**10 Great Reasons to Study Engineering**

*The top 10 reasons for studying engineering:*

Money

Prestige

Professionalism

Flexibility and Choice

Intellectual Development

Entrepreneurship

Challenge

Creativity

Discovery

Helping Society

(Adapted from the list by Raymond Landis in Studying Engineering)

**Reason 1: Money.**

This is always one of the top reasons to study anything. It’s important to know that engineers are among the top-paid professions world-wide. It's well known that if you want money, engineering is one of the best ways to go. And since money is so important in our world, especially in these economic times, this is one factor you should be considering carefully.

**Reason 2: Prestige.**

Along with doctors and lawyers, engineers are professionals who have a lot of prestige. Wouldn’t your mother be proud to tell all her relatives and friends that her son or daughter is an engineer? You’ll gain a desired job image, and join a profession that supports national and global competitiveness, security, and rising living standards. Being an engineer just makes you look great!

**Reason 3: Professionalism.**

Engineering programs worldwide are among the top, most advanced educational programs. Study with top-of-the-line technology, receive great coop placements and training, and join a profession like no other. While working, you’ll benefit from not only competitive wages and prestige − being a member of an engineering society will give you access to information and technology that will help you do your work better and enjoy life. Engineering is a professional choice.

**Reason 4: Flexibility and Choice.**

These days, everybody’s looking for choice. Engineering offers so marry choices you can have a hard time deciding on which one fits you − from electrical and mechanical to computer science or civil, the various areas of engineering are all exciting and in high demand. Engineering degrees open up a road to flexible education- you can continue to earn an MBA, and move into other great careers. Engineering is a great choice that opens up many paths for the future.

**Reason 5: Intellectual Development.**

Engineering will help you grow and develop your ways of thinking. Becoming an engineer will force you to work on many transferable skills including problem-solving and critical reasoning. In addition, you’ll study a large variety of topics in school, including engineering courses but also sciences, and even some arts and languages. Knowing more and having more useful skills will develop you as a person.

**Reason 6: Entrepreneurship.**

Nobody wants to be a little bolt in a big corporate machine. Studying engineering provides you with the knowledge and skills to open up your own business and become your own boss. Engineering training exposes you to businesses and gets you more familiar with things like finance and marketing which is important for business purposes, and transferable skills will help you run your own company. Having technical knowledge will allow you to make a product and centre a business around it (just like John Phillip Green and Maigosia Green who studied computer science and systems design engineering and founded LearnHub!)

**Reason 7: Challenge.**

Everyone likes a good challenge, since life would be boring otherwise. Engineering is
a challenge. Throughout both your studies and your later career, you will be faced with problems which will require your creativity and logical analysis skills. Research problems will be open ended with no wrong or right answer – it’ll be up to you to find a solution and stand up to it, convincing others it’s right. The engineering challenge is something to look forward to.

**Reason 8: Creativity.**

Most jobs don’t allow you to be creative. Engineering on the other hand lets you exercise your judgment however you want. You’ll need to be creative to come up with solutions to fascinating problems and you’ll be able to use both concrete knowledge and your own thoughts and views when coming up with a successful original design or development. Engineering is the art of science!

**Reason 9: Discovery.**

An engineering education will help you discover how the world works. You may be dealing with recent issues such as electric cars, alternative energy sources, nuclear reactors, and more. You may end up seeking for answerson how to solve world hunger or what kinds of technology cause cancer. Engineering is interconnected with science and research, and it will allow you to learn and discover a world of knowledge.

**Reason 10: Society Needs You.**

If you’re smart, you have a responsibility to society. Don’t waste your brain power − become an engineer. From the early days of dawn engineers worked to benefit society − developing everything from necessary forms of safety and security measures [and transportation](file:///C%3A%5CUsers%5CUser%5CDesktop%5Candir.ansportati.on) mechanisms, to devices and technologies that enrich life and make better and more comfortable for everyone. New engineering trends may help solve issues like diseases, hunger, energy, and pollution problems. Make a difference − help us engineer a better tomorrow.

**Don’t hesitate − study engineering!**

**UNIT 1**

**1. What are the oldest tools people still use even in the information age we live today?**

**2. What tools do you use in the classroom, in your kitchen? What operations are performed with them?**

**3. Make up a list of tools people can use for different kinds of communication.**

**4. Read and translate the text.**

**PREHISTORY OF TECHNOLOGY**

 Technology is nothing more than the use of tools. When you use a screwdriver, a hammer, or an axe, you are using technology just as much as when you use an automobile, a television set, or a computer.

 We often think of technology as a human invention. Stone tools found by archeologists show that our ape-like ancestors were already putting technology to use. Using tools may have helped them to transform into human beings.

 Most of the tools invented have helped our bodies rather than our minds. They help us lift, move, cut and shape. Only quite recently we have developed tools to help our minds as well. The tools of communication, from pencil and paper to television, were designed to serve our minds. These devices transmit information or preserve it but they do not modify it. With time people’s interest went to the machines that classify and modify information. So we may say that the computers and calculators are mind tools. The widespread use of machines for information processing is a modern development.

**5. Answer the questions:**

1. What is the difference between body and mind tools?

2. What do we mean by classification and modification of information?

3. What machines process information and in what way?

4. Can mind tools change both our minds and body?

**UNIT 2**

**1. Try to remember at least three discoveries and the names of the people who made them.**

**2. Read the text paying special attention to the facts and names.**

**FROM HISTORY OF SCIENCE**

 During the period of human history called Enlightenment (usually considered to extend from 1680 to 1800), writers, philosophers and statesmen struggled to create “perfect societies” in which unlimited improvements could be made in human capacities and human happiness. Above all else, Enlightenment thinkers urged the progress of science. They talked about an ideal “republic of science” where reason, logic would be supreme, ideas would be freely examined and exchanged and useful knowledge would serve people.

 The period from 1810 through 1910 was a glorious 100 years for science in Western Europe. Major breakthroughs were made in understanding and, in some cases controlling events and systems in nature – from the structure of atoms to the movement of stars. Britain, France and Germany were the leading sources of new ideas in science and mathematics. These new ideas included: Dalton’s atomic theory; Humphrey Davy’s electrochemistry discoveries; Kelvin’s relationships between heat and electricity; Rutherford’s theory of the atomic nucleus; Lagrange’s celestial mechanics formulas; Marie and Pierre Curie’s studies of radioactivity; Roentgen’s discovery of x-rays; and Mendel’s ideas of heredity.

 Scientific achievements in the United States during the same period seem pale in comparison to European developments. Isolated by the Atlantic Ocean from the mainstreams of scientific thought and research in Europe, American scientists often invented products and processes that already existed in Europe. The United States was a relatively poor nation at that time. However, thousands of products that make life easier, safer and more enjoyable for people were developed by Americans during the 19-th century.

 In the early part of the century many developments in tool making, agriculture and construction were not based much on scientific knowledge and methods. Many later developments in electricity, magnetism, chemistry, biology and structural mechanics required a basic understanding of scientific discoveries and principles. This linking of scientific understanding and technological know-how led to a type of applied science for which Americans are known today. The biggest invention that created the computer age was barely noticed in 1948 but changed and is still changing the way millions of people work, study, do business and research.

**3. Derive the nouns which mean the doers of the action (people) as in example:**

 **science – scientist**

 physics – …, invent −…, chemistry –…, discover −…, biology −…, think −…, astronomy –…, philosophy –…, mechanics –…, research –… .

**4. Complete the sentences matching the words on the left with those on the right from task 3:**

 Radioactivity

 Theory of heredity

 Movement of stars

 Heat and electricity is/are studied by . . .

 Celestial bodies

 Atomic nucleus

 Magnetism

**5. Choose the right variant:**

 1) During the Enlightenment period the focus was put mostly on:

 a) technology;

 b) science;

 c) human capacities.

 2) Enlightenment was given its name because:

 a) electricity was discovered;

 b) people became more educated;

 c) theory of light was developed.

 **6. Check your knowledge of the vocabulary from the text:**

1) The word “supreme” in the second passage means:

 a) most important;

 b) quite possible;

 c) desirable.

2) The word “breakthrough” in the third passage does not mean:

 a) progress;

 b) innovation;

 c) damage.

3) The words “pale” in the fourth passage means:

 a) having little color;

 b) bloodless;

 c) not very significant.

4) The word “know-how” in the last passage means:

 a) knowledge of methods;

 b) high qualification;

 c) business plan.

5) The word “applied” in the last passage is related to science means:

 a) well developed;

 b) put to practical use;

 c) theoretically developed.

**7. Answer the questions:**

 1) Why is history of American science different from that in Europe?

 2) What are specific features of American science?

 3) What were the biggest scientific discoveries of the 19th century?

 4) Which of the discoveries mentioned in the text are related to your speciality? Can you add up any more?

 5) Can you name any inventions made in the USA in the 20th century?

 6) What countries are developing their science very rapidly? What are today’s priorities in research?

 7) Can you predict the future of the world science?

**UNIT 3**

1. **Read and learn your new words:**

transistor − транзистор

item − деталь; частина

definition − визначення

motion − рух

charge − заряд; заряджати

semiconductor − напівпровідник

division − ділення; розподіл

to emerge − з’являтися

device − пристрій

bulb − лампочка

wire − дріт

research − дослідження

application − застосування

to deal with − мати справу з

quantity − кількість; величина

circuit − ланцюг

conversion − перетворення; трансформація

property − властивість

regard − розглядати

distribution − розподіл

processing − обробка

distinction − відмінність

to serve − слугувати

to separate − відокремлювати

to comprise − містити; охоплювати

to encompass − охоплювати

1. **Read and translate the text.**

**A BRIEF HISTORY OF ELECTRONICS**

Electronics − to most of us this brings to mind a variety of things from **“chips”** and computers to television and **transistors**. Yet, while we agree on specific items that constitute electronics, its definition is elusive.

 Electronics, in the strictest sense, is the science and technology of the motion of **charges** in a gas, **vacuum**, or **semiconductor**. Note that charge motion confined to a metal is not considered electronics. This was an historical division used early in the twentieth century to separate **the already flourishing field of electrical engineering** from **the new and emerging field of electronic engineering**. At that time electrical engineering dealt with devices that depended solely on the motion of electrons in metals, such as **motors**, **generators**, **light bulbs**, and **wire communication systems** (telephone and telegraph). However, the historical division between electrical and electronic engineering no longer serves its original function.

