МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ
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АНГЛИЙСКИЙ ДЛЯ СТУДЕНТОВ, ИЗУЧАЮЩИХ РАДИОФИЗИКУ И КОМПЬЮТЕРНЫЕ НАУКИ

Учебно-методическое пособие по курсу "Иностранный язык"

Рекомендовано методической комиссией
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Настоящая работа состоит из четырёх разделов, включающих 40 текстов с заданиями к каждому из них. Пособие ориентировано на студентов начального этапа обучения. Содержащиеся в нём тексты связаны с основными разделами физической науки, с компьютерной тематикой и телекоммуникацией, с выдающимися открытиями в соответствующих областях знаний и биографией всемирно известных учёных.

Предлагаемая система заданий направлена на формирование и развитие навыков чтения и перевода профессионально-ориентированных текстов, совершенствование произношения, лексической и грамматической стороны речи.

Учебно-методическое пособие предназначено для студентов радиофизической специализации, обучающихся английскому языку по программам бакалавриата и специалитета.

Ответственный за выпуск:

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ВВЕДЕНИЕ

Данное учебно-методическое пособие содержит материалы для обучения английскому языку студентов, специализирующихся в области радиофизики и компьютерных наук. Разделы пособия, соответственно, посвящены этим двум направлениям их профессиональной подготовки. Дополнительные тексты также связаны с избранной специальностью. Способствуя расширению научного кругозора, они позволяют судить о направлении и ходе научной мысли в исторической перспективе, от предшествующих периодов до наших дней.

Представленные в пособии тексты и задания по уровню сложности соответствуют начальному этапу обучения английскому языку в условиях вуза и базируются на знаниях, предусмотренных программой средней школы.

Одним из условий выполнения заданий является владение лексическим и грамматическим минимумом в объёме предшествующего периода обучения. В работе над грамматическими упражнениями в качестве справочных материалов могут использоваться учебники по грамматике, приведённые в списке использованной литературы, а также любые другие нормативные грамматики современного английского языка.

Предполагается также предварительное ознакомление с грамматическим материалом предстоящего задания и его частичное выполнение во время аудиторных занятий под руководством преподавателя. Полностью все задания выполняются студентами во внеаудиторное время в самостоятельном режиме подготовки.

При работе над материалами пособия следует уделять внимание произношению незнакомых и трудных для прочтения слов, чтению текста вслух, использованию транскрипционных символов: умению транскрибировать, т. е. передавать звучащее слово с помощью знаков транскрипции, с одной стороны, и с другой, умению озвучить его согласно приведённой в фонетическом упражнении транскрипции.

Результаты выполнения заданий пособия фиксируются в рабочей тетради студента, ведение которой рассматривается как важная часть текущей работы и учитывается при выведении оценки за семестр и учебный год. Регулярная и тщательная работа способствует успешному усвоению материалов пособия и подготовке к выполнению заданий контролирующего характера, включая устные словарные зачёты и письменные тесты по пройденному грамматическому материалу.

PART I. FOUNDATIONS OF PHYSICS

Text 1. THE SCIENCE OF PHYSICS

Sugar, rubber, glass, silver, milk, wood and modeling clay are all common substances. They are easy to tell apart and each one is useful in its own way. No one would think of trying to make an ink-pot out of milk, or a candle out of sugar. No one would make a bracelet out of modeling clay, a dinner plate out of silk. No one would try to drink wood or build a fire with water, no one would make a baseball bat of glass, or a baseball out of silver. Every substance has, what scientists call, properties of its own. Yet, all substances are alike in one way. They all weigh something, and they all take up room.

When scientists talk about all substances taken together, they use the word *matter*. Every substance is a kind of matter. The science of physics is partly a study of matter. It explains how water can evaporate and become a gas as well as how it can freeze and become a solid. It explains why some substances are solids, why others are liquids, and why still others are gases. It explains why butter melts more easily than iron, and where a lump of sugar goes when it is put into hot coffee. It explains why a tire is more likely to blow out on a hot day than on a cold one. It explains many of the changes that go on around us.

But physics is also a study of energy – of light, heat, sound, electricity, magnetism, of the energy of moving bodies, and of atomic energy. One of the commonest of all questions is, "How does it work?" Many, many times we must go to the science of physics to get the answer. And most of the answers have something to do with energy. How does television work? How fast does sound travel? How can a camera take a picture? What are cosmic rays? What are the problems in travelling through outer space? How does an airplane fly? These are a few questions that the science of physics answers.

Phonetics

I. Pronounce the following words according to the transcription.

glass [glɑːs] - стекло
rubber [ˊrʌbə] - резина; каучук
clay [klei] - глина
substance [ˊsʌbstəns] - вещество
weigh [wei]- весить
matter [ˊmætə] - вещество, материя
candle [kændl] - свеча
properties [ˊprɔpətiz] - свойства
evaporate, *v* [iˊvæpəreit] - испарять(ся)
freeze, *v* [friːz] - замерзать
liquid [ˊlikwid] - жидкость
solid [ˊsɔlid] - твёрдое тело
tire [tɑiə] - шина, покрышка

gases [ˊgæsiz] - газы
magnetism [ˊmægni¸tizm] - магнетизм
cosmic [ˊkɔzmik] - космический

Comprehension Check

II. Answer the following questions.

1. Why is it impossible to make all things out of one and the same substance?
2. What is a common name for all substances?
3. What does physics explain while studying matter?
4. What else does physics study, apart from matter?
5. What questions connected with energy does the science of physics answer?

III. Complete the following sentences.

1. Every substance is a kind of ...
2. Physics is a study of ...
3. Every substance has ...
4. Physics explains ...
5. Every substance is useful in ...

Vocabulary

IV. Match the following.

1. to have something to do with	a) брать в целом
2. to tell apart	b) космос
3. partly	c) быть похожим
4. to take up room	d) частично
5. to lump together	e) иметь отношение к
6. to be alike	f) различать
7. a kind of	g) занимать место в пространстве
8. likely	h) разновидность
9. outer space	i) вероятный

Grammar

V. Fill in the gaps with appropriate prepositions.

1. All substances take ... room.
2. Physics is a study ... matter.
3. A lump of sugar dissolves when it is put ... hot tea.
4. The explanations have something to do ... energy.
5. All substances are easy to tell ...
6. When water evaporates, it turns ... a gas.
7. Physics explains many things that are happening ... us.

VI. Give degrees of comparison of the following words (*adjectives and adverbs).*

Easy, common, useful, energetic, fast, few, difficult, cold, many, little, hot, light, slow, often, seldom, heavy, hard, soft, complicated, sharp, important, likely, simple, early, busy, clever, narrow, able.

VII. Put the verbs in the following phrases in the Past and Future tense forms.

1. water freezes;
2. the substance becomes a solid;
3. butter melts;
4. the substance weighs;
5. a tire blows out;
6. sugar dissolves;
7. sound travels;
8. an airplane flies;
9. the light goes down;
10. water evaporates;
11. the liquid becomes a gas;
12. the substance turns into a solid.

VIII. Put the following phrases in the Present, Past and Future Indefinite Passive forms.

Model: the water (to be heated): a) is heated b) was heated c) will be heated

	a	b	c
1. the solid (to be dissolved)			
2. the liquid (to be frozen)			
3. the metal (to be melted)			
4. the picture (to be taken)			
5. the problem (to be solved)			
6. the phenomenon (to be explained)			
7. the fire (to be made)			
8. magnetism (to be studied)			
9. the question (to be raised)			
10. the answer (to be given)			

Translation

IX. Translate the following sentences into English making use of the text.

1. Каждое вещество по-своему полезно.
2. Никому не придёт в голову сделать свечу из сахара или браслет из модельной глины.
3. Все вещества схожи в одном.

4. Физика объясняет, как вода испаряется и становится газом и как она замерзает и становится твёрдым телом.

5. Мы обращаемся к физике, для того чтобы получить ответы на все эти вопросы.

X. Translate the following sentences paying attention to the italicized words (*water, house, power, demand***).**

1. The *water* in the lake is said to have a healing effect.
2. These flowers should be *watered* once a week.
3. Large cities nowadays are confronted with the problem of *kitchen*, or *drinking water*.
4. I think that *soda water* does not appease thirst, but only increases it.
5. Nowadays, people prefer drinking *purified*, or *bottled water.*
6. A lot of citizens now live in multistorey *houses* called highrises.
7. The building *houses* several exhibition halls.
8. The leading *powers* are responsible for keeping peace in the world.
9. The Soviet scientists did all within their *power* to create an atomic bomb as soon as possible.
10. Several *power plants* were built on the Volga and other big rivers of the country.
11. Many regions are provided with electricity generated at *nuclear power stations,* or *plants.*
12. The bill adopted by the British Parliament limited the *power* of the King.
13. Physics deals with such notions as force, work, energy and *power.*
14. There is an increasing *demand* for physicists, mathematicians, engineers and IT specialists in Russia as well as in the whole world now.
15. The work of a computer specialist is very *demanding.*
16. Our dean *demands* that all students should be present at the meeting.
17. The problems of *demand* and supply are studied in Economics.

Revision

XI. Fill in the blanks choosing the corresponding pronoun: *you/ yours, their/ theirs, my/ mine, our/ours, her/hers, his.*

1. He broke my pen but gave me ...
2. Tell him not to forget ... ticket; she mustn't forget ... either.
3. He has lost ... book; perhaps, you can lend him ...?
4. Let them have your dictionary: they have left ... at home.
5. These seats are not ..., they are ... .
6. My luggage is heavier than ... .
7. We must get our bags. Here is your bag. And where is ...?
8. We've taken our books; has she taken ... ?
9. Here are our essays. This is your exercise-book, and that is ... .
10. I can't find my pencils. Has Alex found ...?
11. This is my sister's jacket. The hat is ... , too.

12. I haven't written my report yet. And is ... ready?
13. This isn't my pencil; ... is blue.

Text 2. ELECTRICITY – SOUND AND LIGHT

Flip a switch and a light goes on. It's simple, right? Wrong! Every time you flip a light switch, you make billions of little electrons go to work for you. Uncountable hours of work have gone into providing you with the electricity you need to turn that light on. Without electricity, you wouldn't have telephones, television, video games, and many other things you use every day.

What is Electricity?

Have you ever got a shock when you touched a doorknob, or seen sparks fly when you combed your hair? That's electricity. Electricity is a type of energy that gives things the power to work. This energy comes from electrons. Scientists have learned how to use electrons to produce electricity.

How Does It Work?

It takes billions of electrons to make electricity operate. Electrons move through an electric wire in much the same way water moves through a garden hose. Turning on the faucet pushes the water through the hose. Pushing electrons makes electricity move through the wire. The machine that pushes the electrons through the wire is called a generator. The wire from the generator goes to your home and into a control center, which is either a fuse box or a circuit breaker. The fuse box controls how much electricity you use. If you try to use too much, you will "blow a fuse," and the electricity from that fuse will be cut off. A circuit breaker works differently from a fuse box. A circuit breaker does not let you use too much electricity. It cuts off the flow before there's an overload. If you did not have a fuse box or a circuit breaker, your electric wires could overheat and start a fire! From the fuse box or the circuit breaker, the wires go inside your walls to light switches and sockets. Turning on the light switch lets the electricity flow to the light, and the light goes on. When you put a plug into a socket, electricity comes to the socket. But it doesn't flow into the lamp until the switch is turned on.

How Can We Use It?

Besides turning on lights, we can use electricity to carry sound. Sound is made by vibrations called sound waves. In a telephone, electricity picks up the sound waves from the speaker on one end and carries them to the receiver on the other end. The electricity moves so fast that you can hardly notice the time it takes to travel from one place to another. When you turn on your TV, you get both light and sound. Again, it is electricity that makes this possible, allowing you to see and hear your favourite shows!

