

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ  
НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ УКРАЇНИ  
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ  
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**ENGLISH FOR INFORMATION TECHNOLOGY:  
FUNCTIONAL UNITS OF A COMPUTER  
НАВЧАЛЬНИЙ ПОСІБНИК**

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## ENGLISH FOR INFORMATION TECHNOLOGY: FUNCTIONAL UNITS OF A COMPUTER НАВЧАЛЬНИЙ ПОСІБНИК

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**АНОТАЦІЯ.** Навчальний посібник призначений для аудиторної і позааудиторної роботи зі студентами першого курсу факультету інформатики та обчислювальної техніки. Видання складається з трьох розділів, які охоплюють професійно-орієнтовані теми: “A Typical Computer”, “Computer Hardware”, “Computer Safety”. Посібник також містить робочі аркуші, додатки, словник, список аббревіатур і акронімів до кожного розділу, відповіді.

Представлені в посібнику вправи спрямовано на розвиток вмінь усного та писемного мовлення, читання, аудіювання і перекладу, а також удосконалення лексичної та граматичної компетентностей. Мета навчального посібника – розширити професійний тезаурус студентів, сформувати навички роботи з автентичними матеріалами, сприяти розвитку професійно-орієнтованої комунікативної компетентності, сформувати інтерес до вивчення англійської мови професійного спрямування.

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## CONTENTS

<b>Передмова</b> .....	4
<b>Unit 1. A Typical Computer</b> .....	6
<b>Unit 2. Computer Hardware</b> .....	16
<b>Unit 3. Computer Safety</b> .....	24
<b>Revision</b> .....	34
<b>Worksheet A</b> .....	38
<b>Appendices</b> .....	40
<b>Appendix A</b> .....	40
<b>Appendix B</b> .....	41
<b>Appendix C</b> .....	44
<b>Appendix D</b> .....	45
<b>Word List</b> .....	46
<b>List of Abbreviations and Acronyms</b> .....	50
<b>Answer keys</b> .....	51
<b>Audio scripts</b> .....	63
<b>References</b> .....	68

## ПЕРЕДМОВА

Навчальний посібник призначено для забезпечення підготовки бакалаврів спеціальностей 121 «Інженерія програмного забезпечення», 123 «Комп'ютерна інженерія», 126 «Інформаційні системи та технології». Видання створено для аудиторної і позааудиторної роботи зі студентами першого курсу факультету інформатики та обчислювальної техніки. Його мета – сформувати у студентів іншомовну комунікативну компетентність, необхідну для англomовного ситуативного і професійного спілкування.

Навчальний матеріал посібника організований за тематичним принципом та відповідає вимогам робочої навчальної програми з кредитного модуля «Вступ до загальнотехнічної англійської мови» дисципліни «Іноземна мова». Видання розраховане на 10 годин аудиторних і позааудиторних занять у першому семестрі.

Посібник містить сучасні автентичні професійно-орієнтовані матеріали з інформаційних технологій, які було адаптовано для студентів першого курсу факультету інформатики та обчислювальної техніки. Видання забезпечує роботу студентів із текстами, відео- й аудіоматеріалами, включає лексичні та граматичні вправи, розроблені відповідно до тем професійного спрямування.

Навчальний посібник складається з трьох розділів, які охоплюють професійно-орієнтовані теми: “A Typical Computer”, “Computer Hardware”, “Computer Safety”. Видання також містить робочі аркуші, додатки, словник, аббревіатур і акронімів до кожного розділу, відповіді.

Усі розділи навчального посібника включають некоммунікативні, умовно-коммунікативні та коммунікативні вправи, спрямовані на розвиток умінь усного мовлення, читання, аудіювання, перекладу, письма, а також удосконалення лексичної та граматичної компетентностей. Після трьох розділів є секція для перевірки залишкових знань (Revision) із завданнями для контролю рівня засвоєння пройденого лексичного і граматичного матеріалу.

У робочому аркуші (Worksheet A) подано рисунки для самостійної візуалізації матеріалу, вивченого в першому розділі посібника.

Додатки (Appendices) містять пояснення граматичних явищ, вправи на опрацювання яких включено в перший, другий та третій розділи посібника.

У словнику (Word list), а також списку аббревіатур і акронімів (List of Abbreviations and Acronyms) подано перелік ключових загальнонавчаних та термінологічних лексичних одиниць до кожного розділу.

Під час роботи з навчальним посібником студенти зможуть розширити професійний тезаурус, сформувати навички роботи з автентичними матеріалами, удосконалити професійно-орієнтовану комунікативну компетентність.

Перевагами видання є забезпечення інтенсифікації пізнавальної, інтелектуальної та творчої діяльності студентів, формування інтересу до вивчення і практичного застосування англійської мови професійного спрямування, а також доступність цього посібника в мережі Інтернет.

*Автор*

## UNIT 1

### A TYPICAL COMPUTER

#### LEAD-IN

1. a) *Answer the following questions.*

1. What components make up a typical desktop computer?
2. Will desktop computers always look the way they do today? Will computer components ever change?
3. What computer components are indispensable?

b) *In pairs, label the components of a typical desktop computer. Use a dictionary if necessary.*

A



B



C



D



E



F



G



H



I



J



K



L



M



## READING

### 2. a) *Read and translate the article into your native language.*

#### PARTS OF A COMPUTER

A computer is any machine that can be programmed to carry out a set of **algorithms** and arithmetic instructions. It can be used to do just about anything from simple calculations to preparing reports, sending rockets into space, or **simulating** the spread of cancer in body organs.

A typical computer consists of two parts: hardware and software. Software is a set of instructions and computer programs that control what a computer does. Hardware is any physical and electronic part of a computer, rather than the instructions it follows.

Whether it's a powerful **mainframe** or a home PC, the main components that make up a typical, present-day computer include: the motherboard, the central processing unit (CPU), the main memory and peripherals.

All components of a computer communicate through a **circuit board** called the motherboard. It acts as a **nexus** because it facilitates the communication of the other components in a computer. There are ports on the motherboard that face the outside of the computer, allowing you to **plug** in different components into your computer and also to charge it.

The CPU is often called the “brain” of a computer. Whenever you write a line of code, it's broken down into **assembly language** – which is a language that the processor can understand. The CPU **fetches**, decodes, and executes these instructions. Thus, all the processes a computer handles are taken care of by the CPU.

The main memory stores the instructions and data which are being processed by the CPU. It has two main sections: Read Only Memory (ROM) and Random Access Memory (RAM). ROM, also known as **non-volatile** memory, is the part of a computer where permanent instructions and information are stored. RAM, also referred to as **volatile** memory, acts as a temporary store for information which gets erased every time the computer restarts.

Peripherals are physical units attached to the computer to extend its functionality. The umbrella term “peripherals” spans all hardware units that are used to input, output, or store information. Input devices (e.g., mice, keyboards) are used to feed the data into a computer. Output devices (e.g., monitors, speakers, printers) are used to extract the results from the system. Storage devices (e.g., hard / DVD / flash drives) are used to store information permanently, or transfer data to and from your computer.

Adapted from <https://www.cgdirector.com/parts-needed-to-build-a-pc/>  
<https://smallbusiness.chron.com/parts-computer-uses-54052.html>

**b) Answer the following questions.**

1. What is a computer?
2. What does hardware do?
3. What is software?
4. What are the main components of a typical PC?
5. What is the motherboard? What does it do?
6. What is the main function of the CPU?
7. What are the two main memory sections?
8. What does ROM stand for? What does it do?
9. What does RAM stand for? What does it do?
10. What are peripherals? What are they used for?

**c) Explain the words in bold in the text. Use a dictionary if necessary.**

## ENGLISH IN USE

**3. a) Study APPENDIX A. Then use the suitable relative pronoun to complete the sentences below. Give alternative options if possible.**

1. Good graphics cards also come in handy for 3D modelers ... rely on images to create a 3D representation of an object.
2. A storage device is a piece of computer equipment ... is used to keep information and instructions.



3. You can also expand the motherboard by adding more ports ... allow you to connect even more auxiliary devices to your computer.
4. An optical drive is used to read CDs and DVDs ... can be used to listen to music or watch movies.
5. A computer support specialist helps computer users ... are having problems with computer software or hardware.
6. A hard disk drive (HDD), ... is commonly known as a hard drive (HD), is a non-volatile memory hardware device ... permanently stores and retrieves data on a computer.
7. A solid-state storage device (SSD) uses integrated circuit assemblies as memory ... stores data continuously.
8. Yesterday I met a friend ... helped me troubleshoot my computer.
9. The CD ... you lent me last week is scratched.
10. The I5 INTEL processor is fairly adequate for average home users ... don't do intensive graphics work, engineering / science or gaming.
11. Could you tell me ... tablet this is?
12. This is a computer support specialist to ... I spoke on the phone.
13. My neighbor, ... lives across the street, decided to assemble his own PC.
14. That is a netbook ... I want to buy.
15. Have you ever met a programmer ... knows more about computers that he does?!

**b) Look through the sentences again and answer the following questions.**

1. Are there any relative pronouns you can leave out?
2. Which of the sentences above contain:
  - defining clause(s) .....
  - non-defining clause(s) .....

4. Study APPENDIX B. Then use the word in capitals to form a word that fits in the spaces.

### WHY COMPUTER CASE IS IMPORTANT

The computer case serves mainly as a way to

1) ..... mount and contain all of the actual components inside of a computer (e.g., motherboard, hard / optical / floppy drive). They typically come bundled with a power supply. The 2) ..... of a

laptop, netbook, or tablet is also considered a case but since they aren't purchased separately or very

3) ....., the computer case tends to refer to the shell protects a traditional desktop PC.

Motherboards, computer cases, and power supplies all come in different sizes called form factors. All three must be

4) ..... to work properly together.

There are several reasons why we use computer cases. One is for 5) ....., which is easy to assume

because it's the most obvious. Dust, animals, toys, liquids can all damage the internal parts of a computer if the hard shell of

a computer case doesn't 6) ..... them and keep them away from the outside environment. Hand-in-hand

with protection, a computer case also doubles as a way to hide all those parts of the computer that nobody really wants to see

each time they look in that 7) .....

Another good reason to use a computer case is to keep the area cool. While the case has special vents to allow some of the fan

air to escape, the rest of it can be used to cool down the hardware, which would otherwise get pretty hot and possibly

8) ..... to the point of malfunction.

**PHYSICAL**

**HOUSE**

**REPLACE**

**COMPATIBILITY**

**PROTECT**

**CLOSE**

**DIRECT**

**HEAT**

Keeping 9) ..... computer parts, like the fans, in a closed space within the computer case is one way to reduce the noise that they make.

The structure of the computer case is also important. The different parts can fit together and become easily 10) ..... to the user by being compacted in a case to hold it all together.

