МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
ХАРКІВСЬКА НАЦІОНАЛЬНА АКАДЕМІЯ МІСЬКОГО ГОСПОДАРСТВА

К. О. Міщенко, Л. М. Писаренко

ЗБІРНИК ТЕКСТІВ І ЗАВДАНЬ

ДЛЯ ОРГАНІЗАЦІЇ САМОСТІЙНОЇ РОБОТИ
З ДИСЦИПЛІНИ

«ІНОЗЕМНА МОВА (ЗА ПРОФЕСІЙНИМ СПРЯМУВАННЯМ)»

(АНГЛІЙСЬКА МОВА)

(для студентів 2 курсу денної форми навчання напрямку підготовки 6.050701 «Електротехнічні системи електроспоживання», «Світлотехніка і джерела світла»)

ХАРКІВ
ХНАМГ
2010

Збірник текстів і завдань для організації самостійної роботи з дисципліни «Іноземна мова (за професійним спрямуванням)» (англійська мова) (для студентів 2 курсу денної форми навчання напрямку підготовки 6.050701 «Електротехнічні системи електроспоживання», «Світлотехніка і джерела світла») / Харк. нац. акад. міськ. госп-ва; уклад.: К. О. Міщенко, Л. М. Писаренко. – Х.: ХНАМГ, 2010. – 76 с.

Укладачі: К. О. Міщенко,
Л. М. Писаренко

Збірник текстів і завдань рекомендується для самостійної роботи студентів 2 курсу денної форми навчання напрямку підготовки 6.050701 «Електротехнічні системи електроспоживання», «Світлотехніка і джерела світла». Головною метою збірника є формування навичок читання і розуміння інформації з автентичних англомовних джерел, та засвоєння необхідного обсягу лексичного матеріалу, що відповідає вимогам професійно-орієнтованого навчання іноземній мові. Зміст завдань відповідає вимогам учбових програм, а тематика текстів сприяє розширенню обсягу сучасної англійської науково-технічної лексики.

Рецензент: канд. філол. наук, доцент кафедри іноземних мов ХНАМГ
О. Л. Ільєнко

Рекомендовано кафедрою іноземних мов,
протокол № 8 від 06.04.2010 р.

INTRODUCTION
TO THE STUDENT

This book is to help you to improve your skills in reading and speaking English, the English grammar and vocabulary.

All students need practice. There are a lot of different certain basic things in English. They cannot be mastered without a great deal of practice. In order to improve your English, you should try to make the most of your classroom time.

REMEMBER:

- Good learners know that a teacher cannot do everything.
- To make progress, you must take responsibility for your own learning. Learning English or other languages is like learning to ski or skate. Your teacher can show you what to do, but you must do it.
- People often remember things better when we work them out for ourselves, rather when we are simply told. Asking questions does not mean you are stupid. It is a vital part of the learning process.
- Speaking tasks, group work are not a waste of time. If you are asked to do this, it gives you a chance to use your English.
- Do more than give a 'minimum response'. This will help you to be more confident with your English.
- No one can learn languages without making mistakes. Don't worry about every little mistake, identify important mistakes and work on those.
- Your first languages can help you learn English, if some words or grammar structures are similar. But the less you rely on translation, the better you will communicate in English.
- It is never enough simply to know something. You must be able to do things with what you know.

Each unit here gives you the vocabulary of transport, words and expressions that will be useful to you and help you understand written and spoken English.

TO THE TEACHER

This course is for the students studying English for scientific and technical purposes (ESP). The course is designed to familiarize the students of non-language higher education institutions with the information on urban electric power supply and lighting

The material has been specifically designed for a variety of class environments and as the basis for self-study.

This course consists of the twelve units and is expected to be covered during about 100 hours for self-study.

Most of the units provide the learner of English with original texts from different sources.

Units contain:

- ***Texts*** which focus on one of the topic.
- ***Reading Comprehension*** which confirms the content of the text either in general or in detail.
- ***Vocabulary Focus*** which encourages students to work out the meaning from the context and reinforces the vocabulary further.
- ***Vocabulary Development*** with word-formation exercises which helps students improve the range of words and phrases for active or passive use.
- ***Vocabulary Exercises*** which are means of presenting and improving the vocabulary.
- ***Writing Skills*** which include different tasks that help students put their thoughts into words in a meaningful form and to mentally interact with the message.

Unit 1

Task 1. Read the text.

Profession of an entertainment electrician.

In the theatre, the director directs, the actors act, the designers design, the riggers rig, and the fly man flies. But electricians, by some twist of logic, are responsible for an array of technology, including supplying electricity in a safe and efficient manner. They are also responsible for making sure that everything that is connected to show power is properly rigged, configured, and functioning. The same applies to the production electricians or entertainment electricians who work in a variety of fields — concert tours, industrial and corporate events, theme parks, cruise ships, and more.

A good master electrician needs to have an excellent grasp not only of electricity (no, not literally!), but also of electronics , networking , rigging, safety, local codes and regulations, and everything else involved with keeping the show up and running from a standpoint of safety first and operation second. What, then, is an electrician in the entertainment industry? What distinguishes an electrician from a technician? The answer is not always clear cut, and it might vary from venue to venue, from region to region, and from job to job. But on the most basic level, an electrician is typically responsible for making sure that show power is available for every device that requires it in order to make the show a success. In some instances that means that he or she must "tie in" the feeder cable to the main supply, or in the case of a theatre or other venue where power is already distributed to the stage electrics, make sure it is distributed properly. But that's not where the electrician's area of responsibility ends.

Almost all of the responsibility for making sure all of the gear plays well together rests on the backs of the electricians and technicians. That increasingly means rigging a device and running power to it, using the right hardware to make the connection, knowing how networks are wired and distributed, configuring computerized devices like automated lighting and media servers, and more.

The show must go on, but it must go on safely. And the electrician must do his or her part to make sure there are no technological glitches.

Task 2. Give English equivalents to the following words and word combinations.

1) автоматичне освітлення, 2) безпечно та ефективно, 3) бути відповідальним за, 4) бути добре оснащеним, 5) бути скомпонованим, 6) велика кількість техніки, 7) відрізнятися, 8) вірна апаратура, 9) вміння схоплювати все на льоту, 10) з позицій безпеки, 11) інженер-електрик, 12) під’єднувати, 13) підключення до мережі, 14) постачання електрики, 15) сфера відповідальності інженера-електрика, 16) технологічні труднощі, 17) той, що працює, 18) чіткий.

Task 3. Summarize the main information about profession of an entertainment electrician.

Unit 2

Task 1. Read and translate the text

Electricity

Electricity (from the New Latin *ēlectricus*, "amber-like") is a general term that encompasses a variety of phenomena resulting from the presence and flow of electric charge. These include many easily recognizable phenomena such as lightning and static electricity, but in addition, less familiar concepts such as the electromagnetic field and electromagnetic induction.

In general usage, the word 'electricity' is adequate to refer to a number of physical effects. However, in scientific usage, the term is vague, and these related, but distinct, concepts are better identified by more precise terms:

- **Electric charge** – a property of some subatomic particles, which determines their electromagnetic interactions. Electrically charged matter is influenced by, and produces, electromagnetic fields.

- **Electric current** – a movement or flow of electrically charged particles, typically measured in amperes.
- **Electric field** – an influence produced by an electric charge on other charges in its vicinity.
- **Electric potential** – the capacity of an electric field to do work on an electric charge, typically measured in volts.
- **Electromagnetism** – a fundamental interaction between the magnetic field and the presence and motion of an electric charge.

Electrical phenomena have been studied since antiquity, though advances in the science were not made until the seventeenth and eighteenth centuries. Practical applications for electricity however remained few, and it would not be until the late nineteenth century that engineers were able to put it to industrial and residential use. The rapid expansion in electrical technology at this time transformed industry and society. Electricity's extraordinary versatility as a source of energy means it can be put to an almost limitless set of applications which include transport, heating, lighting, communications, and computation. The backbone of modern industrial society is, and for the foreseeable future can be expected to remain, the use of electrical power.

Task 2. Vocabulary

electricity - электричество

electric charge - электрический заряд

lightning - молния

static electricity - статическое электричество

electromagnetic field - электромагнитное поле

electromagnetic induction - электромагнитная индукция

electric current - электрический ток

electric potential - электрический потенциал, напряжение

electromagnetism - электромагнетизм, электромагнитные явления heating - нагревание

computation - розрахунок

Task 3. Answer the questions:

a) What is electricity?

b) What is electric charge?

c) What is electric current?

d) What is electric field?

e) What is electric potential?

f) What is Electromagnetism?

g) What is an Electrical phenomenon?

Task 4. Define, whether the following statements are true (T) or false (F):

	T	F
a) Electrically charged matter is influenced by, and produces, electromagnetic fields.		
b) Electricity's extraordinary versatility as a source of energy means it can’t be put to an almost limitless set of applications which include transport, heating, lighting, communications, and computation.		
c) Electric power will not play an important role in the future		
d) Electricity does not result from the flow of electric charge		
e) The word 'electricity' is used to refer to a number of physical effects		

Task 5.Summarize all the information, received from the text in the written form

Unit 3

Text 1

Task 1. Read and translate the text:

The History of electricity

Long before any knowledge of electricity existed people were aware of shocks from electric fish. Ancient Egyptian texts dating from 2750 BC referred to these fish as the "Thundered of the Nile", and described them as the "protectors" of all other fish. They were again reported millennia later by ancient Greek, Roman and Arabic naturalists and physicians. Several ancient writers, such as Pliny the Elder and Scribonius Largus, attested to the numbing effect of electric shocks delivered by catfish and torpedo rays, and knew that such shocks could travel along conducting objects. Patients suffering from ailments such as gout or headache were directed to touch electric fish in the hope that the powerful jolt might cure them. Possibly the earliest and nearest approach to the discovery of the identity of lightning, and electricity from any other source, is to be attributed to the Arabs, who before the 15th century had the Arabic word for lightning (*raad*) applied to the electric ray.

That certain objects such as rods of amber could be rubbed with cat's fur and attract light objects like feathers was known to ancient cultures around the Mediterranean. Thales of Miletos made a series of observations on static electricity around 600 BC, from which he believed that friction rendered amber magnetic, in contrast to minerals such as magnetite, which needed no rubbing. Thales was incorrect in believing the attraction was due to a magnetic effect, but later science would prove a link between magnetism and electricity. According to a controversial theory, the Parthians may have had knowledge of electroplating, based on the 1936 discovery of the Baghdad Battery, which resembles a galvanic cell, though it is uncertain whether the artifact was electrical in nature.

Benjamin Franklin conducted extensive research on electricity in the 18th century. Electricity would remain little more than an intellectual curiosity for millennia until 1600, when the English physician William Gilbert made a careful study of electricity and magnetism, distinguishing the lodestone effect from static electricity produced by rubbing amber. He coined the New Latin word *electricus* ("of amber" or "like amber", from *ήλεκτρον* [*elektron*], the Greek word for "amber") to refer to the property of attracting small objects after being rubbed. This association gave rise to the English words "electric" and "electricity", which made their first appearance in print in Thomas Browne's *Pseudodoxia Epidemica* of 1646.