What Does It Do?

Electricity makes so many things possible. Most of our food comes from farms that use machinery that runs on electricity. Most of our clothes are made in factories that need electricity to operate. It is hard to imagine what our lives would be like without electricity. Scientists have worked for hundreds of years to bring electricity

to us, and are still working to find new and better ways to produce the electricity that makes so many things happen.

Phonetics

I. Pronounce the following words according to the transcription.

electricity [i¸lek´trisiti] - электричество
electron [i´lek¸trɔn] - электрон
comb [kəum] - расчёска
through [ðru:] - через, по
circuit [´sə:kit] - цепь
generator [´dʒenə¸reitə] - генератор
vibration [vɑi´breiʃn] - колебание
machinery [mə´ʃi:nəri] - машинное оборудование
scientist [´sɑiəntist] - учёный

Comprehension Check

II. Answer these questions:

1. What is the most general definition of electricity?
2. What does it take to make electricity operate?
3. Where does energy come from?
4. What is a generator?
5. What could happen if you did not have a fuse box or a circuit breaker in your home?
6. What can electricity do besides turning on lights?
7. How is sound made?
9. What does electricity do in a telephone?
10. What is the role of electricity in our day-to-day life?
11. Why are scientists still working to find new and better ways to produce electricity?

III. Complete the following sentences.

1. Without electricity, you wouldn't have ...
2. Electricity is a type of energy ...
3. The energy comes from ...
4. Scientists have learnt how to use electrons ...
5. It takes billions of electrons ...
6. The machine that pushes the electrons through the wire ...
7. Besides turning on lights, we can use electricity ...
8. It is hard to imagine ...
9. When you turn on your TV, you get ...
10. Scientists have worked for hundreds of years ...

Vocabulary

IV. Match the following.

1. a fuse box	a) сделать короткое замыкание
2. a circuit breaker	b) такой же
3.wires	c) шланг
4. it takes	d) розетка
5. the same	e) штепсельная вилка
6. hose	f) провода
7. to cut off	g) выключатель
8. plug	h) прерывать
9. socket	i) требуется
10. to blow a fuse	j) перегрузка
11. light switch	k) перегреться
12. to run on electricity	l) работать на электричестве
13. overload	m) распределительный шкаф с предохранителями
14. to overheat	n) автоматический выключатель

V. Say if the word is a noun, a verb, an adjective or an adverb.

Operation, uncountable, production, generate, vibrate, electrical, differently, electronic, measurement, finally, frictional, acquaintance, automatic, possibility, explanation, hardly, calculate, appliance, scientist, evaporation, closely, portable, positive, strength, innovation, truly, voltage, proportionality, easily, conservation.

Grammar

VI. Fill in the blanks with appropriate prepositions.

1. Farms use machinery that runs ... electricity.
2. Sound is made ... vibrations called sound waves.
3. Electrons move ... an electric wire like water moves ... a garden hose.
4. Electricity flows ... the lamp when the light switch is turned ...
5. Factories are in need ... electricity to operate.
6. It is hard to notice the time it takes electricity to travel ... one place ... another.
7. Electricity comes ... the socket when you put a plug ... it.
8. Most ... our food comes ... farms that use electricity.
9. Most ... our clothes are made ... factories that run ... electricity.
10. It is hard to imagine our life ... electricity.

Translation

VII. Translate from Russian into English.

1. Требуются миллионы электронов, для того чтобы заставить электричество работать.
2. Нажми на выключатель и свет загорится.

3. Без электричества у нас не было бы многих вещей, которые мы используем в своей повседневной жизни.

4. Если вы попытаетесь использовать слишком много электричества, вы устроите короткое замыкание.

5. Без этих устройств провода могли бы перегреться и вызвать пожар.

6. Электричество используется также для передачи звука.

7. Когда вы включаете телевизор, вы видите свет и слышите звук.

8. В телефоне звуковые волны передаются от говорящего до адресата с помощью электричества.

9. Именно электричество позволяет нам смотреть и слушать любимые программы.

10. Современная жизнь была бы невозможна, если бы у нас не было электричества.

Revision

VIII. Fill in the blanks with reflexive pronouns (*myself, himself, herself, etc.).*

1. I will ask him ... .
2. She will answer the letter .... .
3. We'll find it ... .
4. Did you invite him ...?
5. He wants to do it ... .
6. They told me the news ... .
7. He defended ... bravely.
8. She hurt ... .
9. Be careful! Don't cut ... .
10. I saw it ... .
11. You said it ... .
12. I ask nothing for ... .
13. Don't hurt ... , Mary!
14. He bought ... a new coat.

IX. Write the plural forms of the following words.

Inch, box, key, army, hero, cargo, tomato, piano, photo, leaf, knife, wolf, chief, roof, handkerchief, safe, fish, datum, phenomenon, penny, passer-by, mother-in-law, housewife, postman, hotel-keeper.

X. Fill in the blanks with the articles (*definite, indefinite, zero article).*

1. Give me a list of ... students, please.
2. When the ambulance arrived, ... wounded were taken to the hospital.
3. ... African elephant is taller than the Indian.
4. Our planet is millions of kilometers from ... Sun.
5. Don't write in ... red biro!
6. We know that ... water is necessary for life.

7. It is known that ... salt can be obtained from sea water.
8. He said that ... water in that river was always cold.
9. It should be kept in mind that ... water from a well is always cold.
10. I like ... music of this ballet.
11. He is quite ... old man.
12. What ... interesting book!
13. It is rather ... complicated question.
14. All ... students of our group attended the meeting.

Text 3. ELECTRICITY - Discovery and Terms

Electricity has been known since the days of ancient Greece. The word *electricity* comes from the Greek word for amber. The Greeks discovered that if a piece of amber was rubbed with fur, it would pick up bits of straw or other light-weight materials. Later, scientists discovered that other materials would act like amber. They could be given charges of electricity. Charges of this kind are called charges of frictional, or static, electricity. They are not very useful.

In 1800, an Italian scientist named Volta found a way of getting an electric current. He invented an electric cell. But electricity became truly useful after Michael Faraday invented a machine to push electrons on their way. A machine which furnishes a current of electricity is called a generator. Today we use both cells and generators.

A battery is made up of two or more electric cells joined together. We use batteries in such things as portable radios, flashlights, electric games, and automobiles. The current which comes to our houses, stores and offices and lights our streets comes from generators.

In buying and using electrical appliances there are some terms everyone needs to know. *Volt* is one. *Ampere* is another. *Watt* is a third. The push that forces a current through a circuit is measured in volts. A volt is a measure of electrical force. Most household appliances are built for a voltage of either 127 or 220.

An ampere is a measure of the strength of a current. Electric lamp bulbs are marked in watts. A watt is a measure of electrical power. A kilowatt is 1,000 watts.

Phonetics

I. Pronounce the following words according to the transcription.

Volta [ˊvɔultə] - Вольта
Faraday [ˊfærədeɪ] - Фарадей
amber [ˊæmber] - янтарь
frictional [ˊfrikʃənəl] - фрикционный, определяемый трением
static [ˊstatik] - статический
current [ˊkʌrənt] - электрический ток
volt [vəult] - вольт
ampere [ˊæmˌpɛə] - ампер
watt [wɔt] - ватт
voltage [ˊvəultɪʤ] - напряжение

appliance [ə′ plɑiəns] - прибор
measure [′meʒə] - мера
kilowatt [′kılə˛wɔt] - киловатт

Comprehension Check

II. Answer the following questions.

1. How long has humanity been acquainted with electricity?
2. What is the origin of the word *electricity?*
3. What did the Greeks discover?
4. When was an electric current discovered?
5. When did electricity become truly useful?
6. How are batteries and generators used?
7. What scientific terms are to be known in dealing with the use of electric appliances?

Vocabulary

III. Complete the following sentences using the words given below.

a) volts b) ampere	c) watts d) battery e) generator

1. A machine that furnishes a current of electricity is called ...
2. A ... is made up of two or more electric cells joined together.
3. The push that forces a current through a circuit is measured in ...
4. ... is a measure of the strength of a current.
5. Electric lamp bulbs are marked in ...

Grammar

IV. Turn *Active* into *Passive*.

1. The Italian scientist Volta invented an electric cell.
2. Michael Faraday invented a machine to push electrons on their way.
3. We mark electric lamp bulbs in watts.
4. We use batteries in flashlights and automobiles.
5. We light our houses and streets by the current which comes from generators.
6. Today, we use both cells and generators.
7. People have known electricity since ancient times.
8. If you rub a piece of amber with fur, it will pick up bits of light-weight materials.
9. Volta found a way of getting an electric current.

V. Put questions to the following sentences.

1. Now we know the mechanism by which bodies become electrified by friction. (*General question, disjunctive question*)

2. The modern theory of electrification is based on the principle that all substances are made of atoms and molecules. (*Special question, disjunctive question*)

3. Each atom contains a nucleus having a known amount of positive charge. (*General question, special question, disjunctive question*)

4. This positive charge is due to the presence in the nucleus of a certain number of protons. (*Special question, disjunctive question*)

5. All protons are alike and have the same mass and positive charge. (*General question, alternative question*)

6. Around every atomic nucleus there are some negatively charged particles called electrons. (*General question, disjunctive question*)

7. When an electron current is sent through a wire, heat is generated and the temperature of the wire rises. (*Special questions, general question*)

8. James Joule was the first to determine the proportionality factor. (*General question, special question)*

9. Joule's law is another aspect of the law of conservation of energy. (*General question, disjunctive question*)

VI. Fill in the blanks with appropriate articles.

1. Since ... heat is a form of energy, Joule's law pertains to the law of conservation of energy.

2. The students were to calculate ... heat generated in an electric circuit.

3. The value varies considerably from ... atom to .. atom and from ... substance to ... substance.

4. This is what happens when ... amber is rubbed with ... fur.

5. The effect depends on ... number of factors.

6. According to ... Pauli principle, only a limited number of particles follows the same orbit.

7. Franklin was the first to show that lightning is ... discharge of electricity through the air.

8. The discovery of the electron was ... outstanding event in the history of science.

9. The electrons bombarded ... target placed in front of the screen.

10. The ionization of the atom resulted in ... production of a positive ion and another electron.

11. When ionization takes place, there is ... increase in the current.

12. Mendeleyev placed elements with similar properties in ... same vertical column.

13. The vacant spaces in ... periodic table have now all been filled.

14. Some elements were discovered as a result of ... advances made in the field of nuclear physics.

Translation

VII. Translate the following sentences paying attention to Passive Constructions with Modal Verbs.

1. Papers on this subject *can be found* in a number of foreign magazines.
2. The biographies of remarkable scientists are full of examples that *should be followed* by all young researchers.
3. The great Russian scholar Lomonosov *may be called* the founder of higher education in Russia.
4. Many complicated tasks *can be solved* only by highly qualified specialists.
5. Programs *must be compiled* thoroughly and with great attention to detail.
6. The requirements must be met by all means.
7. There is no denying the fact that health *ought to be taken* great care of.
8. The course paper projects *are to be given in* at the end of the term.
9. The experiment *should be completed* next week.

Revision

VIII. Translate the following sentences into Russian paying attention to the italicized pronouns.

1. Will you give me another book? I don't like *this one.*
2. This book is mine, and *that one* is yours.
3. *That* is what she said.
4. The price of tin is higher than *that* of copper.
5. At our factory, there are a few machines similar to *those* described in this magazine.
6. *Such* was the agreement between the two parties.
7. *Which* do you prefer to learn: French or English?
8. He came to see me off, *which* was very kind of him.
9. I had the *same* difficulty as you had.
10. Here are some books. *Which ones* would you like?