Today **practicing electrical engineers** perform diverse functions (design, development, production, research, and even teaching) with varied applications. They deal with systems by which we can communicate with one another worldwide, by which vast quantities of **data** are manipulated, and by which highly **complex manufacturing processes** are automated, and with the elements used to realize them. **The province of electrical engineering** also includes the **devices**, **circuits**, and systems used for the **generation, distribution, and conversion of electric energy**. The group mentioned in the first of the two previous sentences possesses the common property of processing information; the group mentioned in the second one can be regarded as processing energy. This distinction between **information processing** and **energy processing** serves to separate electronics from the rest of electrical engineering. Consequently, we view the nature of the discipline of electronics comprising the four C’s − **communication, computation, control**, and **components**.

The history of electronics is divided into two major periods of time, referred to as the *vacuum-tube era* and the *transistor era.* The former encompasses developments in the first half of the twentieth century, and the latter era begins with the invention of the transistor in 1948.

1. **Translate words and word combinations in bold type.**
2. **Match the following words with their meanings:**

a variety the last

elusive to include

confined to field

flourishing difficult to understand or do

solely many different…

diverse all over the world

worldwide not so simple

complex different

province the first

distinction actively developing

to comprise limited to

the former only

the latter difference

**5. Answer the following questions:**

1. What is electronics in the strictest sense?

2. Can you explain what historical principle was used to separate the field of electrical engineering from the new field of electronic engineering?

3. What distinction serves nowadays to separate electronics from the rest of electrical engineering?

4. What four C’s does the field of electronics comprise?

5. How many periods is the history of electronics divided into?

6. When was the transistor invented?

**UNIT 4**

**1. Can you differentiate science, technology and engineering?**

**2. Which of the three mentioned above did you study at school mostly?**

**3. What are the main functions an engineer has to perform? Does he create/design/plan?**

**4. Read and translate the text.**

**SCIENCE, ENGINEERING AND TECHNOLOGY**

Technology and science are closely tied together, but they are different. **Science** is the study of facts, phenomena, etc. It usually gives you the theories (ideas about how nature works). Science deals with man’s understanding of the real world – the properties of space, matter, energy and their interaction. **Technology** is systematic knowledge and action, usually of industrial processes. Technology lets you use your knowledge and resources to solve different problems. It deals with the tools and techniques for carrying out the plans. Technology is the application of scientific and engineering knowledge to achieve a practical result. **Engineering** is the application of the knowledge learned to develop products. It uses the knowledge to create plans, designs and means for achieving desired goals.

 Most people think that technology is related only to science and math. While this connection is easy to see, technology is just as much a part of social studies and other subjects.

Example: Flow of electrons produces current; this is a fact or concept of science. When current is passed through a semiconductor device such as silicon or germanium, the mechanism is known as electronics. The production of an electronic device using the concept of electronics is known as electronics engineering. Computers are developed using electronics engineering. Using the computer to store digital information, processing it and sending it from one place to

another through telecommunication equipment in a secure manner is information technology.

 Advancements in technology have given us the quality of life we enjoy today. It is easy to see how the speed of technology has increased. Technology definitely has changed with times. Some technologies no longer exist because there is no use for them today. Other technologies have changed to better meet our needs. At each step in time, different technologies were important for what they could do to help us.

 The rapid growth of technology has caused our society to change rapidly too. The study of technology is a study process that includes both technical and social processes. It has to do with designing, making, and doing things. It is enhanced by discoveries in science and shaped by the designs of engineers. Technology is the way that things are introduced into society.

 Technology has changed the way we work, the way we study and play. It affects the whole world, but the effects have been both good and bad. People see some of technologies as being positive and some as being negative.

Some people just do not like any change at all. But one thing is for sure: change keeps happening. We cannot always predict accurately how a change will affect us or our world. Our task is to constantly evaluate how technology can be used with the most benefits to people and the environment.

**5. Say whether statements below are TRUE or FALSE:**

 a) We use technology to solve practical problems.

 b) To use technology means to practice science and math.

 c) Even science about our society includes technology.

 d) The higher is the level of technology, the higher our standards of living are.

 e) The speed of technology is hard to see.

 f) Changes will never stop.

 g) People can predict changes easily.

 h) Technology needs control.

**6. Answer the questions:**

 a) Why do some technologies disappear?

 b) Are all technologies positive?

 c) In what way do we depend on technologies?

 d) Why do some people ignore modern technologies?

 f) What newest technologies have entered your life recently?

**7. Fill in the gaps with proper prepositions:**

a) Technology deals . . . tools and techniques to carry out plans.

b) Technology is not related . . .science and math only.

c) It is shaped . . . the designs of engineers.

d) Technology introduces new things . . . society.

e) We should use technology . . . the best benefits . . . people and the environment.

**8. Topics for discussion in the class:**

a) Being professional means to master technologies.

b) Any technology can be used for both the good and the bad. Give examples.

c) High technologies and students’ life.

d) Possible ways to control technology.

e) The newest technologies in language learning.

f) Changes in technology cause changes in mentality.

**UNIT 5**

**1. What is the scientific method? What is it for?**

**2. Do you remember all five steps of the scientific method?**

**3. Do you think that only scientists need the scientific method?**

**4. Read and translate the text.**

**APPLICATION OF THE SCIENTIFIC METHOD**

 While the scientific method is necessary in developing scientific knowledge, it is also useful in everyday problem-solving. What do you do when your telephone doesn’t work? Is the problem in the hand set, the cabling inside your house, hookup outside, or in the workings of the phone company? The process you might go through to solve this problem could involve scientific thinking, and the results might contradict your initial expectations.

 Like any scientist, you may question the range of situations in which the scientific method may be applied. From what has been stated above, we determine that the scientific method works best in situations where one can isolate the phenomenon of interest, by eliminating or accounting for extraneous factors, and where one can repeatedly test the system under study after making limited, controlled changes in it.

 The scientific method is associated with science, the process of human enquiry that pervades the modern era on many levels. While the method appears simple and logical in description, there is perhaps no more complex question than that of knowing how we come to know things. The scientific method distinguishes science from other forms of explanation because of its requirement of systematic experimentation.

**5. Find in the text and translate into Ukrainian:**

 contradict, expectations, determine, eliminate, extraneous, repeatedly, enquiry, pervade.

UNIT 6

1. Read these words carefully and learn by heart:

an electron tube − електронна трубка

a light bulb − лампа розжарювання

harmful − шкідливий

infrared type − інфрачервоного типу

radiant heat − променева теплота

to fall far short of correct number − збитися з лічби

a furnace blower − тепловентилятор

an accessory − допоміжний прилад, пристрій

a heating pad − грілка

a filament − нитка розжарювання

to lift the receiver − зняти трубку

to dial − набирати (номер)

a measuring device − вимірювальний прилад

a Geiger counter − лічильник Гейгера

uranium − уран

offhand − без підготовки, експромтом

1. Translate these words and word combinations into Ukrainian:

electricity, electronics, magnet, generator, motor, radio, transistor, fluorescent lamps, electric lamp, effect motor, comfort, refrigerator, starter motor, toaster, coffee maker, radiotelephone station, uranium, the field of electricity; electric lamps of the ultraviolet type; to provide for your comfort; to fall far short of the correct number; motor-driver accessories; dimly lighted electric lamps; to send one’s voice to the distant point; by the magic of electricity; X-ray machines; for medical purposes; collecting information from the upper regions; battery-operated radio transmitters.

1. **Read and translate the text.**

**ELECTRICITY AND ELECTRONICS**

It is very difficult to separate the meaning of the two words electricity and electronics. The field of electricity is usually thought of as electricity that is used in magnets, generators, motors, lights and heaters.

The field of electronics is usually thought of as electricity that is used in radio, television, and other equipment where electron tubes and transistors are needed.

In the Home

Probably the most important use of electricity in the modern home is for producing light, either by the common light bulb or fluorescent lamps. In addition to furnishing light, electric lamps of the ultraviolet type can bring the effects of sunshine into the home and also kill harmful germs in the air. Electric lamps of the infrared type can provide us with the effects of radiant heat.

How many electric motors are working in your home to lighten household tasks and provide for your comfort? If you gave an answer offhand without stopping to count them you would probably fall far short of the correct number. In the average modern home electric motors operate the clothes washer and drier, refrigerator, garbage disposal, fan, electric razor, clock, furnace blower, and workshop equipment. And if we include the family automobile, we can add to the above list, starter motor, and many other motor-driven accessories that are being installed on modern automobiles. The uses for electricity in the home do not end with furnishing light and motor power. Electrical heating provides for the comfort of the family by operating the range, toaster, waffle iron, water heater, coffee maker, heating pad, iron and ironer, clothes drier and electric blanket. And while the tubes in our radio and television sets appear as dimly lighted electric lamps and are not classed as heating devices, the oper­ation of the tube also depends upon the heat given off by its filament.

For Communication

Primitive man depended upon fire, smoke, or drum signals to send his thoughts to his neighbor. Modern man has only to lift the receiver of his telephone and dial a series of numbers to send his voice to the most distant point of our nation. And with little more effort he can talk with someone in some distant foreign land or on ship thousands of miles from our shores.

All of this is made possible by the magic of electricity working through our land telephone lines and domestic and foreign radiotelephone stations.

In Research

Little could be done in a modern research laboratory without the aid of electricity. Nearly all of the measuring devices used in developing nuclear power for the use of mankind are electrically operated. Geiger counters which detect the presence of uranium ores in the field are run with batteries. X-ray machines, which depend upon electricity for operation, are used in industry to detect flaws in metal castings, as well as for medical purposes. With travel in outer space scientists are now engaged in collecting information from the upper regions, such as the strength and direction of winds, tem­peratures, density of the atmosphere, humidity, and gravitational pull of the earth. Most of this information is obtained by means of balloons and rockets. In some cases, small battery-operated radio transmitters are sent up into the air to send the information back to earth. Much of today's scientific research requires the solving of difficult mathematical problems, some of which would require days to solve by the usual methods. Electrically operated computers now make the answers to these available in seconds.

1. Answer the questions:

1. What is the difference between the meaning of two words electricity & electrons?

2. What do you think is the most important use of electricity in the modern home?

3. What devices do electric motors operate in the modern home?

4. In which way does electrical heating provide for the comfort of the family?

5. In which way does the magic of electricity make possible communication of the people in distant points?

6. Why could little be done in a modern research laboratory without the aid of electricity?

7. In which way do outer space scientists collect information from the upper regions?

1. Translate into English:

електричні лампи ультрафіолетового типу; вбивати шкідливих мікробів; освітлювати приміщення; електричне нагрівання; сміттєпровід; кип’ятильник; електробритва; дослідницька

лабораторія; виявляти дефекти у металевих корпусах; сила та напрямок вітру; сила тяжіння; робити доступними відповіді на ці запитання.