Further work was conducted by Otto von Guericke, Robert Boyle, Stephen Gray and C. F. du Fay. In the 18th century, Benjamin Franklin conducted extensive research in electricity, selling his possessions to fund his work. In June 1752 he is reputed to have attached a metal key to the bottom of a dampened kite string and flown the kite in a storm-threatened sky. He observed a succession of sparks jumping from the key to the back of his hand, showing that lightning was indeed electrical in nature.

In 1791 Luigi Galvani published his discovery of bioelectricity, demonstrating that electricity was the medium by which nerve cells passed signals to the muscles. Alessandro Volta's battery, or voltaic pile, of 1800, made from alternating layers of zinc and copper, provided scientists with a more reliable source of electrical energy than the electrostatic machines previously used. The recognition of electromagnetism, the unity of electric and magnetic phenomena, is due to Hans Christian Ørsted and André-Marie Ampère in 1819-1820; Michael Faraday invented the electric motor in 1821, and Georg Ohm mathematically analyzed the electrical circuit in 1827.

While it had been the early 19th century that had seen rapid progress in electrical science, the late 19th century would see the greatest progress in electrical engineering. Through such people as Nikola Tesla, Thomas Edison, Ottó Bláthy, George Westinghouse, Ernst Werner von Siemens, Alexander Graham Bell and Lord

Kelvin, electricity was turned from a scientific curiosity into an essential tool for modern life, becoming a driving force for the Second Industrial Revolution.

Task 2. Vocabulary

electric shocks - электрошок
torpedo rays - электрический скат, электрический луч
conducting objects - предметы, проводящие электричество
jolt - толчок
amber - янтарь
friction - трение
magnetic - магнитный
electroplating - гальванопокрытие
galvanic cell - гальванический элемент
rubbing amber - янтарь для трения
to conduct - проводить ток
spark - искра
bioelectricity - биоэлектричество
nerve cells - нейрон, нервная клетка
voltaic pile - гальванический столб
layer - слой
zinc - цинк
copper - медь
driving force - движущая сила
electric motor - электрический мотор

Task 3. Answer the questions:

a) How did ancient Egyptians call an electric fish?
b) How was electricity used for medical purposes in ancient time?

c) What were the 1st attempts to make electricity?

d) What did Benjamin Franklin do in the 18th century?

e) How did the electricity get its present name?

f) What did Benjamin Franklin do in 1752?

g) What did Luigi Galvani do for the development of the electricity in 1791?

h) How did the electricity develop in 19th century?

Task 4. Match the Inventors with their contribution to electricity:

1) William Gilbert	a) invented the electric motor in 1821, and Georg Ohm mathematically analyzed the electrical circuit in 1827
2) Benjamin Franklin	b) conducted extensive research in electricity, selling his possessions to fund his work. In June 1752 he is reputed to have attached a metal key to the bottom of a dampened kite string and flown the kite in a storm-threatened sky.
3) Luigi Galvani	c) made a battery, or voltaic pile, of 1800, made from alternating layers of zinc and copper, provided scientists with a more reliable source of electrical energy than the electrostatic machines previously used
4) Alessandro Volta	d) published his discovery of bioelectricity, demonstrating that

	electricity was the medium by which nerve cells passed signals to the muscles
5) Hans Christian Orsted and André-Marie Ampère	e) The recognition of electromagnetism, the unity of electric and magnetic phenomena
6) Michael Faraday	f) made a careful study of electricity and magnetism, distinguishing the lodestone effect from static electricity produced by rubbing amber.

Task 5. Define, whether the following statements are true (T) or false (F):

	T	F
a) While it had been the early 19th century that had seen rapid progress in electrical science.		
b) certain objects such as rods of amber could be rubbed with cat's fur and attract light objects like feathers was known to ancient cultures around the Mediterranean. Thales of Miletos made a series of observations on static electricity		
c) According to a controversial theory, the Parthians may not have had knowledge of electroplating, based on the 1936 discovery of the Baghdad Battery, which resembles a galvanic cell, though it is uncertain whether the artifact was electrical in nature.		
d) electricity was turned from a scientific curiosity into an		

essential tool for modern life, becoming a driving force for the Second Industrial Revolution

e) The Greeks, before the 15th century had the word for lightning (*raad*) applied to the electric ray.

Task 6. Summarize all the information, received from the text in the written form

TEXT 2

Task 1. Read the text

Discovering Static Electricity

Around 600 BCE, in Greece, a mathematician named Thales discovered that amber rubbed with animal fur attracted light objects. Even though other people may have noticed this before, Thales was the first to record his findings. We don't have his writings, but from other people's reports of his work we can guess at his experiments. We think that Thales noticed static electricity from polishing amber with a piece of wool or fur. After rubbing the amber, which created a static electric charge, other light objects such as straw or feathers stuck to the amber. At this time, magnetism was confused with static electricity.

Later, other experimenters discovered that other substances, such as diamonds, also attracted light objects the same way amber did. These substances are called insulators. They also discovered that other substances, such as copper, silver, and gold, did not attract anything, no matter how long the object was rubbed and no matter how light or heavy the other object was. These are called conductors because they let electricity flow through them.

Electricity has been moving in the world forever. Lightning is a form of electricity. It is electrons moving from one cloud to another or jumping from a cloud to the ground. Have you ever felt a shock when you touched an object after walking across a carpet? A stream of electrons jumped to you from that object. This is called static electricity.

Have you ever made your hair stand straight up by rubbing a balloon on it? If so, you rubbed some electrons off the balloon. The electrons moved into your hair from the balloon. They tried to get far away from each other by moving to the ends of your hair.

They pushed against each other and made your hair move—they repelled each other. Just as opposite charges attract each other, like charges repel each other.

Task 2. Decide where the following statements are true or false.

	T	F
1. Thales discovered phenomenon of static electricity.		
2. First experiments with amber and wool were made and recorded in the Ancient Rome.		
3. Phenomenon of attracting of light objects by amber rubbed with animal fur was called magnetism.		
4. Later experiments showed that all materials could produce static electricity.		
5. Substances that don’t attract objects if they are rubbed are called semiconductors.		
6. According to the ability to attract other objects and conduct electricity, all materials can be divided into insulators and conductors.		

Task 3. Find the definitions.

1. charge	a) the property of attraction displayed by magnets
2. conductor	b) any phenomenon associated with stationary electrons, ions, or other charged particles

3. experiment	c) the tangible matter of which a thing consists
4. insulator	d) a substance, body, or system that conducts electricity, heat, etc
5. magnetism	e) a test or investigation, especially one planned to provide evidence for or against a hypothesis
6. static electricity	f) any material or device that insulates, esp. a material with a very low electrical conductivity or thermal conductivity or something made of such a material
7. substance	g) to cause to take or store electricity or to have electricity fed into it

Unit 4

Task 1.Read and translate the text:

Electric current

The movement of electric charge is known as an electric current, the intensity of which is usually measured in amperes. Current can consist of any moving charged particles; most commonly these are electrons, but any charge in motion constitutes a current.

By historical convention, a positive current is defined as having the same direction of flow as any positive charge it contains, or to flow from the most positive part of a circuit to the most negative part. Current defined in this manner is called conventional current. The motion of negatively-charged electrons around an electric circuit, one of the most familiar forms of current, is thus deemed positive in the *opposite* direction to that of the electrons. However, depending on the conditions, an electric current can consist of a flow of charged particles in either direction or even in both directions at once. The positive-to-negative convention is widely used to simplify this situation.

An electric arc provides an energetic demonstration of electric current

The process by which electric current passes through a material is termed electrical conduction, and its nature varies with that of the charged particles and the material through which they are travelling. Examples of electric currents include metallic conduction, where electrons flow through a conductor such as metal, and electrolysis, where ions (charged atoms) flow through liquids. While the particles themselves can move quite slowly, sometimes with an average drift velocity only fractions of a millimeter per second, the electric field that drives them itself propagates at close to the speed of light, enabling electrical signals to pass rapidly along wires.

Current causes several observable effects, which historically were the means of recognizing its presence. That water could be decomposed by the current from a voltaic pile was discovered by Nicholson and Carlisle in 1800, a process now known as electrolysis. Their work was greatly expanded upon by Michael Faraday in 1833. Current through a resistance causes localized heating, an effect James Prescott Joule studied mathematically in 1840. One of the most important discoveries relating to current was made accidentally by Hans Christian Orsted in 1820, when, while preparing a lecture, he witnessed the current in a wire disturbing the needle of a magnetic compass. He had discovered electromagnetism, a fundamental interaction between electricity and magnetics.

In engineering or household applications, current is often described as being either direct current (DC) or alternating current (AC). These terms refer to how the current varies in time. Direct current, as produced by example from a battery and required by most electronic devices, is a unidirectional flow from the positive part of a circuit to the negative. If, as is most common, this flow is carried by electrons, they will be travelling in the opposite direction. Alternating current is any current that reverses direction repeatedly; almost always this takes the form of a sinusoidal wave. Alternating current thus pulses back and forth within a conductor without the charge moving any net distance over time. The time-averaged value of an alternating current is zero, but it delivers energy in first one direction, and then the reverse. Alternating current is affected by electrical properties that are not observed under steady state direct current, such as inductance and capacitance. These properties however can become important when circuitry is subjected to transients, such as when first energized.

Task 2. Vocabulary

amperes - амперы
charged particles - заряженные частицы
electrons - электроны
positive part - позитивная частица
conventional current - обычное движение
deem - думать, мыслить
charged particles - заряженные частицы
electric arc - электрическая дуга, вольтова дуга
electrical conduction - элктропроводимость
conductor - проводник
electrolysis - электролиз
ions - ионы
atoms - атомы
drift velocity - скорость дрейфа
speed of light - скорость света
wire - провод
resistance - сопротивление
battery - батарея
steady state - устойчивое состояние
inductance - индуктивность
capacitance - ёмкостное сопротивление

Task 3. Answer the questions

a) What is electric current?

b) What is positive current?

c) What is conventional current?

d) What is electric circuit?

e) What is electrical conduction?

f) What is electrolysis?

g) What happened with Hanna Cristian Orsted in 1820?

h) What is electromagnetism?