IX. *Until* or ***Unless***?

1. I'll stay here ... he comes.
2. I'll go there ... it rains.
3. There's no point in photocopying sheets ... you are going to work away from the library.
4. The students won't be admitted to the examination ... they do the written part of the test.
5. He won't pass the exam ... he works hard.
6. She won't talk to him ... he explains his behaviour and apologizes to her.
7. ... she works harder, she is not going to improve her mark in English.
8. I wouldn't eat fish ... I was extremely hungry.
9. Don't tell your parents about it ... they ask you.
10. We'll be late for the concert ... we hurry.
11. Wait ... I phone you.

12. I'm not going to the party ... you go, too.
13. The dog won't attack you ... you move.
14. You'll not be allowed into the club ... you are a member.
15. He won't go there ... he is invited.
16. He won't finish his work in time ... he works at weekends.
17. Let us wait ... the rain stops.
18. He lay ... he did not feel the pain any longer.
19. I'll stay at the University ... my friend has been examined.

Text 4. MOTION

Force is a push or a pull which affects the motion of matter. Like energy, force cannot be weighed and does not take up space. However, force acts on matter to produce or prevent motion in a given direction. Although we cannot actually see force, we know it is present by the way it affects the movement of matter.

Does force always produce motion? In trying to lift a heavy object, it is possible to exert a great deal of force without moving the object. Thus, all motion is caused by force, but force does not always produce motion.

When you pick up a book or throw a ball, you are using force to put the objects in motion. You may already know that energy is needed to produce motion in matter. Therefore, the force you exert in moving an object is actually produced by your muscles. When you ride in an automobile, you know that force is needed to move the car.

Force is also needed to slow down or stop the motion of an object. When you catch a ball, you use force to stop the motion of the ball. When you use the brake on a bicycle, you are using force to slow it down. To affect motion, force always requires some form of energy, such as mechanical, electrical, chemical, nuclear or heat energy.

We know that gravity attracts all matter toward the centre of the Earth. Since a falling object is in motion, the attraction of gravity is a force that produces this motion in matter. We also know that the pull of gravity, commonly measured as the weight of an object, is greater on objects having more mass than on less massive objects. Does this difference in the pull of gravity affect the rate of speed with which an object falls?

Careful experiments have shown that the speed with which an object falls from a given height is the same regardless of mass. That is, a heavy object falls at the same rate of speed as a light object. Of course, if you drop a feather and a coin from the same height, the coin strikes the ground first. The feather falls more slowly only because it has a larger surface area. It is held back by the amount of air that must be pushed aside to let it fall. This air friction opposes the motion of the feather. If a feather and a coin are placed in a tube and all the air is pumped out, you would discover that both objects fall at the same rate of speed.

There are forces which can overcome the force of gravity. An airplane rises above the ground because the forces acting on its wings lift it off the ground. A helicopter can come to a stop in the air because it is supported by the forces acting on

its rotating wing. Rockets and spaceships can escape the Earth's gravitational pull when upward forces are produced that overcome their weights.

Scientists know that gravity is responsible for holding together our solar system and the entire Universe. Isaac Newton realized that every object on the Earth and in space exerts a force of attraction on every other object, regardless of mass. This force of attraction is known as the law of universal gravitation.

Phonetics

I. Pronounce the following words according to the transcription.

Isaak Newton [ˊaɪzək ˊnjuːtən] - Исаак Ньютон
motion [ˊməuʃən] - движение
affect, *v* [əˊfekt] - воздействовать
prevent, *v* [priˊvent] - препятствовать
exert, *v* [igˊzəːt] - прилагать (силу)
gravity [ˊgræviti] - сила тяжести
require, *v* [riˊkwɑiə] - требовать
experiment [iksˊperiment] - эксперимент
helicopter [ˊheliˌkɔptə] - вертолёт
rotate, *v* [ˊrəuˌteit] - вращать(ся)
Universe [ˊjuːniˌvəːs] - вселенная
universal [ˌjuːniˊvəːsəl] - всемирное (тяготение)

Comprehension Check

II. Answer the following questions.

1. What is force?
2. How does force affect motion?
3. How do we feel the presence of force?
4. Does force always produce motion?
5. What is needed to produce motion?
6. What kinds of energy are required to affect motion?
7. What is the pull of gravity determined by?
8. Does the speed of a falling object depend on its mass?
9. Is it possible to overcome the force of gravity?
10. What is the essence of the law of universal gravitation?

III. Say if it is true (*T)* or false *(F).*

1. All forces produce motion.
2. Force cannot be weighed or seen.
3. Force is needed to stop the motion.
4. Force does not require energy.
5. The speed with which an object falls depends on its mass.
6. It is impossible to overcome the force of gravity.
7. Every object exerts a force of attraction on every other object.

Vocabulary

IV. Match the following.

1. force of attraction	a) производить
2. to affect	b) весь, целый
3. to cause	c) независимо от
4. to produce	d) вызывать
5. to attract	e) удерживать
6. regardless of	f) притягивать
7. to overcome	g) преодолевать
8. to escape	h) соотношение
9. entire	i) избежать
10. careful	j) сила притяжения
11. rate	k) влиять
12. to hold back	l) тщательный

Grammar

V. Put the adjective or adverb in the correct form.

1. A feather has (*large*) surface area than a coin.
2. The pull of gravity is greater on objects having (*much)* weight than on objects which are (little) heavy.
3. A coin falls (*fast*) than a feather.
4. You need (*great)* force to lift a heavy object than a light one.
5. The air friction caused by the fall of the feather is (*big*) than that caused by a coin.
6. Large objects such as the Earth, have *(strong*) pull than small ones.
7. The gravitational pull of a small object is *(weak)* than the pull of the Earth.

VI. *Participle* or *Gerund*?

1. The forces *acting* on the airplane's wings lift it off the ground.
2. Gravity is responsible for *holding* together our solar system.
3. In *trying* to lift a heavy object, we exert a great deal of force.
4. Since a *falling* object is in motion, the attraction of gravity is a force that produces this motion in matter.
5. The pull of gravity, commonly *measured* as the weight of an object, is greater on objects having more mass than on less massive objects.
6. The speed with which an object falls from a *given* height is the same regardless of mass.
7. A push or a pull *affecting* the motion of matter is known as force.

VII. Fill in the gaps with appropriate prepositions: *in, off, round, back, away, into, by, towards, on, of.*

Gravitation is a very important force ... the universe. According to the law ... gravitation, which was discovered ... Newton, everything in the universe attracts everything else ... itself.

Why does the Earth always move ... the Sun, and not fly ... ... cold space? The Sun's gravitation gives the answer. The Earth always tries to move ... ... a straight line, but the Sun always pulls it ... . So, it continues ... its journey ... the Sun.

Translation

VIII. Translate the following sentences into English.

1. Силу нельзя взвесить, и она не занимает места в пространстве.
2. Всякое движение вызывается силой, но сила не всегда производит движение.
2. Для того чтобы замедлить или прекратить движение объекта, требуется сила.
3. Нам известны такие виды энергии, как механическая, электрическая, химическая, ядерная и тепловая.
4. Всякая материя притягивается к центру земли.
5. Скорость падения предмета не зависит от его массы.
6. Тяжёлые предметы падают с такой же скоростью, как лёгкие.
7. Трение о воздух препятствует движению пера.
8. Монета и перо падают с одинаковой скоростью, если их поместить в трубку, из которой выкачан весь воздух.
9. Имеются силы, способные преодолеть силу притяжения.
10.Притяжение удерживает от распада нашу солнечную систему и вселенную.

IX. Translate the following sentences paying attention to different meanings of the italicized words *(current, to provide, to take)***.**

1. A way of getting an electric *current* was obtained in 1800.
2. Sometimes it is very difficult, if not impossible, to fight with the strong *current.*
3. Reading newspapers regularly, you will be able to know all *current* events.
4. The state is expected to *provide* equal opportunities for work and studies.
5. Disabled and old people must be *provided* for by the state.
6. A young specialist will be a success *provided* he has good knowledge of the computer.
7. The scientists determined the conditions under which the splitting of atoms *took place.*
8. Engineers *took an active part* in the creation of the first computers.
9. All people injured in the accident *were taken* to hospital.
10. It *took* people thousands of years to learn more about the nature of electricity and magnetism.

Revision

X. Translate the sentences with the pronoun *one/ones*.

1. These boxes are too small: we need some bigger *ones*.
2. *One must* observe the existing traffic rules.
3. *One can* find lots of similar examples.
4. *One should* take into consideration that the given law does not hold for all equations.
5. *One should* be careful when crossing the street.

6. *One* never knows what his answer may be.
7. *One must* always keep one's word.
8. *One* needs as much information on the subject as possible.
9. The electronic computer is the *one* that can carry out several thousand arithmetical operations in one second.
10. This method of investigation is the *one* which is much spoken about.

Text 5. ATOMS

All the millions of substances in the world are built of only about a hundred simple substances. We call these simple substances elements. The very smallest bit of an element is an atom. Iron, for instance, is one of the elements. The very smallest bit of iron is an atom of iron.

Atoms are so tiny that it is hard to imagine how tiny they are. In a thimbleful of air there are more atoms than you could count if you lived to be a million years old. Of course, atoms are too small to be seen even with powerful microscopes. We know about them only from the way they act.

There can be millions of different substances because atoms of different kinds can join together in different ways. Atoms of oxygen and atoms of hydrogen, for instance, can join to form water. They can join in different proportions to form hydrogen peroxide.

Atoms are so small that it is almost unbelievable that anything could be smaller. But atoms are made up of even smaller particles. Every atom has a centre, or nucleus. The nucleus of an atom always has in it one or more particles called protons. In the case of every element except hydrogen it has particles called neutrons in it, too. Travelling around the nucleus there are one or more tiny particles called electrons.

The atoms of a few rare elements gradually break down by themselves. They shoot out some of the particles they are made of. As they do, they give off energy, mostly in the form of heat and light. These elements, we say, are radioactive. Radium is one of them. Uranium is another.

Several decades ago scientists found a way of splitting atoms artificially and making them give off energy. They used machines called atom-smashers to hurl parts of atoms against the nucleus of an atom with so much force that it would split the nucleus. The splitting of atoms is called atomic fission.

After they found out how an atom can be split, scientists found out how to use the splitting of one atom to set off the splitting of other atoms. They discovered, in other words, how to bring about a chain reaction.

In atomic fission, it is the nucleus that is split. For this reason, atomic energy is often called nuclear energy. Now scientists have found how to control the splitting of atoms. They have worked out ways of making atomic fission supply a steady amount of energy and serve mankind. So, nuclear power stations, or plants, use atomic energy to generate electricity for peaceful aims.

Phonetics

I. Pronounce the following words according to the transcription.

element [ˊelimənt] - элемент
iron [ˊɑiən] - железо
tiny [ˊtɑini] - очень маленький, крошечный
particle [ˊpɑːtikl] - частица
nucleus [ˊnjuːkliəs] - ядро
proton [ˊprəuˌtɔn] - протон
hydrogen [ˊhɑidrədʒən] - водород
neutron [ˊnjuːˌtrɔn] - нейтрон
radium [ˊreidjəm] - радий
uranium [juˊreinjəm] - уран
fission [ˊfiʃən] - ядерный распад

Vocabulary

II. Match the following terms with their definitions.

1. element	a) a part of the nucleus
2. atom	b) an element that gives off energy
3. nucleus	c) a simple substance
4. electron	d) the smallest bit of an element
5. uranium	e) the centre of an atom
6. atomic fission	f) a tiny particle travelling around the nucleus
7. chain reaction	g) the splitting of atoms
8. atom-smasher	h) the splitting of one atom followed by the splitting of other atoms
9. proton	i) a machine used for splitting the nucleus

Comprehension Check

III. Complete the following sentences using the words from the text.

1. Radium and uranium are rare elements that ...
2. Atoms are too small to be seen even ...
3. Atoms of different kinds can join together in ...
4. Atoms consist of ...
5. The nucleus of an atom is comprised by ...
6. Atoms are split artificially to give ...
7. It took scientists long to learn to split ...
8. They discovered how to bring about ...
9. Nuclear power plants use ...