1. Correct the wrong statements:
2. Electronics is the field of electricity that is used in motors and heaters.
3. The most important use of electricity in the modern home is for producing heating.
4. Primitive man depended upon electricity to send his thoughts to his neighbor.
5. Electrical heating provides for the comfort of the family by operating the automobile motor.
6. Little could be done in a modern research laboratory without the aid of computer.

7. Make up a list of electric devices which you have at home.

UNIT 7

1. Read the following words and learn them by heart:

a flow – потік

a conductor – провідник

matter − матерія, субстанція

a particle – частка

charge – заряд

to attract – притягувати

a path − траєкторія, орбіта

outer shell − зовнішня орбіта

to pry apart – вилучити

copper – мідь

hydrogen – кисень

silver – срібло

a circuit – ланцюг

a source of supply − джерело живлення

a dry cell − сухий елемент, батарея

1. Translate into Ukrainian:

gas; electron theory; proton; electron; mile; neutron; atom; center; positive; negative; second; material; rotation; mysterious force; flow of electricity; to vary in the number and arrangement; particle of negative electrical charge; positively charged particles; opposite charges attract; a force of attraction; the total weight; to prevent electrons from moving inward; centrifugal force; outer shell; to be easily dislodged; to start the electrons in motion; an electrical circuit; negative terminal of the dry cell; in adjacent atoms.

1. Translate the following words and define what part of speech they are:

conduct − conductor − conduction − conductive − conductivity;

arrange − rearrange − arrangement;

revolve – revolving − revolution − revolver;

attract − attractive − attraction − attracted;

rotate − rotative − rotation;

connect − connection − connected;

charge − charged.

1. Read and translate the text:

THE ELECTRON THEORY

Matter is anything that has weight and occupies space. It may be in the form of a solid, such as copper; a gas, such as hydrogen; or a liquid, such as water.

Before the acceptance of the electron theory, the effects of the electricity could be seen, felt and measured, but could only be described as a mysterious force that traveled through the conductor at a speed of 186,000 miles per second. The electron theory is widely accepted today as an explanation of the flow of electricity through a conductor.

According to the electron theory, the atoms, which make up all matter are composed of three types of particles, protons, electrons, and neutrons. The atoms of different materials vary only in the number and arrangement of these particles.

The electron is a particle of negative electrical charge revolving around the centre of the atom. The centre of the atom contains positively charged particles called protons and neutral particles (they bare no charge) called neutrons. This center is called the nucleus of the atom.

Since the positive charge of the nucleus of the atom attracts the negative charge of the electron, we can say that opposite charges attract. In other words, there is a force of attraction between the positive and negative charges.

When considering weight, we must note that the proton and neutron about 1847 times as much as the electron. Thus the total weight of the proton and the neutron determine the weight of the material.

The force which holds the electrons in their paths, preventing their breaking outward, is the attraction between the positively charged protons and the negatively charged electrons. The force which prevents the electrons from moving inward is centrifugal force, tending to make a rotating body move from the centre of rotation. Except for the electrons in the outer shell, the particles of an atom are held tightly together and tremendous forces are required to pry them apart. Since the electrons in the outer shells are the farthest from the nucleus, they are least attracted by the positive charge. In materials such as copper and silver which have only one electron in the outer shell, the electron may be easily dislodged.

Since the movement of electrons along the conductor corresponds to the flow of electricity, some means must be provided to start the electrons in motion. When an electrical circuit is connected to a source of supply, such as a dry cell, negatively charged electrons tend to flow from the negative terminal of the dry cell through the conductor. This movement dislodges a negatively charged electron from the outer shell of an atom within the conductor and forces it to the next atom. The newly arrived electron forces the electron in the outer shell to the next atom where a similar action takes place in adjacent atoms until the positive terminal of the dry cell is reached.

1. Answer the questions:

1. In what form may matter exist?

2. What explanation of the electron theory is widely accepted today?

3. What particles does an atom consist of?

4. What particle of the atom is the lightest?

5. What holds the electrons in their paths as they rotate around the nucleus?

6. Why are silver and copper good electrical conductors?

7. What happens when an electrical circuit is connected to a source of supply?

1. Complete the sentences:

1. Matter is anything ...

2. The electron is ...

3. The center of the atom contains…

4. The positive charge of the nucleus of the atom…

5. The force which prevents…

6. Copper and silver have only…

7. The movement of electrons along the conductor corresponds…

8. The movement of negatively charged electron dislodges…

1. Translate into English:

1. До прийняття електронної теорії електрикою вважали містичну силу, яка передавалася через провідник з великою швидкістю.

2. Згідно з електронною теорією атоми складаються з частинок трьох типів: протонів, електронів та нейронів.

3. Ядро атома містить позитивно заряджені частинки − протони та нейтральні частинки − нейрони.

4. Протилежні заряди притягуються.

5. Щодо ваги, то протони і нейрони набагато важчі за електрони.

6. Відцентрована сила заважає електронам рухатися до середини атома.

7. Електрони знаходяться на зовнішніх орбітах і тому найменше притягуються позитивно зарядженим ядром.

8. Якщо електричний ланцюг підключити до джерела постачання, негативно заряджені електрони починають рухатися до позитивного полюса батареї.

1. Make up a topic: «What is the electron theory».

**UNIT 8**

**1. Enlist all kinds of energy people use today.**

**2. What are sources of these kinds of energy?**

**3. Do you need energy to work on this English text? What kind of energy exactly?**

**4. What are the main problems we face when using energy of nature?**

**5. Make sure you understand the words and word combinations from the text:**

primary/secondary energy source, conversion of energy, built alongside of waterfalls, to perform work, electricity generation, electric bulb, indoor lighting, electric utility industry, wire, rotating shaft, to induce electric current, steam engine, internal combustion engine.

**6. Read and translate the text.**

**ELECTRICITY**

 Electricity is a form of energy involving the flow of electrons. Electricity is a basic part of nature and one of the most widely used forms of energy. We get electricity, which is a secondary energy source, from the conversion of other sources of energy, like coal, natural gas, oil, nuclear power and other natural sources, which are called primary sources.

Many cities and town were built alongside waterfalls (a primary source of mechanical energy) that turned water wheels to perform work. Before electricity generation began over 100 years ago, houses were lit with kerosene lamps, food was cooled in iceboxes, and rooms were warmed by wood-burning or coal-burning stoves. In the mid-1800s everybody’s life changed with the invention of the electric bulb. This invention brought indoor lighting to our homes.

 An electric generator (long ago named “dynamo”) is a device for converting mechanical energy into electric energy.

The process is based on the relationship between magnetism and electricity. When a wire or any other electrically conductive material moves across a magnetic field, an electric current occurs in the wire. The large generators used by the electric utility industry have a stationary conductor. A magnet attached to the end of a rotating shaft is positioned inside a stationary conducting ring that is wrapped with a long piece of wire. When the magnet rotates, it induces a small electric current in each section of wire as it passes. All the small currents of individual sections add up to one current of considerable size. This current is used for electric power.

 An electric utility power station uses either a turbine, engine, water wheel, or other similar machine to drive an electric generator or a device that converts mechanical or chemical energy to electricity. Steam engines, internal-combustion engines, gas combustion engines, gas combustion turbines, water turbines, and wind turbines are the most common methods to generate electricity.

**7. Say if the following statements are TRUE or FALSE:**

 1) We take electricity from nature.

 2) Water belongs to the sources of energy people used first.

 3) Refrigerators we use today appeared 200 years ago.

 4) Electricity generation is not a very complicated process.

**8. Find in the text synonyms to the words:**

transform, typical, connect with, great, placed, burning.

**9. Answer the questions:**

 a) What did people in the past have instead of devices we use today?

 b) How long have we been using electricity?

 c) What is dynamo? Is it a football team?

 d) What are the most common methods to generate electricity?

 e) What kinds of conversions does electricity generation involve?

**10. Explain how the electric current is produced in industry.**

**11. Make up a list of “electricity” words in English.**

**UNIT 9**

**1. What do we call the energy of the sun and the earth?**

**2. Is energy of the sun, earth and wind used in Ukraine? Where and in what way?**

**3. What are advantages and disadvantages of these kinds of energy?**

**4. Read three texts about different kinds of energy.**

**TEXT A**. **SOLAR ENERGY**

 Solar power systems generate no air pollution during their operation. Today we often discuss them when considering environmental, health and safety issues. Energy is required to manufacture and install solar components. Materials used in some solar systems can yet create health and safety hazards for workers and anyone else coming into contact with them. If regulated effectively, the dangers can be kept at a very low level.

 The success of solar power will depend on the answer to the following question: “What do you do when the sun goes down?” The simple answer is to build a system that will store energy when the sun is out.

 The ocean is a natural reservoir of solar power and could be used as a source for thermal energy. If we can draw warm water from the surface and cold water from the depths, an ocean thermal plant could operate 24 hours a day.

**TEXT B. WIND ENERGY**

 Wind is an indirect form of solar energy. It is hard to imagine a safer source to the environmental that wind power. It produces no air or water pollution, involves no toxic or hazardous substances and poses no threat to people. Yet there is public opposition today over a visibility and noise of wind turbines and their impacts on wilderness areas. In reality, however, the wind turbines occupy only a small fraction of land area, and the rest can be used for other purposes or left in its natural state. In California cows can be seen peacefully grazing in the shadow of wind turbine towers. The leasing of land can bring benefits to landowners. In other regions wind power development can cause serious land-use conflicts. Wind projects in forested areas and near populated areas often run into opposition of people.

**TEXT C. GEOTHERMAL ENERGY**

 Geothermal energy is heat contained below the earth’s surface. The only type of geothermal energy that has been widely developed is hydrothermal energy, which consists of trapped hot water or steam.

 Geothermal resource types raise a set of environmental issues. Air and water pollution are two leading concerns. Many hydrothermal reservoirs are located in or near wilderness areas of great natural beauty. To develop hydrothermal projects in the future reasonable compromises, have to be reached between environmental groups and industry.

**5. Say whether statements below are TRUE or FALSE:**

a) Solar, wind and geothermal energy belong to the alternative kinds of energy.

b) People have no doubts as for production and use the energy of the sun, earth and wind.

c) Farmers get profit from the wind energy generation.

d) Location of the energy generators is the biggest concern of the environmentalists.

**6. Suggest your compromises as for effective energy use.**

**7. Discuss in the group the environmental problems related to your speciality. Say if you can see their fast and effective solution.**

UNIT 10

1. Read the following words and learn them by heart:

voltage − напруга

a storage battery − акумуляторна батарея

pressure – тиск

a faucet – кран, вентиль

a thermocouple − термопара, термоелемент

direct current − постійний струм

electromotive force − електрорушійна сила

alternating current − змінний струм

terminal − клема, вивід

a scale − шкала

an outlet − розетка

a multimeter − універсальний вимірювальний прилад

post − клема, з’єднувальний зажим

1. Translate into Ukrainian:

system, tank, electricity, volt, generator, photoelectric cell, sun battery, voltmeter (meter), positive terminals, negative terminals, polarity of the meter, pressure of force; electrical circuit; to produce pressure; source of electricity, to produce voltage; electromotive force; source of voltage; direct current; alternating current; to connect across the two terminals; incorrect reading; correct scale; measuring the voltage; a polarity marking.