**NOISE**

**ACCESS**

Retrieved from <https://www.lifewire.com/what-is-a-computer-case-2618149>

**5. Fill in the correct word(s) from the list below.**

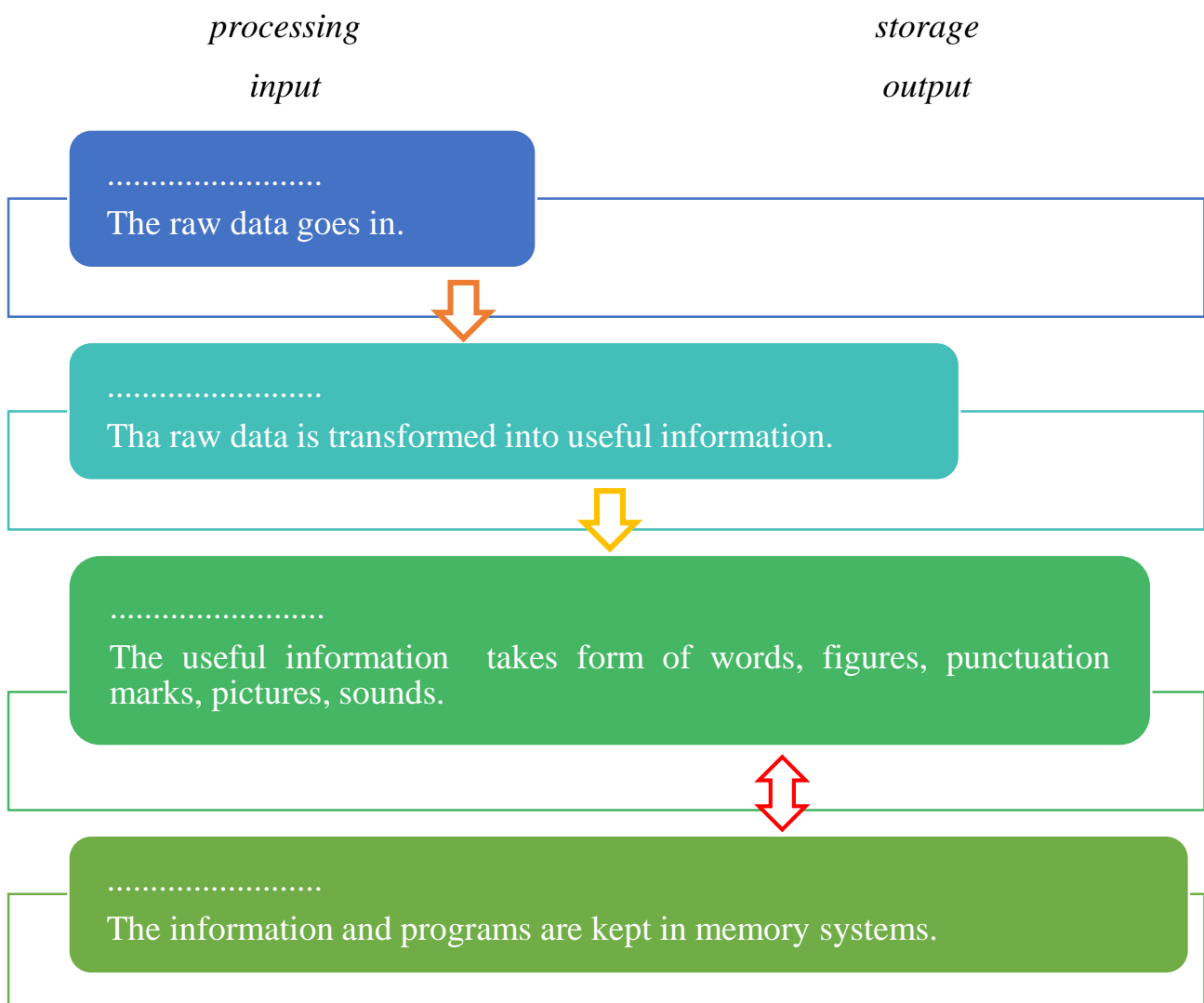
- chassis
- cooling fan
- flat
- hard drive
- heat sink
- indicator lights
- mains electricity
- motherboard
- overheating
- power supply
- voltage swing



1. A computer case, also known as a computer ....., tower, system unit or a cabinet, is the enclosure housing most of the components of a PC.
2. The ..... directs power through the computer.
3. Unlike laptops which can be powered by batteries, desktop computers are fed with .....
4. The surge protector will protect your computer from damage caused by .....
5. The case ..... prompt the user to make a note of the status of a hardware device, hence their name.

6. Have you checked if the batteries of your laptop haven't gone .....
7. The ..... draws cooler air into the case from the outside, expels warm air from inside and moves air across a ..... to cool a particular component.
8. If you want to prevent the processor from ....., make sure that its fan is not clogged with dust.
9. In terms of construction, the main computer components attached to the ..... are put into a protective case.
10. All computers have a ..... installed in them. They need it to store items such as files for the operating system, software programs, and personal files of users.

**6. Complete the diagram below with the suitable function of a PC from the list.**



## LISTENING

### Pre-listening activity

#### 7. a) Answer the following questions.

1. Do you and your friends use any special code when you don't want people to understand you?
2. What special code do computers use?

#### b) Match the words in A to their correct meaning in B.

A	B
1. off the heezy	a. a room or other area kept for reporters to work in, especially at sports events
2. flow	b. made of ones and zeroes
3. ballpark	c. immediately
4. press box	d. using only black, white, and grey, or using only one colour
5. binary	e. a smooth steady movement of liquid, gas or electricity
6. instantaneously	f. continuing for a long time and is not interesting
7. monochrome	g. make or produce something quickly, especially using a keyboard
8. tedious	h. a field for playing baseball with sits for watching the game
9. pound out	i. cool; trendy
10. reflect	j. most important; main
11. primary	k. show or be a sign of something
12. digit	l. one of the written signs that represent the numbers 0 to 9

### While-listening activity

**b) Watch the video about the digital information that computers process (go to <https://www.youtube.com/watch?v=WtY&list=PL7C263C2A3252DCF2>) and answer the following questions.**

1. What did one of the interviewees do when she found out that her e-mail wasn't confidential?
2. Why do computers use ones and zeros as a special code?
3. What does *pixel* stand for?
4. Does a typical computer monitor have 580 pixels?
5. What are the primary colours of each individual pixel?
6. What does *bit* stand for?
7. What is a collection of eight bits called?

**d) Watch the video again and complete the following sentences.**

1. Information in a computer can only be represented by ones and zeros. This code .....  
.....
2. The scoreboard's computer receives .....  
.....which pixel to light up in exactly that location.
3. For color monitors, not only does the computer have to .....  
.....,  
but it also has to give the correct combination of primary to each individual pixel.
4. Though it may seem tedious for us to pound out a letter using ones and zeroes, keep in mind that a computer .....  
and it never gets bored.
5. The computer translates the numbers into a letter using a special code called ASCII – .....  
.....
6. Imagine what it would be like if we could .....  
.....! That's not even close to a computer speed!

## SPEAKING

**8. a)** *In small groups, discuss what your ideal computer would be like. Think about features and functions it would have.*

**b)** *Describe the possible areas of its use. Give a summary of the group's ideas to the rest of the class.*



## WRITING



**9.** *Write a guide about computer assembly in 120-180 words. Use WORKSHEET A and the Internet if necessary.*

## UNIT 2

### COMPUTER HARDWARE

#### LEAD-IN

1. a) *Answer the following questions.*

1. What is computer hardware?
2. Which hardware does your computer have?
3. What hardware categories do you know?



b) *Study the following words and tick (✓) the correct category in the table below.*

<i>Hardware component</i>	<b>Input</b>	<b>Processing</b>	<b>Output</b>	<b>Storage</b>
CD / DVD drive				
Central Processing Unit				
floppy drive				
headphones				
joystick				
keyboard				
light pen				
microphone				
hard disk drive				
monitor				
motherboard				
printer				
scanner				
speakers				
speech synthesizer				
trackball				
webcam				



## READING

**2. a)** Look at the words in the box below and guess at the hardware category (input hardware, processing hardware, output hardware, storage hardware) they refer to.

switch	jumper	stylus	cursor
--------	--------	--------	--------

**b)** Now read the article and check your answers.

We use input devices every time we use a computer. Simply speaking, it is these devices which allow us to enter information. Some of the things we do with input devices are: move a cursor around the screen, enter **alphanumeric** text, draw pictures, and even enter binary data in the form of graphics or audio wave forms.

Input devices have a history as long as computers themselves. Perhaps the first input device was the simple electronic switch (similar to a light switch) which turned bits on or off. Switches and **jumpers** are still used today on computers. For instance, the power button on the computer is a switch which is also an input device telling the computer to power on or power off. Tiny switches called jumpers are also widely used on motherboards to change important settings such as processor **clock speed** or memory speed.

As computers evolved throughout the late 20th century, computers became more and more **interactive**. Input devices came and went. Some lasted and some did not. The light pen and the joystick are almost unknown today, although they were popular before the mouse and the gamepad became well-known. Touch screens are already replacing keypads on mobile phones and may come to replace or augment keyboards and mice on PCs and laptops in the near future.

Different people prefer different input devices for doing the same task. For instance, many graphic artists prefer to use a stylus and graphics tablet rather than a mouse. It might offer them a greater deal of artistic freedom, or **precision** while performing their work. **Handicapped** computer users have invented a wide array of input devices designed to replace the mouse including devices controlled by foot or even eye movement.

Not only PCs and mainframes use input devices. Almost all computers feature some kind of input device. Special scanners are used in many stores and **warehouses** called **barcode** readers to enter stock and sell items at the cashier. These are input devices as well. Even microphones can technically be called input devices as a computer can respond to them and interpret them as incoming data.

Corporations and especially government institutions are already implementing the second generation of input devices to improve security. These include **retina** scanners and / or fingerprint readers to replace or improve accuracy of username and password authentication. Hopefully, you will see more of this kind of **biometric** authentication in the coming years as a general remedy for weak passwords.

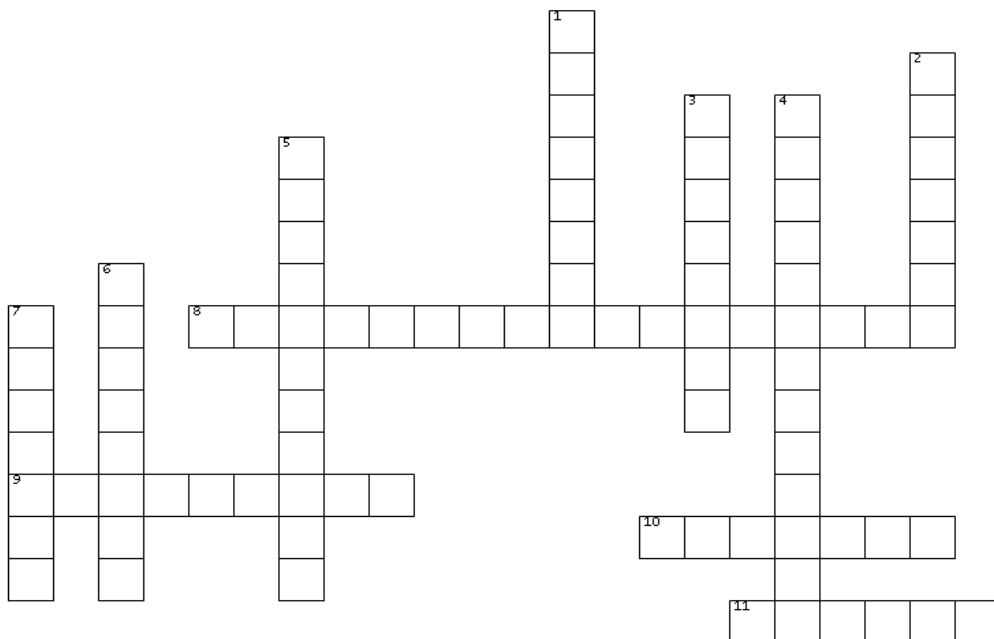
Retrieved from <https://www.english-online.org.uk/comp/comp6.htm>

**c) Translate the words in bold in the text, then give their definitions in English. Use a dictionary if necessary.**

**d) Think of five different questions to the text. Work in pairs and ask each other.**

## LANGUAGE FOCUS

**3. Use the clues to solve the crossword puzzle.**



## Across

4. It is a camera that records moving pictures and sound and allows these to be broadcast on the Internet as they happen.
5. It is a piece of equipment used to draw or write on a computer screen.
6. It is a computerized device that accepts input, interprets data, and produces audible language.
8. It is a ball on a computer mouse or keyboard that you roll with your finger in order to move the cursor on the screen.
9. It is the set of keys on a computer that you press in order to make it work.
11. It is the main printed circuit board that contains the CPU of a computer and makes it possible for the other parts of a computer to communicate with each other.

## Down

1. It is electrical equipment through which recorded or broadcast sound can be heard.
2. It is a device that changes images or text into electronic form.
3. It is a machine that is connected to a computer and can make a printed record of computer information.
7. It is a non-volatile data storage device usually installed internally in a computer and attached directly to the computer's motherboard.
10. It is a computer screen.