IV. Ask your group mate:

1. what atoms are made up of;

2. how electrons are defined
3. what he/she knows about the size and structure of an atom;
4. why certain elements are called radioactive;
5. if scientists have found out how an atom can be split;
6. if he/she can say what happens in a chain reaction;
7. if he/she knows what the machine used to split the nucleus is called;
8. if he/she can explain why atomic energy is often called nuclear energy;
9. how atomic energy can serve peaceful aims.

Grammar

V. Turn *Present Simple Passive* into *Past Simple Passive*.

1. A new substance is formed at this temperature.
2. The rays are absorbed by lead.
3. These heavy particles are charged positively.
4. Only glass tubes are used in this experiment.
5. Alpha particles are deflected when they go through a substance.
6. A beam of particles is directed towards a thin foil.
7. A long slit is made in a block of silver.
8. The rays are absorbed in the air.
9. The air is pumped into the chamber.
10. The fluorescent screen is struck by alpha, beta and gamma particles.

VI. Turn *Past Simple Passive* into *Future Simple Passive.*

For this experiment, a lightproof box was used. A photographic plate was placed at the bottom of it. A piece of aluminium was used. It was placed between the crystals and the photographic plate. The silhouettes of the crystals were seen on the photographic plate. But they were less intensive than in the previous experiment because some of the radiation was absorbed by the aluminium.

Translation

VII. Translate the following sentences into Russian paying attention to the italicized words (*the Complex Subject structures*).

1. The age of the Earth *is assumed to be* equal to three billion years.
2. Cosmic rays *are considered to be* highly energetic nuclei originating outside the atmosphere.
3. *The* equipment *is expected to consist* of automatically operated photographic plates.
4. W. Heisenberg *is known to be* one of the founders of quantum mechanics.
5. Electric forces *are found to be* much weaker than the nuclear ones.
6. These forces *are said to act* over extremely short distances.
7. Atoms *are known to consist* of protons and neutrons.
8. The forces inside a nucleus *are supposed to run* to many million electron volts.
9. The Geiger counter method *is believed to be* appropriate in determining the total charge.

10. The atoms *seem to stick* to one another in some such way as two magnets do.
11. Solar flares *appear to accelerate* particles to high speeds.
12. The Sun did not *prove to be* a major source of cosmic rays.

Revision

VIII. Translate the following sentences into Russian focusing on indefinite pronouns.

1. I've read it in *some* book.
2. They wanted to get *some* samples, and we sent them some.
3. There were *some* fifty people there.
4. You may come at *any* time that is convenient for you.
5. *Anybody* can do it.
6. *Some* teenagers have serious behaviour problems.
7. It was in *some* newspaper.
8. There must be *some* mistake.
9. *Some* man phoned the police and told them about the burglary.
10. *Some* children are very resourceful.

IX. Translate the sentences with the structure *there* + *to be.*

1. There will be an interesting lecture at the University tomorrow.
2. There are different approaches to the solution of the problem.
3. There was an interesting students' scientific conference at our department yesterday.
4. There will be a seminar on information security at our Institute next week.
5. There is a distinction between these two phenomena.
6. There are two categories of software programs.
7. There were several periods in the history of computer development.
8. There is a difference between computers and calculators.
9. There are different opinions about the future of the research in the field of artificial intelligence.
10. There were serious reasons for Einstein to abandon his country in the 1930s, first for Britain, and then for America.

Text 6. RADIANT ENERGY

For many years, men used light and heat energy from the Sun and from fires, but they did not understand the nature of light and heat until quite recently. Near the end of the 19th century, scientists began to think of light as waves travelling through space, somewhat the way that waves move over water.

As the problem was explored, it seemed that there should be other forms of energy which travel in the same way that light does. This study led to the discovery of radio waves which are somewhat like light waves. They both travel at the same speed and go out in all directions, or radiate, from one spot. They are called radiant energy.

Radiant energy waves, though often explained by comparing them with water waves, or sound waves, are unlike anything else in the Universe. Water waves occur in water. Sound waves occur in the air, or other material. But radiant energy waves need no material to carry them from place to place. This seemed so unbelievable to scientists that for years they pretended that space was filled with a substance called ether, through which light, radio and other waves of radiant energy travelled.

The number of waves which are passing a given point in a second is the frequency. In sound, we know that the greater the frequency, the higher the pitch that we hear. Experiment shows that the short, high-frequency light waves are seen as violet in colour, while the longer, low-frequency waves are seen as red in colour. Some radiant energy waves, such as X-rays, are so short and have so high a frequency that they cannot be seen at all. Others, such as radio waves, are so long and have so low a frequency that you do not know they are present. Scientists learn about them only by experimenting and using sensitive instruments.

It is known that a current in a wire produces a magnetic field about it. If the current goes back and forth, or oscillates, a wave is set up which moves through space with the speed of light. These are radio waves. They have all the properties of other waves of radiant energy.

Radio broadcasting stations, television studios, radar sets, and signals from satellites all depend upon radiant energy waves for their operation.

Phonetics

I. Pronounce the following words according to the transcription.

radiant [ˊreidjənt] - лучистый
explore, *v* [iksˊplɔ:] - исследовать, изучать
radiate [ˊreidi¸eit] - излучать
occur, *v* [əˊkə:] - случаться, происходить, наблюдаться
ether [ˊi:θə] - эфир
frequency [ˊfri:kwənsi] - частота
oscillate, *v* [ˊɔsileit] - колебаться
broadcasting [ˊbrɔ:d¸kɑ:stiŋ] - трансляция
studio [ˊstju:diəu] - *зд.* телестудия
satellite [ˊsæti¸lɑit] - спутник
upon [əˊpɔn] - *зд.* от (*зависит от)*

Comprehension Check

II. Answer the following questions.

1. Did people understand the nature of heat and light when they used them in the past?
2. What study led to the discovery of radio waves?
3. What are radio waves like?
4. What were radio and light waves called?
5. What substance was called ether?

6. What is frequency?
7. When are light waves seen as violet and when are they seen as red in colour?
8. Why cannot X-rays be seen?
9. Can radio waves be seen?
10. When do radio waves appear?
11. How is radiant energy used?

III. Say if it is true *(T)* or false *(F).*

1. In the past, men used energy from the Sun and from fires.
2. Radiant energy waves are different from anything else in the world.
3. Radiant energy waves need ether to travel through.
4. In sound, the greater the frequency, the lower the pitch that we hear.
5. X-rays are a kind of radiant energy waves.
6. Neither X-rays nor radio waves can be seen.
7. Radio waves move through space with the speed of light.
8. Radio broadcasting stations operate on radiant energy waves.

Vocabulary

IV. Match the following.

1. high-frequency waves	a) расходиться радиально от центра
2. sensitive instruments	b) высокочастотные волны
3. to radiate	c) точный прибор
4. radar sets	d) наблюдаться
5. speed	e) радиолокатор
6. to occur	f) скорость
7. unbelievable	g) высота звука
8. pitch	h) невероятно
9. current	i) провод
10. properties	j) электрический ток
11. wire	k) свойства

V. Find synonymous expressions in the text to the following words and word-combinations.

1. to go out in all directions from one spot
2. to oscillate
3. to go through ether
4. precision instruments
5. invisible (*waves*)
6. to study a problem
7. to be different from anything else in the Universe
8. to generate a magnetic field
9. to need radiant energy for its operation
10. a wave is created
11. to go to and fro

12. to apply precision instruments
13. water waves are formed in water
14. a wave goes through space
15. to require no material to go through

VI. Match the antonyms.

1. high	a) unlike
2. visible	b) low
3. like	c) invisible
4. length	d) to destroy
5. plausible	e) under
6. to set up	f) shortness
7. over	g) unbelievable
8. to move	h) cold
9. heat	i) slow
10. for a short time	j) to stay
11. speedy	k) for years
12. to begin	l) to be independent of
13. free of	m) full of
14. to depend on smth.	n) to end

VII. Give nouns corresponding to the following verbs.

To bombard, to suggest, to occur, to vary, to apply, to disintegrate, to weigh, to concentrate, to charge, to explain, to compare, to produce, to depend, to experiment.

Grammar

VIII. Change the following sentences:

a) from *Active* into *Passive*

1. The researchers will carry out the experiment with the use of sensitive instruments.
2. The teacher will check our written papers next week.
3. Our physicists explore many important problems.
4. The students translated the text without a dictionary.
5. Lomonosov established the first chemical laboratory at the Russian Academy of Sciences in 1745.

b) from *Passive* into *Active*

1. The discovery was made by the scientist several years ago.
2. Engineering, physics, mechanics and mathematics are studied by the students of Technical Universities.
3. Four exams will be taken by the students at the end of the academic year.
4. A complicated task was done by our group during the laboratory work.
5. A course of lectures on instrument making has been delivered by our dean.

Translation

IX. Read and translate the text without a dictionary (*some of the words are given below***).**

THE ELECTROMAGNETIC SPECTRUM

Different forms of energy spread across a range called the *electromagnetic spectrum.* Energy forms in this spectrum have both electrical and magnetic characteristics. They travel as electromagnetic waves. All waves have *wavelength and frequency.* A wave has an uppermost crest and a bottommost trough.

Wavelength is the distance between the crest of one wave and the next (or between the trough of one wave and the next). Wavelength may be expressed in millimicrones.

Frequency is the number of waves that pass a given point in a given time. Frequency is expressed in *hertz,* or cycles per second. An inverse relationship exists in the electromagnetic spectrum. As the wavelengths of energy forms grow longer, their frequencies diminish.

Gamma rays have the shortest wavelengths and the highest frequencies; long radio waves have the longest wavelengths and the lowest frequencies. We can directly sense only a small portion of the electromagnetic spectrum. We can see visible light and feel the heat of infrared rays. Other forms require instruments that convert the energy into perceptible forms, such as gamma ray counters or radio receivers.

Words

crest – максимум (зд. амплитуды)
trough – минимум (зд. амплитуды)
inverse – обратный
diminish, *v* - уменьшать
perceptible – воспринимаемый
counter - счетчик

Revision

X. Insert prepositions where necessary.

1. I have no objection ... that.
2. It doesn't depend ... me.
3. He was surprised ... it.
4. I am angry ... him.
5. She entered ... the hall.
6. We reached ... the village at night.
7. Wait ... me.
8. He followed ...us.
9. Who takes care ... the child?
10. He cut the paper ... a knife.
11. I'll return ... an hour.

12. He was sure ... it.

XI. Translate the following sentences into Russian focusing on the possessive pronouns (*yours, mine, theirs, their, my, his, her***).**

1. Этот словарь мой, а не ваш.
2. Они всегда делают уроки дома.
3. Сад их, а не её.
4. Где вы провели каникулы?
5. Я попрошу брата достать мне эту книгу.
6. Я не знаю, куда я положил свою сумку.
7. Он положил деньги в карман.
8. Красный карандаш мой.
9. Какая книга ваша?
10. Дом её, а не его.

Text 7. THE GENERAL THEORY OF RELATIVITY

In 1916, Albert Einstein published his *General Theory of Relativity*. This was to do for the 20th century what Newton's work had done for the 17th.