Task 4. Define, whether the following statements are true (T) or false (F):

	T	F
a) Current can't consist of any moving charged particles; most commonly these are electrons, but any charge in motion constitutes a current		
b) The time-averaged value of an alternating current is zero, but it delivers energy in first one direction, and then the reverse		
c) An electric arc provides an energetic demonstration of electric current		
d) Current causes several observable effects, which historically were the means of recognizing its presence.		
e) In engineering or household applications, current is often described as being either direct current (DC) or alternating current (AC)		
f) While the particles themselves can move quite slowly, sometimes with an average drift velocity only fractions of a		

millimeter per second, the electric field that drives them itself propagates at close to the speed of light, enabling electrical signals to pass rapidly along wires

Task 5. Summarize all the information, received from the text in the written form

Unit 5

Task 1.Read and translate the text:

Electric charge

Electric charge is a property of certain subatomic particles, which gives rise to and interacts with, the electromagnetic force, one of the four fundamental forces of nature. Charge originates in the atom, in which its most familiar carriers are the electron and proton. It is a conserved quantity, that is, the net charge within an isolated system will always remain constant regardless of any changes taking place within that system. Within the system, charge may be transferred between bodies, either by direct contact, or by passing along a conducting material, such as a wire. The informal term static electricity refers to the net presence (or 'imbalance') of charge on a body, usually caused when dissimilar materials are rubbed together, transferring charge from one to the other.

Charge on a gold-leaf electroscope causes the leaves to visibly repel each other

The presence of charge gives rise to the electromagnetic force: charges exert a force on each other, an effect that was known, though not understood, in antiquity. A lightweight ball suspended from a string can be charged by touching it with a glass rod that has itself been charged by rubbing with a cloth. If a similar ball is charged by the same glass rod, it is found to repel the first: the charge acts to force the two balls apart. Two balls that are charged with a rubbed amber rod also repel each other. However, if one ball is charged by the glass rod and the other by an amber rod, the two balls are found to attract each other. These phenomena were investigated in the late eighteenth century by Charles-Augustine de Coulomb, who deduced that charge manifests itself in two opposing forms. This discovery led to the well-known axiom: *like-charged objects repel and opposite-charged objects attract*.

The force acts on the charged particles themselves, hence charge has a tendency to spread itself as evenly as possible over a conducting surface. The magnitude of the electromagnetic force, whether attractive or repulsive, is given by Coulomb's law, which relates the force to the product of the charges and has an inverse-square relation to the distance between them. The electromagnetic force is very strong, second only in strength to the strong interaction, but unlike that force it operates over all distances. In comparison with the much weaker gravitational force, the electromagnetic force pushing two electrons apart is 10^{42} times that of the gravitational attraction pulling them together.

The charge on electrons and protons is opposite in sign, hence an amount of charge may be expressed as being either negative or positive. By convention, the charge carried by electrons is deemed negative and that by protons positive, a custom that originated with the work of Benjamin Franklin. The amount of charge is usually given the symbol Q and expressed in coulombs; each electron carries the same charge of approximately -1.6022×10^{-19} coulomb. The proton has a charge that is equal and opposite, and thus $+1.6022\times10^{-19}$ coulomb. Charge is possessed not just by matter, but also by antimatter, each antiparticle bearing an equal and opposite charge to its corresponding particle.

Charge can be measured by a number of means, an early instrument being the gold-leaf electroscope, which although still in use for classroom demonstrations, has been superseded by the electronic electrometer.

Task 2. Vocabulary

electric charge - электрический заряд

subatomic particles - субатомные частицы electromagnetic force - электромагнитная сила

fundamental force - основная сила

conserved quantity - сохраняющаяся величина

static electricity - статическое электричество

gold-leaf electroscope - электроскоп с золотыми листами

glass rod - стеклянная палочка

magnitude - величина

strength - сила

electrometer - электрометр

Task 3. Answer the questions

a) What is electric charge?

b) What is static electricity?

c) What was Charles-Augustine de Coulomb’s contribution to the development of the electricity?

d) What is Coulomb's law?

e) What is symbol *Q?*

f) What is electrometer used for?

Task 4. Define, whether the following statements are true (T) or false (F):

	T	F
a) The charge on electrons and protons is opposite in sign, hence an amount of charge may be expressed as being either negative or positive		
b) The force acts on the charged particles themselves, hence charge has a tendency to spread itself as evenly as possible over a conducting surface		

c) Charge on a gold-leaf electroscope causes the leaves to visibly repel each other

d) The magnitude of the electromagnetic force, whether attractive or repulsive, is given by Coulomb's law, which relates the force to the product of the charges and has an inverse-square relation to the distance between them

e) In comparison with the much weaker gravitational force, the electromagnetic force pushing two electrons apart is 10^{42} times that of the gravitational attraction pulling them together.

Task 5. Summarize all the information, received from the text in the written form

Unit 6

Task 1. Read and translate the text:

Electric circuits

An electric circuit is an interconnection of electric components, usually to perform some useful task, with a return path to enable the charge to return to its source.

The components in an electric circuit can take many forms, which can include elements such as resistors, capacitors, switches, transformers and electronics. Electronic circuits contain active components, usually semiconductors, and typically exhibit non-linear behavior, requiring complex analysis. The simplest electric components are those that are termed passive and linear: while they may temporarily store energy, they contain no sources of it, and exhibit linear responses to stimuli.

The resistor is perhaps the simplest of passive circuit elements: as its name suggests, it resists the current through it, dissipating its energy as heat. The resistance is a consequence of the motion of charge through a conductor: in metals, for example, resistance is primarily due to collisions between electrons and ions. Ohm's law is a basic law of circuit theory, stating that the current passing through a resistance is directly proportional to the potential difference across it. The resistance of most materials is relatively constant over a range of temperatures and currents; materials under these conditions are known as 'ohmic'. The ohm, the unit of resistance, was named in honour of Georg Ohm, and is symbolized by the Greek letter Ω. 1 Ω is the resistance that will produce a potential difference of one volt in response to a current of one amp.

The capacitor is a device capable of storing charge, and thereby storing electrical energy in the resulting field. Conceptually, it consists of two conducting plates separated by a thin insulating layer; in practice, thin metal foils are coiled together, increasing the surface area per unit volume and therefore the capacitance. The unit of capacitance is the farad, named after Michael Faraday, and given the symbol *F*: one farad is the capacitance that develops a potential difference of one volt when it stores a charge of one coulomb. A capacitor connected to a voltage supply initially causes a current as it accumulates charge; this current will however decay in time as the capacitor fills, eventually falling to zero. A capacitor will therefore not permit a steady state current, but instead blocks it.

The inductor is a conductor, usually a coil of wire, which stores energy in a magnetic field in response to the current through it. When the current changes, the magnetic field does too, inducing a voltage between the ends of the conductor. The induced voltage is proportional to the time rate of change of the current. The constant of proportionality is termed the inductance. The unit of inductance is the Henry, named after Joseph Henry, a contemporary of Faraday. One Henry is the inductance that will induce a potential difference of one volt if the current through it changes at a rate of one ampere per second. The inductor's behavior is in some regards converse to that of the capacitor: it will freely allow an unchanging current, but opposes a rapidly changing one.

Task 2. Vocabulary

circuit-окружность, круг

path-тропинка

to return-возвращаться

source-исток

resistor-резистор, катушка сопротивления

capacitor-конденсатор

switcher-перебежчик

semiconductor-полупроводник

linear-линейный

store-запас, резерв

consequence-последсвие, результат

collision-столкновение

circuit theory-теория схем, теория цепей

in honor - в честь

device - устройство, приспособление

foil - фольга

decay - гнить, разлагаться

to induce - побуждать, склонять

time rate - разрядный ток данного режима

inductance - индуктивность

behaviour - поведение

Task 3. Answer the questions

a) What is electric circuit?

b) What are the components of the electric circuit?

c) What is resistor?

d) What is capacitor?

e) What is inductor?

f) What is Ohm's law?

Task 4. Define, whether the following statements are true (T) or false (F):

	T	F
a) The ohm, the unit of resistance, was named in honour of Alexander Graham Bell, and is symbolized by the Greek letter Ω. 1 Ω is the resistance that will produce a potential difference of one volt in response to a current of one amp.		
b) The induced voltage isn't proportional to the time rate of change of the current.		
c) The unit of capacitance is the farad, named after Michael Faraday, and given the symbol *F*: one farad is the capacitance that develops a potential difference of one volt when it stores a charge of one coulomb		
d) The constant of proportionality is termed the inductance. The unit of inductance is the Henry, named after Joseph Henry, a contemporary of Faraday		
e) When the current changes, the magnetic field does not, inducing a voltage between the ends of the conductor		
f) The simplest electric components are those that are termed passive and linear: while they may temporarily store energy, they contain no sources of it, and exhibit linear responses to stimuli.		

Task 5. Summarize all the information, received from the text in the written form

Unit 7

Task 1. Read and translate the text:

Electric field

The concept of the electric field was introduced by Michael Faraday. An electric field is created by a charged body in the space that surrounds it, and results in a force exerted on any other charges placed within the field. The electric field acts between two charges in a similar manner to the way that the gravitational field acts between two masses, and like it, extends towards infinity and shows an inverse square relationship with distance. However, there is an important difference. Gravity always acts in attraction, drawing two masses together, while the electric field can result in either attraction or repulsion. Since large bodies such as planets generally carry no net charge, the electric field at a distance is usually zero. Thus gravity is the dominant force at distance in the universe, despite being much weaker.

Field lines emanating from a positive charge above a plane conductor

An electric field generally varies in space, and its strength at any one point is defined as the force (per unit charge) that would be felt by a stationary, negligible charge if placed at that point. The conceptual charge, termed a 'test charge', must be vanishingly small to prevent its own electric field disturbing the main field and must also be stationary to prevent the effect of magnetic fields. As the electric field is defined in terms of force, and force is a vector, so it follows that an electric field is also a vector, having both magnitude and direction. Specifically, it is a vector field.

The study of electric fields created by stationary charges is called electrostatics. The field may be visualized by a set of imaginary lines whose direction at any point is the same as that of the field. This concept was introduced by Faraday, whose term 'lines of force' still sometimes sees use. The field lines are the paths that a point positive charge would seek to make as it was forced to move within the field; they are however an imaginary concept with no physical existence and the field permeates all the intervening space between the lines. Field lines emanating from stationary charges have several key properties: first, that they originate at positive charges and terminate at negative charges; second, that they must enter any good conductor at right angles, and third, that they may never cross nor close in on themselves.

A hollow conducting body carries all its charge on its outer surface. The field is therefore zero at all places inside the body. This is the operating principal of the Faraday cage, a conducting metal shell which isolates its interior from outside electrical effects.

The principles of electrostatics are important when designing items of high-voltage equipment. There is a finite limit to the electric field strength that may be withstood by any medium. Beyond this point, electrical breakdown occurs and an electric arc causes flashover between the charged parts. Air, for example, tends to arc across small gaps at electric field strengths which exceed 30 kV per centimeter. Over larger gaps, its breakdown strength is weaker, perhaps 1 kV per centimeter. The most visible natural occurrence of this is lightning, caused when charge becomes separated in the clouds by rising columns of air, and raises the electric field in the air to greater than it can withstand. The voltage of a large lightning cloud may be as high as 100 MV and have discharge energies as great as 250 kWh.

