...
 - The question of ...
 - Speaking of ...
 - What we have to decide is ...
- 2) Enumeration of points
 - First of all, I'd like to say ...
 - In addition to that ...
 - Moreover, ...
 - Furthermore, ...
 - Another example of this is ...
 - First, second, third ...
 - Finally, ...
- 3) Stating something as a fact
 - As everyone knows ...
 - It is generally accepted that ...
 - There can be no doubt that ...
 - It is a fact that ...
 - Nobody will deny that ...
 - Everyone knows that ...
- 4) Expressing a personal opinion
 - It seems to me that ...
 - I have the feeling that ...
 - I feel that ...
 - I'm absolutely convinced that ...
 - You can take it from me that ...
 - I think/don't think that ...
 - In my opinion, ...
- Well, if you ask me ...
- As I see it ...
- The way I see it, ...
- Personally, I believe/suppose/feel (that) ...
- I'm convinced that ...
- 5) Expressing pros and cons
 - There are two sides to the question.
 - On the one hand ..., on the other hand ...
 - An argument for/in favour of/against is ...
 - While admitting that ... one should not forget that ...
 - Some people think that ..., others say that ...
- 6) Expressing doubt
 - I'm not sure if ...
 - I'm not convinced that ...
 - I wonder if you realize that ...
 - I doubt that.
- 7) Expressing disagreement
 - I don't agree with you about ...
 - I can't accept your view that ...
 - I'm of a different opinion.
- 8) Expressing support
 - You're quite right.
 - That's a very important point.

- You've got a good point there.
 - I couldn't agree with you more.
 - You took the words right out of my mouth.
- 9) Giving reasons
- The reason for this is (that) ...
 - I base my argument on ...
 - I tell you all this because ...
- 10) Keeping to the point
- It would be more to the point if ...
 - Come to the point.
 - That's not the problem.
 - What we are discussing is ...
- ... has nothing to do with my argument.
 - That's not relevant.
- 11) Drawing conclusions and summing up
- The obvious conclusion is ...
 - Last but not least ...
 - The only alternative (left) is ...
 - The only possible solution/conclusion is ...
 - Summing up, I'd like to say that ...
 - In conclusion we can say that ...
 - To cut a long story short, ...
 - Just to give you the main points again, ...

Expressing opinion:	As far as I'm concerned ... It seems to me ... I (strongly) believe that ... The way I see it ... I am convinced that ... Without a doubt, ...
Defending your opinion:	What I am trying to say is ... Yes, but what I really mean is ...
Asking for opinion:	What do you think about ... Are you sure that ... What's your opinion on ...
Agreeing with another opinion:	I agree with that. That's a good point. You put that very well.
Disagreeing with another opinion:	I don't agree with that. I can't see your point.

	<p>That might be true, but ...</p> <p>That's not the point here.</p> <p>The problem with your point of view is that ...</p>
Clarifying (making sure that you understand sth. correctly):	<p>So, you are saying that ...</p> <p>Can I just check that I understand you correctly? You mean that ...</p> <p>Did you want to say that ...</p>
Giving in:	<p>All right, then.</p> <p>I take that back.</p>

Introducing the subject	<ul style="list-style-type: none"> - I'd like to start by... - Let's begin by... - First of all, I'll... - Starting with... - I'll begin by...
Finishing one subject...	<ul style="list-style-type: none"> - Well, I've told you about... - That's all I have to say about... - We've looked at... - So much for...
...and starting another	<ul style="list-style-type: none"> - Now we'll move on to... - Let me turn now to... - Next... - Turning to... - I'd like now to discuss... - Let's look now at...
Analysing a point and giving recommendations	<ul style="list-style-type: none"> - Where does that lead us? - Let's consider this in more detail... - What does this mean for ABC?