In 1907, at the age of twenty-eight, Einstein began digging at the roots of Newtonian mechanics. This re-examination of the fundamental premises of classical physics was prompted by Einstein's earlier work, *Special Theory of Relativity*, which had been published two years before. This revolutionary theory introduced several profound ideas which differed greatly from those proposed by Newton.

Einstein showed that the Newtonian view was only an approximation of reality. But as it turns out, it proves to be a remarkably close approximation and so continues to be of fundamental importance to the world of science.

In the service of scientists, Newton's mechanics still explains the motion of planets, the Moon, artificial satellites, interplanetary space vehicles, tides, airplanes, automobiles – in fact, any kind of motion in which the relativistic increases in mass do not become important. They become important, as Einstein showed in his *Special Theory of Relativity*, when the speed of light is approached. And even when the speed of light is approached, suitable corrections can easily be made in Newton's laws to compensate for relativity effects.

As for the applications of Einstein's theory, it provides us with guidance in the field of cosmology and the history of the Universe. But perhaps most important of all, general relativity has added to our understanding and appreciation of the Universe.

Phonetics

I. Pronounce the following words according to the transcription.

Albert Einstein [ˊælbət ˊaɪnstaɪn] - Альберт Эйнштейн
relativity [ˌrelәˊtivity] - относительность
premise [ˊpremis] - предпосылка
approximation [әˌprɔksiˊmeiʃәn] - приближённое представление, картина мира
fundamental [ˌfʌndәˊmentәl] - основополагающий

interplanetary [ˌintəˈplænəˌtəri] - межпланетный
vehicle [viːikl] - средство передвижения
increase [ˈinkriːs] - рост
guidance [ˈgɑidəns] - руководство
cosmology [kɔzˈmələʤi] - космология
appreciation [əˌpriːʃiˈeiʃən] - определение, различение

Comprehension Check

II. Answer the following questions.

1. When did Einstein publish his *General Theory of Relativity*?
2. Was it as important as Newton's theory of gravitation?
3. Did Einstein re-examine the fundamental principles of classical physics?
4. Was his general theory of relativity prompted by his previous work, the *Special Theory of Relativity?*
5. Were Einstein's discoveries a great contribution to science?

III. Say if it is true (*T*) or false (*F*).

1. Einstein's *General Theory of Relativity* was published before his *Special Theory of Relativity.*
2. His theory was prompted by Newton's ideas.
3. Einstein's theory rejected the Newtonian view completely.
4. Newton's teaching is still applicable in mechanics.
5. Newton's laws are to be specified only in case the speed of light is approached.
6. Einstein's theory is of great use in cosmology.
7. Einstein's general theory of relativity has enlarged our knowledge of the Universe.

Vocabulary

IV. Match the following.

1. re-examination	a) основополагающий
2. fundamental premises	b) пересмотр
3. profound	c) основы
4. approximation	d) относительный
5. increase, *n*	e) предлагать
6. to propose	f) увеличение
7. relativistic	g) приблизительное соответствие
8. tides	h) межпланетный летательный аппарат
9. space vehicle	i) ценить
10. guidance	j) приливы и отливы
11. to appreciate	k) методологические принципы

V. Give derivatives of the following words.

Relative, theoretical, importance, publication, scientific, approximate, proposal, to suit, revolution, introduction, to apply, to correct, provision, compensation, to understand, to appreciate, cosmic, to guide.

VI. Match the antonyms.

1. profound	a) absolute
2. relative	b) unimportance
3. increase, *v*	c) superficial
4. earlier	d) decrease, *v*
5. still	e) to be alike
6. to approach	f) no longer
7. to differ	g) later
8. to add	h) unsuitable
9. importance	i) to move away
10. suitable	j) to diminish

Grammar

VII. Choose the correct form.

1. At our University, web design is a subject ... optionally.

a) studied *b*) studying

2. Students ... an exam next week will be given a test tomorrow.

a) taken *b*) taking

3. The scientist ... the report is well-known for his research in laser physics.

a) making .....*b*) made

4. The results of the experiment ... out by the students will be discussed at the seminar.

a) carrying.... *b*) carried

5. The manipulator is a mechanical device ... the useful functions of a robot.

a) performed ... *b*) performing

6. It is an electrically ... mechanism capable of a number of independent, coordinated notions.

a) driving .....*b*) driven

7. The great scholar came to his discovery ... with cathode-ray tubes.

a) worked .....*b*) working

8. The tubes played a very important role in the discovery of his ... rays.

a) all-penetrating ... *b*) all-penetrated

9. Roentgen called the rays ... from the glass tube X-rays because he didn't understand what caused them.

a) emerged.....*b*) emerging

10. For every action... on a body, there is an equal and opposite reaction.

a) exerting .....*b*) exerted.

VIII. Use the verbs in brackets in the active or passive form.

1. Albert Einstein (*to know)* as the greatest mathematical physicist.
2. His unusual talent for mathematics and physics *(to begin*) to show very early.
3. In 1896, Albert Einstein (*to admit*) to Zurich Polytechnic.
4. In 1905, three papers (*to publish*) by him.
5. In his first paper, the photoelectric effect (*to explain*) with the help of M. Plank's quantum theory.
6. In his second paper, the theory of Brownian motion *(to develop*).
7. His third paper (*to entitle*) *Special Theory of Relativity*.
8. Scientists (to meet) this work with interest and surprise.
9. In 1921, Einstein (*to award*) the Nobel Prize.
10. His ideas (*to make)* a revolution in natural sciences of the 20th century.

Translation

IX. Translate the first -*ed* word form as Participle II and the second –*ed* word form as a predicate.

Model: the materials tested required – испытываемые материалы требовали

The work performed showed, the results obtained demonstrated, the equipment tested required, the problem solved proved, the equation obtained resulted, the experiments discussed proved, the results obtained required.

Revision

X. Use the verbs in the correct form to complete the sentences.

1. He will do it as soon as he *(to come*) home.
2. What have you been doing since I last *(to see*) you?
3. After the steamer *(to leave*) the port, we sent an email to the buyers.
4. I'll lend you the book on condition that you (*to return*) it on Monday.
5. I'll go there tomorrow unless I (*to be)* too busy.
6. He returned sooner than we *(to expect*).
7. He speaks English perfectly though he never *(to be)* to England.
8. He always comes before I (*to do*).
9. I found the letter after he (*to leave).*
10. He told me what he *(to see)* there.
11. I don't know when he (*to return*).
12. I knew the man who *(to write)* that article.

XI. Translate the following sentences into Russian focusing on the reflexive pronouns equivalent to the Russian *сам, себе, собой, etc.*

1. Она очень мало говорила о себе.
2. Я недоволен собой.
3. Спрячьтесь за деревом.
4. Он помылся, оделся и побрился.
5. Она чувствует себя хорошо.

6. Он вёл себя, как ребёнок.
7. Он сердился на самого себя.
8. Они сами это сказали.
9. Он сам это сделал.
10. Она услышала шаги за собой.
11. Я возьму вас с собой.
12. Он положил карту перед собой.
13. Она сама принесёт вам книгу.
14. Как вы себя чувствуете?
15. Я очень удивлён, что он так себя вёл.
16. Ваш отец сам был здесь.
17. Я сам отнесу письмо на почту.

Text 8. BRANCHES OF PHYSICS

Traditionally, physics is composed of several parts, namely, mechanics, heat, optics, electricity and magnetism, atomic physics and nuclear physics. Because of the remarkable unity of Nature, the division is artificial and is carried out for the convenience of scientific research.

Newton's second law, relating force to acceleration, and his third law, relating action and reaction, form the basis of mechanics. So, mechanics is a part of physics which is concerned with force and motion.

Maxwell's equations, which combine in mathematical form the laws discovered by Ampere and Faraday, form the basis of electricity, magnetism and optics.

An understanding of statics, the laws of mechanics, electricity and magnetism form the basis of heat and thermodynamics. All these subdivisions constitute classical physics of the end of the 19th century.

Modern physics began with the work of Planck and the theory of relativity. Atomic physics made it possible for Mendeleyev to construct his Periodic Table of Elements, to predict their properties and to understand the nature of atomic spectra.

Nuclear physics has been rapidly developing since the 1930s. It includes the discovery of the neutron and other fundamental particles; the creation of artificial radioactivity, the discovery of nuclear fission and fusion; the development of particle accelerators for bombarding nuclei with particles possessing billions of electron volts of energy.

Active research flourishes in many other fields, such as solid state physics and cryogenics - the study of properties of matter at very low temperatures, including superconductivity; microwave and radio frequency spectroscopy.

Plasma physics is growing rapidly because of the current search for controlled thermonuclear fusion and because of the exploration of space.

Physics is considered to be the most basic of natural sciences. It tries to give a unified description of the behavior of matter as well as of radiation, covering as many types of phenomena as possible. In some of its applications, it comes close to the classical areas of chemistry, and in others there are clear connections to the

phenomena traditionally studied by astronomers. Present trends are pointing toward a closer approach of some areas of physics and microbiology.

Physics begins by examining the information that people sense about the world around them. That is why the knowledge of physics is essential, and it is proved by the fact that the most important discoveries nowadays are made at the crossroads of physics with other branches of science, the use of computers playing a vital role in scientific research.

Phonetics

I. Pronounce the following words according to the transcription.

Ampere [ˊæmˌpɛə] - Ампер
Faraday [ˊfærədeɪ] - Фарадей
Planck [ˊplɑːŋk] - Планк
constitute, *v* [ˊkɔnstiˌtjuːt] - составлять
flourish, *v* [ˊflʌriʃ] - процветать
superconductivity [ˌsjuːpəˌkɔndʌkˊtiviti] - сверхпроводимость
plasma [ˊplæzmə] - плазма
thermodynamics [ˊθəːməudaiˊnæmiks] - термодинамика
cryogenics [ˌkraiəuˊdʒeniks] - криогеника, физика низких температур
microwave [ˊmaikrəuˌweiv] - микроволновый
spectroscopy [spekˊtrɔskəpi] - спектроскопия
microbiology [ˊmaikrəubaiˊɔlədʒi] - микробиология

Comprehension Check

II. Answer the following questions.

1. What are the traditional subdivisions of classical physics?
2. What did modern physics begin with?
3. Why is physics considered to be the most basic of natural sciences?
4. What other sciences is physics connected with?
5. Why is the knowledge of physics essential?

III. Complete the following sentences.

1. Physics consists of ...
2. Newton's second law relates force ...
3. Newton's third law relates action ...
4. Mechanics is concerned with ...
5. Maxwell's equations form the basis of ...
6. The basis of heat and thermodynamics is formed by ...
7. Modern physics began ...
8. Active research is carried on in microwave and ...
9. The exploration of space facilitates ... physics.
10. Physics is a natural ...
11. Physics is connected with ...
12. The most important discoveries nowadays ...

Vocabulary

IV. Match the following.

1. to carry out	a) предсказывать
2. equation	b) проводить
3. to be concerned with	c) составлять основу
4. to discover	d) криогеника
5. to form the basis	e) исследование
6. to predict	f) явление
7. rapidly	g) уравнение
8. to include	h) иметь дело с
9. research	i) быстро
10. cryogenics	j) сверхпроводимость
11. superconductivity	k) включать
12. phenomenon	l) открывать (*в науке*)
13. heat physics	m) тепловая физика (*термодинамика*)

V. **Find in the text the English equivalents to the following**.

1. для удобства научного исследования
2. как можно больше
3. устанавливать связь или отношение
4. в математической форме
5. сделать возможным
6. понимать природу ч.-л.
7. физика твёрдого тела
8. контролируемый термоядерный распад
9. изучать информацию об окружающем мире
10. другие области познания мира
11. явления, традиционно изучаемые астрономией

Grammar

VI. Fill in the gaps with appropriate prepositions.

1. the study ... properties ... matter ... very low temperatures
2. traditionally, physics is divided ... mechanics, heat (*thermodynamics*, *optics),* etc.
3. the current search ... controlled thermonuclear fusion
4. to understand the nature ... atomic spectra
5. cryogenics is concerned ... low temperatures
6. the division is carried ... for the convenience ... scientific research
7. branches ... human knowledge ... the world we live ...