1. Read and translate the text:

MEASURING THE VOLTAGE

Voltage is the pressure of force that pushes electrons through an electrical circuit. A single cell of a storage battery produces a pressure of 2 volts. When three cells are connected together they produce three times as much pressure as one cell. The voltage of the battery is 6 volts. The greater the pressure or voltage the more electrons will be forced to flow through a circuit.

Voltage might be compared to the water system in a city. Most towns have a large tank that is used to force water through pipes to the houses throughout the community. The water pressure is available whenever the faucet is opened. If the water in the tank gets low the pressure in the system is low.

In electricity, the source of electricity produces the voltage the same as the water tank provides the pressure. The greater the voltage, the greater the force of the electricity. This force is called the electromotive force and is measured in volts.

Producing an Electromotive Force

The electromotive force, or voltage, may be produced by generators, dry cells, batteries, thermocouples, photoelectric cells, or sun batteries. Generators are the most common source of voltage and are used when large quantities of voltage are needed. Batteries are usually used where it is not convenient to use generators and where direct current is needed. The other methods of producing voltage have limited use except in special places where small quantities of voltage are needed.

Using Voltmeters

A voltmeter is used to measure electromotive force. The meter is connected directly across the two terminals where the voltage is to be measured. One connection of the meter goes to one wire of the circuit and the other connection to the other wire.

When selecting a voltmeter it is necessary to know whether the electricity is alternating current or direct current. Direct current meters will not read alternating current voltages and alternating current meters will give incorrect readings of direct current. It is also important that the meter used have the correct scale for the voltage to be measured. If the voltage is too high for the meter it will burn out the meter.

When measuring the voltage of direct current electricity, it is necessary to notice the polarity of the meter. One terminal of the meter is marked with a + and is sometimes painted red. This is called the positive terminal of the meter and is connected to the positive terminal of the battery. The other terminal of the meter is connected to the negative post of the battery. The voltmeter is connected directly across the source of electricity.

Most homes use alternating current electricity and the voltage of the outlets is from 110 to 120 volts. When measuring the outlet voltage, an alternating current meter must be used. The scale can be a 0-to-150—volt or a O-to-200-volt. Alternating current meters do not have a polarity marking as the direction of electron flow is always changing. The meter is connected directly across the outlet with one terminal of the meter going to one side of the outlet and the other terminal to the other side of the outlet.

Some meters called multimeters can be used for both alternating current and direct current.

1. Answer the questions:

1. What is voltage?

2. Give another name for voltage.

3. What is electromotive force?

4. In which cases are batteries used for producing voltage?

5. What device is used for measuring voltage?

6. What should be taken into account when selecting a voltmeter? Why?

7. In which way is a meter connected when measuring voltage of direct current?

8. When using alternating current voltmeters, why is it not necessary to have polarity marking on the meter?

9. What is the meter that can measure both alternating and direct current called?

1. **Say if the following statements are TRUE or FALSE:**

1. When three cells are connected together, they produce six times as much pressure as one cell.

2. The greater the voltage, the less electrons will flow through a circuit.

3. The greater the voltage, the greater the force of the electricity.

4. The most common source of voltage is dry cells.

5. Batteries are usually used where alternating current is needed.

6. A voltmeter is used to measure current.

7. Direct current meters will not read alternating current readings.

8. The positive terminal of the meter is marked with -

9. The negative terminal of the meter is connected to the positive post of the battery.

10. Alternating current meters also have polarity marking.

1. Translate into English:

електричний ланцюг; акумуляторна батарея; створювати напругу; постійний струм; змінний струм; виміряти електрорушійну силу; прилад для вимірювання постійного струму (перемінного струму), позитивна клема вольтметра; негативна клема батареї; напруга на розетці; показання вольтметра.

1. Read the text again and find the sentences with the passive voice.
2. Retell the text (10 – 12 sentences).

**UNIT 11**

1. Read and learn by heart the following words:

to label − маркувати

wire − провід

connection − з’єднання, схема

a needle − стрілка

solution − розчин

electroplating − гальванопокриття, гальваноностегія

valuable − цінний, дорогий

rust − іржа

chromium − хром

finish − оброблення

to dissolve − розчиняти

well − колодязь.

1. Translate into Ukrainian:

generator; person; ampere; extreme; meter; accurate; conductor; commercial process; nickel; chromium; zinc; cadmium; material; automobile accessories; steel; metallic salt; nickel sulfate; object; positive pole of generator; ammeter; abbreviation; electrolyte; movement of electrons in a circuit; electron flow; direct current; alternating current; to provide the pressure or voltage; to pass through the circuit in one second; the quantity of current flow; unit of measurement; correct scale; extreme care; positive connection; in either direction; a light ampere range; accurate reading; certain chemical solutions; to prevent rust; to improve appearance; plating process; excess of metal particles; plating metal.

1. Translate the following words and define what part of speech they are:

move − moving – movement;

generate − generator − generating – generation;

measure − measuring − measurement – measured;

use − using − used – usage;

improve − improving − improved – improvement;

finish − finished – finishing;

plate − plating – plated.

1. Read and translate the text:

MEASURING THE CURRENT

Current and Electron Flow

The flow of electricity is the movement of electrons in a circuit. This electron flow in a circuit is called current and if the electrons are always going in the same direction it is called direct current. Alternating current is a flow of electrons that is continuously changing directions.

To have a flow of electrons it is necessary to have a source of electricity, such as a generator, to provide the pressure or voltage to push the electrons through the circuit. These electrons go from the negative pole of the generator through the circuit and return to the positive pole of the generator.

Moving electrons might be compared to a bucket brigade used in putting out a fire. The source of water is a well and after the bucket is filled, the people in the brigade pass it from one person to the next. The last person in line receives the bucket and pours the water on the fire. He then passes the bucket to another line of people who return it to the well to be filled again. Buckets are continuously being passed from one person to the next from the well to the fire and from the fire back to the well. This continuous movement of the buckets is like the flow of electrons which leave the source of electricity and flow through the circuit.

Electron Flow Measured in Amperes

In electricity the electron flow is measured in amperes, which indicate the number of electrons that pass through the circuit in one second. Electrons are so very small that it takes millions of them to pass through a circuit in one second to equal one ampere. Since this is such a large figure the quantity of current flow is stated in amperes. Ampere is the unit of measurement for current, the abbreviations being amp or amps.

Using Ammeters

An ammeter is used to measure the electron flow in amperes. All ammeters are labeled as to whether they will read ac or dc. Just as in using a voltmeter it is important that the ammeter have the correct scale for the current to be measured.

To measure the current flow in a circuit the ammeter is connected in one wire of the line so that the electrons must flow through the meter as well as all of the rest of the circuit. Extreme care must be used to be sure that the voltage is not on when the meter is being connected.

Most direct current meters have a + marked on the positive connection. The other terminal is negative and should be connected to the negative side of the circuit. Alternating current ammeters do not have a polarity marking as they are made so that the electrons can flow through the meter in either direction.

When measuring current it is usually advisable to start with a meter that has a high ampere range. If the current is not enough to move the needle so that an accurate reading can be made, a smaller range meter can be used. Starting with a large range meter and then replacing with small range meter will avoid burning out the meter.

Electroplating

Electrons will flow through certain chemical solutions the same as through wire conductors. This principle of current flow in solutions is used in electroplating. Electroplating is a very valuable commercial process used when metals need to be coated to prevent rust or to improve their appearance. Copper, nickel, silver, chromium, zinc, cadmium, and gold are the materials most often used in electroplating. The shiny chromium finish found on many automobile accessories is electroplated onto steel.

Electroplating solutions are usually made of a metallic salt solution such as copper sulfate for copper-plating, or nickel sulfate for nickel-plating. A direct current is always used in the plating process.

The object to be plated is placed in the electrolyte solution and is connected to the negative terminal of the direct current electricity. The positive terminal of the electricity is usually connected to a metal such as copper, nickel, or silver that is being used for the plating process. The object to be plated and the metal used for the plating are placed in the solution.

When direct current electricity is connected to the two metals, a current start to flow through the metallic salt solution. The plating metal is dissolved into the solution. This makes the solution have an excess of metal particles which are pulled toward the material to be plated. As the metal particles reach the object a thin plating of the metal is placed on the object.

1. Answer the questions:

1. What is the flow of electricity?

2. What is necessary to have current?

3. What is the unit of measurement of electron flow?

4. What is the difference between alternating current and direct current?

5. What is the name of the mater used to measure current?

6. Why is it important to have the voltage off when connecting meters?

7. Why is it necessary to start measuring with a large range meter?

8. What type of current is used in electroplating?

9. Why is electroplating a very valuable process to many manufactures of metal objects?

1. Give a definition to the following terms:

current; direct current; alternating current; electron flow; ampere; voltmeter; ammeter; direct current meter; alternating current meter; electroplating; electroplating solution.

1. Translate into English:

1. Постійний струм − це потік електронів, які рухаються в одному напрямку.

2. Потік електронів можна порівняти з безперервним рухом відер, які передаються ланцюгом людей під час гасіння пожежі.

3. Ампер, одиниця вимірювання струму − показує кількість електронів, що проходять по електричному ланцюгу за 1 секунду.

4. Для вимірювання струму необхідно послідовно з’єднати амметр з електричним ланцюгом. Особливу увагу треба приділяти тому, щоб під час підключення омметра у ланцюгу не було напруги.

5. Амметри для вимірювання постійного струму мають маркування на позитивному полюсі.

6. Амметри для вимірювання змінного струму зроблені так, що електрони можуть проходити крізь них у будь-якому напрямку, тому вони не мають маркування полярності.

7. Гальваностегія − це досить дорогий процес, який використовують, щоб перешкодити іржавінню, або покращити зовнішній вигляд деталей.

8. Коли струм проходить через металевий соляний розчин, гальвануючий метал розчиняється у рідині. У розчині створюється надлишок частинок металу, які притягуються до матеріалу, що гальванується.