## ENGLISH IN USE

**4. a)** *Study APPENDIX C. Then choose a hardware component from the list and do not reveal its name. Describe the hardware component's functions and features.*

**b)** *Try to guess which device your partners are describing.*

- |                  |                      |
|------------------|----------------------|
| ➤ headset        | ➤ touchscreen        |
| ➤ floppy drive   | ➤ graphics tablet    |
| ➤ CD / DVD drive | ➤ retina scanner     |
| ➤ keypad         | ➤ fingerprint reader |

**5. a) Rearrange the letters in A to create the name of a printer. Then match the names of a printer in A with its Ukrainian equivalent in B.**

A	B
1. tandrir-pomrtte xi	a. термотрансферний принтер
2. n ikrerptnejit	b. графопобудовник
3. lesprinerart	с. фотонабірний пристрій (принтер)
4. afentrr msranlerprhitte	d. точково-матричний принтер
5. emesraitegt	e. лазерний принтер
6. lttorep	f. струменевий принтер

**b) Describe functions and features of the printers from the list above. Use the Internet if necessary.**

**6. Study APPENDIX B. Then use the word in capitals to form a word that fits in the spaces.**

#### WHAT IS A SCANNER?

In layman's term, a scanner is an electronic device that can scan handwritten or printed documents and pictures and 1) ..... them into a digital file format. It is this function of the scanner that has made this 2) ..... component a boon to businesses. The operation of the scanner is very simple and works on the principle of 3) ..... and transmission. A bright light shines the document to be converted into a digital copy and is reflected onto a sensor – 4) ..... element – after passing through a series of mirrors and lenses. There are

**FORM**

**HARD**

**REFLECT**

**PHOTOSENSITIVITY**

several types of scanners 5) ..... available today to suit your needs. A flatbed scanner is placed on a flat desk surface and has a lid that can be flipped open to view the glass that scans the document. The lid is 6) ..... to take care of scanning form thick books, files or magazines, etc. If you are 7) ..... looking for scanning images, pictures, old photographs than you must go for the photo scanners as they will give premium results. Although other scanners can also scan images, the results achieved through photo scanners will be far superior in terms of colour 8) ..... and also when there is a large number of photographs to scan. As the name suggests, in sheetfed scanners, also known as document scanners, the documents are placed in the feeder and not on the flatbed glass. These devices are ideal option when you have limited working space and need to scan thousands of pages 9) ..... Portable or handheld scanners are 10) ..... and often come in a size that can fit in your pocket. These are good at scanning documents but are not good enough with photos as compared to flatbed or photo scanners.

**COMMERCE**

**ADJUST**

**SPECIFIC**

**DEEP**

**DAY**

**HAND**

*Retrieved from <https://www.classmate4u.com/types-of-scanners/>*

## **LISTENING**

### **Pre-listening activity**

#### **7. a) Answer the following questions.**

1. How many people are involved in microprocessors' design and manufacturing?
2. Who is a mask designer?

**b) Explain the words and phrases in the list. Use a dictionary if necessary.**

Word	Definition
1. painstaking	
2. layout	
3. circuitry	
4. misconception	
5. tweezers	
6. silicon	
7. ingot	
8. wafer	
9. saw	
10. particle	
11. etch	
12. carve	
13. whittle	

### While-listening activity

**c) Go to <https://www.youtube.com/watch?v=C3tA&list=PL7C263C2>. Watch the interview with Greg Wyant (0:01-2:27), the designer of microprocessors, and complete the following notes.**

STAGES IN MICROPROCESSORS' DESIGN		
Stage	People involved	Description
1.		
2.		
3.		
4.		

**d)** Go to <https://www.youtube.com/watch?v=C3tA&list=PL7C263C2>. Watch the interview with an engineer from the fabrication facility where the microprocessors are manufactured (2:30-6:48) and mark the following statements as true (T) or false (F).

1. Microprocessors are made out of copper ingots. ....
2. A diamond saw is used to slice the ingot into polished wafers. ....
3. There are from tens of thousands to millions of transistors in each microprocessor. ....
4. In the cleanroom, every employee wears space-like garments. ....
5. Minuscule particles cannot ruin circuits on the chips. ....
6. The layer material can be either a conductor or an insulator. ....
7. The photoresist is light-resistant. ....
8. An average microprocessor can be compared to a skyscraper. ....

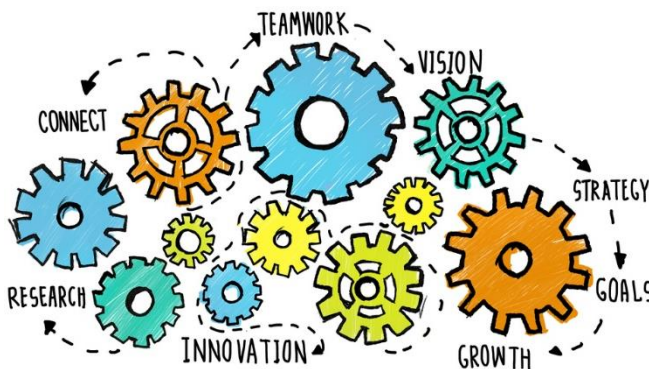
## WRITING

**8.** Summarize the main stages in microprocessors design and manufacturing. Use between 120 and 180 words.

## SPEAKING

**9. a)** In small groups, choose a hardware component you would like to design and manufacture. Discuss the following:

- target audience;
- applications;
- functions and features;
- design and manufacturing process.



**b)** Make a PowerPoint presentation summarizing your discussion. Give a summary of the group's ideas to the rest of the class.



## UNIT 3

### COMPUTER SAFETY

#### LEAD-IN

1. a) *In small groups, discuss what computer ergonomics is and how it might be related to the pictures below.*

b) *Look at the words in the list and use as many of them as you can to describe the pictures.*

adjust      bend forward      crane      elbows      eyestrain      fatigue  
hang down      hunch      slouch      stretch      posture

A



B



C



D



E



F





## READING

**2. a)** *Look at the headings in the box below and discuss with a partner what you think the article might be about.*

**b)** *Read the article which appeared in the latest edition of 'Labour and Trade Union' and choose the most suitable headings (A-G) for each paragraph (1-6). There is one extra heading which is not needed.*

- A. Free eyes tests
- B. Repetitive Strain Injury
- C. Using a computer safely
- D. What you should do next
- E. Where to get help
- F. Your employer's responsibilities
- G. Your right to breaks

1. ....

Many people use computers or Visual Display Units (VDUs) as part of their job and most suffer no ill-effects. VDUs don't give out **harmful** levels of radiation and rarely cause skin complaints. If you do suffer ill-effects, it may be because of the way you're using the computer and this can be **avoided** by well-designed workstations. When working at a VDU, make sure you keep a good posture and that your eyes are level with the screen.

2. ....

Under health and safety regulations your employer should look at VDU workstations, **assess** and reduce any risks by supplying any equipment considered necessary (e.g. a wrist rest). They should also provide health and safety training. This also applies if you're working at home as an employee and using a VDU for a long period of time.

3. ....

There is no legal limit to how long you should work at a VDU, but under health and safety regulations you have the right to breaks from work using a VDU. This doesn't have

to be a rest break, just a different type of work. Guidance from the Health and Safety Executive (HSE) suggests it's better to take frequent short breaks but if your job means spending long periods at a VDU, for example as in the case of data input, then longer breaks from your workstation should be introduced. When working at a VDU make sure you can sit in a comfortable position, and keep a good posture. Your eyes should be level with the screen. Make sure you have enough space and don't sit in the same position for too long. If you're disabled, your employer's duty to make reasonable adjustments for you may mean that they will provide you with special computer equipment, or alter existing equipment, to suit your needs.

#### 4. ....

Studies haven't shown a link between VDU use and damage to eyesight, but if you feel that using a VDU screen is making your eyes tired, tell your employer or employee safety representative. You have the right to a free eyesight test if you use, or are about to use, a VDU a lot during work hours. You can also get more free tests if recommended by the optician. If you're prescribed glasses to help you work with a VDU, your employer must pay for a basic pair of glasses, provided they're needed especially for your work.

#### 5. ....

Make sure your employer has assessed the risks of your job, paying special attention to computer use. Make sure any desks and other equipment are comfortable to use and ask your employer if you need special equipment like wrist rests. If you have any health problems you think may be caused by your VDU, contact your line manager or safety representative. Your employer has a duty to consult you on health and safety issues that affect you and should welcome early reporting of any issue.

#### 6. ....

The Labour Relations Agency (LRA) offers free, confidential and impartial advice on all employment rights issues.

*Retrieved from <https://www.nidirect.gov.uk/articles/safe-computer-use>*

**c) In pairs, come up with the title and introduction (2-3 sentences) to the article.**  
**Share your ideas with the rest of the class.**

<b>Title:</b>	.....
<b>Introduction:</b>	..... ..... ..... ..... ..... ..... .....

**d) Mark the following statements as true (T) or false (F).**

1. Dermal diseases never occur as a result of computer use. ....
2. Employers may be required to provide you with items such as a wrist rest to use while at work. ....
3. If your job involves tasks such as data input, the advice from the HSE may apply. ....
4. Financial assistance in the case of special requirements may be available from the job centre. ....
5. The detrimental effect of a VDU screen on the eyesight is a scientifically proven fact. ....
6. The company is obliged to cover the cost of glasses if you need them while working. ....
7. Any concerns about the effect of using a VDU on your general well-being should be reported to your direct supervisor. ....
8. The Labour Relations Agency is always biased against employers. ....

e) Match the highlighted words in the text to the synonyms below.

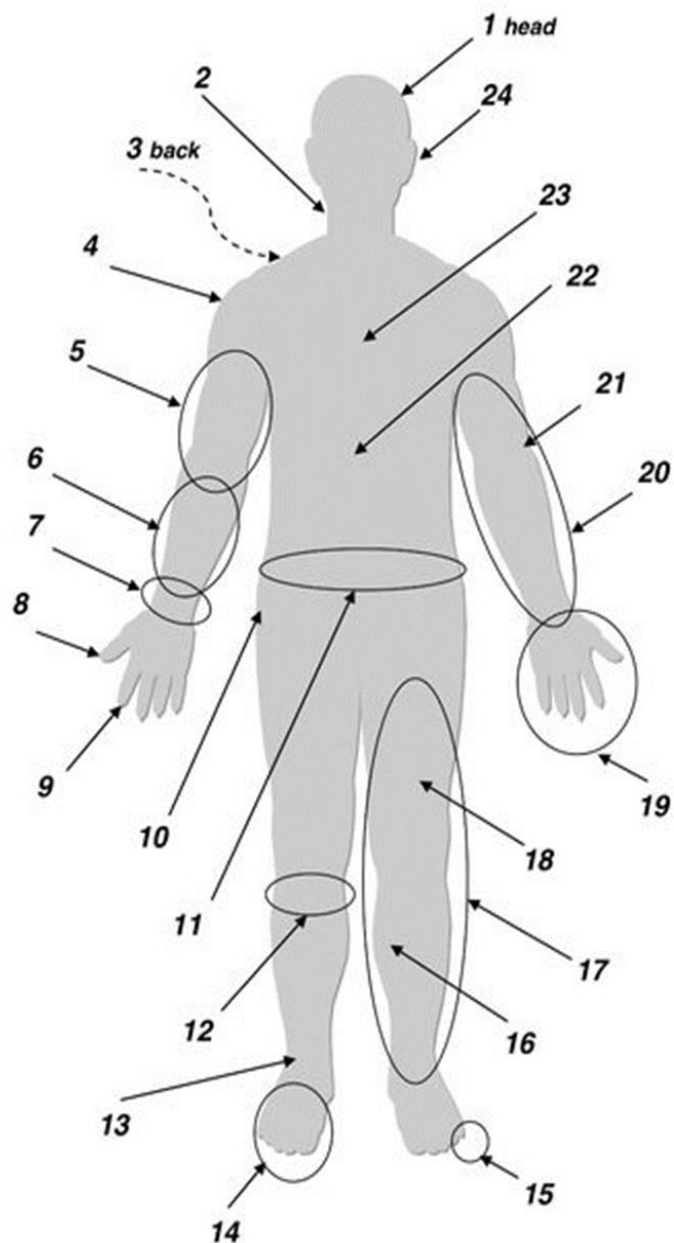
1. alterations .....
2. appraise .....
3. averted .....
4. delegate .....
5. detrimental .....

6. handicapped .....
7. influence .....
8. repeated .....
9. spectacles .....
10. unprejudiced .....

## LANGUAGE FOCUS

3. Match body parts from the list below with the correct numbers (1-24). Then say which of them are susceptible to injuries caused by continuous computer use.

- |            |             |
|------------|-------------|
| ➤ abdomen  | ➤ toe       |
| ➤ ankle    | ➤ waist     |
| ➤ arm      | ➤ wrist     |
| ➤ back     | ➤ upper arm |
| ➤ calf     |             |
| ➤ chest    |             |
| ➤ ear      |             |
| ➤ elbow    |             |
| ➤ finger   |             |
| ➤ foot     |             |
| ➤ forearm  |             |
| ➤ hand     |             |
| ➤ head     |             |
| ➤ hip      |             |
| ➤ knee     |             |
| ➤ leg      |             |
| ➤ neck     |             |
| ➤ shoulder |             |
| ➤ thigh    |             |
| ➤ thumb    |             |



**4. a)** Which of the following nouns refer to healthy state of the human body (HS)? Which are associated with injuries or disease (I/D)? Tick (✓) the correct category in the table below.