Translation

VII. Translate the following sentences paying attention to the words *few* (мало), *a few* (несколько), *little* (мало), *a little* (немного).

1. *Few* people were interested in science at that time.
2. There were *a few* scientific terms in the text that seemed unknown to the students.
3. Few scientists supported the theory because they had *little* information about it.
4. These are only *a few* facts about this science.
5. Roentgen was *a little* puzzled when he understood the rays were unknown to him.
6. *Few* people dared to oppose the Inquisition.
7. Very *little* was known to people about electricity in those days.
8. Many participants were invited, but *few* came.
9. They knew that he had passed a difficult exam *a few* days before.
10. You rest too *little*.
11. There was *a little* liquid in the test tube.
12. He said *little* about his research work.
13. There are *few* articles on this question.
14. She is known to be *a little* vain.
15. He has *few* friends among his peers.
16. They had *a few* acquaintances in Cambridge.

VIII. Translate the following sentences into Russian.

1. Mass is the internal quality of the object.
2. Energy is the kind and size of any change of the object.
3. Mechanics deals with the state of rest or motion of particles and rigid bodies and with forces acting on bodies.
4. Optics investigates and studies the process of light emission, its propagating in various medium and its interaction with the substance.
5. Electricity and magnetism are the basic subdivisions of physics dealing with the existence, movement and interaction of charged particles.
6. Atomic physics deals with atoms, elements, their properties, and the nature of atomic spectra.
7. Nuclear physics includes the discovery of the neutron and other fundamental particles.
8. Cryogenics is the study of properties of matter at very low temperatures, including superconductivity.
9. Plasma physics studies controlled thermonuclear fusion and the exploration of space.
10. Accelerators are devices for bombarding nuclei with particles possessing billions of electron volts of energy.

Revision

IX. Translate the following sentences into English paying attention to the use of the formal subject *it.*

1. В феврале часто идёт снег.
2. Становится темно.
3. Дождь идёт с трёх часов.
4. До вокзала недалеко.

5. От нашего дома до реки один километр.
6. Раннее утро.
7. Было трудно найти подходящий автобус.
8. Бесполезно говорить ему об этом.
9. Было ясно, что он не придёт.
10. Был тёплый весенний день.

Text 9. NUCLEAR PHYSICS

As its name suggests, nuclear physics is the study of the central cores (nuclei) of atoms. An atomic nucleus is a tightly knit group of particles called protons and neutrons. Since protons are positively charged and neutrons are uncharged, the nucleus as a whole carries a positive charge.

Virtually, the whole weight of an atom is concentrated in its nucleus. Any atom of any one chemical element contains the same number of protons. This is its atomic number. But atoms of the same element may contain different numbers of neutrons. An element may therefore have more than one atomic weight. Hydrogen has just one proton in its nucleus (and so it is element number 1 in the periodic table). But deuterium, or heavy hydrogen, has a neutron as well as a proton in its nucleus. Its atomic weight is therefore 1 + 1 = 2. Elements like hydrogen and deuterium, that have the same atomic number but different atomic weights, are called isotopes.

Nearly all the elements occurring in nature are stable but many isotopes are radioactive, i.e. their nuclei break up, throwing out rays and particles. The nuclear physicist can make radioactive isotopes by bombarding elements with atomic particles in an atom-smasher, or particle-accelerator. This may be one of several types, such as cyclotrons, synchrotrons or linear accelerators. But the most fruitful source of radioactive isotopes for use as *tracers* in a wide variety of applications is the nuclear reactor. A reactor is used for controlling the type of nuclear disintegration called a chain reaction, when the products are able to trigger off the break-up of further atoms.

Phonetics

I. Pronounce the following words according to the transcription.

nuclei [ˊnju:kliɑi] - ядра
atom [ˊætəm] - атом
virtually [ˊvə:tjuəli] - фактически, практически
deuterium [dju(:)ˊtiəriəm] - дейтерий, тяжёлый водород
isotope [ˊɑisəuˌtəup] - изотоп
stable [ˊsteibl] - устойчивый
radioactive [ˊreidiəuˊæktiv] - радиоактивный
physicist [ˊfizisist] - физик
bombard, *v* [bɔmˊbɑ:d] - бомбардировать, облучать частицами
accelerator [əkˊseləˌreitə] - ускоритель
cyclotron [ˊsɑikləˌtrən] - циклотрон

synchrotron [ˊsiŋkrəuˌtrɔn] - синхротрон
linear [ˊliniə] - линейный
variety [vəˊraiəti] - разнообразие

Comprehension Check

II. Answer the following questions.

1. What does nuclear physics study?
2. What is an atomic nucleus?
3. Does an atom of any chemical element contain the same number of protons?
4. What is the weight of an atom concentrated in?
5. What is the atomic number of an atom?
6. Do atoms of the same element always contain the same number of neutrons?
7. What are isotopes?
8. What isotopes are radioactive?
9. What is the nuclear reactor used for?

III. Say if it is true *(T)* or false *(F).*

1. An element may have only one atomic weight.
2. Elements that have the same atomic number but different atomic weights are called protons.
3. The nucleus carries a positive charge.
4. Elements are normally stable.
5. There are several types of particle-accelerator.
6. The most fruitful source of radioactive isotopes is a cyclotron.
7. The nuclear reactor is used for controlling a chain reaction.

Vocabulary

IV. Complete the following sentences using the words and word-combinations given below.

a) nuclei; b) periodic table; c) deuterium; d) rays and particles; e) nuclear physicists; f) tracers; g) synchrotron

1. Hydrogen is element number 1 in the ...
2. Heavy hydrogen is another name for ...
3. Nuclear physics studies the ... of atoms.
4. The scientists who study nuclear physics are called ...
5. When the nuclei break up, they throw out ...
6. One of the several types of particle-accelerators is a ...
7. Radioactive isotopes are used as ... in a wide variety of applications.

V. Give nouns corresponding to the following verbs.

To bombard, to suggest, to occur, to vary, to apply, to disintegrate, to weigh, to concentrate, to charge.

VI. Match the synonyms.

1. to cause	a) heavy hydrogen
2. central cores	b) to have
3. deuterium	c) the biggest
4. to contain	d) to trigger off
5. the most fruitful (*source*)	e) practical use
6. application	f) to study
7. disintegration	g) nuclear break-up
8. to investigate	h) actually
9. virtually	i) to irradiate
10. to bombard	j) to be positively charged
11. to carry a positive charge	k) nuclei

VII. Give nouns corresponding to the following verbs.

To bombard, to suggest, to occur, to vary, to apply, to disintegrate, to weigh, to concentrate, to charge.

Grammar

VIII. Put the verbs of the following sentences in all the 16 tense/aspect forms.

1. I do my homework.
2. I read a book in English.
3. I write e-mail letters.

IX. Choose the appropriate Tense form for each English verb.

1. discusses	a) Present Progressive
2. has done	b) Present Perfect Progressive
3. is performing	c) Future Simple
4. has been measuring	d) Past Progressive
5. will analyze	e) Present Perfect
6. were working	f) Present Simple
7. will have studied	g) Future Perfect
8. had discovered	h) Future Perfect in the Past
9. are heating	i) Past Simple
10. would have been exploring	j) Past Perfect
11. have carried out	k) Future Progressive
12. would have completed	l) Future Simple in the Past
13. published	m) Future Progressive in the Past
14. will be writing	n) Future Perfect Progressive in the Past
15. would organize	o) Past Perfect Progressive
16. would be investigating	p) Future Perfect Progressive
17. had been lying	
18. will have been building	

Translation

X. Translate the following word-combinations paying attention to *Participle I* **and** *Participle II.*

A

1) elements with atomic particles bombarded in a particle-accelerator
2) the material prepared for the laboratory work
3) the results obtained by the research group
4) the properties investigated by the experimenters
5) the technique applied in the experiment
6) a reactor used for controlling a chain reaction
7) the weight of an atom concentrated in its nucleus
8) radioactive isotopes used as *tracers* (меченые элементы)
9) the means used for solving the problem
10) discoveries made by modern scientists

B

1) atoms containing the same number of protons
2) the nuclei of the isotopes throwing out rays and particles
3) elements occurring in nature
4) physicists making radioactive isotopes
5) nuclear physicists studying the central cores of atoms
6) elements having the same atomic number but different atomic weights
7) the products triggering off the break-up of further atoms
8) the science studying properties of matter at very low temperatures
9) the laws forming the basis of mechanics

C

1) the scientists doing research; the research done by the scientists
2) the researchers applying the method; the method applied by the researchers
3) the engineers using the reactor; the reactor used by the engineers
4) the delegation representing the country; the country represented by the delegation
5) the experimenters processing the sample; the sample processed by the experimenters
6) scientists predicting the properties of elements; the properties of elements predicted by the scientists
7) scientists developing particle accelerators; particle accelerators developed by scientists

Revision

XI. Translate the following sentences into English.

1. Они хотят, чтобы мы зашли к ним сегодня (*to call on smb.).*
2. Он хочет, чтобы его сын стал специалистом в области компьютерных технологий.
3. Вы хотите, чтобы я вам помог?

4. Я хочу, чтобы его статья была опубликована.
5. Ему не нравится, когда его прерывают.
6. Ей хочется, чтобы её пригласили в театр.
7. Ей не нравится, когда дети делают уроки вечером.
8. Он хочет, чтобы его послали на конференцию в Москву.
9. Он не хочет, чтобы его брат поехал на юг.
10. Я хочу, чтобы ты подождал меня здесь.

Text 10. ENGINEERING

A science dealing with design, construction and operation of structures, engines, machines, various devices is known in English as engineering, for which it is sometimes difficult to find Russian equivalents. The proper Russian equivalents used to be “техника, строительство, инженерное дело". Some more equivalents have appeared of late: "машинная индустрия, инжиниринг, техника связи, инженерно-проектные работы, проектирование и разработка, конструирование, инженерно-техническое обеспечение", etc.

Now the art of building houses, temples, pyramids and other structures is called *civil engineering*. At the time of the Roman Empire there were already two branches of engineering: civil engineering and military engineering. Military engineering included the building of fortifications and military devices. One may find the remains of Roman structures in Italy, on the territory of modern England which was under Roman rule for about four centuries. With time, civil engineering grew into a profession requiring college training and has become an important branch of national economy.

With the invention of the steam engine and the growth of factories, practical application of the science of mechanics and thermodynamics to the design of machines attracted the attention of civil engineers. They called themselves *mechanical engineers*, separating themselves from civil engineering. It laid the foundation for a new branch of engineering – mechanical engineering.

Mechanical engineering deals with design, construction and operation of engines, turbines, air-conditioning, refrigeration devices, elevators, conveyers, escalators. The mechanical engineer designs machine-tools for various operations and their application in various production processes. One of the many branches of mechanical engineering is aeronautics which deals with the mechanics of moving bodies in fluid or air.

In the 19th century, with the development of the science of electricity, a new branch of engineering, electrical engineering, appeared. Electrical engineering is divided into the two main branches: communications engineering and power engineering. Communications engineering deals with minute quantities of electricity used for all kinds of communication; power engineering – with the means for producing power. Therefore, the electrical engineer designs radio, television and telephone equipment; the power engineer – generators, switches, transformers, etc.

In the middle of the 20th century, there appeared some new branches of engineering – nuclear engineering and space engineering. Nuclear engineering is

based on atomic physics. Space engineering is impossible without all modern scientific achievements.