1. Retell the text (10 − 12 sentences).

UNIT 12

1. Read and learn by heart your active vocabulary:

resistance − опір

to consume − споживати, витрачати

friction − тертя

to reduce − зменшувати(ся)

to increase − збільшувати(ся)

ability − здатність

heat − теплота

to rub − терти

collision − зіткнення

appliance − прилад, пристрій

nichrome − ніхром

an alloy – сплав

to melt − плавитися

incandescent lamp − лампа з газожаровою сіткою

carbon − вугілля, вугільний реостат

to damage − пошкоджувати

stripe − смуга

tolerance − допуск

tan − рудувато-коричневий

variable resistor − реостат; резистор, що регулюється.

1. Translate into Ukrainian:

complete electrical circuit; electrical friction; to keep things in motion; friction between pavement and tires; to slow down the object; the length of wire; ability to make electricity produce heat; owing to the friction caused by rubbing; collision of electrons; heating effect of electricity; without melting; the unit of measurement of resistance; radio circuits; measuring resistance with ohmmeter; a tan body; to determine the resistance of circuits; fairly heavy current; consume, consumer, consuming, consumption; resist, resisting, resistor, resistance; develop, developing, developed, developer, development, developmental; reduce, reducing, reduced, reduction, reducible; produce, producing, produced, production, producer, producible; add, adding, addition, additional; depend, depending, dependent, independent; mark, marked, marker, marking.

1. Read and translate the text:

MEASURING RESISTANCE

Every complete electrical circuit includes wire and a device that consumes current. The voltage forces the current through the circuit. The wire and the current-consuming device, such as a lamp, provide what is called resistance. Resistance is the opposition to electron flow that is found in every circuit.

Electrical resistance can be called friction. Electrical friction might be compared to friction which tends to keep things in motion from moving freely. Automobiles traveling on a highway have friction between the pavement and the tires, boats have friction when moving in water, and friction is developed when an airplane flies through the air. In all of these examples, friction is slowing down the object.

In electricity, the friction or resistance developed by the flow of electrons in a circuit tends to reduce the amount of current flow. The greater the resistance in a circuit, the less the current flow, just as the increased friction developed when an automobile drives off a paved highway onto a dirty road tends to slow it down. The re­sistance in a circuit can be increased if the length of the wire used in the circuit is made longer, since this will lengthen the path over which the electrons must flow. If the wire is made smaller this too will increase the resistance since it will provide a smaller path for the electrons to flow through.

How Resistance Produces Heat

Electrical resistance has many uses. One of the most important uses of resistance is its ability to make electricity produce heat. Heat is produced by friction. This can be demonstrated if we rub two wooden blocks together very rapidly. The blocks will become warm owing to the friction caused by the rubbing. In electricity, the elec­trons that are flowing through the wires hit each other, and this collision of electrons results in heat being developed the same as by the rubbing of the blocks together.

We can increase the heating effect of electricity if we can increase the amount of current flow. Current flow can be increased by adding additional voltage or pressure to the circuit. The greater the electron flow the greater the friction from the electrons coming in contact with each other and thus the greater the heat developed.

We are all familiar with the use of electricity in many types of heating appliances such as electric stoves, hot water heaters, flat irons, waffle irons, toasters, and electric blankets. In these appliances a special resistance wire called nichrome is used to produce heat. Nichrome is an alloy of nickel and chromium and has a high resistance to electron flow. This high resistance plus its ability to be very hot without melting makes it ideal for use as a heater element. The light bulb, called an incandescent lamp, also uses the heating effect of electricity to produce light.

Resistance Measurement

The unit of measurement of resistance is the ohm. Some circuits have a very few ohms resistance whereas others may have a million ohms resistance. All circuits have resistance in the wire and in the device using the electricity.

Where fairly heavy current is flowing fixed resistors are made of nichrome wire. If small amounts of current are flowing through the circuit, such as in many radio circuits, fixed resistors made of carbon can be used. Variable resistors are also made of nichrome wire or carbon, depending upon the amount of current to be controlled.

Resistance can be measured directly by the use of a meter called an ohm-meter. Some multimeters used to measure voltage and current are also used as ohmmeters. Care must be used in measuring resistance with an ohmmeter to be sure that the voltage has been dis­connected from the circuit. Leaving the voltage on when measuring the resistance will damage the ohmmeter.

In circuits where heat is developed the true resistance cannot be measured with an ohmmeter. As wires heat they increase their opposition to electron flow and the resistance in the circuit is increased. To determine the resistance of circuits where heat is being developed Ohm's law must be used.

Color-Coding

Resistors for use in circuits usually have the resistance marked on them. The markings may be in numerals or in the form of color codes. A composition fixed resistor usually has a tan body with three or four colored stripes on one end. The first two indicate the first two figures of the ohmic value. The third stripe designates the number by which those figures must be multiplied. The tolerance (how much the resistor may vary from its rated value) is indicated by the last stripe. If there is no fourth stripe, the tolerance is plus or minus 20%. The values indicated by the colors are taken from a table.

1. Answer the questions:

1. What is resistance? (2 versions)

2. Give the examples of friction in everyday life.

3. What happens to the current flow if the resistance increases?

4. What happens to the resistance of a circuit if a large diameter wire is replaced with a smaller diameter wire?

5. How does resistance produce heat?

6. In which way can the heating effect of electricity be increased?

7. What material is used for heater elements? Why?

8. What is the unit of measurement of resistance called?

9. What happens to the resistance of a heater element when the current is turned on?

10. In which way is the resistance marked on resistors?

1. Translate into Ukrainian the following word-combinations:

current-consuming device; current flow; additional voltage; heating appliances; electric stove; hot water heater; flat iron; waffle iron; toaster; electric blanket; an alloy of nickel and chromium; a heater element; light bulb; incandescent lamp; fixed resistor; variable resistor; multimeter; true résistance; Ohm’s law; col or code; composition fixed resistor; ohmic value; tolerance; resistance wire.

1. Translate into English:

1. Кожний електричний ланцюг складається з дроту та пристрою, який споживає струм. Провід та електричний пристрій створюють опір.

2. Опір, який виникає у потоці електронів у електричному ланцюгу, зменшує силу струму.

3. Чим більша довжина дроту, тим більший опір у електричному ланцюгу.

4. Теплота виникає внаслідок тертя. Електрони, що проходять через проводи, зіштовхуються, і внаслідок такого зіткнення виникає теплота.

5. Тепловий ефект електрики підвищиться, якщо збільшити величину струму. Струм можна збільшити, додаючи додаткову напругу у ланцюг.

6. Нагрівальний елемент у багатьох електроприладах виготовлений з ніхрому. Ніхром - це сплав нікелю та хрому, який має великий опір.

7. Ом − це одиниця вимірювання опору. Опір вимірюють за допомогою приладу, який називається омметр.

8. Резистори, які застосовуються у електричних ланцюгах, зазвичай мають маркування. Маркування може бути у вигляді цифр або кольорових кодів.

1. Make up a plan to the text.
2. Retell the text using your plan.

UNIT 13

1. **Read and learn by heart your active vocabulary:**

a conductor – провідник

liquid – рідина

a wire − провід

plentiful − численний

to supply − живити, постачати

breaker − вимикач

electroscope leaf − пластинчаста стулка електроскопа

tungsten − вольфрам

fuse − запобіжник

brass − латунь

tin − олово

solder − припій

lead − свинець

mercury − ртуть

wire gage − калібр для дроту

stranded − багатожильний, скручений

solid − суцільний

cord − шнур, мотузка

1. Translate into Ukrainian:

electricity, metal, special, electrolyte, type, need, transmission, line, aluminum, zinc, nickel, steel, contact, radio, lamp, telephone, telegraph, battery, element, opposition, cable; to conduct electricity; conductors of electricity; for special purposes; low resistance; special types of circuits; copper wire; extremely light weight; amount of electricity; opposition to electron flow; selecting the correct conductors; to prevent loss; excess current in wires; electrical device.

1. Read and translate the text:

CONDUCTORS

We have stated that wires are used to provide a path through which electrons flow. These wires are called conductors because they conduct the electricity to the various parts of the circuit. Conductors are usually made of metal since most metals permit electrons to flow through them easily. Some liquids are conductors of electricity but are used only for special purposes, such as the electrolyte in storage batteries and electroplating.

All metals are conductors of electricity but some have more resistance than others. Copper is one of the metals which has a low resistance. Silver has a slightly lower resistance than copper but because it is more expensive than copper it is used only in special types of circuits. Almost all circuits use copper wire for conductors, as it is an excellent conductor that is fairly plentiful and not too expensive.

Aluminum has a higher resistance than copper but is occasionally used when extremely light weight is needed. Long power transmission lines are sometimes made of aluminum to reduce the weight of the wire.

Since all metals are conductors, different metals are sometimes used where they can supply special needs. These metals and some of their uses are listed below. They are listed according to their resistance with the first, silver, having the lowest resistance and the last, carbon, having the highest resistance.

Measuring Wire Sizes

All conductors have resistance. Large conductors have less resistance than small conductors because the electrons have more freedom to move in the large conductors. Long conductors have more resistance than short conductors (of the same size) because the electrons have a longer path to flow through in the long conductor.

Since resistance can reduce the amount of electricity that flows in a circuit, it is often necessary to have conductors which will provide very little opposition to electron flow. To help in selecting the correct conductor all wires are designated according to number size. The smaller the number, the larger the wire. Wire sizes may be measured by a gage called a wire gage.

Use of the correct wire size for different circuits is necessary to prevent loss due to resistance and to keep the wire from heating. If the wire used is too small for the amount of current flowing in the circuit, heat will be produced. This heat from excess current in wires can produce a fire and has been the cause of many houses burning down. Each electrical device and every circuit in the home uses a size wire that will carry the current safely. It is important to know how much current each circuit will be using in order to select the proper size wire.

Wire may be obtained either solid or stranded. Solid wire is usually used for wiring homes and in places where the wires do not need to be moved. Stranded wire is made up of several small wires twisted together. By using several small wires together, it is possible to have a very flexible wire that can be moved easily. All large cables used for transmission lines are stranded. Cords used on home appliances and extension cords are stranded so that the cords can be moved and coiled readily.

1. Answer the questions:

1. What is a conductor?

2. Why are conductors made usually of metal?

3. Where are liquids used as a conductor?

4. Why is copper used most often as a conductor?

5. Where is aluminum used as a conductor?

6. What metal has the lowest resistance?

7. What conductors (of the same size) have more resistance: long or short? Why?

8. Why is it important to use the correct wire size wire when wiring a home?

9. Where is usually solid wire used?

1. Find adjectives and adverbs in the text and translate them.
2. Translate into English:

1. Провідник − це провід, що проводить струм до різних ділянок електричного ланцюга.

2. Більшість металів легко пропускають крізь себе потік електронів.

3. Найкращим провідником є срібло, але цей метал надто дорогий, тому він застосовується тільки в окремих типах електричних ланцюгів.