The field strength is greatly affected by nearby conducting objects, and it is particularly intense when it is forced to curve around sharply pointed objects. This principle is exploited in the lightning conductor, the sharp spike of which acts to encourage the lightning stroke to develop there, rather than to the building it serves to protect.

Task 2. Vocabulary

charged - заряженный

space - пространство

infinity - бесконечность

draw - тяга

define - определять

universe - мироздание

disturb - беспокоить

direction - направление

terminate - ограничивать

existence - бытие

emanate - истекать

voltage - электрическое напряжение

cage - клетка

finite - ограниченный

gap - брешь

spike - острие

encourage - ободрять

stroke - удар

Task 3. Answer the questions

a) Who introduced the concept of electric field?

b) How does gravity act?

c) How does electric field act?

d) What is the voltage of a large lightning cloud?

e) What is lightning conductor?

f) What is Faraday’s cage?

Task 4. Define, whether the following statements are true (T) or false (F):

	T	F
a) The study of electric fields created by stationary charges is called electrostatics		
b) The voltage of a large lightning cloud may be as high as 100 MV and have discharge energies as great as 25 kWh.		

c) The field lines are the paths that a point positive charge would seek to make as it was forced to move within the field; they are however an imaginary concept with no physical existence, and the field permeates all the intervening space between the lines

d) The conceptual charge, termed a 'test charge', must be vanishingly small to prevent its own electric field disturbing the main field and must also be stationary to prevent the effect of magnetic fields

e) Field lines emanating from stationary charges have several key properties: first, that they originate at positive charges and terminate at negative charges; second, that they must enter any good conductor at right angles, and third, that they may never cross nor close in on themselves.

Task 5. Summarize all the information, received from the text in the written form

Unit 8

Task 1.Read and translate the text:

Electric potential

A pair of AA cells. The + sign indicates the polarity of the potential differences between the battery terminals.

The concept of electric potential is closely linked to that of the electric field. A small charge placed within an electric field experiences a force, and to have brought that charge to that point against the force requires work. The electric potential at any point is defined as the energy required to bring a unit test charge from an infinite distance slowly to that point. It is usually measured in volts, and one volt is the potential for which one joule of work must be expended to bring a charge of one coulomb from infinity. This definition of potential, while formal, has little practical application, and a more useful concept is that of electric potential difference, and is the energy required to move a unit charge between two specified points. An electric field has the special property that it is *conservative*, which means that the path taken by the test charge is irrelevant: all paths between two specified points expend the same energy, and thus a unique value for potential difference may be stated. The volt is so strongly identified as the unit of choice for measurement and description of electric potential difference that the term voltage sees greater everyday usage.

For practical purposes, it is useful to define a common reference point to which potentials may be expressed and compared. While this could be at infinity, a much more useful reference is the Earth itself, which is assumed to be at the same potential everywhere. This reference point naturally takes the name earth or ground. Earth is assumed to be an infinite source of equal amounts of positive and negative charge, and is therefore electrically uncharged – and unchargeable.

Electric potential is a scalar quantity, that is, it has only magnitude and not direction. It may be viewed as analogous to height: just as a released object will fall through a difference in heights caused by a gravitational field, so a charge will 'fall' across the voltage caused by an electric field. As relief maps show contour lines marking points of equal height, a set of lines marking points of equal potential (known as equipotentials) may be drawn around an electrostatically charged object. The equipotentials cross all lines of force at right angles. They must also lie parallel to a conductor's surface, otherwise this would produce a force on the charge carriers and the electrons will stream out of the conductor.

The electric field was formally defined as the force exerted per unit charge, but the concept of potential allows for a more useful and equivalent definition: the electric field is the local gradient of the electric potential. Usually expressed in volts per meter, the vector direction of the field is the line of greatest gradient of potential, and where the equipotentials lie closest together.

Task 2. Vocabulary

link - соединять

measure - измерять

application - просьба

conservative - консервативный

relevant - важный

reference - ссылка на к.-либо

scalar - скалярный

stream out - вывалить

Task 3. Answer the questions

a) What is the concept of electric potential?

b) How was electric field formally defined?

c) What is voltage?

d) How the voltage is measured?

Task 4. Define, whether the following statements are true (T) or false (F):

	T	F
a) Electric potential is a scalar quantity, that is, it has only magnitude and not direction. It may be viewed as analogous to height: just as a released object will fall through a difference in heights caused by a gravitational field, so a charge will 'fall' across the voltage caused by an electric field.		
b) The electric field was formally defined as the force exerted per unit charge, but the concept of potential allows for a more useful and equivalent definition: the electric field is the local		

gradient of the electric potential.

c) The concept of electric potential is closely linked to that of the electric field

d) The electric potential at any point is defined as the energy required to bring a unit test charge from an infinite distance slowly to that point

e) The equipotentials cross all lines of force at right angles

Task 5. Summarize all the information, received from the text in the written form

Unit 9

Task 1. Read and translate the text:

Electromagnetism

Magnetic field circles around a current

Orsted's discovery in 1821 that a magnetic field existed around all sides of a wire carrying an electric current indicated that there was a direct relationship between electricity and magnetism. Moreover, the interaction seemed different from gravitational and electrostatic forces, the two forces of nature then known. The force on the compass needle did not direct it to or away from the current-carrying wire, but acted at right angles to it. Orsted's slightly obscure words were that "the electric conflict acts in a revolving manner." The force also depended on the direction of the current, for if the flow was reversed, then the force did too.

Orsted did not fully understand his discovery, but he observed the effect was reciprocal: a current exerts a force on a magnet, and a magnetic field exerts a force on a current. The phenomenon was further investigated by Ampère, who discovered that two parallel current-carrying wires exerted a force upon each other: two wires conducting currents in the same direction are attracted to each other, while wires containing currents in opposite directions are forced apart. The interaction is mediated by the magnetic field each current produces and forms the basis for the international definition of the ampere.

The electric motor exploits an important effect of electromagnetism: a current through a magnetic field experiences a force at right angles to both the field and current

This relationship between magnetic fields and currents is extremely important, for it led to Michael Faraday's invention of the electric motor in 1821. Faraday's homopolar motor consisted of a permanent magnet sitting in a pool of mercury. A current was allowed through a wire suspended from a pivot above the magnet and dipped into the mercury. The magnet exerted a tangential force on the wire, making it circle around the magnet for as long as the current was maintained.

Experimentation by Faraday in 1831 revealed that a wire moving perpendicular to a magnetic field developed a potential difference between its ends. Further analysis of this process, known as electromagnetic induction, enabled him to state the principle, now known as Faraday's law of induction, that the potential difference induced in a closed circuit is proportional to the rate of change of magnetic flux through the loop. Exploitation of this discovery enabled him to invent the first electrical generator in 1831, in which he converted the mechanical energy of a rotating copper disc to electrical energy. Faraday's disc was inefficient and of no use as a practical generator, but it showed the possibility of generating electric power using magnetism, a possibility that would be taken up by those that followed on from his work.

Faraday's and Ampère's work showed that a time-varying magnetic field acted as a source of an electric field, and a time-varying electric field was a source of a magnetic field. Thus, when either field is changing in time, then a field of the other is necessarily induced. Such a phenomenon has the properties of a wave, and is naturally referred to as an electromagnetic wave. Electromagnetic waves were analyzed theoretically by James Clerk Maxwell in 1864. Maxwell developed a set of equations that could unambiguously describe the interrelationship between electric field, magnetic field, electric charge, and electric current. He could moreover prove that such a wave would necessarily travel at the speed of light, and thus light itself was a form of electromagnetic radiation. Maxwell's Laws, which unify light, fields, and charge, are one of the great milestones of theoretical physics.

Task 2. Vocabulary

discovery - открытие
interaction - взаимодействие
needle - игла
reciprocal - взаимный
exert - приводить в действие
exploit - деяние
mercury - ртуть
flux - течение
pivot - болт, штифт
loop - петля
rotate - вращаться
milestone - камень с указанием ч.л

Task 3. Answer the questions

a) What did Orsted discovered in 1821?
b) What did Faraday invent in 1821?
c) Who analyzed electromagnetic wave?
d) What is Maxwell’s law?
e) What did Faraday do in 1831?

Task 4. Define, whether the following statements are true (T) or false (F):

	T	F
a) Faraday's and Ampère's work showed that a time-varying magnetic field acted as a source of an electric field, and a time-varying electric field was a source of a magnetic field.		
b) Orsted not fully understood his discovery, but he observed the effect was reciprocal: a current exerts a force on a magnet, and a magnetic field exerts a force on a current.		
c) Electromagnetic waves were analyzed theoretically by James Clerk Maxwell		
d) This relationship between magnetic fields and currents is extremely important, for it led to Michael Faraday's invention of the electric motor in 1821		
e) Maxwell's Laws, which unify light, fields, and charge, are one of the great milestones of theoretical physics.		
f) Faraday's disc was inefficient and of a great use as a practical generator, but it showed the possibility of generating electric power using magnetism, a possibility that would be taken up by those that followed on from his work.		

Task 5. Summarize all the information, received from the text in the written form

Unit 10

Task 1. Read and translate the text:

Electricity usages

The light bulb, an early application of electricity, operates by Joule heating: the passage of current through resistance generating heat

Electricity is an extremely flexible form of energy, and has been adapted to a huge, and growing, number of uses. The invention of a practical incandescent light bulb in the 1870s led to lighting becoming one of the first publicly available applications of electrical power. Although electrification brought with it its own dangers, replacing the naked flames of gas lighting greatly reduced fire hazards within homes and factories. Public utilities were set up in many cities targeting the burgeoning market for electrical lighting.

The Joule heating effect employed in the light bulb also sees more direct use in electric heating. While this is versatile and controllable, it can be seen as wasteful, since most electrical generation has already required the production of heat at a power station. A number of countries, such as Denmark, have issued legislation restricting or banning the use of electric heating in new buildings. Electricity is however a highly practical energy source for refrigeration, with air conditioning representing a growing sector for electricity demand, the effects of which electricity utilities are increasingly obliged to accommodate.

Electricity is used within telecommunications, and indeed the electrical telegraph, demonstrated commercially in 1837 by Cooke and Wheatstone, was one of its earliest applications. With the construction of first intercontinental, and then transatlantic, telegraph systems in the 1860s, electricity had enabled communications in minutes across the globe. Optical fiber and satellite communication technology have taken a share of the market for communications systems, but electricity can be expected to remain an essential part of the process.

The effects of electromagnetism are most visibly employed in the electric motor, which provides a clean and efficient means of motive power. A stationary motor such as a winch is easily provided with a supply of power, but a motor that moves with its application, such as an electric vehicle, is obliged to either carry along a power source such as a battery, or by collecting current from a sliding contact such as a pantograph, placing restrictions on its range or performance.

Electronic devices make use of the transistor, perhaps one of the most important inventions of the twentieth century, and a fundamental building block of all modern circuitry. A modern integrated circuit may contain several billion miniaturized transistors in a region only a few centimeters square.