Present day engineering includes chemical engineering, dealing with processes and equipment possible to change the state, energy content, physical and chemical composition of various materials. Nowadays, there are hundreds of subdivisions of engineering, but all of them branched off from civil, mechanical, electrical or chemical engineering.

The education of an engineer extends over a wide range of knowledge: from pure science, or engineering science, to technology. It is covered by various branches: civil, electrical, industrial, mechanical, metallurgical, geological, nuclear engineering, etc. An engineer's education will be influenced by the choice he has made. Modern engineering demands a sound training in general sciences, particularly, in physics, mathematics and chemistry. It may be added that the relative importance of the fundamental sciences depends on the corresponding branch of engineering. For example, an electrical engineer needs extensive knowledge of physics; for an agricultural engineer, a basic knowledge of biology is more important. All specialities demand deep knowledge of the computer, an ability to deal skillfully with problems of human relations, which is sometimes as important as technical knowledge.

Phonetics

I. Pronounce the following words according to the transcription.

equivalent [iˊkwivələnt] - эквивалент
pyramid [ˊpirəmid] - пирамида
engine [ˊendʒin] - двигатель
turbine [ˊtəːbin] - турбина
conveyer [kənˊveiə] - конвейер
escalator [ˊeskəˌleitə] - эскалатор
speciality [ˌspeʃiˊæliti] - специальность
minute [mɑɪˊnjuːt] - мельчайший

Comprehension Check

II. Answer the following questions.

1. What does engineering deal with?
2. What is civil engineering?
3. What did military engineering include at the time of the Roman Empire?
4. What is mechanical engineering concerned with?
5. What does aeronautics study?
6. What two branches is electrical engineering divided into?
7. What does the electrical engineer design?
8. What does the power engineer design?
9. What is nuclear engineering based on?
10. What are other branches of engineering known nowadays?
11. What branches of engineering are engineers trained for?
12. The knowledge of what subjects does engineering demand?

13. How is an engineer's education influenced by his choice of a profession?
14. What skills do all engineering specialities demand?

III. Complete the following sentences.

1. Civil engineering is an important branch of national ...
2. Mechanical engineering deals with ...
3. Electrical engineering appeared in the ... century.
4. Communications engineering deals with ...
5. Power engineering deals with ...
6. Nuclear engineering and space engineering appeared in the ... century.
7. Nowadays, there are hundreds of ...
8. Engineers should have profound knowledge of ...

IV. Choose the sentences containing information from the text.

1. England was under the Roman rule for about six centuries.
2. The word *engineering* has many meanings.
3. There are some Russian equivalents to the term *engineering*.
4. The art of building was known hundreds of years ago.
5. Mechanical engineers dealt with the design, construction and operation of machines.
6. There wasn't any other branch of engineering besides civil engineering at the times of the Roman Empire.
7. The profession of a civil engineer deals with many branches of national economy and science.
8. Electrical engineering is older than mechanical engineering.

Vocabulary

V. Match the following.

1. civil engineering	a) конструировать
2. communications engineering	b) машиностроение
3. to design	c) техника средств связи
4. electrical engineering	d) основательная подготовка
5. power engineering	e) обширные познания
6. mechanical engineering	f) электротехника
7. chemical engineering	g) энергомашиностроение, энергетика
8. sound training	h) инженер-энергетик
9. extensive knowledge	i) гражданское строительство
10. oil engineer	j) химическое машиностроение
11. nuclear engineering	k) инженер-нефтяник
12. power engineer	l) военно-инженерное строительство
13. military engineering	m) инженер-строитель
14. civil engineer	n) ядерная техника
15. space engineering	o) станок
16. machine-tool	p) космическая техника

VI. Give derivatives of the following words.

Equivalence, variety, to produce, to divide, possible, to correspond, to extend, to achieve, mechanics, purity, to design, difficult, to equip, to communicate, chemistry, to operate, important, science, wide, to correspond, special.

VII. Match the antonyms.

1. to include	a) absolute
2. to appear	b) to diminish
3. to grow	c) to unite
4. particularly	d) to distract
5. to attract	e) military
6. relative	f) limited
7. to divide	g) modern
8. civil	h) shallow
9. extensive	i) big
10. ancient	j) to disappear
11. deep	k) generally
12. minute	l) to exclude

Grammar

VIII. Use the verbs in brackets in the active or passive form.

1. At the end of the 19th century civil engineering (*to enrich)* with new achievements of science.
2. The profession of a civil engineer (*to require*) college training.
3. Now, civil engineering (*to speak of)* as an important branch of national economy.
4. It (*to deal*) with the building of industrial structures, bridges, houses, tunnels, etc.
5. Dams, water systems, railways, etc. (*to build*) by civil engineers.
6. A very important branch of engineering (*to call*) mechanical engineering.
7. Mechanical engineering *(to achieve*) a prominent position from the very beginning.
8. Machine-tools (*to use)* in various production processes.
9. It (*to know*) that space engineering occupies a most prominent position.
10. It (*to say)* that electrical engineering (*to subdivide*) into two branches.
11. The science of mechanics (*to study*) the forces dormant in bodies at rest and the working forces in bodies in motion.
12. Civil engineers (*to use)* information from statics – how bodies behave at rest – to prevent disastrous movement in stable structures, such as bridges and buildings.
13. Industrial robots (*to make up*) of several basic components: the manipulator, the control and the power supply.

IX. Transform the following sentences using the verbs in brackets in the Passive voice.

Model:

Being at rest, objects move at a steady zero speed. (*to say*)

Being at rest, objects *are said to move* at a steady zero speed.

1. Personal experience depends on practical work. (*to know*)
2. He is a talented researcher in the field of fiber optics. (*to believe*)
3. Demand for power will increase in the next 10 years. (*to expect)*
4. The further advance of science is closely linked with the development of higher education. (*to suppose*)
5. At the end of the course of studies, a final project will be presented by the undergraduates. (*to expect*)
6. The term *engineering* has a number of meanings. (*to know)*
7. Mechanical engineering is one of the most important branches of engineering. *(to consider*)
8. Crookes' cathode ray tubes were valuable for scientific research. (*to think)*

Translation

X. Translate the following word-combinations.

1. a hydraulically or pneumatically driven jointed mechanism;
2. an electrically driven mechanism capable of a number of independent, coordinated motions;
3. a gripping device or tool, designed for the specific tasks to be done by the robot;
4. the robots control system;
5. controls ranging in complexity from simple stepping switches to minicomputers;
6. a bus going 20 miles per hour;
7. precisely controllable femtosecond high-brightness laser and ultra-short electron beams;
8. on-site diagnosis of turbines in power stations while they are in operation;
9. a super-high-speed camera;
10. very fast moving objects such as turbine blades;
11. the most abundant metal in the world;
12. a long-range flight;
13. a jet-propelled vehicle for interplanetary communication;
14. engineers designing machine-tools;
15. a profession requiring college training.

XI. Translate the following sentences into English.

1. Термин *engineering* имеет много значений. Одним из самых распространенных значений слова *engineering* является *техника*.
2. Самой старой отраслью техники считается гражданское строительство зданий, дорог, мостов.
3. Появление машиностроения было связано с изобретением паровой машины.
4. Инженер-механик имеет дело с проектированием и конструированием различных машин.
5. Появление электротехники связано с достижениями в области электричества.
6. В середине XX в. появились новые отрасли машиностроения: ядерная техника и космическая техника.
7. Ядерная техника основана на атомной физике.

8. Космическая техника базируется на достижениях всех отраслей науки и техники.

Revision

XII. Give the English for the following Russian sentences.

1. Я никогда не слышал, чтобы он говорил по-английски.
2. Мы не слышали, как он постучал в дверь.
3. Я слышал, как он спросил её об этом.
4. Я никогда не видел, как он играет в шахматы, но я слышал, что он играет очень хорошо.
5. Она видела, как он вошёл в дом, и спустилась вниз, чтобы встретить его.
6. Я наблюдала, как садилось солнце.
7. Я видел, как такси остановилось у двери.
8. Никто не заметил, как она вышла из комнаты.
9. Я видел, как она вошла в комнату, включила свет и села за стол.
10. Я почувствовал, как кто-то дотронулся до моей головы.

XIII. Fill in the blanks with prepositions where necessary (*in, of, to, from, on, into, for, throughout, at, during, by, with).*

1. In 1797, the family moved ... Kazan where Lobachevsky graduated ... the University.
2. He stayed ... Kazan all his life, occupying the position ... dean ... the faculty ... Physics and Mathematics and president ... Kazan University.
3. He lectured ... mathematics, physics, and astronomy.
4. Lobachevsky is the creator ... non-Euclidean geometry, the name being due ... Gauss.
5. His theory remained obscure ... several decades and was ignored ... most mathematicians.
6. Few people took notice ... his book, and the full importance ... his discovery was first recognised ... Riemann.
7. At that time, any geometrical system not ... absolute agreement ... that of Euclid's would have been considered as obvious nonsense.
8. Non-Euclidean geometry has developed ... an extremely useful instrument ... application ... the physical world.
9. The discovery ... non-Euclidean geometry was believed to be shared ... Carl Frederich Gauss, Janos Bolyai, and Nikolai Ivanovich Lobachevsky.
10. Lobachevsky was the father ... the most famous revolution ... mathematics, but the government erected no monument ... his honour,.
11. Instead, he was relieved ... his job ... the age ... fifty-four ... no explanation whatsoever, the result being deterioration ... health and loss ... eyesight.
12. Lobachevsky was not duly appreciated ... his life time, but he is held ... high esteem ... his descendants ... present.
13. He is universally acknowledged as a great mathematician, well-known ... the whole world.

PART II. COMPUTER SCIENCE

Text I. COMPUTER HISTORY

The computer didn't just "happen" along in the previous century, but is the result of thousands of years of development and research. Computing can be traced back to the primitive tribes. Ancient calculating involved the manipulation of the fingers to represent various numbers. *Abacus* and *astrolabe* appeared about 3000 B.C. and were the first tools used to facilitate counting and increase the speed of calculation.

Variations and refinements of counting led to fairly elaborate calculators involving addition, subtraction, multiplication and division. As man continued to work with numbers and the demand for information increased, more complex devices were developed.

The achievements in this field, which step by step led to the computer as we know it today, include such names as *Napier* (1612) – the inventor of *logarithms*; *Pascal* (1642) – the creator of the first gear-driven *calculating machine*; *Leibnitz* (1671), who invented a special mechanism which is still used in many modern day calculators, *Thomas* - the creator of the first successful mechanical *calculator* that could add, subtract, multiply and divide.

At the beginning of the 19th century, *Jacquard* developed the *punched-card* principle, and *Hollerith* introduced the *unit record* principle by which data were coded and represented by holes in cards.

In the middle of the 19th century Charles Babbage, a mathematics professor in Cambridge, constructed large-scale calculating machines when he realized that many long calculations were really a series of predictable actions that were constantly repeated. He called his automatic mechanical calculating machine a *difference machine*. The difference machine was really a great advance. Babbage continued to work on it for 10 years but then he started to work at the construction of a fully program-controlled, automatic mechanical *digital computer*. He called this idea an *Analytical Engine*, but failed because the necessary parts couldn't be manufactured precisely in his time. Despite the failure, his work was a valuable contribution to the later engineering of calculating machines.

Between 1850 and 1900, great advances were made in mathematical physics, and it came to be known that most observable dynamic phenomena can be identified by different equations (which meant that most events occurring in nature can be measured or described in one equation or another).

The 20th century saw several generations of computers, each successive generation being more reliable and faster than the previous one. From bulky boxes requiring large amounts of air conditioning and repair time, they turned into modern computers using new technologies with new programming languages capable of amazing feats in the area of artificial intelligence.