Noun	HS	I/D	Definition
1. blink			
2. breath			
3. burning			
4. fatigue			
5. numbness			
6. stiffness			
7. strain			
8. swelling			
9. tenderness			
10. throbbing			
11. tingling			
12. yawn			

**b)** Explain the nouns. Use a dictionary if necessary.

**c)** Make your own sentences with the nouns.

**5. a)** Translate the words in the list.

blurred   common   fatigue   joint   muscular   numbness  
posture   tendons   vital   wrist

**b)** Fill in the gaps with words from 5a.

### COMPUTER-RELATED INJURIES

The computer is a 1) ..... tool in many different jobs and activities. However, continuous and inappropriate computer use can cause muscle and

2) ..... pain, repetitive strain injury, and eyestrain. Back and neck pain, headaches, and shoulder and arm pain are 3) ..... computer-related injuries. Such muscle and joint problems can be caused or made worse by poor workstation design, bad 4) ..... and sitting for long periods of time. Although sitting requires less 5) ..... effort than standing, it still causes physical 6) ..... and you need to hold parts of your body steady for long periods of time. Muscles and 7) ..... can become painful with repetitive movements and awkward postures. This is known as repetitive strain injury (RSI) and typically occurs in the neck, arm, elbow, hand, or 8) ..... of computer users. Symptoms of RSI include pain, swelling, stiffness of the joints, weakness and 9) ..... Looking at the screen for long periods of time and computer screen illumination can cause eye fatigue. Although there is no evidence that eye fatigue damages your eyesight, computer users may get symptoms such as 10) ..... vision, temporary inability to focus on faraway objects and headaches.

Retrieved from <https://www.betterhealth.vic.gov.au/health/healthyliving/computer-related-injuries>

## ENGLISH IN USE

**6. Study APPENDIX D. In pairs, practise giving advice about how to use a computer safely. Use these guidelines.**

1. Sit at an adjustable desk specially designed for use with computers.
2. Have the computer monitor either at eye level or slightly lower.
3. Have your keyboard at a height that lets your elbows rest comfortably at your sides.
4. Position your forearms roughly parallel with the floor and level with the keyboard.
5. Adjust your chair so that your feet rest flat on the floor, or use a footstool.
6. Use an ergonomic chair, specially designed to help your spine hold its natural curve while sitting.
7. Use an ergonomic keyboard so that your hands and wrists are in a more natural position.
8. Take frequent short breaks and go for a walk, or do stretching exercises at your desk.
9. Mix your tasks to avoid long, uninterrupted stretches of using the computer.
10. Frequently look away from the screen and focus on faraway objects.

## LISTENING

### Pre-listening activity

**7. a)** *Translate the words in italics into your native language. Then match the words with their definitions.*

	<i>footrest</i> <i>kickstand</i> <i>pelvic</i> <i>ream</i> <i>scapular</i> <i>squeeze</i> <i>tilt</i>
1.	a. something that supports your feet when you are sitting, for example a small piece of furniture
2.	b. a pile of papers arranged one on top of another
3.	c. a part attached to a laptop, tablet, cell phone, etc. that supports it when you want it to be vertical
4.	d. relating to the shoulder blade
5.	e. press something firmly, especially from all sides in order to change its shape,
6.	f. relating to the pelvis (= the set of large curved bones at the base of your spine, to which your legs are joined)
7.	g. a sloping or uneven position, or a movement into this position

### While-listening activity

**b)** *Watch an expert in computer ergonomics explaining how to set up your desk in order to avoid pain later on in life (go to [https://www.youtube.com/watch?v=ME4VwTiw\\_F8](https://www.youtube.com/watch?v=ME4VwTiw_F8)). For A, tick (✓) the grammatical structures used by the expert to give instructions and advice. For B, put the events into the correct order by numbering them 1 to 7 with 1 being the earliest event and 7 being the most recent event.*

A	
1. The imperative.	.....
2. Should / shouldn't + infinitive.	.....
3. It's a good / bad idea to + infinitive.	.....
4. We / I recommend + that-clause / -ing form.	.....

5. The tip is to + infinitive. ....

**B**

1. Consider using a headset. ....

2. For your laptop, use a kickstand. ....

3. Adjust your monitor. ....

4. Position the keyboard where your hands end up. ....

5. Put the phone on your non-writing side. ....

6. Take exercise regularly. ....

7. Adjust your chair. ....

**c) Watch the video again and complete the following sentences.**

1. The average desk height is ..... tall.

2. If you don't have access to a footrest, we recommend using .....

3. If you work from two monitors, .....

4. Step number three is ..... your keyboard.

5. You want to move from your elbow instead of your shoulder to prevent overuse or .....

6. After 10, 15 minutes, we all begin .....

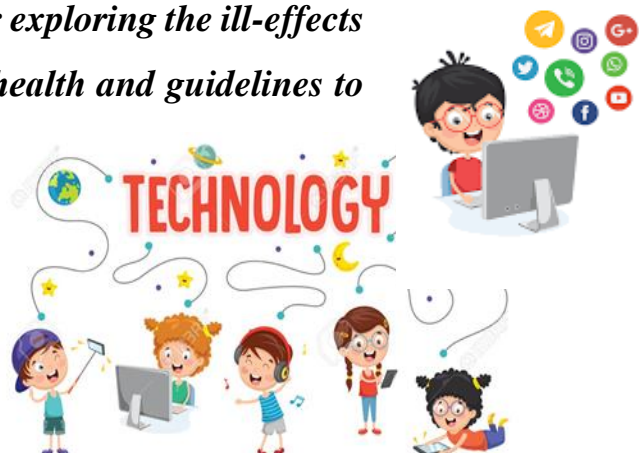
7. The fourth exercise is for your .....

This is what we call a pelvic tilt.

**SPEAKING**

**8. a) In small groups, create a big poster exploring the ill-effects of computer technology on children's health and guidelines to avoid them.**

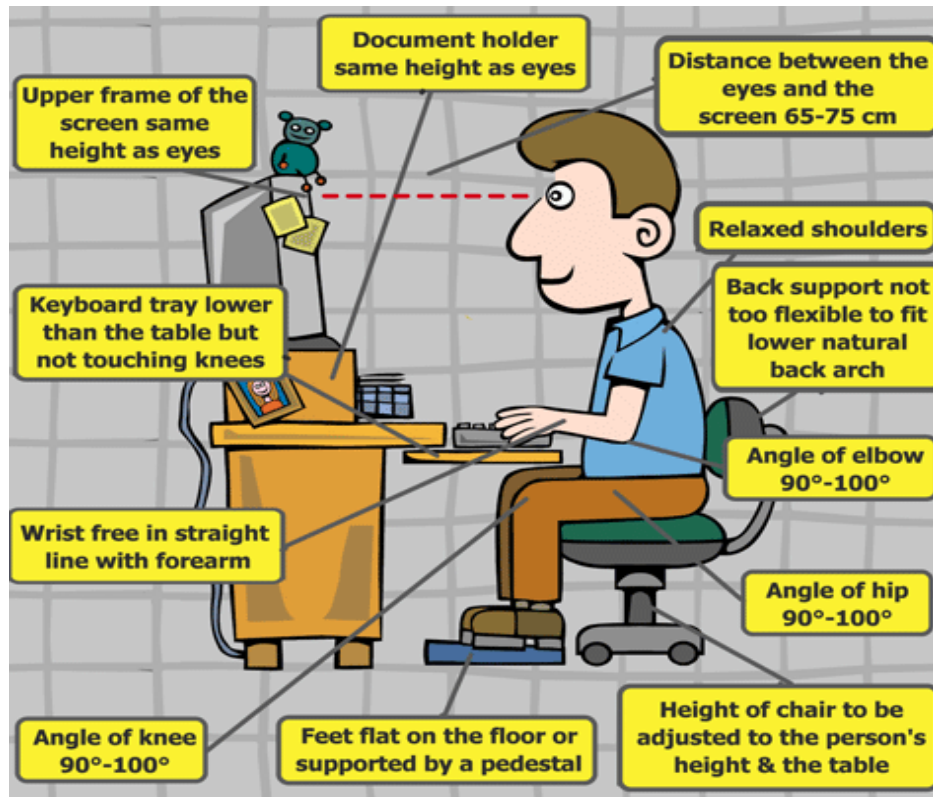
**b) Present your poster to the rest of the class.**





## WRITING

9. Use the clues in the picture and your own ideas to write the guidelines for organising an ergonomic workplace. Write 120-180 words.



## REVISION

### VOCABULARY

**1. Expand the following abbreviations and acronyms.**

1. CPU .....
2. DVD .....
3. HDD .....
4. RSI .....
5. SSD .....
6. VDU .....
7. bit .....
8. pixel .....

**Total \_\_\_\_ / 16**

**2. Label the hardware components shown in the picture. Then say whether they are used for input, output, storage or processing.**



**Total \_\_\_\_ / 9**

**3. Look at the definitions and write the parts of human body that they refer to.**

Definition	Part of body
1. The curved part of the back of the human leg below the knee.	
2. The lower part of a person's or body, containing the stomach, bowels, and other organs.	

3. The part in the middle of the arm where it bends.	
4. The lower part of the arm.	
5. One of the two parts on each side of your body between the top of your leg and your waist.	
6. One of the two parts of the body at each side of the neck where the arm is connected.	
7. The short, thick finger on the side of your hand that makes it possible to hold and pick things up easily.	
8. The part of the body between the hand and the arm.	
9. The joint between the foot and the leg, or the thin part of the leg just above the foot.	
10. The upper front part of the body of humans containing the heart and lungs.	

**Total \_\_\_\_ / 20**

## TRANSLATION

**4. Translate the words / phrases in A into your native language.**

A	B
1. blurred	
2. fetch	
3. impartial	
4. nexus	
5. non-volatile	
6. втома	
7. графопобудовник	
8. сітківка	
9. струменевий принтер	
10. тактова частота	

**Total \_\_\_\_ / 20**

## ENGLISH IN USE

**5. Use the suitable relative pronoun (who / which / that) to complete the sentences below.**

1. Most MP3 players can reach levels of 120 decibels, ... is louder than a lawnmower.
2. Professor Greenfield claims that living in a virtual world where actions are rewarded without needing to think about the moral implications makes young people lose awareness of ... they are.
3. The cell phone's antenna emits extremely potent radiation ... has been shown to cause genetic damage and an increase in the risk of cancer.
4. The human body consists of trillions of cells ... use faint electromagnetic signals to communicate with each other.
5. We cannot easily perceive the long-term effects of technology on our health. Unfortunately, it is the most vulnerable members of our society ... will be affected.

**Total \_\_\_\_ / 5**

## READING

**6. Read the text below. Fill in the gaps with the name of the correct device from the pictures.**

### Input Devices



When personal computers first came out in the 1980s, there was really only one way to get information into them – with a

1) ..... Then graphical interfaces came along, and it became important to be able to interact with objects on the screen.

The commonest way of doing this is with a 2) ....., but some computers – for example tablet-style computers – have screens you can write on directly, using a touchscreen or a



3) ..... People who use their computers mainly for games will tell you that the most important way of communicating with their computers is with a 4) ..... It took almost a decade before computers became powerful enough to accept voice commands, but today we can communicate with our computer with a 5) ..... We can also talk to other computer users, and even see them through a 6) ..... The computer has mostly replaced the 7) ..... machine, but if you do receive a printed page, you can still put a copy into your computer with a 8) ..... Today, a 9) ..... network or Bluetooth will let you connect to your computer with almost any electronic device, such as a 10) ..... phone.



Retrieved from <https://www.english-online.org.uk/comp/comp6.htm>

**Total \_\_\_\_ / 10**

## WRITING

**7. Choose one of the following hardware components and write the description of its features and functions:**

- *barcode reader;*
- *portable scanner.*

**Total \_\_\_\_ / 5**

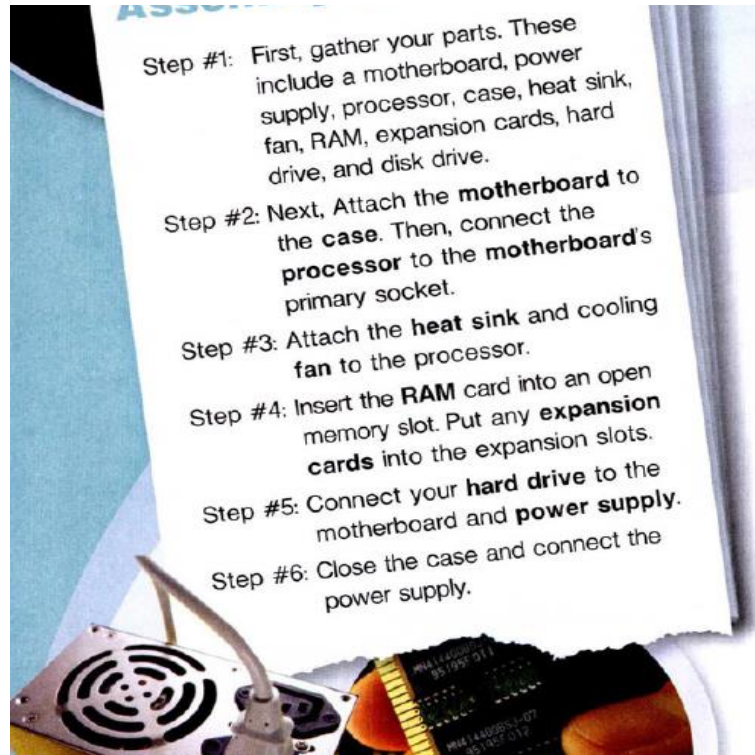
**8. Write an email to your friend about the most common computer-related health problems and give a piece of advice on how to avoid them.**

**Total \_\_\_\_ / 15**

**TOTAL \_\_\_\_ / 100**

## WORKSHEET A

a) Read this technology guide about computer assembly.