Task 2. Vocabulary

light bulb - лампочка
huge - огромный
incandescent light bulb - лампочка накаливания
danger - опасность
replace - заменять
hazard - опасность
electric heating - электронагрев
versatile - многосторонний
refrigeration - охлаждение
air conditioning - кондиционирование воздуха
optical fibre - оптоволокно
satellite communication - спутниковое общение
electric vehicle - электрический транспорт
integrated circuit - интегральная схема

Task 3. Answer the questions

a) What is a light bulb?
b) What happened in 1870?

c) Why did a number of countries, such as Denmark, have issued legislation restricting or banning the use of electric heating in new buildings?

d) What are Joule heating effects?

e) What is electric motor?

Task 4. Define, whether the following statements are true (T) or false (F):

	T	F
a) The light bulb, an early application of electricity, operates by Joule heating: the passage of current through resistance generating heat		
b) Electronic devices make use of the transistor, perhaps one of the most important inventions of the twentieth century, and a fundamental building block of all modern circuitry		
c) The effects of electromagnetism are most visibly employed in the electric motor, which provides a clean and efficient means of motive power		
d) The invention of a practical incandescent light bulb in the 1870s led to lighting becoming one of the first publicly available applications of electrical power		
e) Optical fiber and satellite communication technology have taken a share of the market for communications systems, but electricity can be expected to remain an essential part of the process.		

5. Summarize all the information, received from the text in the written form

Unit 11

Task 1.Read and translate the text:

Electrical phenomena in nature

Electricity is not a human invention, and may be observed in several forms in nature, a prominent manifestation of which is lightning. Many interactions familiar at the macroscopic level, such as touch, friction or chemical bonding, are due to interactions between electric fields on the atomic scale. The Earth's magnetic field is thought to arise from a natural dynamo of circulating currents in the planet's core. Certain crystals, such as quartz, or even sugar, generate a potential difference across their faces when subjected to external pressure. This phenomenon is known as piezoelectricity, from the Greek *piezein* (πιέζειν), meaning to press, and was discovered in 1880 by Pierre and Jacques Curie. The effect is reciprocal, and when a piezoelectric material is subjected to an electric field, a small change in physical dimensions take place.

Some organisms, such as sharks, are able to detect and respond to changes in electric fields, an ability known as electroreception, while others, termed electrogenic, are able to generate voltages themselves to serve as a predatory or defensive weapon. The order Gymnotiformes, of which the best known example is the electric eel, detect or stun their prey via high voltages generated from modified muscle cells called electrocutes. All animals transmit information along their cell membranes with voltage pulses called action potentials, whose functions include communication by the nervous system between neurons and muscles. An electric shock stimulates this system, and causes muscles to contract. Action potentials are also responsible for coordinating activities in certain plants and mammals.

Task 2. Vocabulary

touch - прикосновение

friction - трение

chemical bonding - химическая связь

electric eel - электрический угорь

mammals - млекопетающие

Task 3. Answer the questions

a) Who invented electricity?

b) What is piezoelectricity?

c) Who can detect and respond to changes in electric fields?

Task 4. Define, whether the following statements are true (T) or false (F):

	T	F
a) Electricity is a human invention		
b) Some organisms, such as sharks, are able to detect and respond to changes in electric fields, an ability known as electroreception, while others, termed electrogenic, are able to generate voltages themselves to serve as a predatory or defensive weapon.		
c) Action potentials are also responsible for coordinating activities in certain plants and mammals.		

Task 5. Summarize all the information, received from the text in the written form

Unit 12

Text 1

Task 1. Read the text.

How Energy Is Used

If the world's population growth continues at the current rate and energy conservation does not improve, the worldwide demand for energy will more than double by the year 2020. Not all countries use energy in the same way. In industrialized nations, energy is used about equally for three purposes: (1) residential and commercial, (2) industrial, and (3) transportation. In less-developed nations, most the energy used is for residential purposes. In developing countries, most of the energy is for industrial purposes.

Different nations vary in the amount of energy they use as well as in what uses they make of the energy. To maintain their style of living, individuals in Canada and the United States use about twice as much energy as someone in France or Japan and over twenty-five times as much energy as a person in Africa.

Task 2. Decide where the following statements are true or false.

	T	F
1. World’s demand for energy is constantly growing.		
2. The world’s population growth is one of the most important factors influence the energy demands.		
3. Energy is used equally for different purpose.		
4. Industry is the main energy consumer in developing country.		
5. In Japan and France less energy is used for residential purposes than in Canada and the United States.		

Task 3. Read the text again and try to answer the following questions.

What factors influence the worldwide demand for energy?

How do the industrialized nations distribute their energy resources?

Why is most of the energy in developing countries used for industrial purposes?

Could you explain the fact that in such countries as France or Japan less energy is used for residential purposes in comparison with Canada and the United States?

Text 2

Task 1. Read the text.

Residential and Commercial Energy Demand

The amount of energy required for residential and commercial use varies greatly throughout the world. A country with a |high GNP uses a lower percentage of its energy per capita for residential and commercial needs than a less-developed country. For example, about 30 percent of the energy used in North America is for residential and commercial energy, while in India, 90 percent of the energy is for residential uses. The types of uses that different nations make of residential and commercial energy also vary widely. Of the residential and commercial energy usage in North America, 75 percent is for air conditioning, refrigeration, water heating, and space heating. In India, almost all of the energy used in the home is for cooking since the scarcity and high cost of fuel precludes uses for other purposes.

Therefore, when residential and commercial energy conservation is considered, the current pattern of energy use in the region of the world determines the type of conservation methods that could be effective. In Canada, which has a cold climate, 40 percent of the residential energy is used for heating. Proper conservation practices could reduce this by 50 percent. In Africa, almost half of the energy used in the home is for cooking. Using more efficient stoves instead of open fires could reduce these energy requirements by 50 percent. North Americans and people in other developed countries also could reduce energy consumption in many ways.

Task 2. Match the words from two columns.

A	B
commercial	countries
energy	conditioning
water	conservation
air	methods
energy	requirements
developed	energy usage
conservation	heating

Task 3. Number the following ideas depending on the order in which they appear in the text.

People in developed countries could reduce energy consumption in many ways. ☐

Conservation methods can reduce the residential energy usage for heating by 50 percent. ☐

The types of effective conservation methods depend on the current pattern of energy use in the region. ☐

More efficient stoves could reduce residential energy requirements in Africa. ☐

The energy demands for residential and commercial use are not the same in different countries of the world. ☐

In North America three quarters of residential energy usage is for ☐

different electrical appliances.

In India greater percentage of energy is used for residential uses. ☐

Text 3

Task 1. Read the text.

Industrial Energy Demand

The amount of energy used for industrial processes varies considerably. Nearly 60 percent of all the commercial energy used in the former Soviet Union is used by industry. In addition, many of the industrial processes used in the former Soviet Union are not energy efficient. In the United States, about 30 percent of the energy is used by industry. Therefore, replacing obsolete machinery in the former Soviet Union would lessen energy demand more than similar measures in the United States.

The types of industrial processes in various countries are major factors in the energy demand of those countries. In the former Soviet Union, which has large coal, oil, and natural gas reserves, steel is processed from ore because energy is readily available. Spain and Italy, on the other hand, lack large deposits of fossil fuel and produce steel from scrap steel because it requires less energy. Producing 1 metric ton of steel from iron ore in the former Soviet Union uses twice as much energy as producing a metric ton of steel from scrap in Spain or Italy.

Large capital investment is necessary to upgrade processes and reduce industrial energy consumption. Many countries cannot afford to convert to a more efficient method. For example, India, a nation with few coal deposits, still uses the outdated open-hearth furnace to produce steel. This requires nearly double the worldwide energy average for producing a metric ton of steel. Yet, the high cost of converting to modern methods forces India to continue to use this energy-expensive method.

Task 2. Complete the following sentences, using your own words.

1. As many of the industrial processes used in the former Soviet Union are not energy efficient, ……………………………………………………………………
2. Energy demand for industrial processes in the former Soviet Union can be lessen if …………………………………………………..…………………….
3. The major factors in the energy demand for industry are ……………………..…………………………………………………………………
4. In Spain and Italy steel is produced from scrap steel because ………………………………………………………………….…………………………
5. Considering the production of steel in the former Soviet Union and in Spain or Italy, we can definitely say that …………………………… ………………….…………………………………………………………………

Task 3. Explain the meaning of the following words and phrases.

energy demand

obsolete machinery

scrap steel

capital investment

energy consumption

outdated furnace

energy-expensive method

Additional texts

MY ACADEMY

Let me tell you about my Academy.

Its full name is Kharkov National Municipal Academy. I am really glad that I study here. It is one of the finest country's higher educational institutions.

Studying at our Academy provides a solid background in all spheres of knowledge and prepares for practical work.

Our Academy is quite large and old. First it was an All – Ukrainian Technical College of Municipal Engineers. It was in 1922. Later, in 1930, it was rearranged into Kharkov Institute of municipal economy engineers. Now it is a large school where more than 5,000 students are currently enrolled. About 3,000 are full-time students, like me, and the rest are the students of distant education. There are also about… graduate students. They carry out independent research work and have pedagogical practice.

The course of study in my Academy lasts five years.

There are many faculties in my Academy.

These faculties are:

- Economics Faculty
- Management Faculty
- Engineering Ecology Faculty
- Urban Planning and Development Faculty
- Electric Transport Faculty
- Urban Electric Power Supply and Lighting Faculty
- Correspondence Department
- The Department of Upgrading Skills
- The Preparatory Department

Our Academy is large and we have several multi-storey buildings. Lectures and seminars are held there. There are many large halls so that students of three or four groups together can fit in there. And that is more than 100 people.

The acoustics in such large halls is very good, but sometimes it is very noisy when students chat during the lecture.

We also have laboratories which are equipped with up-to-date equipment and students can carry out lab works and conduct various experiments there.

The students from my group do their own research work.

There are several snack-bars at the Academy and one canteen. The food is tasty and affordable there.

There are also several hostel buildings where students from other cities live. Some students rent an apartment. But you know already that I live neither in a hostel nor in an apartment.

I am a Kharkovite and live with my family.

EVERYDAY ENGLISH AND TECHNICAL ENGLISH

At present, the contacts between people of different countries are increasing. This enhances the importance of the study of foreign languages we should take into consideration. The matter is that the total number of languages in the world is very large. In different reference books it varies from five to eight thousands. The numerical distribution of people speaking different languages is extremely uneven. There are not many languages in the world each of which has more than 50 million people. On the other hand, there are languages spoken by only several thousands of people. To the first group belong such languages as English, French, Russian, Ukrainian, etc.

Everyone should understand that for the linguist there are no big or small languages. For each people the language is not only a means of communication, but also an embodiment of national and cultural values. Nevertheless, when we have to decide which of the world’s languages to study, we take into consideration the differences in the social and functional status of each language.