	<ul style="list-style-type: none"> - Translated into real terms...
Giving an example	<ul style="list-style-type: none"> - For example,... - A good example of this is... - As an illustration,... - To give you an example,... - To illustrate this point...
Dealing with questions	<ul style="list-style-type: none"> - We'll be examining this point in more detail later on... - I'd like to deal with this question later, if I may... - I'll come back to this question later in my talk... - Perhaps you'd like to raise this point at the end... - I won't comment on this now...
Summarising and concluding	<ul style="list-style-type: none"> - In conclusion,... - Right, let's sum up, shall we? - I'd like now to recap... - Let's summarise briefly what we've looked at... - Finally, let me remind you of some of the issues we've covered... - If I can just sum up the main points...
Ordering	<ul style="list-style-type: none"> - Firstly...secondly...thirdly...lastly... - First of all...then...next...after that...finally... - To start with...later...to finish up...

APPENDIX C. SPECIALTY INFO

Electric Power Stations

The Department trains electrical engineers in specialty Electric Power Stations for work concerned with operation and design of power stations of different types: thermal, atomic, hydraulic and power stations working from the untraditional sources of energy such as solar, wind, tidal and geothermal power stations.

Graduates' training in different spheres of technical disciplines permits them to work in the power systems and associations, at different power plants, at the design organizations, scientific and research institutes and to be engaged in problems of reliability of power stations and systems, operation and maintenance of power equipment, design of electrical power plants, design and maintenance of automated designing systems, automation of modes control for electric power plants (automated control systems for power stations and electric consumption of industrial plants, powerful electric drive compressing gas pipelines).

The department trains students according to individual plans, which can include problems of the use of personal computers for elaboration and decision of problems in electric power engineering, use of resumed power sources, insulating, and cable equipment, diagnostics of equipment, construction, and use of trainers based on modern computer systems for training operating and dispatching staff for power plants. This leads to the necessity to have good English knowledge and skills. So students learn specific English terms, topics and themes that can be useful in their specialty.

- Priority directions of scientific researches of the department;
- Ecological system of power and energy saving technology;
- Development methods of a choice of modes of electro supply in conditions of the indistinct information;
- Creation of methods and expert systems for an estimation of technical conditions of power supplies of power equipment;
- Control of technological processes and equipment during the manufacture of electric power.

This developing sphere needs effective communication skills to cooperate with foreign specialists. Many patents and documentation for new inventions of the students and staff of the faculty are also written in English. For this and many other reasons, it is clear and obvious that much emphasis is put on students acquiring necessary knowledge and skills of the language. The textbooks and other materials, used during learning process focus on grammatical structures and vocabulary, characteristic of scientific and technical activity, which students are involved in during their time at the university and in their future professional life.

The grammar material, which students learn, includes a wide range of topics, from modal verbs and parts of speech to non –finite forms of the verbs and their complexes. The specific vocabulary includes such semantic fields as power systems, energy, electrical engineering etc.

Textbooks and other learning materials include both Ukrainian and foreign. Students' studies are divided into in –class work and self –study assignments and projects. They also write articles in English to have them published in order to take part in different conferences and meetings, connected with their specialty.

Electric Networks and Systems

The Department trains electrical engineers in specialty Electric Networks and Systems for work on operation and design of electric networks and systems of different class of voltages, for work in dispatching services and computing centers of large power systems, production power associations, design and scientific –research institutes.

Graduates' training enables them to work in power systems and associations, at different power plants, design organizations, scientific –research institutes and to be engaged in the problems of analysis and optimization of normal and emergency operation modes of united power systems, increasing of technical and economic indexes of the operation modes of different type voltage electric networks, calculation of local electric networks, choice of parameters for compensating devices installed in distributive networks on the base of modern computer and microprocessor facilities.

The Department disposes of the up –to –date material –technical and laboratory base, which can flexibly correspond to educational process complicated with training of foreign specialists for needs of their national engineering. One of the main directions of the department's scientific activity is the design of installations for diagnostics of oil –filled power equipment for the substations with voltage 110 –1150 kV.

Recently completed scientific works of the department:

- Methods and models for research of processes of development of system failures at computer trainings.
- Priority directions of scientific researches of the department:
- Research of survivability of modern electric power systems of Ukraine in conditions of extreme situations;
- Development of computer systems for a choice of the optimum circuits of development and optimization of modes of operations of electrical networks of a high –pressure voltage.