4. Менші за діаметром провідники мають більший опір, тому що електронам складніше рухатися, ніж у провідниках з більшим діаметром.

5. Для вимірювання розміру дроту застосовують пристрій, який називається калібром.

6. Щоб запобігти перегріванню дроту та втрат через опір треба використовувати провід необхідного розміру.

7. Перегрів проводів від надлишку електричного струму часто призводить до пожежі в будинку.

8. У лініях електропередач завжди використовуються багатожильні кабелі. Суцільний провід зазвичай використовують для електропроводки будинків.

1. Retell the text (10 − 12 sentences).

UNIT 14

1. Read and learn by heart your active vocabulary:

an insulator – ізолятор

 short circuit − коротке замикання

enamel − емаль

rubber − гума

cotton − вата; бавовняна нитка

lightning − блискавка

ceramic − кераміка

mica − слюда

steatite − стеатит

polystyrene − полістирол

bakelite − бакеліт

winding − обмотка

solenoid − соленоїд

capacitor − конденсатор

fiber − волокно, нитка

1. Read and translate the following words:

nonmetallic, nonconductor, path, occur, allow, enamel, touch, ceramic, asbestos, mica, flat iron, high-frequency, fiber, steatite, polystyrene, bakelite; to provide a definite path; to avoid a short circuit; bare electrical contacts; without causing a short circuit; heavy insulation; specific purpose; high power transmission lines; power poles; high frequency radio circuits; high-frequency waves; to separate windings in transformers; a shock from electricity.

1. Read, translate these words and define their part of speech:

to conduct, conductor, non-conductor, conduction, conductivity, conducting;

to insulate, insulator, insulation, insulating, insulated; to flow, flow, flowing, flowage, flowability; to select, selection, selective, selector, selectivity; to protect, protective, protection, protector, protected; species, specific, specify, specifications, specified, specimen; to require, required, requirement; to prevent, preventer, prevention, preventive, preventing; capacity, capacitor, capacitance, capacious.

1. Read and translate the text:

INSULATORS

Materials which do not permit electrons to flow through them are called nonconductors or insulators. These insulators are nonmetallic. In electrical circuits insulators are just as important as conductors. Conductors provide a definite path through which electrons will flow; insulators are used to prevent the electrons from flowing where they are not wanted.

Insulation is necessary in most electrical wiring to avoid short circuits. Short circuits occur when wires or bare electrical contacts touch each other so that an unwanted path is made through which current can flow. These unwanted paths allow the current to flow through them instead of through the regular circuit. The wires used in electrical circuits in the home are covered with insulation so that they can be placed next to each other without causing a "short circuit." Should the bare copper wires touch each other the electrons would stop flowing through the necessary parts of the circuit. Most wires are covered with enamel, cotton, rubber, or plastic materials. The type of material selected for wire insulation depends upon where the wire is going to be used. Heavy insulation is needed on wires that will rub

or come in contact with other objects or where high voltages are used.

Insulation is needed to protect people from coming into contact with electrical circuits. All switches must be insulated so that people may turn them off and on without receiving a shock from the electricity. Wall outlets are insulated so that they will not shock anyone that touches them.

Types of Insulators

There are many types of insulators. Each is used for a specific purpose. Air is a good insulator and is used where space is not a problem and where people cannot touch the circuit. Air is actually the insulation between the wires that are strung on high power transmission lines.

Circuits carrying very high voltages require extremely good insulators. The pressure from high voltages can make the electrons jump from one part of the circuit to another the same as lightning jumps between the sky and the ground. High-voltage transmission lines use large glass or ceramic insulators on the power poles. These insulators prevent the electricity from flowing through the poles to the ground. Power poles made of wood become very good conductors of electricity when wet.

In circuits where heat is involved asbestos, ceramic, and mica are used for insulation. Wire cords connected to heater elements, such as in flat irons, are usually covered with asbestos and cotton. The asbestos will not burn and is a very good insulator for electricity. Mica and ceramic materials are used as a base to hold the heater elements made of nichrome wire in toasters, flat irons, and all types of electrical heaters. Both materials are good insulators and can withstand tremendous heat without burning or melting.

Special types of insulators are needed in high-frequency radio cir­cuits. These high-frequency waves have the ability to make electrons flow through some types of insulation. Materials such as steatite and polystyrene are often used in high-frequency circuits since they are good insulators for this purpose.

 **5. Answer the questions:**

1. What is an insulator?

2. What is the purpose of insulators in a circuit?

3. What is the difference between conductors and insulators?

4. When do short circuits occur?

5. Where is air used as an insulator?

6. What insulators are used on the power of high-voltage transmission lines? Why?

7. Where are special types of insulators needed?

**6. What statements are true or false:**

1. Insulators are used to avoid short circuits.

2. Not all insulators are nonmetallic.

3. Though the wires in home electrical circuits are covered with insulation they can cause a short circuit.

4. The type of material used for wire insulation depends upon where the wire is going to be used.

5. Ceramics is the insulation between the wires of high power transmission lines.

6. High-frequency waves make electrons flow through some types of insulation that’s why asbestos and cotton are used for this purpose.

**7. Translate into English:**

1. Ізолятор не дозволяє електронам проходити крізь себе.

2. Щоб запобігти короткому замиканню, потрібні ізолятори. За ізолятори у домашній електропроводці використовуються такі матеріали, як емаль, гума, пластмаса та бавовна.

3. Щоб можна було безпечно вмикати світло у будинку, всі вимикачі та розетки повинні бути ізольованими.

4. Дуже гарні ізолятори необхідні для електричних ланцюгів під високою напругою. Висока напруга змушує електрони перескакувати з однієї частини ланцюга на іншу.

5. У нагрівальних приладах, таких як тостери та праски, використовують слюду та керамічні матеріали як основу для нагрівальних елементів із хрому. Провід зазвичай ізолюється азбестовою або бавовняною ниткою.

6. Для ізоляції витків обмотки в трансформаторах та двигунах використовують папір.

7. Емаллю зазвичай покривають проволоку для обмотки електромагніту.

1. **What is the main idea of the text (5 – 7 sentences).**

**UNIT 15**

1. **Read and learn by heart your active vocabulary:**

chip − мікросхема

planar − плоский

to predict − провіщати

trend − напрям

whereas − тоді як; оскільки

drain − витікання

to spur − спонукати

consumption − споживання

to emit − виділяти

to file − трувати

to owe − заборгувати

to decrease − зменшувати

1. **Read and translate the text.**

**MICROELECTRONICS**

The term “microelectronics” refers to the design and **fabrication** of **high-component-density ICs.** The following approximate dates give some indication of **the increasing component count per chip:**

1951— **discrete transistors**

1960—**small-scale integration** (SSI), fewer than 100 components

1966—**medium-scale integration** (MSI), 100 to 1000 components

1969—**large-scale integration** (LSI), 1000 to 10,000 components

1975—**very-large-scale integration** (VLSI), more than 10,000 components (by 1984, most VLSI chips had 100,000 or more components). One can divide the electronic industries into chip manufacturers and chip users. The IC manufacturers are the major segment of the component indus­tries, whereas chip users are most often the companies producing communi­cation, control, and computer equipment. Since the invention of the IC, many innovations contributed to the growth of microelectronics. Among them was the field-effect transistor.

Much of the work leading to the invention of the **bipolar transistor** involved studies of the effect an **applied electric field** had on the **conductivity of semiconductors.** Shockley proposed the **junction field-effect transistor** (JFET) in 1951, but early attempts at fabrication failed because a stable surface could not be obtained. This difficulty was overcome with the introduction of the planar process and silicon dioxide (Si02) passivation. In 1958, the first JFET was produced by Teszner in France.

The techniques used to make reliable junction field-effect transistors led to an even more important device, the **metal-oxide-semiconductor field-effect transistor** (MOSFET). The structure consists of a metallic electrode (the gate) placed on the SiO2 between two electrodes in the semiconductor. In 1960 at Bell Laboratories reported the first such device suitable for IC fabrication. Subsequent improvements in processing and device design and the growth of the computer industry have made MOS devices the most widely used transistors.

The growth of the computer industry spurred new IC development; in turn, new IC concepts resulted in new computer architectures. Two of the major advances were in new circuit configurations and semiconductor mem­ories. Speed, **power consumption,** and **component density** are important consid­erations in digital ICs.

**It is in semiconductor memories that MOSFETs are a major force. Random-access memories**(RAMs), capable of both storing and retrieving data (write and read, respectively), were first developed by using bipolar transistors and marketed in 1970. These early RAMs stored approximately 1000 bits of information. With the use of MOS technology, 16,000-bit RAMs were available in 1973, 64.000-bit chips in 1978. and 288,000-bit RAMS were reported in 1982. 1,000.000-bit chips became available in 1986.

**Read-only memories** (ROM), used for look-up tables in computers (e.g., to obtain the values of sin x) were first introduced in 1967. Subsequent developments included programmable ROMs (PROMs) and erasable PROMs (EPROM) in which data stored could be removed (erased) and new data stored.

More than half of the MOS ICs produced in 1970 went into manufacture of calculators. In an effort to standardize chip design while maintaining **proprietary circuits** demanded by customers, several IC manufacturers proposed **parti­tioning calculator architecture into its circuit functions.** This concept led to the microprocesso*r* first developed by Intel (1969). Four-bit micro­processors were introduced by Intel in 1971, followed 1 year later by an 8-bit device. Soon, other manufacturers were also producing microprocessors, increasing their capacity. The development of the microprocessor led to the “computer on a chip”. Cochran and Boone of Texas Instruments were awarded a patent, filed in 1971, for such a single-chip mi­crocomputer, although the Intel 8048 was the first commercially available prod­uct.

Another area of contributions to reliable IC design and production was the development of **computer-aided design** (CAD) and **automated testing.**

From the few companies manufacturing ICs in the early 1960s, the industry has experienced tremendous growth.

1. **Translate words and word combinations in bold type.**
2. **Match the following words with their meanings:**

refer to remove

major following

fail manage, cope with;

stable reason

overcome deal with

subsequent fixed

consideration main

eraze be unsuccessful

1. **Answer the following questions:**

1.What is the size of a large IC chip?

2.How canwesubdivide the electronic industries production?

3. What do we call the major segment of the component industries?

4.When was the junction field-effect transistor proposed?

5.When were Hofstein and Heiman awarded a patent for the development of MOSFETs?

6. What are the most important considerations in digital ICs?

7.Why was the use of MOS devices so attractive?