When we consider English, we cannot disregard the fact that the English language is spoken by more native speakers than any other language except, presumably, North Chinese. English is native or the first language for most population of Great Britain, USA, Canada, Australia, and New Zealand. Besides, there are many areas, former British colonies (India, Nigeria, Ghana) where English is not a native language, but a second language with official status in education and administration, and for communication between speakers of other languages. If we take into account the important factor of speakers of English as a foreign language, it is most widely spread of the world’s languages.

English is one of the five official languages of the UNO (alongside of French, Russian, Spanish and Chinese). It is the working language during the meetings of the General Assembly and Security Council of the UNO. No wonder that so many people in various countries spare no efforts to acquire English for communication.

In Ukraine, higher schools students and postgraduates are trained to have a good knowledge of English, to read and use professional literature in their practical activity.

Technical English is often said to be difficult to understand. At first sight this may seem true. There are a number of reasons why technical writing is rather difficult. It concerns first of all its vocabulary.

The scientific and technical progress has enriched the vocabulary with a great deal of new words, new meanings and new word-combinations. Scientists and technologists also use many ordinary, everyday words to denote new terminological meanings.

Each branch of science and technology has its own vocabulary (terminology). Many of them are formed on the basis of Greek or Latin words and are often international.

Some technical words, such as *power, stress, strain, movement,* etc. borrowed from everyday English sometimes cause much greater difficulty than terminology. In addition to terms, a text on some special problem usually contains so-called learned words, such as *approximate, compute, feasible, exclude, indicate, initial, respectively*, etc.

As to grammatical patterns and models, they are the same as in everyday English. There is, certainly, a difference in the frequency with which certain grammatical forms occur.

Scientific and technical writing is usually about things, matter, natural processes, and it is impersonal in style. The Passive Voice of verb forms, the constructions Subject and Complex Object are frequently used.

Simple sentences are rarely used, for isolated facts or events are seldom dealt with by the engineer. He has to show what the connection is, not only what happens, but also how it happens, when it happens, why it happens, and what is being affected.

The style of most texts, besides being impersonal, is also very concise. It is because the author-scientist is writing primarily for other scientists.

In order to master technical English the learner must first acquire a thorough knowledge of everyday literary English with its grammar, vocabulary and rules of word formation. Then it will be easy for him to learn, step by step, the peculiarities of technical English. But understanding and translation of scientific-technical literature requires an additional training connected with knowledge of specific terminology.

THE ETHICS AND SOCIAL RESPONSIBILITY OF SCIENTISTS AND TECHNOLOGISTS

Modern scientific and technological progress has raised a complicated problem of the social responsibility of scientists. Here are some of them: How far are scientists responsible for the application of their work? If they are how they can best fulfill this responsibility? What is the ethics of scientific exploration, how is it related to the universal ethical values of mankind? Finally a number of scientists have raised the problem of the socio-ethical control of research referring to man, the justification for a moratorium on some fields of research threatening man and the entire mankind. Is such control possible in whatever form? Will it not restrict the freedom of research? How is this freedom related to the social and humanistic responsibility of scientists and technologists?

The very fact that these specific problems are raised at all levels with increasing clarity shows the dissatisfaction with the idea that science is a self-contained and absolute value, a sphere of unadulterated knowledge independent of all other values of humanity and standing above them.

Scientists are realizing more and more clearly the indisputable fact that their social responsibility, the role of the ethical principle in science should grow in geometrical progression, if mankind and science itself are to develop at least in arithmetic progression. The ethics of science is being asserted as a *sine qua non* of effective performance of humanistic-oriented scientific research. There is no alternative to this either for science or for humanity.

In mastering nuclear energy man has developed a power which, unless controlled by his intellect, could extinguish life and snuff out our planet's blue glow. This idea is convincingly proved by the disaster at the Chornobyl atomic power station in Ukraine. Such accidents take place from lack of knowledge in the fields of natural and technical sciences or from lack of consciousness about the negative consequences of the application of the scientific and technological innovations.

In the event of war, the last lines of civilization's history will be written in thermonuclear ink.

So it is not without reason that modern science is compared to Pandora's Box. Indeed, its eternal curiosity compels mankind to learn what is there beyond the Pillars of Hercules. But has mankind enough common sense, social responsibility and self-control to resist the temptation of dangerous curiosity? This is, in effect, a life-and-death question for mankind.

Science and technology by themselves are not a source of ethics and values. They can tell you what will happen if you do this or that: for instance, how many people might be killed by a nuclear bomb- But the decision on whether to develop the bomb cannot be a scientific decision. This can only be judged by something outside science — ethics. Scientists and technologists should be aware of the consequences of their discoveries, projects.

Hence the crucial importance is attached to-day to the problem of socio-ethical control of science with a view to its humanistic orientation and development as a science for man. We need a new ethics and it must be many-sided. The belief that only one idea is true is tremendously dangerous. If you have only one way of looking at the world you abuse it. The new ethics must recognize that there are many ways out of the human predicament, which present different aspects of the same situation.

Only on the basis of such an ethical attitude can we solve the problems which threaten the world today — the destruction of the environment, drugs, AIDS, totalitarism. It is our duty to share a better world for all of us here on Earth.

UKRAINIAN NAMES IN WORLD SCIENCE

Rich is Ukraine in talented people, men of genius, devoted heart and soul to their native land. Scientists and inventors, engineers and architects, singers and composers, writers and poets did their best to raise national science, culture, art to the highest world standards. They did it in and out of this country, within its borders [s] and far away — in many parts of the whole wide world.

The sons and daughters of this blessed land made an endless row of contributions to other people's civilizations, stimulating their growth, enriching their spiritual world, raising their life standards and well-being. The Ukrainian people's cultural and economic ties with other nations went down in history for many centuries, they existed from time immemorial, growing, developing, and strengthening, now on the upsurge, now on the down-grade.

Yuri Kotermak — named Drohobych after his native land, - a well-known astronomer, philosopher and medicus, Rector of Bologna University in the 15th century, was one of the first to pave the way into world science.

Historical events, tragic, dramatic, unforeseen and unfavourable for the gifted people's descendants made many Ukrainians either leave their Homeland, or stay away ^in other countries. Absorbing other nations' culture and science, language and mode of life, Ukraine's intellectuals spared no effort to advance the peoples who sheltered them, gave them a chance to display their best natural qualities, let them contribute to the realm of knowledge and wisdom. America and Canada, Great Britain and Australia, Germany and France, Italy, as well as many other countries of East and West benefited and continue to benefit from Ukraine's descendants, from their strength of mind and intellect. Within their native land and outside its borders Ukrainian men of genius have been restlessly making contributions to world science.

To mention but a few we shall remember the names of Stepan Tymoshenko in the USA whose works *Strength of Materials* and *The History of the Strength of Materials* have become textbooks for the generations of students, Ivan Puluy in Austro-Hungary and Czechoslovakia whose inventions preceded those of Wilhelm Roentgen, as well as many others.

There were such Ukrainians in our land whose discoveries paved the way into outer space, whose inventions promoted the further steps in space exploration: — a hero of the 1812 War General Olexandr Zassyadko, a freedom fighter,-member of *Naradna Volya (People's Will)* **Mykola** Kybalchych, Kostyantyn Tsiolkovsky whose ancestor was Severyn Nalyvaiko.

Quite a special place belongs to the man of dramatic fate Yuri Kondratyiik (Olexandr Shargey) whose scientific exploit was duly appreciated by Academician Boris Rauschenbach. A man of tragic circumstances himself Rauschenbach wrote that it was Kondratyuk who suggested the idea of creating **a** base round the Moon and not on the Earth, to ensure the rocket starts for the

Moon. Kondratyuk's idea was later realized in the *Appollo* flight programme many years after the author had been killed in action at the front.

Among other brilliant scientists who were working in this field and who gained breath-taking results were Serhiy Korolyov, a constructor of cosmic systems, Academician Arkhyp Lyuika, a turbojet engines constructor, Lieutenant-General Mykola Dukhov, one of the creators of the atomic bomb.

Very near cosmic research stands another *flying* branch of scientific investigation — aviation and its affiliated domain hydronavigation. Most famous names here are Fedir Tereshchenko who constructed a monoplane with parameters far surpassing the existing models (as far back as 1913) and Dmytro Hryhorovych, a graduate of the Kyiv Polytechnic Institute, who constructed a seaplane (airplane rising from and alighting on water) for the first time in aeriel navigation.

And it was in Ukraine that such gigantic airplanes were brought into being and use, as *Antsy, Ruslan, Mriya (Dream).* Quite unexpected is the turn at recent times to the long-forgotten kind of aviation — airships (dirigible balloons). Super-light (deltaplanes) and *wingless* aviation attracts Ukrainian plane-constructors' positive attitude and serious attention owing to such characteristic features of airships as practically unlimited weight-lifting ability, distance and time of flight, vertical start and landing. Today airships are built in such industrially developed countries as the USA, Canada, Great Britain, Germany, China and many others.

Among other illustrious personalities in Ukrainian science, Volodymyr Vernadsky's name deserves a special reverence for his indomitable scientific courage, for his abitity to foresee the development of human knowledge, for his efforts, to foretell the future of mankind and its ways of progress.

The above mentioned names are only a few stars in the constellation of genius representing Ukrainian science in the world.

INFORMATION EXPLOSION AND DATA PROCESSING IN MODERN TECHNOLOGY

An outstanding characteristic of modern society is the powerful flow of knowledge and information in different fields of human activities. Information is often called the lifeblood of modern civilization. It plays an ever increasing part in everyday life, management of business, etc.

The scientific activity, with all its technical and economic outcomes and consequences, is today passing through a period of particularly rapid development. For instance, over the past 150 years the range of human, knowledge has been doubled every twelve to fifteen years. In 1930, man knew four times as much as he did in 1900; by I960 man's knowledge had grown six fold and by the year 2000 it can be expected to be a hundred times what it had been a century ago.

The present-day information explosion must be properly dealt with. To handle the information flow properly and instantly, to help specialists find immediately an information and data needed urgently a multiple of machines have been invented. They are now widely used for this purpose.

The computer, with its million fold increase in man's capacity to handle information, undoubtedly, holds the first place. Without the computer, data and information processing would be impossible, say, in space- programs. It is the phenomenal speed of computers that makes them practically well suited to pursuing activities that requires instant solution to complex dynamic problems. They are extensively used in the control and monitoring of space vehicles. Computers are ideal for high-volume computing tasks such as the computation and analysis of statistical and mathematical data as well as scientific and engineering calculations.

For example, before production can be started in the factory, raw materials and parts have to be procured; this involves the data processing system in the preparation of purchase orders. When supplies are received they have to be recorded on appropriate stock or job records, which again involve data processing.