Technology guide about computer assembly from Evans, V., Dooley, J., & Wright, S. (2014).  
*Career Paths: Information Technology*. Newbury: Express Publishing.

b) Study the infographic below and write your own short guide on computer assembly. Use between 120 and 180 words.

For more ideas access ➡ <http://www.pcbuildadvisor.com/wp-content/uploads/2015/08/How-to-build-a-computer-PC-step-by-step-infographic.jpg>









# Why DIY?



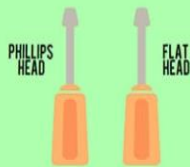
ASSEMBLING YOUR OWN COMPUTER FROM INDIVIDUALLY-PURCHASED PARTS IS ONE OF THE BEST WAYS TO GET INCREDIBLE PERFORMANCE FOR MONEY WHEN IT COMES TO BUYING A PC ON A BUDGET.

-  Fully customize parts to your personal requirements
-  Save money compared with pre-built computers with similar specifications
-  Ability to upgrade individual parts in the future
-  Learn a new skill

## Tools

### REQUIRED

#### SCREWDRIVERS



### OPTIONAL

#### ANTI-STATIC WRIST STRAP



#### SCISSORS



#### FLASHLIGHT



#### CABLE TIES



**TIP:** Set up your building workspace at a good height and ensure there is good lighting and plenty of room for you to work.



**WARNING:** Static electricity can damage your parts!  
Discharge yourself on metal casing and do not work on a conductive surface.  
You can also wear an anti-static wrist strap for extra peace of mind.

## Safety



Always disconnect and unplug all sources of power before working on your computer



Some parts can store charge even after power has been disconnected. Allow some time for these to discharge naturally.



Never disassemble individual parts like your power supply or monitor



Take care of sharp edges on your computer case which can cause cuts or injury



## RELATIVE CLAUSES AND THEIR TYPES

RELATIVE CLAUSES
<p><b>Relative clauses</b> are introduced with relative pronouns such as <i>who(m)</i>, <i>which</i>, <i>whose</i>, <i>that</i>. We use:</p> <ul style="list-style-type: none"> <li>➤ <i>who(m)/that</i> to refer to people;</li> <li>➤ <i>which / that</i> to refer to objects or animals;</li> <li>➤ <i>whose</i> with people, objects, animals to show possession (i.e., instead of possessive adjectives such as <i>my</i>, <i>your</i>, <i>his</i>, etc.).</li> </ul>
<p><b>NB!</b> <i>Who</i> and <i>that</i> are not used after prepositions. E.g.,</p> <p style="padding-left: 40px;"><i>The man <b>to whom</b> I gave the money repaired my laptop. (formal use)</i></p> <p style="padding-left: 40px;"><i>The man <b>who</b> I gave money <b>to</b> repaired my laptop. (informal – usual structure)</i></p>
<p><i>Which / who / that</i> <b>can be omitted</b> when it is <b>the object</b> of the relative clause. E.g.,</p> <p style="padding-left: 40px;"><i>This is the computer support specialist <u>who / that</u> I told you about.</i></p> <p style="text-align: center; margin-left: 150px;">↓ object</p>
<p><i>Which / who / that</i> <b>can't be omitted</b> when it is <b>the subject</b> of the relative clause. E.g.,</p> <p style="padding-left: 40px;"><i>The man <u>who / that</u> lives next door is computer support specialist.</i></p> <p style="text-align: center; margin-left: 100px;">↓ subject</p>
<p><i>Whose</i> is <b>never omitted</b>.</p> <p style="padding-left: 40px;"><i>That is the man <u>whose</u> computer I repaired.</i></p>
DEFINING AND NON-DEFINING RELATIVE CLAUSES
<p>There are two types of relative clauses <b>defining relative clauses</b> and <b>non-defining relative clauses</b>.</p>
<p>A <b>defining relative clause</b> contains information essential to the meaning of the main sentence. It is not put in commas. E.g.,</p> <p style="padding-left: 40px;"><i>The man <u>whose son won Sikorsky Challenge</u> was very happy.</i></p> <p style="padding-left: 40px;"><i>The day <u>when I got my first computer</u> was the happiest day of my life.</i></p>
<p>A <b>non-defining relative clause</b> gives extra information that is not essential to the meaning of the main sentence.</p> <p style="padding-left: 40px;"><i>John, <u>who lives next door</u>, offered me to repair my laptop.</i></p>



## WORD FORMATION

There are two main types of word formation that may come in handy in word formation tasks. They are:

- prefixation – adding a prefix to the beginning of a word;
- suffixation – adding a suffix to the end of a word.

Before filling the gap, scrutinize the sentence to identify the part of speech required (verb, noun, adjective, adverb). Then fill the gap with the correct form of the stem word. Here is the list of common word-forming suffixes and prefixes.

### COMMON SUFFIXES

NOUN SUFFIXES		
Suffix	Meaning	Example
-acy	<i>state or quality</i>	accuracy
-al	<i>act or process of</i>	approval
-ance /-ence	<i>state or quality of</i>	guidance, convenience
-dom	<i>state or place of being</i>	wisdom, kingdom
-ee	<i>one who is affected by an action</i>	employee
-er/-or	<i>one who performs an action</i>	employer, supervisor
-hood	<i>state or condition</i>	childhood
-ism	<i>doctrine, belief</i>	skepticism
-ist	<i>one who</i>	specialist
-ity/-ty	<i>quality, condition degree</i>	responsibility, safety
-ment	<i>condition of</i>	punishment
-ness	<i>state of being</i>	usefulness
-ry	<i>the group or state of, the state or character of</i>	gadgetry, bravery
-ship	<i>position held</i>	professorship
-sion/-tion	<i>state of being</i>	comprehension, ambition
-ware	<i>refers to objects of the same material or type</i>	software

ADJECTIVE SUFFIXES		
Suffix	Meaning	Example
-able /-ible	<i>capable of being</i>	portable, flexible
-al	<i>having characteristics of</i>	digital
-ant	<i>inclined to or tending to</i>	reliant
-en	<i>made of</i>	wooden
-esque	<i>reminiscent of</i>	picturesque
-ese	<i>of a country or city</i>	Portuguese
-ful	<i>full of</i>	useful
-ic; ical	<i>pertaining to</i>	domestic, musical
-ing	<i>used to form participial adjectives</i>	growing
-ish	<i>having the quality of</i>	girlish
-ive	<i>having the nature of</i>	creative
-less	<i>without</i>	worthless
-ly	<i>having the nature or qualities of, occurring at certain intervals</i>	friendly, hourly
-ous	<i>characterized by</i>	hazardous
-y	<i>characterized by</i>	clunky
VERB SUFFIXES		
Suffix	Meaning	Example
-ate	<i>become</i>	allocate
-en	<i>become</i>	strengthen
-ify	<i>become</i>	solidify
-ise (Br) / -ize (Am)	<i>make or become</i>	organize / organize
ADVERB SUFFIXES		
Suffix	Meaning	Example
-ly	<i>in a certain manner</i>	<i>quickly</i>
-ward(s)	<i>indicating the direction towards</i>	<i>upwards</i>
-wise	<i>in a specified manner, direction, position</i>	<i>clockwise</i>

## COMMON PREFIXES

Prefix	Meaning	Example
ab-	<i>opposed to</i>	abnormal
anti-	<i>against, opposite of</i>	antisocial
auto-	<i>self</i>	autobiography
de-	<i>make the opposite of or reverse</i>	decrease
co-	<i>together, with</i>	co-worker
dis-	<i>opposite of, reverse or remove</i>	dissimilar, disarrange
en-	<i>put into</i>	encase
ex-	<i>former</i>	ex-president
extra-	<i>beyond</i>	extraordinary
hyper-	<i>extreme</i>	hyperactive
il-, im-, in-, ir-	<i>not</i>	illegal, impartial, inadequate, irreversible
in-	<i>into</i>	infiltrate
inter-	<i>between</i>	interaction
mis-	<i>incorrectly</i>	misinterpret
non-	<i>not</i>	non-existent
over-	<i>too much</i>	overcharge
out-	<i>go beyond</i>	outwit
post-	<i>after</i>	post-war
pre-	<i>before</i>	preproduction
re-	<i>again</i>	recalculate
sub-	<i>under</i>	subcategory
super-	<i>beyond</i>	supernatural
tele-	<i>at a distance</i>	telemedicine
trans-	<i>across, over, through</i>	transfer, transcontinental
ultra-	<i>extremely</i>	ultrathin
un-	<i>remove, not</i>	uncover, unable
under-	<i>beneath, less than</i>	underground, undersized
up-	<i>make or move higher</i>	upgrade

### DESCRIBING FUNCTIONS AND FEATURES

Functions and features of hardware components can be described in a variety of ways. Here some are some common syntactic structures used *to describe functions* of hardware components:

- used + to + infinitive, e.g.

*This gamepad **is used to control** videogames.*

- relative pronoun (which / that) + verb, e.g.

*This is a gamepad **which controls** videogames.*

- relative pronoun (which / that) + used + to + infinitive, e.g.

*This is a gamepad **which is used to control** videogames.*

- work by + gerund, e.g.

*The device **works by projecting** small ink droplets onto the paper.*

Here some are some common words and syntactic structures used *to describe features* of hardware components:

- *A barcode reader **consists of / has** a light source, a lens and a light sensor.*

- *This keyboard **features** the “snow mode” key with snowflake icon next to Ctrl caption.*

- *You **can** plug it into a socket.*

- *It **operates / works** without electricity.*

- *It is **powered by** batteries.*

- *Headphones **allow** you **to** listen to music without other people hearing.*

## INSTRUCTIONS AND ADVICE

There are different ways to give instructions and advice.
<p>1) We use <u>the imperative</u> to give instructions, e.g.</p> <p style="text-align: center;"><i><b>Adjust</b> the height of your chair.</i></p> <p style="text-align: center;"><i><b>Don't put</b> the monitor higher than your eye level.</i></p>
<p>2) We use <u>should / shouldn't + infinitive</u> to give advice, e.g.</p> <p style="text-align: center;"><i>You <b>should</b> place your mouse within easy reach.</i></p>
<p>3) We use set phrases like <u>It's a good / bad idea to + infinitive, We / I recommend + that-clause / -ing form, The tip is + infinitive</u>, e.g.</p> <p style="text-align: center;"><i><b>It is a good idea to adjust</b> your chair.</i></p> <p style="text-align: center;"><i><b>We recommend that you buy</b> an adjustable chair.</i></p> <p style="text-align: center;"><i><b>We recommend buying</b> adjustable chair.</i></p> <p style="text-align: center;"><i><b>The tip is to buy</b> an adjustable chair.</i></p>

## WORD LIST

### UNIT 1

<i>assembly</i>	<i>heat sink</i>
<i>assembly language</i>	<i>housing</i>
<i>auxiliary</i>	<i>indicator lights</i>
<i>average</i>	<i>indispensable</i>
<i>ballpark</i>	<i>input devices</i>
<i>be off the heezy</i>	<i>instantaneously</i>
<i>binary</i>	<i>integrated circuit</i>
<i>charge</i>	<i>liquid</i>
<i>chassis</i>	<i>mainframe</i>
<i>circuit board</i>	<i>mains electricity</i>
<i>come bundled with (sth)</i>	<i>malfunction</i>
<i>come in handy</i>	<i>monochrome</i>
<i>compatible</i>	<i>motherboard</i>
<i>computer case</i>	<i>nexus</i>
<i>continuously</i>	<i>non-volatile</i>
<i>cooling fan</i>	<i>obvious</i>
<i>decode</i>	<i>optical drive</i>
<i>execute</i>	<i>output devices</i>
<i>expand</i>	<i>overheating</i>
<i>facilitate</i>	<i>peripherals</i>
<i>feed into (sth)</i>	<i>permanent</i>
<i>fetch</i>	<i>plug in</i>
<i>floppy drive</i>	<i>pound out</i>
<i>flow</i>	<i>power supply</i>
<i>hand-in-hand</i>	<i>press box</i>
<i>handle</i>	<i>purchase</i>
<i>hard drive</i>	<i>reflect</i>
<i>hardware</i>	<i>rely on (sth / sb)</i>