This developing sphere needs effective communication skills to cooperate with foreign specialists. Many patents and documentation for new inventions of the

students and staff of the faculty are also written in English. For this and many other reasons, it is clear and obvious that much emphasis is put on students acquiring necessary knowledge and skills of the language. The textbooks and other materials, used during learning process focus on grammatical structures and vocabulary, characteristic of scientific and technical activity, which students are involved in during their time at the university and in their future professional life.

The grammar material, which students learn, includes a wide range of topics, from modal verbs and parts of speech to non –finite forms of the verbs and their complexes. The specific vocabulary includes such semantic fields as operation and design of electric networks and systems of different class of voltages, for work in dispatching services and computing centers of large power systems, production power associations, design and scientific –research institutes etc.

Textbooks and other learning materials include both Ukrainian and foreign. Students' studies are divided into in –class work and self –study assignments and projects. They also write articles in English to have them published in order to take part in different conferences and meetings, connected with their specialty.

High Voltages Technique

Students specializing in the High voltage engineering and Electrophysics program study a broad range of phenomena and processes in solid, liquid, and gas media under high electric field stress. The program puts emphasis on advanced knowledge and understanding of physical, mathematical, and material science aspects of high voltage technology. In addition, they complete coreclass sequences in power engineering, computer science, and economics.

Students receive education in the following areas: insulation of high voltage equipment; electromagnetic compatibility; lightning protection; grounding; diagnostics and design of high voltage equipment; evaluation and extension of lifetime of electric power equipment and grounding systems; related modern electrical engineering issues, such as laser technology, fluid power, and X –ray equipment; economics.

The graduates of the program, prepared according to the national and international professional standards, are ready for productive work in electric power generation, transmission, and distribution (both commercial and residential); construction and maintenance organizations; commercial units dealing with electric equipment; as well as in research and development centers.

Priority directions of scientific researches of the department:

- Creation of systems of the experimental stand and realization of tests of space apparatus;
- Analysis of the over voltages and development of means of protection from their influence.

This developing branch needs effective communication skills to cooperate with foreign specialists. Many patents and documentation for new inventions of the students and staff of the faculty are also written in English. For this and many other reasons it is clear and obvious that much emphasis is put on students acquiring necessary knowledge and skills of the language. The textbooks and other materials, used during learning process focus on grammatical structures and vocabulary, characteristic of scientific and technical activity, which students are involved in during their time at the university and in their future professional life.

The grammar material, which students learn, includes a wide range of topics. The specific vocabulary includes such semantic fields as operation and design of electric networks and systems of different class of voltages, for work in dispatching services and computing centers of large power systems, production power associations etc. Students have in –class work and self –study assignments and projects; write articles in English to have them published in order to take part in different conferences and meetings, connected with their specialty.

Automation in Electric Power Systems

The Department trains electrical engineers in specialty Control systems of production and distribution of power electric energy for work in the electrical power systems, at control centers and scientific –research institutes.

Graduates' training in different spheres of technical disciplines enables them to decide up –to –date scientific and technical problems in the field of automation of production, distribution, and consumption of electric power energy on the base of wide use of modern computer and micro processing facilities.

Educational and scientific complex of the Department comprises six study and scientific –research laboratories equipped with computer and micro processing facilities, automated, and relay devices, means of teleinformation supply and dispatching control for power systems.

The main scientific trend of the Department is the development and inculcation of theoretical grounds and technical means, algorithmical and information support and software for control of complicated power systems.

The Department performs training of engineering staff and brainpower not only for Ukraine, but also for foreign countries.

Recently completed scientific works of the department:

- Research of distributive electrical networks for high –speed transfer of the information in control systems of electrical power supply and information networks of common usage;
- Development of digital relay; methods and means of power system protection, automation, and control; modeling of processes in power system for protection and control;
- Automatic frequency and power –frequency control; voltage control systems. Power automatic systems.

Priority directions of scientific researches of the department:

- Perspective information technologies, devices of complex automation, system of communications;
- Ecological clean power energetics and energy saving technologies. Wind power stations with power storage elements.