When production is due to begin materials and parts have to be issued to the production centers and suitability recorded on issue notes which are subsequently recorded on stock and job records. The issues are often priced and extended. These are also data processing operations.

In the industry, for instance, one of the new generations of press control combines a menu-driven press computer with a programmable press controller. The press control system monitors all vital functions of the stamping system. . It provides an infinite capacity for storing all your setup information.

Total system diagnostics are enhanced by the computer to provide on screen remedies for identifiable problems. Not only do you know why the press has stopped, but now you know where the problem is and how to remedy it.

On-line operating data are automatically recorded. You can now call up a report to tell all about the job while it is running and how long to completion. The computerized control system has the flexibility to meet all production needs; its configuration can be expanded to meet new requirements [v] for more information.

Thus information and data processing is a special activity performed by the administrative organization for the business as a whole. It is concerned with the systematic recording, arranging, filing, processing and dissemination of facts relating to the physical events occurring in business.

From the above said it can be concluded that data processing systems provide information and information provides the basis for managerial control of business operations to achieve corporate objectives as effectively as possible. This means making the most suitable decisions based on the information provided.

A management information system therefore embraces the data processing systems, control systems (using information provided by the data processing system), and decision-making based on the facts indicated by the control systems.

A data processing system in-its simplest form consists of three primary elements: input, processing and output. These elements apply whether the system is manual, mechanical or electronic.

A computer system consists of five elements, viz. input, processing, output, storage and control.

It is absolutely necessary for every active member of modern society to be able to use the computer system in data (information) processing and management.

THE NEED FOR COMPUTER LITERACY IN MODERN SOCIETY

The introduction of new procedures and new technology is said to be disruptive. Many people, particularly the older generation, cannot and do not want to change their ways of life. They tend to be afraid of the new systems. They believe that they won't be able to learn the new skills and will appear awkward and dumb. Nevertheless, changing technology tends to enforce this on them.

The introduction of computers is said to follow that pattern. Slowly but surely, however, computers have crept into our life. The microcomputer is now widely accepted as a very efficient device for performing many types of operation, such as the display of business and other information from a data base. It is used for performing computations of varying types at high speed including professional, scientific, engineering and accounting calculations. It is employed for mathematical calculations for the classroom as well as for word processing in typing and secretarial departments.

In business the computer is known to be a means increasing administrative efficiency, payroll processing, sales, etc.

Therefore the pressure on those who still are unfamiliar with computers and their use is ever greater. So almost everyone will need to become familiar with data processing and computing, particularly micro computing, to a greater or lesser extent. No matter whether we need it in the home, office, school, college or factory, it will be almost as common place to use a computer as it is to drive a car.

Computers today are said to become more and more user *friendly*. That is they are becoming much easier to use and understand. To use a computer in the past, one had to learn computer languages such as FORTRAN (FORmula TRANslation) or COBOL (COmmon Business-Oriented Language). The learning process was slow, errors were plentiful; and the whole process was difficult for many students.

Today's computers are much easier to use. Focus in many schools is shifting away from programming computers to using them for managerial decision making a more enjoyable high-level function. Clerks do not need to become involved with the programming of computers as this is the prerogative of the systems staff. Package programs may be used for the various applications in most instances.

Let's make acquaintance now with some of the terms and uses of computers, robots, and other high-tech equipment in today's organizations.

Here are selected computer languages:

Ada: A goverment (especially military) computer language; ALGOL (Algorithmic Language): math-oriented language used most often for larger computers;

APL (A Programming Language): IBM-devised language useful for math;

BASIC (Beginners All-purpose Symbolic Instructional Code); used mostly for math and statistics; COBOL (Common Business-Oriented Language): used for business applications such as billing, payroll, or inventory;

FORTRAN (Formula Translation): used most often for scientific problems;

LISP: Advanced artificial intelligence language for programs that deal with human languages;

LOGO: Language useful for graphics; widely used in schools;

RASCAL: Language that teaches a structured approach to programming;

PL1 (Programming Language 1): similar to ALGOL, but handless business files better;

PROLOG (Programming in Logic): basic artificial intelligence program.

Due to computer application, a lot of new jobs have appeared. Some of the careers in computers, according to the government, will involve systems analysts. Systems analysts have the challenging job of analyzing the many functions of the firm and designing a computer system to perform those functions more efficiently. First the systems analysts study how the- job is now being performed. Then they design a system to do the job better. To do that, they must learn what information must be collected *and* processed, what output is needed, what computer capacity is needed, and the costs involved. Systems analysts must explain the system to the various computer users and tell the programmers what the system needs to do.

The greatest increase in computer jobs in the future may be for computer service technicians. During the last decades, companies were busy installing computers. Someone has to maintain and fix those computers. This is a great opportunity for someone to start his or her own service business.

Dozens of careers have evolved because of computers and the information revolution. Someone, for example, must teach people how to use computers (computer trainers). There are computer consultants who advise firms which computer to buy. Computer librarians keep track of all the tapes, disks, and other data storage devices. A data processing manager supervises the data processing center. Computer security specialists try to prevent computer crime. Technical writers write the manuals that tell how to use the computer. Naturally, there are also computer engineers who design computers and manufacturers that produce computers.

There is a device that allows people to stay at home and work with a computer at work. It is called a modem. A modem converts data into a form that can be sent over phone lines so that one computer can «talk» to another.

Another major revolution is occurring in the use of computers to run machines, including robots, i. e. the use of computer-driven machines to do work formerly done by humans. Robot technology has improved dramatically in the last few years. Today, *intelligent* robots are being used in factories. Some robots can *see* and *read* using cameras. One robot, for example, detects irregularities in welded seams and corrects any mistakes. Another robot reads identifying numbers in nuclear fuel rods. The newest robots can *feet* the difference between an egg and a piece of steel and handle each of them accordingly. Some robots even respond to voice commands. Computers linked with robots can perform dirty, difficult, repetitive tasks faster, cheaper, and better than people.

RECENT DEVELOPMENTS

The future is bright if new technologies in alternative fuels are exploited wisely around the world. Every country can meet the challenging energy demands of the future if national and local governments dedicate themselves to building power plants that use these renewable energy sources. In the U.S., following the creation of the Department of Energy in 1977, several important renewable energy sources were developed for industrial and residential power. In 1980, a geothermal plant that generates 10 megawatts of electricity was built in Brawley, California. Also in California in the early 1980s, more than 15,000 large wind generators with a combined capacity of 1,300 megawatts were installed near Palm Springs. The first commercial synthetic gas plant began operation in the state of North Dakota in .1983. After federal and state laws were passed giving tax credits for renewable energy users, manufacturing and shipments of solar panels increased by over 500 percent between 1982 and 1996. Tougher pollution laws gave an extra incentive to produce cleaner energy.

However, a drop in oil prices in the mid-1980s combined with government leaders more friendly to oil and gas companies than to alternative energy development policies led to the expiration of tax credits for solar collectors and the shutdown of the two largest solar dish plants. Still, there were signs for hope. By

1990, over 100 landfill methane power plants were in operation. Concerns about pollution and global warming have given operators of alternative energy plants added public support. Let's take a closer look at how various renewable energy technologies are being used around the world and how they might be used more widely.

SOLAR

Ultimately, almost all energy comes from the sun. The energy stored in coal, oil, and natural gas is the result of photosynthesis carried out by plants that lived hundreds of millions of years ago. Wind energy is actually the movement of the atmosphere driven by the heat from the sun. Currently solar energy is used two ways: for heat (thermal) and to generate electricity (photovoltaic). Solar rays can be directly thermal in two ways: actively as can be seen in the thousands of rooftop water heaters throughout Italy and Greece, and passively with proper design of homes and build-ings. Improvements in photovoltaic (or solar electric) panels continue to make this technology more applicable, especially for developing countries without widely established power grids that transport electricity generated at large public utilities. Increased efficiency of converting sunlight to electricity, using thin film silicon panels or copper indium thin film, has been an ongoing goal of several manufacturers of solar energy technology.

As technology has improved, the cost of using solar energy has dropped. In 1996, the average price of solar panels was one-tenth what it was in 1975. However, one concern about widespread use of solar panels to generate the large amounts of electricity needed for industries and cities is the environmental impact—they take up a lot of space and are highly visible. But this is an acceptable tradeoff because solar energy is totally clean and panels have a long lifespan. Panels are also easy to maintain for there are no moving parts, only moving electrons!

A more serious concern for widespread use is that solar energy is an intermittent energy source, as are wind and tides. Therefore, storage of excess energy or backup sources of energy are needed for times when there is not adequate sunshine for the panels to function efficiently. Improved battery technology has made use of photovoltaic panels easier for users in remote areas who live "off the grid" of the public utility company and need to store excess power. In some areas, users of solar panels who are connected to the grid may sell back any surplus power to the public utility company.

Development of thin film technology has made solar power viable for use in some forms of transportation (see Prospects for Transportation below). For all its advantages, however, solar power remains the least used of the main alternative energy sources.

MODERN BIOMASS

Biomass simply means fuel produced from organic sources. Traditional biomass such as wood, charcoal, and other plant matter has been the fuel of choice for thousands of years, and it remains so in many parts of the world. Modern biomass, however, includes other types of fuel derived from plants, such as the residues of existing agricultural, livestock, and lumber industries, from forests planted and harvested renewably, and from farms dedicated to this purpose.

Biomass needs to be produced on a sustainable basis, whether on deforested lands or on excess agricultural land, and never from virgin forests. Some of the most suitable locations are areas where widespread deforestation has already occurred, but there are still other possible sources of biomass. For example, residues from the processing of pulpwood, cereals, and logging operations can be processed into gas or burned in power plants to generate electricity. Methane from urban landfills and from animal and human wastes is another potential type of fuel derived from biomass, although the derivation of fuels from landfills requires the labor-intensive separation of various materials.

As an alternative to non-renewable energy sources, modern biomass may have the greatest potential for growth, especially in transportation and powering vehicles. For example, Brazil has been a leading nation in the use of ethanol (alcohol-based fuel) for automobiles. It is derived from sugar cane and grains grown specifically to produce ethanol. Biomass also looks promising as a fuel source for electricity if it is burned in small, local power stations.

SMALL HYDROELECTRIC

The high capital cost and environmental and social impact of large hydroelectric power plants (large dams) have made small hydroelectric power (SHP) an attractive alternative in recent years. Rather than building huge dams with lakes behind them that submerge entire towns or beautiful rivers and canyons, some countries have opted to generate electricity using small hydroelectric power plants. Switzerland has used the power of melting snow running off die Alps for years. According to a UNESCO survey conducted in China, about 800 of its 2,300 counties can be electrified using SHP and die government is giving preferential loans and tax exemptions to SHP developers.

Other countries are giving assistance for the development of small hydroelectric power. In Nepal, die government is providing loans and materials to SHP equipment manufacturers, and in Pakistan, the Ministry of Science and Technology has subsidized SHP construction. Similar efforts are occurring in the Andean region of Latin America and in Canada. All of these places are especially suited for small hydroelectric power generation because they have high mountain ranges. As the engineering and equipment required for SHP become more widespread, other countries with mountains and rivers should be able to take advantage of this clean source of electricity.