*retrieve*  
*scratched*  
*shell*  
*simulate*  
*software*  
*span*  
*speakers*  
*storage devices*  
*system unit*

*tedious*  
*temporary*  
*tower*  
*troubleshoot*  
*umbrella term*  
*vent*  
*volatile*  
*voltage swing*

## UNIT 2

*accuracy*  
*alphanumeric*  
*array*  
*augment*  
*barcode reader*  
*boon*  
*carve*  
*CD drive*  
*circuit designer*  
*circuitry*  
*clock speed*  
*colour depth*  
*cursor*  
*dot-matrix printer*  
*DVD drive*  
*etch*  
*fingerprint reader*  
*flatbed scanner*  
*gamepad*  
*garments*

*graphics tablet*  
*handicapped*  
*hard disk drive*  
*headphones*  
*hopefully*  
*imagesetter*  
*implement*  
*in layman's term*  
*incoming data*  
*ingot*  
*inkjet printer*  
*joystick*  
*jumper*  
*keyboard*  
*laser printer*  
*layout*  
*lens*  
*lid*  
*light pen*  
*light-resistant*

<i>mask</i>	<i>saw</i>
<i>mask designer</i>	<i>saw</i>
<i>microphone</i>	<i>scanner</i>
<i>minuscule</i>	<i>settings</i>
<i>misconception</i>	<i>sheetfed (document) scanner</i>
<i>monitor</i>	<i>silicon</i>
<i>motherboard</i>	<i>speakers</i>
<i>painstaking</i>	<i>speech synthesizer</i>
<i>particle</i>	<i>stylus</i>
<i>particle</i>	<i>switch</i>
<i>photosensitive</i>	<i>thermal transfer printer</i>
<i>plotter</i>	<i>touch screen</i>
<i>portable (handheld) scanner</i>	<i>trackball</i>
<i>power button</i>	<i>tweezers</i>
<i>precision</i>	<i>wafer</i>
<i>printer</i>	<i>warehouses</i>
<i>remedy for (sth)</i>	<i>webcam</i>
<i>retina scanner</i>	<i>whittle</i>

### UNIT 3

<i>abdomen</i>	<i>blink</i>
<i>adjust</i>	<i>blurred</i>
<i>adjustments</i>	<i>breath</i>
<i>alterations</i>	<i>burning</i>
<i>ankle</i>	<i>calf</i>
<i>appraise</i>	<i>chest</i>
<i>arm</i>	<i>computer ergonomics</i>
<i>assess</i>	<i>crane</i>
<i>avert</i>	<i>curve</i>
<i>back</i>	<i>dermal</i>
<i>bend forward (sth / sb)</i>	<i>detrimental</i>



<i>disabled</i>	<i>ream</i>
<i>ear</i>	<i>roughly</i>
<i>elbow</i>	<i>scapular</i>
<i>eyesight</i>	<i>shoulder</i>
<i>eyestrain</i>	<i>skin complaint</i>
<i>fatigue</i>	<i>slouch</i>
<i>footrest</i>	<i>spectacles</i>
<i>footstool</i>	<i>squeeze</i>
<i>forearm</i>	<i>stiffness</i>
<i>glasses</i>	<i>strain</i>
<i>guidance</i>	<i>stretch</i>
<i>hand</i>	<i>swelling</i>
<i>hang down (sth)</i>	<i>tenderness</i>
<i>head</i>	<i>tendons</i>
<i>hip</i>	<i>thigh</i>
<i>hunch</i>	<i>throbbing</i>
<i>ill-effects</i>	<i>thumb</i>
<i>impartial</i>	<i>tilt</i>
<i>joint</i>	<i>tingling</i>
<i>kickstand</i>	<i>toe</i>
<i>knee</i>	<i>unprejudiced</i>
<i>leg</i>	<i>upper arm</i>
<i>muscular</i>	<i>vital</i>
<i>neck</i>	<i>waist</i>
<i>numbness</i>	<i>wrist</i>
<i>optician</i>	<i>wrist rest</i>
<i>pay attention to (sth / sb)</i>	<i>yawn</i>
<i>pelvic</i>	
<i>posture</i>	
<i>radiation</i>	

## LIST OF ABBREVIATIONS AND ACRONYMS

CPU	Central Processing Unit
CD	Compact Disk
DVD	Digital Versatile Disk
HD	Hard Drive
HDD	Hard Disk Drive
HSE	Health and Safety Executive
LRA	Labour Relations Agency
RAM	Random Access Memory
ROM	Read Only Memory
RSI	Repetitive Strain Injury
SSD	Solid-state Storage Device
VDU	Visual Display Unit
bit	binary digit
pixel	picture element

## ANSWER KEYS

### UNIT 1

#### 1 a. Open task

##### 1 b.

A – monitor

H – webcam

B – speakers

I – router

C – processor

J – printer

D – hard drive

K – keyboard

E – USB ports

L – mouse

F – CD / DVD

M – memory cards

G – flash drive

#### 2 a. Open task

##### 2 b.

1. A computer is any machine that can be programmed to carry out a set of algorithms and arithmetic instructions.

2. Hardware is any physical and electronic part of a computer, rather than the instructions it follows.

3. Software is a set of instructions and computer programs that control what a computer does.

4. The main components of a typical PC are the motherboard, the central processing unit (CPU), the main memory and peripherals.

5. The motherboard is a circuit board which acts as a computer nexus because it facilitates the communication of the other computer components.

6. The CPU is the brain of a computer which fetches, decodes, and executes program instructions.

7. The two main memory sections are Read Only Memory (ROM) and Random Access Memory (RAM).

8. ROM is non-volatile memory, i.e. the part of a computer where permanent instructions and information are stored.

9. RAM is volatile memory which acts as a temporary store for information that gets erased every time the computer restarts.

10. Peripherals are physical units attached to the computer to extend its functionality. They are used to input, output information, store it permanently, or transfer it to and from your computer.

##### 2 c.

*Algorithms* are a set of instructions that are followed in a fixed order and used for solving a mathematical problem, making a computer program etc.

*To simulate* is to make or produce something that is not real but has the appearance or feeling of being real.

*A mainframe* is a large powerful computer that can work very fast and that a lot of people can use at the same time.

A *circuit board* is a board in a piece of electrical equipment that uses thin lines of metal to conduct electricity between different points.

A *nexus* is an important connection between the parts of a system or a group of things.

To *plug* is to attach electrical equipment to a supply of electricity with a plug.

An *assembly language* is a low-level programming language designed for a specific type of processor.

To *fetch* is to get something.

*Non-volatile* is permanent.

*Volatile* is changeable.

## **2 d. Open task**

### **3 a.**

- |                               |                  |
|-------------------------------|------------------|
| 1. who / that                 | 10. who / that   |
| 2. which / that               | 11. whose        |
| 3. which / that               | 12. whom         |
| 4. which / that               | 11. whose        |
| 5. who / that                 | 12. whom         |
| 6. which / that; which / that | 13. who / that   |
| 7. which / that               | 14. which / that |
| 8. who / that                 | 15. who / that   |
| 9. which / that               |                  |

### **3 b.**

1. You can leave out the relative pronoun which (that) in the 9<sup>th</sup> and 14<sup>th</sup> sentences.

### **2.**

- defining clause(s) – 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 15
- non-defining clause(s) – 6, 13

### **4.**

- |                |                |
|----------------|----------------|
| 1. physically  | 6. enclose     |
| 2. housing     | 7. direction   |
| 3. replaceable | 8. overheat    |
| 4. compatible  | 9. noisy       |
| 5. protection  | 10. accessible |

### **5.**

- |                      |                           |
|----------------------|---------------------------|
| 1. chassis           | 6. flat                   |
| 2. power supply      | 7. cooling fan; heat sink |
| 3. mains electricity | 8. overheating            |
| 4. voltage swing     | 9. motherboard            |
| 5. indicator lights  | 10. hard drive            |

### **6.**

- |               |            |
|---------------|------------|
| 1. input      | 3. output  |
| 2. processing | 4. storage |

## **7 a. Open task**

### 7 b.

- |      |       |
|------|-------|
| 1. i | 7. d  |
| 2. e | 8. f  |
| 3. h | 9. g  |
| 4. a | 10. k |
| 5. b | 11. j |
| 6. c | 12. l |

### 7 c.

1. She and her friends started using certain numbers and shift, and number keys.
2. Because ones and zeros are the only two numbers you need to reflect the flow of electricity. On is one, off is zero.
3. Pixel stands for picture element.
4. No, it doesn't. A typical computer monitor has 480 pixels.
5. The primary colours of each individual pixel are red, blue, and green.
6. Bit stands for binary digit.
7. A collection of eight bits is called byte.

### 7 d.

1. is called digital information
  2. a binary command telling
  3. handle which pixel to light up
  4. can do the same a million times a second
  5. the American Standard Code for Information Interchange
  6. pound out the bits as fast as a computer
8. Open task
9. Open task

## UNIT 2

### 1 a. Open task

### 1 b.

<i>Hardware component</i>	Input	Processing	Output	Storage
CD / DVD drive				✓
Central Processing Unit		✓		
floppy drive				✓
headphones			✓	
joystick	✓			
keyboard	✓			
light pen	✓			
microphone	✓			
hard disk drive				✓
monitor			✓	
motherboard		✓		

printer			✓	
scanner			✓	
speakers			✓	
speech synthesizer			✓	
trackball	✓			
webcam	✓			

**2 a. Open task**

**2 b. Open task**

**2 c.**

1. *Alphanumeric* – *алфавітно-цифровий* – containing or using letters of the alphabet and also numbers.

2. *Jumper* – *мікроперемикач* – a switch on a motherboard used to change important settings such as processor or memory speed.

3. *Clock speed* – *тактова частота* – the speed at which a computer can deal with information, usually measured in megahertz or gigahertz.

4. *Interactive* – *інтерактивний* – designed to involve the user in exchange of information.

5. *Precision* – *точність* – the quality of being exact and accurate.

6. *Handicapped* – *із обмеженими фізичними можливостями* – not able to use a part of your body or your mind because it has been damaged or does not work normally.

7. *Warehouse* – *склад* – a large building for storing things before they are sold, used, or sent out to shops. etc.

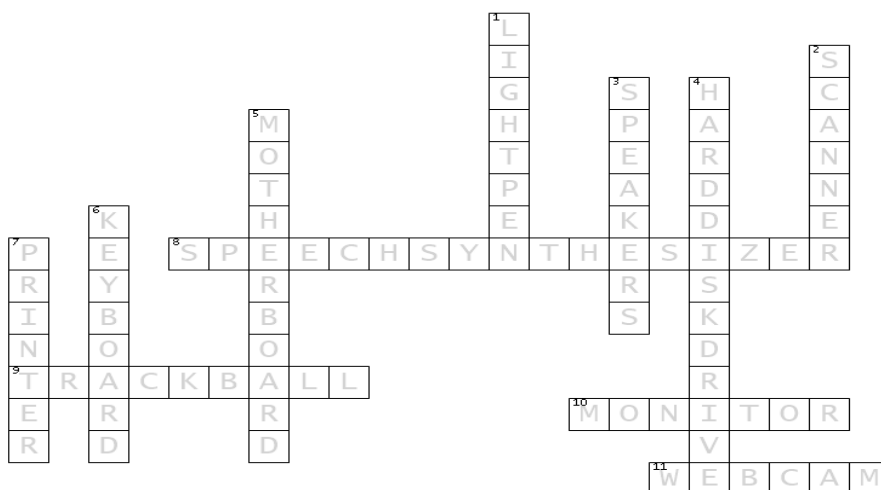
8. *Barcode* – *штрих-код* – a small rectangular pattern of thick and thin black lines printed on a product, or on its container, so that the details of the product can be read by and recorded on a computer system.