Effective communication skills are necessary for cooperating with foreign specialists or getting deeper knowledge of specialty and specific items. Many patents and documentation for new inventions of the students and staff of the faculty is also written in English. For this and many other reasons, it is clear and obvious that much emphasis is put on students acquiring necessary knowledge and skills of the language. The textbooks and other materials, used during learning process focus on grammatical structures and vocabulary, characteristic of scientific and technical activity, which students are involved in during their time at the university and in their future professional life. Textbooks and other learning materials include both Ukrainian and foreign. Students' studies are divided into in –class work and self – study assignments and projects. They also write articles in English to have them published in order to take part in different conferences and meetings, connected with their specialty.

The grammar material, which students learn, includes a wide range of topics, from modal verbs and parts of speech to non –finite forms of the verbs and their complexes. The specific vocabulary includes such semantic fields as automation of production, distribution, and consumption of electric power energy etc.

Electric Drive and Automation of Industrial Plants and Technological Complexes

The Department trains electromechanical engineers in specialty Electric Drive and Automation of Industrial Plants and Technological Complexes providing two specializations: general technical and robotic installations.

In the process of study students in addition to general technical education get fundamental training in the theory of automatic control and theory of electric drive, electronics, computer engineering and programming, modeling, technical means of automated electric drive and automated technological processes including microprocessing means and systems.

The curriculum of this specialty foresees special courses in electric drive control systems, program control, automated electric drives of general industrial mechanisms, flexible productions, metal working robots for machine building, as well as the course of electromechanics and mechanics of robotic mechanisms.

Wide spectrum of multidisciplinary knowledge and high request for graduates from industry are based on the fact that electrical drives and electromechanical systems provide the electromechanical energy conversion of more than 60% of all generated energy in different branches of industry, transport systems, agriculture, and military applications.

The Department has great experience in training of engineers and scientific brainpower for foreign countries of Europe, Asia, Africa, Central and South America.

Priority directions of scientific researches of the department:

- Theory and practice of complex electromechanical systems of automatic control with the increased technical, economical and qualitative parameters on the basis of engines of rotating and linear movement;
- Theory of extreme energy saving electromechanical systems of automatic control of continuous transport;
- Energy saving algorithms of vector management of asynchronous engines.

This developing sphere needs effective communication skills to cooperate with foreign specialists. Many patents and documentation for new inventions of the

students and staff of the faculty are also written in English. For this and many other reasons, it is clear and obvious that much emphasis is put on students acquiring necessary knowledge and skills of the language. The textbooks and other materials, used during learning process focus on grammatical structures and vocabulary, characteristic of scientific and technical activity, which students are involved in during their time at the university and in their future professional life.

The grammar material, which students learn, includes a wide range of topics, from modal verbs and parts of speech to non –finite forms of the verbs and their complexes. The specific vocabulary includes such semantic fields as electric drive control systems, program control, automated electric drives of general industrial mechanisms, flexible productions, metal working robots for machine building, as well as the course of electromechanics and mechanics of robotic mechanisms etc.

Electric Machines

The Department trains electrical engineers in specialty Electric machines and apparatus for work in operation, design and production technology of electric machines of different types, and various electromechanical devices.

Graduates training in different spheres of technical disciplines enable them to work at scientific –research institutes, higher educational institutions, electrical machine building, and transformers making plants, enterprises of different branches, which have big electric shops and labs, and also in organizations operating with electric machines and movable –electrode vacuum tube complexes.

The Department graduates are able to decide difficult technical problems concerned with the design of electric machines with involving of modern computation facilities, specified methods of analysis of physical fields in electric motors and generators on the base of field numerical methods, technology of production of electric motors and generators and their reliability.

Training of specialists is carried both within the extents of educational programmed and according to individual plans, their contents being in agreement with organizations interests or student's will.

This developing sphere needs effective communication skills to cooperate with foreign specialists. Many patents and documentation for new inventions of the students and staff of the faculty is also written in English. For this and many other reasons, it is clear and obvious that much emphasis is put on students acquiring necessary knowledge and skills of the language. The textbooks and other materials, used during learning process focus on grammatical structures and vocabulary, characteristic of scientific and technical activity, which students are involved in during their time at the university and in their future professional life. Textbooks and other learning materials include both Ukrainian and foreign. Students' studies are divided into in –class work and self –study assignments and projects. They also write articles in English to have them published in order to take part in different conferences and meetings, connected with their specialty.