8. What was introduced by Intel in 1971?

9. Who invented the first computer on a chip and what led to it?

10. Which single-chip microcomputer is considered the first commercially available product?

UNIT 16

1. Read and learn your active vocabulary:

density − густина

scale − масштаб, розмір

respectively − відповідно

antecedent − попередник

target − ціль, мішень

inevitably − неминуче, безперечно

counterpart − копія, двійник

sample − проба, зразок

bring to bear on − впливати на

expertise − знання, майстерність

evaluation − оцінювання

closely specified − чітко обумовити

comprehensive − вичерпний

to enable − забезпечити

aggregate − сукупність

1. **Read and translate the text.**

**MOLECULAR ELECTRONICS**

 The subject of molecular electronics evolved during the 1980s as scientists and technologists became aware of the potential applica­tions for organic materials. As a highly interdisciplinary field, progress has depended on **successful interactions across the boundaries of traditional disciplines.** Molecular electronics encompasses biology, chemistry, computing, electronics and physics, each subject with its own methodology and **jargon.** This can be **daunting** to the newcomer.

 Molecular electronic devices are both a reality and a possible basis for a future generation of electronic systems. The best known of molecular electronic devices currently **incorporated in products** is the **liquid crystal display.** The hope for the future is that molecules, either singly or as **aggregates of nanometre dimensions,** can be utilized to provide the elementary active units of electronic systems with **extremely high compo­nent density.** These two areas have been described as **molecular materials for electronics** and **molecular scale electronics** respectively.

Often molecular electronics has been taken as exclusively dealing with the prospects for molecular scale electronics. However, new technologies rarely spring up spontaneously. They may involve significant changes of direction but usually evolve from less sophisticated use of similar materials and properties. The “cats whisker” diode in early radio receivers was an antecedent of today’s integrated circuits. Furthermore, the use of the macroscopic electrical and optical properties of molecular materials is facilitated by a thorough understanding of microscopic molecular scale models. **The latter are essential** if new molecules **with either improved or specifically targeted properties** are to be developed. Thus inevitably the development of molecular materials for electronics leads to a better understanding of microscopic properties and the potential that exists for molecular scale electronics. The two branches of molecular electronics are strongly inter-related and cannot be separated if the subject is to progress.

 One consequence of this is that molecular electronics is inevitably a broad and interdisciplinary topic. The materials available for study include **synthetic low molecular weight molecules,** and macromolecules and their natural counterparts. The preparation of samples for study involves the chemist, biologist and physicist, i.e. **synthesis, extraction and manipulation respectively**. The investigation of the properties of these materials involves the same three disciplines **bringing to bear their different expertise and perspectives.**

 The practical utilization of materials of interest requires input from physicists, engineers and computational scientists. The former two groups are involved in the fabrication of devices and the evaluation of their performance, while the latter can provide new concepts for devices and systems which employ the unique properties of molecular materials **tobest effect.** The outcome of the applied science is often a requirement for materials with more **closely specified properties to enable improvements in device performance to be achieved.** While such a scenario can be considered appropriate for many areas of materials development, that **described above** embraces more disciplines and skills than are generally required.

 While the current uses of molecular materials in electronics are clearly defined, which materials will be used and how they will be used in molecular scale electronics **remains to be determined** as our knowledge of molecular scale science grows. Because of this and **the cross-disciplinary nature** of molecular electronics, **no single book can hope to give a comprehensive account of molecular electronics.** Only **selected topics within molecular electronics** can be described.

1. **Translate words and word combinations in bold type.**
2. **Match the following words with their meanings:**

encompass use

jargon include

daunting appear

incorporated in make easy

spring up discouraging

spontaneously result

sophisticated consist of

facilitate suddenly

the latter social dialect

consequence complex

to embrace result

the former included in

employ the first

outcome the last

1. **Answer the following questions:**
2. When did molecular electronics evolve?
3. What subjects is it based on?
4. What is the basis for new technologies development? Give examples.
5. What is the relationship between the two branches of molecular electronics?

**UNIT 17**

**1. The words “management” and “manager” are spoken and heard so frequently. Do people really know what they mean?**

**2. Is management necessary only for students of economics?**

**3. Do you have any managerial skill? Prove it if you do.**

**4. Read the text.**

**THE ROLES OF MANAGERS**

 A manager is a person responsible for using available resources – people, materials/equipment, land, information, money – to achieve the goals of an organization. Managers are the key decision makers and problem solvers in companies. In order to perform most efficiently and effectively, managers must receive the information they need in a timely manner.

 Managers work toward goals through five major functions:

 **Planning**

 **Staffing**

 **Organizing**

 **Directing**

 **Controlling resources**

 Planning is the future-oriented process of developing courses of action. Staffing is assembling and training personnel. Organizing provides resources and a structure. Directing supplies leadership in supervising personnel. It works through communication and motivation. Controlling involves development of procedures to measure actual performance.

 Management is divided into three basic levels:

 **1) Strategic (top-level managers)**

 **2) Tactical (middle-level managers)**

 **3) Operational (low-level managers)**

 Strategic managers make decisions involving the long-range, or strategic goals of companies. Top-level managers spend most of their time planning and organizing. They need summarized information that covers past and present operations as well as future projections. Information from internal sources gives them views of the internal situation in the company. External information permits them to evaluate industry trends, world economic trends, government regulations and other outside activities.

 Tactical managers are concerned with short terms, tactical decisions directed toward accomplishing the organizational goals. Middle-level managers work on budgets, schedules and performance evaluations and need fairly detailed information. They require mainly internal information but also use some external information. Today many companies reduce the number of tactical managers and cut costs through computerization.

 Operational managers are involved with day-today operations of business. They are responsible for seeing that the tactical decisions of middle-level managers are implemented by personnel at the operations level. For them the information must be detailed, current and focused. It comes from inventory lists, historical records and procedures manuals.

**5. Complete the sentences below:**

a) A manager is responsible for . . .

b) Managers are . . . decision makers.

c) Managers must receive . . . they need in a . . . manner.

d) Managers work through five major functions: . . .

e) Directing supplies leadership in . . .

f) Controlling involves . . .

g) Three basic levels of management are . . .

h) Strategic managers make decisions involving . . .

i) Tactical managers are concerned with . . .

j) Operational managers are directly involved with . . .

**6. Take a particular industry that you know better than others and try to describe the decisions of all the three basic levels of its management.**

**UNIT 18**

**1. Name ten world known brands. Then name five more which are the best known in Ukraine.**

**2. Which of the brands you know belong to long-lasting brand names?**

**3. What must be done to launch a new brand or relaunch an existing one to appeal to new generations of consumers?**

**4. Do you feel like you can manage a business and launch a particular product? What kind of product?**

**5. Read the text.**

**BRAND MANAGEMENT**

 People often wonder what makes a brand different from a product? Quite simply, in marketing terms, products are not brands. Products are general, while brands are something quite unique. Brand identity consists of far more than the physical product itself. It includes all the psychological features that we have learnt to associate with it. Top brands form a personal relationship with consumers; they are able to make us feel more confident, more powerful, healthier, and happier. Brand are promises and people buy what they believe in.

 A brand has USPs (Unique Selling Propositions), specific features which set it up apart from its competitors. For example, Barbie was the first doll to look like a young woman, and a metal river was the unique feature of Levi jeans. Both brands have had numerous imitators, but a ‘me-too’ product will not achieve the success of the one it follows.

 Competent managers have to know how to position their brand in relation to the competition, in terms of factors like price and quality of the product. Managers should relate the brand’s values in a meaningful way to the consumers they have targeted. With worldwide brands this may mean changing your message from country to country.

 The product life-cycle is a familiar one in marketing. A product is launched, developed, goes through the period of growth, enters maturity, declines, and eventually dies. A top brand should go on and on if it is well managed. A brand manager is like a doctor or plastic surgeon, who can keep the brand healthy and looking fresh down the years. Knowing what stage your branded product is at this cycle may help you decide when to launch a line extension – or if you ought to relaunch it with ‘added-value’ features.

 **6. Agree or disagree:**

 a) Consumers need top brands because they bring them comfort.

 b) Brand is a sort of religion.

 c) Management has nothing to do with psychology as it is just a very practical thing.

 d) A manager has to design a perfect message and this will guarantee him success all over the world.

**7. Answer the questions:**

 a) What is the difference between brand and product?

 b) What makes a brand so personal?

 c) How to manage competition in business?

 d) What life does any product live?

 e) What are brand managers paid money for?

**8. Look through the text again and find the words which:**

 a) belong to management;

 b) are used indirectly to make the information more emotional and illustrative.

**9. Say which of the slogans (brand messages) we have on Ukrainian TV today you consider really meaningful.**

**10. Do you think that the rules and recommendations given in the text should be concerned only by managers?**

**UNIT 19**

**1. How often and for what purposes do you use a computer? How do you feel if your computer is broken?**

**2. What kinds of information do you look for and use mostly?**

**3. Have you ever considered your computer skills as a tool of career choices?**

**4. Read the text.**

**INFORMATION SYSTEMS**

 There are two tools that are used to convert data into information and communicate it to the people. They are computers and information systems. A system is any set of components that work together to perform a task. An information system is a set of components that work together to manage the acquisition, storage, manipulation and distribution of information.

 Information systems designed to be used by many users are called multiuser information systems. They are found in most businesses and organizations. Information systems designed for use by an individual are called personal information systems. You might set one up on your home computer to manage your financial portfolio.

 An information system has three basic functions: (1) to accept data (input), (2) to convert data to information (process), and (3) to produce and communicate information in a timely fashion to users for decision making (output).

 Many of todays’ products could not be produced without the effective use of information systems. Aerospace, automotive and industrial manufacturers use information systems to automate production and streamline engineering, speed developing time, reduce costs, keep up with the competition. These industries invest a lot in information systems to compete in cost, quality and delivery. Computers and information systems can also improve your productivity which refers to the amount of time and resources required to gain a desired result.

 As you examine potential career choices, you will find that many require knowledge and understanding of computers and information systems as well as the ability to use them. Possessing knowledge and understanding of computers and information systems in combination with the ability to use them is called computer literacy.

 Information is the life-blood of the company. Most activities performed by managers - such as problem identification and solution, control and decision-making- are based on information. Automation systems technology is growing rapidly as a business. It can be divided into three major segments: communications, data processing and office automation.

**5. Answer the questions:**

a) Whereare multiuser information systems usually found?

b) What are personal information systems designed for?

c) In what way can information systems be useful in industry?

d) Why is it important to have a basic level of knowledge, understanding and skills in using computers and information systems?

e) What activities do managers perform?

**6. Give definitions or simply complete the sentences:**

a) An information system is . . .

b) . . . are called multiuser information systems.

c) . . . are called personal information systems.

d) Three basic functions of any information system are . . .

e) Industries invest a lot in information systems to . . .

f) Productivity refers to . . .

g) Computer literacy means . . .

h) . . . are based on information.