9. *Retina* – *сітківка* – the area at the back of the eye that receives light and sends pictures of what the eye sees to the brain.

10. *Biometric* – *біометричний* – referring to detailed information about someone's body, such as the patterns of colour in their eyes, that can be used to prove who that person is.

**2 d. Open task**

**3.**



#### 4. Open task

5.

1. dot-matrix printer - d
2. inkjet printer - f
3. laser printer - e

4. thermal transfer printer - a
5. imagesetter - b
6. plotter - c

#### 5 b. Open task

6.

1. transform
2. hardware
3. reflection
4. photosensitive
5. commercially
6. adjustable
7. specifically
8. depth
9. daily
10. handy

#### 7 a. Open task

#### 7 b.

Word	Definition
1. painstaking	<i>very careful and thorough</i>
2. layout	<i>the way in which something is arranged</i>
3. circuitry	<i>a system of electric circuits</i>
4. misconception	<i>an idea which is wrong or untrue, but which people believe because they do not understand the subject properly</i>
5. tweezers	<i>a small tool that has two narrow pieces of metal joined at one end, used to pull or move very small objects</i>
6. silicon	<i>a chemical substance that exists as a solid or as a powder and is used to make glass, bricks, and parts for computers. It is a chemical element: symbol Si</i>
7. ingot	<i>a piece of pure metal, especially gold, usually shaped like a brick</i>
8. wafer	<i>a very thin, dry biscuit that is often sweet or something that resembles it</i>
9. saw	<i>a tool that you use for cutting wood</i>
10. particle	<i>a very small piece of something</i>
11. etch	<i>corrode or eat away the surface of something</i>
12. carve	<i>to make something by cutting into especially wood or stone, or to cut into the surface of stone, wood, etc.</i>
13. whittle	<i>to make something from a piece of wood by cutting off small, thin pieces</i>

#### 7 c.

STAGES IN MICROPROCESSORS' DESIGN		
Stage	People involved	Description
1. Architectural design	Architects	The stage involves specifying the features that you want inside the chip.
2. Logic design	Logic designer	The stage involves creating logic blocks based on the features specified by the architects.

3. Circuit design	Circuit designer	The stage involves creating physical circuitry of the chip, connecting the transistors in a way that will ensure that the chip performs the functions specified by the architects and logic designers.
4. Mask design	Mask designer	The stage involves creating an actual template of a functional microchip.

### 7 d.

1. F (Microprocessors are made out of silicon ingots.)
2. T
3. T
4. T
5. F (Minuscule particles can ruin circuits on the chips.)
6. T
7. F (The photoresist is light-sensitive.)
8. T
8. Open task
9. Open task

## UNIT 3

### 1 a. Open task

### 1 b. Open task

### 2 a. Open task

### 2 b.

1 – C

4 – A

2 – F

5 – D

3 – G

6 – E

### 2 c. Open task

### 2 d.

1. F

5. F

2. T

6. T

3. F

7. T

4. T

8. F

### 2 e.

1. adjustments

6. disabled

2. assess

7. affect

3. avoided

8. frequent

4. representative

9. glasses

5. harmful

10. unprejudiced

### 3.

1. head

5. upper arm

2. neck

6. forearm

3. back

7. wrist

4. shoulder

8. thumb



9. finger
10. hip
11. waist
12. knee
13. ankle
14. foot
15. toe
16. calf

17. leg
18. thigh
19. hand
20. arm
21. elbow
22. abdomen
23. chest
24. ear

#### 4 a, b

<i>Noun</i>	<i>HS</i>	<i>I/D</i>	<i>Definition</i>
1. blink	✓		the act of closing and opening the eyes quickly, once or several times
2. breath	✓		the act of taking air into your lungs and sending it out again
3. burning		✓	sensation of being on fire or excessively heated or pain that resembles this sensation
4. fatigue		✓	extreme tiredness
5. numbness		✓	lack of physical feeling
6. stiffness		✓	the condition of being unable to bend or move easily
7. strain		✓	an injury to a muscle or part of your body that is caused by using it too much
8. swelling		✓	the condition of being or becoming bigger because of injury; bigger body part because of injury
9. tenderness		✓	the fact of a part of the body being painful when you touch it
10. throbbing		✓	a low strong regular beat or sensation
11. tingling		✓	feeling when body part stings slightly
12. yawn	✓		the act of opening your mouth wide and breathing in deeply because you are tired or bored

#### 4 c. Open task

##### 5 a.

1. blurred – розмитий, нечіткий
2. common – загальний, поширений
3. fatigue – втома
4. joint – зв'язка
5. muscular – м'язовий

6. numbness – оніміння (тканин, м'язів)
7. posture – осанка
8. tendons – жили, сухожилля
9. vital – життєво необхідний, надважливий
10. wrists – зап'ястя

##### 5 b.

- 1) vital
- 2) joint
- 3) common
- 4) posture

- 5) muscular
- 6) fatigue
- 7) tendons
- 8) wrist

9) numbness

10) blurred

**6.**

1. You should sit at an adjustable desk specially designed for use with computers.

It is a good idea to sit at an adjustable desk specially designed for use with computers.

We recommend that you sit at an adjustable desk specially designed for use with computers.

We recommend sitting at an adjustable desk specially designed for use with computers.

The tip is to sit at an adjustable desk specially designed for use with computers.

2. You should have the computer monitor either at eye level or slightly lower.

It is a good idea to have the computer monitor either at eye level or slightly lower.

We recommend that you have the computer monitor either at eye level or slightly lower.

We recommend having the computer monitor either at eye level or slightly lower.

The tip is to have the computer monitor either at eye level or slightly lower.

3. You should have your keyboard at a height that lets your elbows rest comfortably at your sides.

It is a good idea to have your keyboard at a height that lets your elbows rest comfortably at your sides.

We recommend that you have your keyboard at a height that lets your elbows rest comfortably at your sides.

We recommend having your keyboard at a height that lets your elbows rest comfortably at your sides.

The tip is to have your keyboard at a height that lets your elbows rest comfortably at your sides.

4. You should position your forearms roughly parallel with the floor and level with the keyboard.

It is a good idea to position your forearms roughly parallel with the floor and level with the keyboard.

We recommend that you position your forearms roughly parallel with the floor and level with the keyboard.

We recommend positioning your forearms roughly parallel with the floor and level with the keyboard.

The tip is to position your forearms roughly parallel with the floor and level with the keyboard.

5. You should adjust your chair so that your feet rest flat on the floor, or use a footstool.

It is a good idea to adjust your chair so that your feet rest flat on the floor, or use a footstool.

We recommend that you adjust your chair so that your feet rest flat on the floor, or use a footstool.

We recommend adjusting your chair so that your feet rest flat on the floor, or using a footstool.

The tip is to adjust your chair so that your feet rest flat on the floor, or to use a footstool.

6. You should use an ergonomic chair, specially designed to help your spine hold its natural curve while sitting.

It is a good idea to use an ergonomic chair, specially designed to help your spine hold its natural curve while sitting.

We recommend that you use an ergonomic chair, specially designed to help your spine hold its natural curve while sitting.

We recommend using an ergonomic chair, specially designed to help your spine hold its natural curve while sitting.

The tip is to use an ergonomic chair, specially designed to help your spine hold its natural curve while sitting.

7. You should use an ergonomic keyboard so that your hands and wrists are in a more natural position.

It is a good idea to use an ergonomic keyboard so that your hands and wrists are in a more natural position.

We recommend that you use an ergonomic keyboard so that your hands and wrists are in a more natural position.

We recommend using an ergonomic keyboard so that your hands and wrists are in a more natural position.

The tip is to use an ergonomic keyboard so that your hands and wrists are in a more natural position.

8. You should take frequent short breaks and go for a walk, or do stretching exercises at your desk.

It is a good idea to take frequent short breaks and go for a walk, or do stretching exercises at your desk.

We recommend that you take frequent short breaks and go for a walk, or do stretching exercises at your desk.

We recommend taking frequent short breaks and going for a walk, or doing some stretches at your desk.

The tip is to take frequent short breaks and go for a walk, or do stretching exercises at your desk.

9. You should mix your tasks to avoid long, uninterrupted stretches of using the computer.

It is a good idea to mix your tasks to avoid long, uninterrupted stretches of using the computer.

We recommend that you mix your tasks to avoid long, uninterrupted stretches of using the computer.

We recommend mixing your tasks to avoid long, uninterrupted stretches of using the computer.

The tip is to mix your tasks to avoid long, uninterrupted stretches of using the computer.

10. You should frequently look away from the screen and focus on faraway objects.

It is a good idea to frequently look away from the screen and focus on faraway objects.

We recommend that you frequently look away from the screen and focus on faraway objects.

The tip is to frequently look away from the screen and focus on faraway objects.

## 7 a.

	<i>footrest</i>	<i>kickstand</i>	<i>pelvic</i>	<i>ream</i>	<i>scapular</i>	<i>squeeze</i>	<i>tilt</i>
1. <i>footrest</i>	a. something that supports your feet when you are sitting, for example a small piece of furniture						

2. <i>ream</i>	b. a pile of papers arranged one on top of another
3. <i>kickstand</i>	c. a part attached to a laptop, tablet, cell phone, etc. that supports it when you want it to be vertical
4. <i>scapular</i>	d. relating to the shoulder blade
5. <i>squeeze</i>	e. press something firmly, especially from all sides in order to change its shape,
6. <i>pelvic</i>	f. relating to the pelvis (= the set of large curved bones at the base of your spine, to which your legs are joined)
7. <i>tilt</i>	g. a sloping or uneven position, or a movement into this position

### 7 b.

A	
1. The imperative.	.....✓.....
2. Should / shouldn't + infinitive.	.....✓.....
3. It's a good / bad idea to + infinitive.	.....
4. We / I recommend + that-clause / -ing form.	.....✓.....
5. The tip is to + infinitive.	.....✓.....
B	
1. Consider using a headset.	.....6.....
2. For your laptop, use a kickstand.	.....3.....
3. Adjust your monitor.	.....2.....
4. Position the keyboard where your hands end up.	.....4.....
5. Put the phone on your non-writing side.	.....5.....
6. Take exercise regularly.	.....7.....
7. Adjust your chair.	.....1.....

### 7 c.

- |                             |                            |
|-----------------------------|----------------------------|
| 1. 29 to 30 inches          | 5. strain or pain          |
| 2. a ream of paper          | 6. to slouch in out chairs |
| 3. consider how to use them | 7. lower back              |
| 4. to mind your mouse and   |                            |
8. Open task
9. Open task

## REVISION

### 1.

- |                                   |                                     |
|-----------------------------------|-------------------------------------|
| 1. CPU – Central Processing Unit  | 5. SSD – Solid-state Storage Device |
| 2. DVD – Digital Versatile Disk   | 6. VDU – Visual Display Unit        |
| 3. HDD – Hard Disk Drive          | 7. bit – binary digit               |
| 4. RSI – Repetitive Strain Injury | 8. pixel – picture element          |

2.

1. Computer case / computer chassis / tower / system unit / cabinet	Processing
2. Computer monitor / computer screen	Output
3. Speakers	Output
4. Printer	Output
5. Scanner	Input
6. Mouse	Input
7. Keyboard	Input
8. Compact disks	Storage
9. Headset	Output + Input

3.

<i>Definition</i>	<i>Part of body</i>
1. The curved part of the back of the human leg below the knee.	Calf
2. The lower part of a person's or body, containing the stomach, bowels, and other organs.	Abdomen
3. The part in the middle of the arm where it bends.	Elbow
4. The lower part of the arm.	Forearm
5. One of the two parts on each side of your body between the top of your leg and your waist.	Hip
6. One of the two parts of the body at each side of the neck where the arm is connected.	Shoulder
7. The short, thick finger on the side of your hand that makes it possible to hold and pick things up easily.	Thumb
8. The part of the body between the hand and the arm.	Wrist
9. The joint between the foot and the leg, or the thin part of the leg just above the foot.	Ankle
10. The upper front part of the body of humans containing the heart and lungs.	Chest

4.

<b>A</b>	<b>B</b>
1. blurred	розмитий, нечіткий
2. fetch	вилучати
3. impartial	неупереджений
4. nexus	ядро
5. non-volatile	постійний, незмінний
6. втома	fatigue
7. графопобудовник	plotter
8. сітківка	retina
9. струменевий принтер	inkjet printer
10. тактова частота	clock speed

**5.**

1. which / that
2. who
3. which / that

**6.**

1. keyboard
2. mouse
3. stylus
4. joystick
5. microphone

**7.** Open task

**8.** Open task

4. which / that

5. who / that

6. webcam

7. fax

8. scanner

9. wireless

10. cell / mobile

## TAPESCRIPTS

### UNIT 1

**Rebecca White:** So what kind of codes do you use when you don't want people to understand you?

**Interviewee 1:** The type of code we use is like body language. We just say something with our body or with our eyes.

**Interviewee 2:** We use Spanish. We just write anything we want in Spanish.

**Interviewee 3:** We're not allowed to wear beepers, but when we do use them, we have codes which are numbers. Like 1-2-3 as I love you.