WIND

The use of wind energy is growing faster than any other type of renewable energy because of improvements in wind turbine technology over the past 20 years. The best locations for wind as an energy source are coasts, mountains, and plains. Like solar rays, wind is also a form of intermittent renewable energy, available only about 30 percent of the time. Often, when the sun isn't shining, the wind is blowing; so many users rely on wind turbines to complement solar panels.

Most of the world's wind generation capacity is located in the United States, Denmark (the pioneer in wind generation), the Netherlands (famous for its use of windmills), Germany, and India. While wind generation of electricity is clean, some disadvantages include the noise of the blades of windmills and the appearance. A large wind farm on a hillside is clearly visible, in the same way that large arrays of solar panels are. People who rely on wind-generated electricity, however, may not mind the view of clean energy being created.

GEOTHERMAL

Geothermal energy, or heat from the earth in the form of steam, has been used for many years for heating buildings. Geothermal energy is renewable only if the water that brings the heat to the surface as steam is replenished. A recent application of geothermal heating is in greenhouses. For example, a large flower-growing operation in the state of New Mexico uses geothermal energy to heat over ten hectares of greenhouses in the winter so that roses will be available for sale during major holidays in February (Valentine's Day), March or April (Easter), and May (Mothers Day).

In addition to heating, geothermal electrical generating facilities have been installed in over 20 countries and the potential for many more exists worldwide.

OCEAN

The sea could provide an abundant supply of renewable energy, but the large engineering challenges and negative effects on the ecology of coastal areas have limited its use. Thermal gradients, or currents caused by varying temperatures in the water, have the greatest potential as a source of renewable energy, especially in tropical areas. Large heat exchangers are required to capture the energy of thermal gradients. Tidal energy has the widest present application, because it uses dams and turbines similar to those now in use for hydroelectric power plants. The constant movement of the waves is the third possible form of energy from the ocean. Ocean energy has vast promise for the future but will need financial support from governments and cooperation between neighboring countries to handle the large start up costs and to overcome the negative environmental impact on bays, marshes, beaches, and marine animals.

WHERE DO WE GO FROM HERE?

What will it take for renewable energy sources to be exploited on a wider basis? International cooperation, through such organizations as the World Energy Council, is needed to coordinate policy planning, research and development, and economic assistance efforts. Also, changes are needed in the way that electric utility companies, petroleum companies, and automobile manufacturers operate.

Electric utility companies need to act as energy distributors as much as producers. They can integrate new renewable energy technologies into existing grids and ensure that new equipment is properly designed and efficiently connected. Large oil companies could also act as brokers for renewable fuels from diverse markets, for example, by helping to start bio-mass plantations on deforested or overgrazed lands in countries where they currently drill for oil. These international corporations could benefit local communities by providing jobs, engineering skills in chemical processing, and capital in exchange for the product they would market. Automobile manufacturers will need to make changes in existing practices by increasing their support for research and development of alternatives to gasoline cars and by making a genuine commitment to design changes to improve fuel efficiency.

Other renewable sources of energy, such as hydrogen-powered cars, are not yet sufficiently developed to meet the growing world demand for energy. But clearly, the production of vast amounts of energy using technology that exploits renewable sources will be needed as the world enters the inevitable post-fossil fuel future.

PROCESS CONTROL SYSTEMS

Control systems provide a means of replacing human operators in many industrial processes. They are widely used to monitor and control pressure, temperature, motor speed, the flow of a liquid, or any other physical variable. They must be capable of fulfilling a number of functions. First, the physical variable to be controlled, such as the air temperature in a factory or the pressure of a hydraulic system, must be measured. Then its value must be compared with the desired value. Next, action has to be taken to reduce to zero the difference between the actual and desired value.

The basic components of a control system are an input transducer, an error sensor, a controller and an output transducer. The input transducer converts changes in the physical variable into electrical signals. Figure 1 shows one type of transducer which converts changes in pressure to frequency changes. Pressure changes move the diaphragm in or out, thus altering the position of the ferrite core in L_t which forms part of a tuned circuit. This causes the frequency of the circuit to change, thus altering the output frequency of the oscillator. The output is then fed to an error sensor.

The error sensor measures the deviation between the actual and desired values for the variable. The controller receives the error sensor output and uses it to control the variable either directly or indirectly. A simple controller is an electromagnetic relay which uses a small signal to control a much larger signal such as a power supply output.

The output transducer converts the electrical output from the controller into whatever form of energy is required to change the physical variable. It may be a valve, a heater, a motor or any electrically operated piece of equipment. An example is a motor-operated valve which controls the flow of fluid in a pipeline.

Let us take as an example a process system for controlling the speed of a dc motor. The input transducer measures the speed and converts it into a voltage. The error sensor compares this voltage with the voltage across a speed-setting 30 potentiometer. The error sensor output is fed to the controller which sends a signal to the power supply of the motor. This increases or reduces the supply of current to the motor, thus controlling its speed.

The operation of a process control system is summarized in Figure 2 which shows a closed-loop system. In such a system the results of the action of the 35 controller are constantly fed back to it.

Vocabulary

A

air conditioning - кондиционирование воздуха

application - просьба

atoms - атомы

amperes - амперы

amber - янтарь

B

behaviour - поведение

battery - батарея

bioelectricity - биоэлектричество

C

chemical bonding - химическая связь

cage - клетка

conservative - консервативный

collision - столкновение

circuit theory - теория схем, теория цепей

charged - заряженный

computation - вычисление, расчет

conducting objects - предметы, проводящие электричество

conduct - проводить ток

copper - медь

charged particles - заряженные частицы

conventional current - обычное движение

charged particles - заряженные частицы

conductor - проводник

capacitance - ёмкостное сопротивлении

conserved quantity - сохраняющаяся величина

circuit - окружность, круг

capacitor - конденсатор

consequence - последсвие, результат

D

disturb - беспокоить

discovery - открытие

direction - направление

danger - опасность

draw - тяга

define - определять

device - устройство, приспособление

decay - гнить, разлагаться

deem - думать, мыслить

drift velocity - скорорть дрейфа

driving force - движущая сила

E

electric eel - электрический угорь

electric heating - электронагрев

electric vehicle - электрический транспорт

electricity - электричество

electric charge - электрический заряд

electromagnetic field - электромагнитное поле

electromagnetic induction-электромагнитная индукция

electric current - электрический ток

electric potential - электрический потенциал, напряжение

electromagnetism - электромагнетизм, электромагнитные явления

exert - приводить в действие

exploit - деяние

existence - бытие

emanate - истекать

electric shocks - электорошок

encourage - ободрять

electric arc - электрическая дуга, вольтова дуга

electrical conduction - элктропроводимость

electric charge - электрический заряд

electrometer - электрометр

electroplating - гальванопокрытие

electromagnetic force - электромагнитная сила

electrolysis - электролиз

electrons - электроны

electric motor - электрический мотор

F

friction - трение

foil - фольга

flux - течение

finite - ограниченный

fundamental force - основная сила

G

gold-leaf electroscope - электроскоп с золотыми листами

glass rod - стеклянная палочка

gap - брешь

galvanic cell - гальванический элемент

H

huge - огромный

hazard - опасность

heating - нагревание

I

invention - изобретение

integrated circuit - интегральная схема

in honour - в честь

infinity - бесконечность

inductance - индуктивность

incandescent light bulb - лампочка накаливания

induce - побуждать, склонять

interaction - взаимодействие

ions - ионы

inductance - индуктивность

J

jolt - толчок

K

L

light bulb - лампочка

loop - петля

link - соединять

lightning - молния

linear - линейный

layer - слой

M

mammals - млекопетающие

mercury - ртуть

milestone - камень с указанием ч.л

measure - измерять

magnitude - величина

magnetic - магнитный

N

needle - игла

nerve cells - нейрон, нервная клетка

O

optical fibre - оптоволокно

P

path - тропинка

pivot - болт, штифт

positive part - позитивная частица

Q

R

refrigeration - охлаждение

relevant - важный

reference - ссылка на к.либо

replace - заменять

reciprocal - взаимный

rotate - вращаться

resistor - резистор, катушка сопротивления

return - возвращаться

resistance - сопротивление

rubbing amber - янтать для трения

S

subatomic particles - субатомные частицы

space - пространство

satellite communication - спутниковое общение

scalar - скалярный

stream out - вывалить

spike - острие

stroke - удар

switcher - перебежчик

semiconductor - полупроводник

static electricity - статическое электричество

store- запас, резерв

source - исток

strength - сила

speed of light - скорость света

static electricity - статическое электричество

steady state - устойчивое состояние

spark - искра

T

terminate - ограничивать

touch - прикосновение

time rate - разрядный ток данного режима

torpedo rays - электрический скат, электрический луч

V

voltaic pile - гальванический стол

versatile - многосторонний

voltage - электрическое напряжение

U

universe - мироздание

W

wire - провод

X

Y

Z

zinc - цинк

Список використаної літератури

1. Cadena, Richard. Electricity for the entertainment electrician & technician. - Oxford: Focal Press, 2009. - 271 p.
2. Modern dictionary of electronics / Rudolf F. Graf. - 7th edition revised and update. - Boston: Newnes, 1999. - 886 p.
3. Oxford Collocations Dictionary. - Oxford: Oxford University Press, 2005. - 897 p.
4. Oxford Dictionary of Synonyms and Antonyms. - Oxford: Oxford University Press, 1999. - 572 p.
5. Oxford Encyclopedic English Dictionary. – Oxford: Clarendon Press, 1991. – 1754 p.
6. Oxford English Dictionary. – Oxford: Clarendon Press, 1991. – 1015 p.

CONTENTS

Навчальне видання

МІЩЕНКО Костянтин Олександрович,

ПИСАРЕНКО Людмила Миколаївна

Збірник текстів і завдань для організації самостійної роботи з дисципліни **«Іноземна мова (за професійним спрямуванням)»** (англійська мова) (для студентів 2 курсу денної форми навчання напрямку підготовки 6.050701 «Електротехнічні системи електроспоживання», «Світлотехніка і джерела світла»).

Відповідальний за випуск к.філол.н. *І. О. Наумова*

Редактор *З. І. Зайцева*

Комп’ютерне верстання *Л. М. Писаренко*

План 2010, поз. 450 М

Підп. до друку: 29.06.2010 р. Формат 60 х 84 1/16

Друк на ризографі. Ум. друк. арк. 3,3

Зам. № Тираж 50 пр.

Видавець і виготовлювачі
Харківська національна академія міського господарства,
вул. Революції, 12, Харків, 61002
Електронна адреса: rectorat@ksame.kharkov.ua
Свідоцтво суб’єкта видавничої справи:
ДК № 731 від 19.12.2001