Renewal Sources of Energy

The Chair of Renewable Energy Sources (RES) was founded in 2002 and is one of the youngest and most promising units in the National University of Kiev Polytechnic "KPI". The Department adheres to three –level training of graduates (bachelors, specialists and masters) in Power Engineering, Electricity Engineering and Electricity Technologies.

Apart from day –time regime of teaching a licensed extra mural form of is also adopted which is financed from the State Budget and supported contract agreements as well. The training of qualified scientific personnel is permanently under way through post –graduate courses and doctorate. The Department has modern laboratories, test benches and a PC class with the access to the Internet.

The Chair's teaching staff consists of two state prize winners, a corresponding member of Ukrainian Academy of Sciences, and five PhD holders in engineering seven candidates in engineering and economics. All teachers are leading scientists engaged in scientific development effort focused on harnessing renewable energy sources all the way down to the stage of practical introduction.

During training period the students acquire the following skills:

- design, construction and commissioning of renewable energy –based power units supplying energy to industrial, agricultural and municipal objects as well as to private sector;
- ability of conducting and making practical use of relevant R&D activity for creating advanced heat and power generating equipment intended for the operation in the general grid and distributed power units;
- solid engineering and technological basis for efficient running of RES –based and conventional heat and power generating units fully drawing for that purpose on the latest achievements in the field of information technologies;
- practical experience in marketing, management and audit related to RES harnessing practice.

The Chair maintains close contacts and has agreement on students' exchange with foreign organizations and universities.

This developing sphere needs effective communication skills to cooperate with foreign specialists. Many patents and documentation for new inventions of the students and staff of the faculty are also written in English. For this and many other reasons it is clear and obvious that much emphasis is put on students acquiring necessary knowledge and skills of the language. The textbooks and other materials, used during learning process focus on grammatical structures and vocabulary, characteristic of scientific and technical activity, which students are involved in during their time at the university and in their future professional life.

The grammar material, which students learn, includes a wide range of topics, from modal verbs and parts of speech to non –finite forms of the verbs and their complexes.

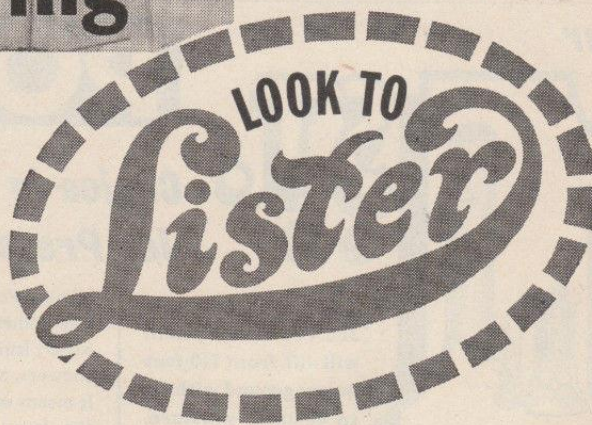
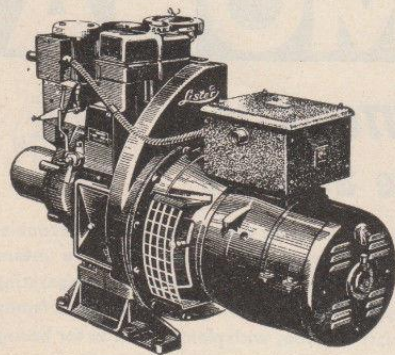
APPENDIX D. VISUALS

Image to task 12, Unit 6



Have the best of two worlds. The freedom of life on the land **and** the benefits of every modern electric labour-saving appliance. And you can with a Lister Start-O-Matic electric generating set. Flick a switch anywhere in your home and in a flash the Start-O-Matic comes to life automatically, bringing your light globe or cooking range or TV set to life!

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APPENDIX E. LETTER OF REQUEST (semi-formal)

1) Dear Mr/Ms

I recently saw an article about a new motor design for engineering equipment in your magazine.

I have a lot of disciplines connected with motors and am interested in new products or new designs of motors etc. Could you therefore please send me some other articles and materials which include such topics as motors, generators, engineering?