**Interviewee 4:** We're mostly speaking like street slang ... You know. Would be like ... You know ... somebody is off the heezy.

**Interviewee 5:** When we found out that our email wasn't confidential, we started using certain numbers and shift, and number keys.

**Interviewee 6:** You just like mess up the words a little bit, break them up like, for example, her name is Claudia so it'd be Klaffa Uffi Difiafa.

**Annette Chavez:** Computers have a special code too though it never changes and it's not really a secret. Information in a computer can only be represented by ones and zeros. This code is called digital information. Why ones and zeros? Because those are the only two numbers you need to reflect the flow of electricity. It's either on or it's off. On is one, off – zero. Everything you say to a computer has to be put in terms of these two numbers.

**Brahman Turner:** Everything seems to be digital these days: old movies are remastered in digital, watches are digital, CDs are digital. Excuse me but digital is just a bunch of ones and zeros ... you know... I mean you can't really do anything with a bunch of ones and zeros, right? Well ... now... that's why we've come at the ballpark. Let's take a closer look at the power digital. This scoreboard is like a big computer monitor, a really big computer monitor. And the guy that runs it sits way over there in the press box. Anyway... Just like the monitor on your school computer, everything on this scoreboard is run through a combination of ones and zeroes. Hey Dave! Can I get a dot please? Observe ... A dot... Well actually it's one picture element or a pixel. You see ... the scoreboard's computer receives a binary command telling it which pixel to light up in exactly that location. This dot is just it's response. Now ... By entering a new group of ones and zeros the programmer can change which pixel is lit. Watch ... A typical computer monitor has 480 lines of pixels and each line has 640 pixels. That's over three hundred and seven thousand individual pixels that the computer is asked to control. Here's one pixel from a scoreboard. The computer has to handle thousands of these instantaneously. And this is just a monochrome this way. Here's a color pixel. For color monitors, not only does the computer have to handle which pixel to light up, but it also has to give the correct combination of primary colors to each individual pixel. Primary colors being red, blue, and green. And this has to happen very fast. So, what do you get when you add all these pixel changes together? So the next time you're at the ballpark and you see something like this you'd better keep in mind that the computer power is just as impressive as home run power.

**Rebecca White:** Have you ever counted in binary numbers? Probably not because the digits build up too fast – 0-1-10-11-100-101-110-111-1000. Now all those numbers only take you up to 8 in the base 10 numbers we use. I mean would you rather say 20 or 1-0-11-0? Though it may seem tedious for us to pound out a letter using ones and zeroes, keep in mind a computer can do the same thing millions of times a second and it never gets bored. In fact, each button on this board represents a binary digit or bit. Now ... A bit is the smallest unit of digital information taken together. These eight bits are equal to one byte and each unique combination of eight bits has a meaning for the computer. When I enter eight binary numbers into the board, a letter appears up here. The computer translates the numbers into a letter how using a special code called ASCII – the American Standard Code for Information Interchange. It's a standard way for computers to translate binary information into a letter, a number, even a punctuation mark. This board gives us 2 to the 8 possible combinations of zeros and ones so we can create 256 different values using these bits. Many computers today have 32-bit microprocessors. With 32 buttons, we could create almost 4.3 billion different values that's why 32-bit computers are so much more powerful than 8-bit computers. Imagine what it would be like if we could pound out the bits as fast as a computer! That's not even close to a computer speed!

## UNIT 2

**Brahman Turner:** What's truly amazing about microprocessors is their size. About fifty transistors would fit on the width of this hair. Millions of transistors have to be fit onto a piece of silicon no larger than a dime and they're like miniature 20-story high skyscrapers with circuits going over and ducting under the different floors. It takes hundreds of engineers months of painstaking work to design a new microprocessor. Greg Wyant is an Intel engineer who helped to explain the design process to us. I spoke to him recently about what's involved.

**Greg Wyant:** There's four main development stages that you need to worry about when you're designing a microprocessor: there's the architectural design stage; there's logic design; there's circuit design and finally mask design.

**Brahman Turner:** This is the layout that all four will work on ... or?

**Greg Wyant:** Actually it starts out in architect ... is ... is the first set of people that work on it. And what the architects are responsible for is specifying what are the features that you want inside the chip. Think of the architect of a microprocessor in much the same way as you think of an architect on a building. They're the people that come up with how tall is the building going to be, how many floors do you want in the building, is it going to have elevators, is it going to have stairs ... The next team – the logic team – is responsible for taking those features that the architects specified and actually putting the logic blocks together.

**Brahman Turner:** So you could say they're the builders?

**Greg Wyant:** They're the builders. The circuit designer is the one that says: “All right I understand what the logic designer wants to do, but I need to build this physical circuitry, connect up the transistors that are going to perform that function”.

**Brahman Turner:** How do they get all this information from this sheet onto something that's small?



**Greg Wyant:** Well that's the role of the mask designers which is the last step in the process of building a microprocessor. All this information is captured in a computer. And so, they go through, they test the design on the computer. It's simulated. You often hear people talk about simulating aircrafts or a new car or something like that. The same thing happens for microprocessors. Once they think they've got the design right, it then goes to a mask designer who's responsible for translating this information into the physical location ... The transistors will sit on one of these chips and so they create something called masks.

**Brahman Turner:** See, I had a total misconception on how these were built! I thought that there were people with tweezers picking up little dots and putting them on. So that's not how it goes?

**Greg Wyant:** That's not how it's done.

**Brahman Turner:** So the more transistors or building blocks you have, the better the product is going to be?

**Greg Wyant:** That's exactly it! So more complex microprocessors have more transistors enabling them to do a lot more things.

**Rebecca White:** The building behind me is a fabrication plant or fab. Now it's such a sensitive environment that employees are about the only people allowed any closer than this. The rules are understandable though the cleanroom, which is the area inside the fab where the chips are actually manufactured, has to be a thousand times cleaner than a hospital surgical room. But earlier I did talk to an engineer who explained the fabrication process. Oh my God! This is super heavy!

**Engineer:** Definitely!

**Rebecca White:** Well, what you do with this?

**Engineer:** Basically, this is what most of our processors are made out of. Silicon ingot. And actually silicon is derived from one of the most common material on earth. Which is from sand.

**Rebecca White:** So what ... what happens? You've got the ingot and then how do you make the wafers?

**Engineer:** What we do is we basically use a diamond saw and then slice the ingot into polished wafers.

**Rebecca White:** What are the things I see on the top of the wafer?

**Engineer:** We do a very specific processing steps to create patterns on these wafers.

**Rebecca White:** So these are the actual circuits and transistors?

**Engineer:** Yes, but you can't see them. Because if you can take a closer look at it, some of these have repeating patterns. Each one of them is actually a processor and within it they have anywhere from tens of thousands to millions of transistors on them. So in order to make sure that all of them function properly, we have to make our processing factory very clean. In order to make these complex chips with millions of transistors on them, we need a special place to do it. This special place is called fab – short for fabrication facility – and within it there's a place called cleanroom and that's where all the processing is done. All the people inside the cleanroom wear special suits something almost like a spacesuit. They also wear special booties, helmets and gloves. So it's quite interesting to go in and take a look at the fab because

everybody looks like they're from outer space. Now you may ask why we need the cleanroom. It is because our chips are small now and our circuits are so tiny that unless we take care in avoiding all particles such as particles in the air dandruff particles from your sneezes all of them could fall onto the wafer and therefore ruin your entire chip. Robots are there to help us automate, i.e. automatically process these wafers. Robot will automatically pick up the wafers, put them in the machine and process them.

**Rebecca White:** Well ... what are the technologies that you use in the fabrication process?

**Engineer:** Well ... actually if you look at it, it's actually a very simple four step processing which would lay our patterns onto the wafer. And what we do is we combine these different four processes to create what we call the skyscraper or a city onto these wafers. First, we deposit layer material onto the wafer. This material can be either a conductor or an insulator. Second, we deposit another layer material called photoresist onto the wafer. This photoresist it's a light sensitive chemical. This is how we're going to create our circuits now. What we do is we put a mask over our material. This mask contains images of our circuits. We then expose the mask to some special kind of light which would then expose the photoresist. Third, we would then etch the photoresist away using very strong chemicals. In that way you also directly etch the material below it.

**Rebecca White:** And that's how you get the patterns that we saw in the wafer?

**Engineer:** Exactly... because we cannot deposit material at will, i.e. meaning anywhere we want. That's why we had to slowly build up the material by putting it everywhere we can on the wafer and then taking away the material we don't want.

**Rebecca White:** So it's like somebody carving or whittling?

**Engineer:** That's definitely... yes ... that's the way it goes. Now after we're done with this, the fourth step is what we will do to embed different kinds of material into that layer to change his characteristics. Finally, we'll remove the unneeded photoresist and then we start the process over again.

**Rebecca White:** So even though this wafer ... I mean to me it looks really flat ... But it's actually got layers and layers of materials on them.

**Engineer:** That's right! Some of our latest processors are actually very-very thick. So if you think about a skyscraper ... this is actually quite tall.

### UNIT 3

**Narrator:** Here's your desk. Your chair, monitor, keyboard, mouse, phone, a plant, chair. The problem is your desk isn't really built for you. It's for anyone, spending eight hours a day reaching, slouching, or craning can lead to pain, at least that's what John Cinkay from the Hospital for Special Surgery says.

**John Cinkay:** I do say that, every day.

**Narrator:** So he's here to, well, he can tell you.

**John Cinkay:** I'm here to show you how to set up your desk ergonomically, so you can avoid pain later on in life. Step one, adjust your chair. The average desk height is 29 to 30 inches tall. For some, this could be too tall or too short. That's where your chair comes in. The first thing you want to do is adjust the height. When you do, make sure your elbows are bent to 90 degrees. So if a person's feet are not touching the floor, this could become an issue, so we're

gonna give her a footstool. If you don't have access to a footrest, we recommend using a ream of paper. Step two is adjust your monitor. The tip is to have the monitor close enough, about arm's length so you're able to read without having to strain your eyes or to bend forward and adjust your posture. So what you want to do is raise the monitor up 'til the top of the screen is eye level. If your monitor's not adjustable in height, use your reams of paper, much better. If you work from two monitors, consider how you use them. If you have a primary monitor, you want that directly in front of you. If you use both monitors equally, you want them lined up so you are in the middle of the two. For a laptop, you want to use a kickstand to raise the screen up to the proper height. Then, you can attach an external keyboard and mouse to it. Step number three is to mind your mouse and your keyboard. Where your hands end up is where your keyboard should be. Your mouse should end up right next to your keyboard. You want to move from your elbow instead of your shoulder to prevent overuse or strain or pain. The key is not to reach for your tools. Step four is to position your phone. You want to put the phone on your non-writing side, so you don't have to cradle it to your shoulder. This could eventually lead to neck pain. If you're on the phone a good portion of your day, you want to consider using a headset, that way your hands are free to write down anything, or to type on the computer. Step five move. After 10, 15 minutes, we all begin to slouch in our chairs. So here are some basic exercises you can do while sitting in your chair. The first exercise is a chin tuck. Second exercise is for your upper traps. You're gonna do a basic stretch where you bend your head to one side, and then gently pull for a little more. Oomph. The third exercise is called a scapular retraction. You basically are going to squeeze your shoulders back. The fourth exercise is for your lower back. This is what we call a pelvic tilt. The most important thing you want to do is get up out of your chair every hour. Get up and walk, get something to eat, get something to drink, just get up.

**Narrator:** John? John are we done?

**John Cinkay:** Yeah, we're good.

**Narrator:** Great.

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32. <https://i.pinimg.com/564x/e5/5e/a5/e55ea531bbe1fd4651b6578ba85d8753.jpg>
33. <https://i.pinimg.com/originals/d6/a8/7d/d6a87d374f2a1d615f59eed5b6b38df4.jpg>
34. [https://www.liveu.tv/media/k2/items/cache/36529921163871d27e3bd3fe6d1a538e\\_L.jpg](https://www.liveu.tv/media/k2/items/cache/36529921163871d27e3bd3fe6d1a538e_L.jpg)