**UNIT 20**

**1. Do you remember when you were given electronic services at the library for the first time? How many years ago was it?**

**2. Has the situation changed a lot?**

**3. What is the list of computer services that students can have at Sumy state university library? Are students satisfied with them?**

**4. Is it easier to find the information you need just staying at home with your computer attached to the Internet?**

**5. Read the text about Electronic libraries.**

**ELECTRONIC LIBRARIES**

 Prompt and efficient provision of documents or information is the most important function of the library. Librarians have worked for a long time towards performing this function more effectively and satisfactory in the service of users.

 Recent developments in information technology, which could be defined as a sophisticated technology related to the production, transfer, processing, and presentation of information based on a combination of computer and telecommunications technologies, opened a new way for librarianship. Save for some small libraries, it is difficult now to find one not equipped with a computer. The computer has come to be used for almost all tasks carried out in the library: acquisition, cataloguing, searching, circulation and for reference services.

 Currently with the development of computer technology, there have also been the development of communications technology and the construction of extensive communication networks. The library community has been working to exploit this technology as well. As a result, library networks, large and small, have been built in many parts of the world. At present, many libraries, having completed the first phase of computerization and networking, are trying to make the systems more intelligent and easier to access and to make use of extensive information resources distributed at many places. The libraries resulting from these efforts are sometimes called electronic libraries.

 By the term “electronic library”, however, different people mean different things. Besides the problem of the definition, the distinction between the electronic library and certain other concepts is not clear. In fact, there have been a variety of approaches to the electronic library:

 - library automation and networking

 - electronic publishing

 - computer networks

 - hypermedia systems

 - more intelligent systems

 Actual systems usually adopt some combinations of these approaches.

**6. Answer the questions:**

a) What is the main function of any library?

b) What new technologies have come to librarianship?

c) What tasks are performed by computers at the library?

d) Why is it so difficult to define what electronic library is?

e) What is your personal concept of the electronic library?

**7. Complete the sentences:**

 a) The computer has come to be used for almost …

 b) Library networks have been built . . .

 c) By the term “electronic library” different people . . .

 d) In fact, there have been a variety . . .

**8. Give some practical advice to electronic libraries users from your own experience.**

**UNIT 21**

**1. Do you do shopping on-line? What do you buy preferably? Where do you receive necessary information?**

**2. What goods are bought mostly on-line in Ukraine today? How much does an average discount make?**

**3. Read the text.**

**E- COMMERCE**

E-commerce is growing with meteoric speed, powered by Internet retailers that expanded beyond selling books on-line to offering toys, consumer electronics, videos, music, auctions, gifts and electronic greeting cards and prepared to enter into on-line grocery business. E-commerce sites continue to pop up as the investors seem to believe that e-commerce will provide big paybacks in the future.

 Technology is being developed that will make shopping on-line more attractive. Among the new techniques are three-dimensional on-line catalogs that allow products being viewed on the screen to be rotated so they can be viewed from any angle. In addition, models with the same physical measurements as the viewer’s can “try on” clothes and be viewed on the computer screen. Booksellers use software to track the buying preferences of customers; the software recommends a book to a customer on the basis of buying habits of other customers with similar tastes.

 Other forms of commerce allow an investor to buy stocks at lower commissioning price and to trade stocks when the stock exchanges are not open. These stock-trading sites have proved to be very popular, recording hundreds of thousands of stock trades daily.

Non-Web businesses are also getting into the e-commerce. Banks are said to have an interest in allowing consumers to pay bills on-line because it allows the banks to control transactions.

 Not everyone is happy about the growth of e-commerce.

State governments fear losing substantial sales tax revenues to on-line purchases that are not currently fixed.

 The arrival of e-commerce raised concerns about medical ethics when it became clear that some doctors were writing prescriptions for people on the Net whom they had never examined or ever met and some on-line pharmacies were shipping drugs across state lines without the proper authority.

 European and U.S. trade negotiators are in dispute over data-privacy issues because consumer privacy must be protected.

**4. Are the sentences TRUE or False?**

 a) Internet retailers stopped selling books on-line.

 b) E-commerce is very profitable because investors receive big paybacks.

 c) On-line investors can buy stocks at lower prices.

 d) Governments are not allowed to collect taxes from on-line sales.

**5. Answer the questions:**

 a) What are the biggest advantages that e-commerce has introduced?

 b) What are the biggest threats that have resulted?

 c) What on-line consumer groups can be indicated after reading the text?

 d) Can you offer any idea as for e-commerce legislation?

**6. See the list of nouns and adjectives on the left and pair them with the verbs having the same root:**

 consumer −

 prescription −

 investor –

 preference −

 measurements −

 arrival −

 attractive –

**UNIT 22**

**1. Have you ever done research? What field did it belong to? Did you do it for money? Did you work alone or in a group?**

**2. Are there amateur scientists among the people you know? What is the main thing that drives and inspires them in their investigation? What do other people think and say about them?**

**3. Read the text.**

**IN PRAISE OF AMATEURS**

 Only in the past century or two has it become possible to make a living from investigating the workings of nature. Modern science was, in other words, built on the work of amateurs. Today, science is an increasingly specialized subject, the domain of experts who know more and more about less and less. Perhaps surprisingly, however, amateurs- even those without private means- are still important. A recent poll found that amateurs are actively involved in astronomy, acoustics, ornithology, hydrology and palaeontology. Amateur scientists are often in close touch with professional, some of whom rely heavily on their cooperation.

Some fields are more open to amateurs than others. Anything that requires expensive equipment is a no-go area. Some kinds of research can be dangerous. But amateurs can make valuable contributions in fields from rocketry to palaeontology and the rise of the Internet made it easier than ever before to collect data and to distribute results.

 There is a long tradition of collaboration between amateur and professional sky watches. Numerous comets, asteroids and even the planet Uranus were discovered by amateurs. They continue to do valuable work observing the brightness of variable stars and detecting new ones. Amateur astronomers outnumber professionals and they are distributed all over the world.

 Another field in which amateurs have traditionally played an important role is palaeontology. Despite high-tech equipment, the best sensors for finding fossils are human eyes– lots of them. Amateurs have contributed to ornithology. There are about 60 million birdwatchers in America alone.

 However, collaboration between amateurs and professionals is not without difficulties. Not everyone is happy with a term ‘amateur’ The new term ‘citizen scientists’ has been coined. Some feel let down when their observations are used in scientific papers, but they are not listed as co-authors.

 The amateurs provide enthusiasm and talent, while the professionals provide guidance. Having laid the foundations of science, amateurs will have much to contribute to its ever-expanding edifice.

**4. Questions for discussion:**

1. Is research a business or a hobby?

2. Why do some people take amateurs quite negatively?

3. Why do amateurs cooperate with scientists?

4. What are the most common fields of their cooperation?

5. What are the problems which appear between professionals and amateurs?

6. Can you offer any legislation improvements to solve these problems?

7. Can you name some scientific journals that are popular with amateur scientists in Ukraine?

8. What TV programs can tell us about amateurs’ scientists?

9. Do you watch them regularly?

10. What is the field that you’d like to contribute to it as an amateur? Explain why.

11. Can your comment/enlarge on the last passage of the text?

**UNIT 23**

**1. What would you chose if proposed a job either in designing or production? Do you feel more a “creator” than a “producer”? Or maybe a manager? Give your arguments. What is easier: to make an invention or to put it into use?**

**2. Read the text about inventions, inventors and some practical recommendations that one might follow.**

**HOW TO BE A SUCCESSFUL INVENTOR**

 Well, good timing for a start. You can have a great idea which the public simply does not want … yet. Take the Italian priest, Giovanni Caselli, who invented the first fax machine using an enormous pendulum in the 1860s. Despite the excellent quality of the reproductions, his invention quickly died a commercial death. It was not until the 1980s that the fax machine became an essential piece of equipment in every office . . . too late for Signor Caselli.

 Money also helps. The Frenchman Denis Par (1647 − 1712) had the idea for a steam engine almost a hundred years before the better remembered Scotsman James Watt was even born, but he never had enough money to build one.

 You also need to be patient (it took scientists nearly eighty years to develop a light bulb which actually worked) … but not too patient. In the 1870s, Elisha Gray, a professional inventor from Chicago, developed plans for telephone. Gray saw it as no more than a “beautiful toy”, however. When he finally sent details of his invention to the Patent Office on February 14th 1876, it was too late; identical designs had arrived just two hours earlier . . . and the young man who sent them, Alexander Bell, will always be remembered as the inventor of the telephone.

 Of course what you really need is a great idea – but if you haven’t got one, a walk in the country and a careful look at nature can help. The Swiss scientist, George de Mestral, had the idea for Velcro when he found his clothes covered in sticky seed pods after a walk in the country. During a similar walk in the French countryside some 250 years earlier, Rene Antoine Ferchault de Reaumur had the idea that paper could be made from wood when he found an abandoned wasps’ nest.

 You also need good commercial sense. Willy Higinbotham was a scientist doing nuclear research in the Brookhaven National Laboratory in Upton, USA. In 1958 the public were invited to the Laboratory to see their work; but both parents and children were less interested in the complicated equipment and diagrams than in a tiny 120cm screen with a white dot which could be hit back and forth over a “net” using a button and a knob. Soon hundreds of people were ignoring the other exhibits to play the first ever computer game – made from a simple laboratory instrument called an “oscilloscope”. Higinbotham, however, never made a cent from his invention: he thought people were only interested in the game because the other exhibits were so boring!

**3. Answer the questions:**

a) Did Caselli’s fax machine actually work?

b) Who designed the first steam engine?

c) Who built the first steam engine?

d) Why does the story of the light bulb show that inventors need to be patient?

e) Who invented the first telephone?

f) What did the inventors of Velcro and of paper have in common?

g) What was the purpose of the exhibition at the National Laboratory at Upton in 1958?

h) What was the first computer game like?

i) Did Professor Higinbotham understand the potential of his ‘computer game’?

**4. See the words below and find their synonyms in the text:**

 necessary, very small, same, made up of many parts, really, dull, left.

**5. Complete the sentences:**

a) People come to the museums to see . . .

b) The inventors register their inventions at the …

c) Paper could be made from . . .

d) We often ignore things which are not interesting because we find them . . .

**6. Indicate the nationality of each inventor:**

George de Mestral, Denis Par, Giovanni Caselli, Willy Huginbotham, Elisha Gray, Alexander Bell, Rene Antoine Ferchault de Reaumur, James Watt.

**7. Tasks for discussion in the class:**

 a) Make a list of inventions mentioned in the text and rank them due to their current use. Share your ideas on the point with your classmates.

 b) Say which information in the text you already knew.

 c) Find the most surprising information.

 d) Give examples of modern inventions or inventors.