I would also be grateful if you could include details of the authors of these materials if it is possible so I can communicate with them via mail.

Thank you in advance.

Best regards

2) Dear Prof. Ac. Antrold,

I discovered your presentation on the open –source website and was very happy to find it incredibly useful for my studying of MHD generators. But, unfortunately, the file appeared to be damaged.

Could you please send me information missing on pp. or the whole presentation if it is possible? My address is Mykola_Svistyuk@gmail.com

Thank you for responding. I look forward to hearing from you.

3) Dear editors of EngineeringMag,

I am writing to thank you for the great article on conductors and insulators you published last month. It was very useful for my studying and project.

I would like to ask you further information on this month's article about generator's usage that I read in April's issue. If it is possible I would like to ask not about technical characteristics but focus more on everyday usage of this useful device. Maybe in next issue you can give some examples or promote an idea of a penpal engineering club.

Thank you in advance!

Sincerely yours,

4) Dear ...

I saw information about your summer school in a magazine and I am writing to ask you for a favor. I want to find out more about the possibility to enroll on a course in your school. I am interested in a few aspects of studying and facilities. Here are my questions:

- How much does it cost to take a two-month course?
- Which documents should I bring with me?
- Will I receive a certificate at the end of the course?
- Do I need to speak perfect English?
- What kind of accommodation do you offer?
- Are there any outdoor activities during the course?

At the moment this is all I wanted to know but I would be grateful if you could send me a telephone number of a person responsible for the electroengineering course.

I am looking forward to your reply.

Thank you in advance!

Best regards,

Список використаних джерел

1. Department of Engineering [Електронний ресурс] – Режим доступу: http://www3.eng.cam.ac.uk/DesignOffice/mdp/electric_web/AC/AC_1.html
2. Electric motor [Електронний ресурс] – Режим доступу: <http://targetstudy.com/knowledge/invention/78/electric-motor.html>
3. Electrical Machines [Електронний ресурс] – Режим доступу: <https://www.safaribooksonline.com/library/view/electricalmachines-2nd/9788131760901/>
4. Electricity [Електронний ресурс] – Режим доступу: <http://www.songsforteaching.com/science/professorboggs/electricity.htm>
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7. Hsu T.C. Physics A First Course [Електронний ресурс] – Режим доступу: http://www.northernhighlands.org/cms/lib5/NJ01000179/Centricity/Domain/214/cp_physics/online_textbook/pfc_student_ebook_2008.pdf.
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12. Motor types – AC motor [Електронний ресурс] – Режим доступу: <http://techinventory.blogspot.com/2014/01/motor-types-ac-motor.html#axzz3KIWU1HiP>
13. Nuclear energy [Електронний ресурс] – Режим доступу:

<http://www.edfenergy.com/energyfuture/nuclear>

14. Official page of BEST organization [Электронный ресурс] – Режим доступа: <http://www.best.eu.org/index.jsp>

15. Top 10 Renewable Energy Sources [Электронный ресурс] – Режим доступа: <http://listverse.com/2009/05/01/top-10-renewable-energy-sources>

16. Ukrainian science. [Электронный ресурс] – Режим доступа: <http://hi-tech.org.ua/ukrainian-science/>

17. Classroom management and discipline [Электронный ресурс] – Режим доступа: http://mvnu.edu/ncate/NCATE_standards/standard_1/2007_2008_syllabi/PEL/PEL6073s.pdf

Video materials

18. Electromotive Force [Электронный ресурс] – Режим доступа: <https://www.youtube.com/watch?v=cbSKkrzdXe4>

19. Follow Electricity's Journey Through the Transmission System. [Электронный ресурс] – Режим доступа: <https://www.youtube.com/watch?v=TQg2Y0kp2vI>

20. How nuclear energy works [Электронный ресурс] – Режим доступа: <https://www.youtube.com/watch?v=VJfIbBDR3e8>

21. Magnetism: Motors and Generators [Электронный ресурс] – Режим доступа: https://www.youtube.com/watch?v=d_aTC0iKO68

22. Scientific research at RTU: Faculty of Power and Electrical Engineering [Электронный ресурс] – Режим доступа: https://www.youtube.com/watch?v=MНofY4c_66Y

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