Phonetics

I. Read the following words according to the transcription.

abacus [ˊæbəkəs] - счёты
astrolabe [ˊæstrəuˌleib] - астролябия
facilitate, *v* [fəˊsiliteit] - облегчать
Napier [ˊneipiə] - Нейпир
Pascal [pæˊskæl] - Паскаль
Leibnitz [ˊlɑipnits] - Лейбниц
Thomas [ˊtɔməs] - Томас
Jacquard [ˊdʒækɑːd] - Жаккард
Hollerith [ˊhɔləriθ] - Холлерит
Babbage [ˊbæbidʒ] - Баббидж
digital [ˊdidʒitəl] - цифровой
phenomena [fiˊnɔminə] - явления
equation [iˊkweiʃən] - уравнение

Comprehension Check

II. Answer the following questions.

1. How long did it take humanity to invent the computer?
2. What devices were used to increase the speed of calculation?
3. What scientists of the past contributed the most to the invention of the computer?
4. What was the first achievement that led to the invention of the computer?
5. Who was the creator of the first gear-driven calculating machine?
6. What mechanism was invented by Leibnitz?
7. What operations were performed by Thomas' mechanical calculator?
8. What principles did Jacquard and Hollerith develop?
9. Why couldn't Babbage realize his idea of a fully program-controlled digital computer?
10. What important observation was made between 1850 and 1900?
11. How did computers change in the 20th century?

Vocabulary

III. Find in the text the English equivalents to the following Russian words and word- combinations.

Перфокарта, элементарная запись, предсказуемый, кондиционирование воздуха, время для ремонта, искусственный интеллект, уравнение, полномасштабный, дифференциальная машина, цифровой компьютер, ценный вклад, кодировать, с зубчатым приводом, усовершенствование, с программным управлением, превратиться, изобретатель, создавать, достижение, язык программирования, современные калькуляторы, спрос на информацию.

IV. Match the synonyms.

1. large	a) to happen
2. to produce	b) in spite of
3. to calculate	c) bulky
4. to foresee	d) to manufacture
5. previous	e) next following
6. to proceed	f) to count
7. despite	g) to predict
8. to occur	h) fail-safe
9. successive	i) to fulfill
10. reliable	j) to surprise
11.to perform	k) to apply
12. to amaze	l) to build
13. to construct	m) to continue
14. to use	n) discover
15. find out	o) preceding

V. Match the antonyms.

1. modern	a) different
2. most	b) natural
3. simple	c) flexible
4. constantly	d) slow
5. identical	e) failure
6. still	f) to complete
7. fast	g) to decrease
8. success	h) temporarily
9. to increase	i) outdated
10. artificial	j) no longer
11. fixed	k) complex
12. to start	l) least

Grammar

VI. Use the appropriate degree of comparison of the adjectives or adverbs in brackets.

Computers come in all sizes. Large ones are called *mainframes*. The mainframes have been around (*long*), and there are a lot of them, especially in larger organizations.

The (*powerful*) computers, however, are called *supercomputers*. The supercomputers are so powerful that they are found in only a few of the larger business organizations. Supercomputers are (*much*) often used for scientific calculations.

The recent trend has not been to (*large*) computers, but to *(small*) ones. In the 1970 s, this trend got its start with *minicomputers*, or *minis.* These computers were (*small)* than the mainframes, but, in many cases, outperformed the (*large*) units.

The minis were received so well that computer manufacturers produced even *(small*) units – called *microcomputers*, or *micros.* (*Much*) of the microcomputer's main circuitry is in the form of a small silicon chip, (*small*) than your fingernail. The chip is called a microprocessor.

VII. Ask your group mate:

1. if most observable dynamic phenomena can be described in one equation or another;
2. how modern computers differ from the preceding ones;
3. what name Babbage gave to his automatic mechanical calculating machine;
4. if Babbage's difference machine was really a great advance;
5. who logarithms were invented by;
6. why Babbage failed to design a digital computer;
7. when the first gear-driven calculating machine was created;
8. if he/she knows how people counted in the early ages;
9. what arithmetic operations calculators can perform;
10. what scientists found out in the field of mathematical physics between 1850 and 1900;
11. if he/she knows what tools facilitating counting appeared about 3000 B.C.;
12. what times computing can be traced back to.

VIII. Insert prepositions where necessary: *of, on, into, for, at, in, to.*

1. A monitor is responsible … conveying information … the user.
2. A system unit is a box made … metal or plastic.
3. A mouse contains … least one button.
4. Different drives may be installed … a computer.
5. There are two types … processor: slotted and socket.
6. Memory is a temporary storage place … data.
7. The mouse controls the movement … the pointer … the screen.
8. All computer components are either contained … or attached … the motherboard.

Translation

IX. Translate the following phrases and note the differences in the translation.

A

digital computer
computer technology
chain reaction
light year
laboratory model

government grant
algebraic structure
common centre of gravity
thermal pressure
gravitational radius
nuclear fuel

B

data processing
the punched-card principle
expansion parameter
game theory
speed increase
time machine
earth satellite
sound production
Penrose's theorem
second-order effects
brief-case size computer
space travel
petroleum engineer
space woman
computer research

Revision

X. Translate the following sentences from Russian into English.

1. Я люблю, когда люди говорят правду.
2. Они не любят, когда их спрашивают об этом.
3. Они видели, как самолёт летел над домами.
4. Он слышал, как его имя упоминали во время разговора.
5. Я слышал, что он вернулся в Москву.
6. Я вижу, вы достигли успехов в изучении английского языка.
7. Я считаю, что он умный человек.
8. Я полагаю, что ему около шестидесяти лет.
9. Мы ожидаем, что он скоро приедет.
10. Я увидел, что в комнате никого не было.
11. Он заметил, что пакет был порван.
12. Они увидели, что все преподаватели были в зале.
13. Мы видели, как багаж положили в машину.
14. Я видел, что он был взволнован, и спросил, в чём дело.
15. Я видел, что она не знала этого правила, и решил помочь ей.

Text 2. COMPUTER COMPONENTS

A computer consists of a variety of *hardware* and *software* components that work together to perform calculations, organize data, and communicate with other components. The main components of the computer are as follows:

Monitor. A monitor is an output device, which looks like a television screen, displaying texts, graphics and video information to the user.

Keyboard. A keyboard is an input device which allows the user to enter data and instructions into a computer. The keyboard contains keys that allow you to type letters of the alphabet, numbers, spaces, punctuation marks, etc. The keyboard also contains special keys for entering instructions.

Mouse. A mouse is a small hand-held device that contains at least one button. The mouse controls the movement on the screen of a symbol called the pointer.

System Unit. A system unit is a box-like case made of metal or plastic that protects the internal components of the computer from damage. The circuitry in the system unit is a part of or is connected to a circuit board called the motherboard. The system unit consists of the following components:

CPU - The Central Processing Unit, also called a processor, is an electronic device that interprets and carries out the basic instructions that operate the computer. There are basically two types of processors, i.e. *slotted* and *socket* processors. Many modern CPUs are covered with fins or a fan to dissipate the heat they generate.

Motherboard. A motherboard is the primary printed circuit board in a PC. All of the basic circuitry and components required for a PC to function are either contained in or attached to the motherboard. The motherboard typically contains the system bus, processor and coprocessor sockets, memory sockets, serial and parallel ports, expansion slots, and peripheral controllers.

Bios - A BIOS (*Basic Input Output System*) is the program that enables a PC to boot after power-up. The BIOS is a built-in set of routines that serves as an interface between the computer's operating system and hardware devices. It is stored on a ROM chip generally located near the computer's real-time clock or lithium battery. By processing requests from applications as well as drivers, the BIOS permits the user to maintain control of hardware settings.

Disc Drives. One may have several different drives installed on the computer system. The following drives may be installed:

Hard Drive. A hard drive is an important part of your computer used for long-term storage of data, as opposed to Random Access Memory (RAM) which loses data as soon as your PC loses power.

Floppy Disc Drive. A Floppy Disc Drive is used for storing information into a floppy disk. A floppy disk consists of a thin, circular, flexible disk enclosed in a plastic shell. It stores data and information using magnetic patterns.

A CD ROM\DVD ROM drive\CD RW - CD ROMs are a little bit different to floppy and hard disks. Instead of electromagnetism, they use a laser to reflect light off microscopic pits embedded in the disks. When a pit swings by, the light is reflected to an electric eye. Where there is no pit, the light is not reflected.

DVD ROMs store more data. They can do it by having smaller pits, using two levels of pits, one under a translucent surface containing the other layer, and in some cases, by storing data on both sides of the disk.

Video Card. One of the expansion cards, called a display, video or graphics card, is for the monitor. This card is responsible for converting graphics and text into the monitor.

Power Supply. An internal power supply is responsible for converting your standard household power into a form that your computer can use. The power supply is responsible for powering every device in your computer; if it has a problem or is of low quality, you may experience many difficulties.

System buses. A bus, in computer terms, is simply a channel over which information flows between two or more devices.

Memory Module. A Memory module is a temporary storage place for data, instructions, and information.

Phonetics

I. Read the following words according to the transcription.

circuitry [ˊsəː kitri] - цепи
processor [ˊprəusesə] - процессор
translucent [trænsˊluːsənt] - просвечивающий
microscopic [ˌmɑɪkrəsˊkɔpɪk] - микроскопический
module [ˊmɔdjuːl] - модуль
peripheral [pəˊrifərəl] - периферийный
temporary [ˊtempərəri] - временный
routine [ruːˊtiːn] - стандартная программа
dissipate [ˊdisipeit] - рассеивать, разгонять

Comprehension Check

II. Answer the following questions.

1. What are the two main groups of computer components that enable it to operate?
2. What is the function of the monitor?
3. What does the keyboard allow the user to do?
4. What does the mouse control?
5. What does the system unit protect the computer components from?
6. What electronic device interprets and carries out the basic instructions that operate the computer?
7. What does the motherboard contain?
8. What is a BIOS?
9. What drives may be installed on the computer?
10. How is a system bus defined?
11. What is the internal power supply responsible for?

III. Complete the following sentences.

1. The monitor is ...
2. The mouse controls ...
3. The keyboard is ...
4. The hard drive is used for ...
5. A BIOS is the program ...
6. A Floppy Disc Drive is used for ...
7. The video card is responsible for ...
8. A channel over which information flows between two or more devices is called ...
9. A memory module is ...
10. An internal power supply is responsible for ...

Vocabulary

IV. Match the following.

1. system buses	a) пунктуационные отметки
2. punctuation marks	b) системные шины
3. serial and parallel ports	c) гнездо памяти
4. memory socket	d) программы
5. power supply	e) включение
6. boot	f) источник питания
7. power-up	g) запуск
8. routines	h) периферийные контроллеры
9. peripheral controllers	i) последовательные и параллельные порты
10. coprocessor	j) слот расширения
11. expansion slot	k) сопроцессор
12. circuitry	l) аппаратные компоненты
13. hardware components	m) электронная схема
14. software components	n) процессорное гнездо
15. fan	o) вентилятор
16. processor socket	p) программные компоненты

V. Give derivatives of the following words.

Processor, to store, to operate, to expand, digit, magnet, basic, to interpret, to apply, to control, to point, information, calculation, responsibility, to connect, to use.

Grammar

VI. Complete the phrases with the correct prepositions. **Translate them into Russian.**

1. to be responsible ...
2. to consist ...
3. to communicate ...
4. to enter data ... a computer

5. to protect the internal components ... damage
6. to carry ... the basic instructions
7. to be used ... long-term storage ... data
8. to be ... low quality
9. to store data ... both sides of the disc
10. the flexible disc enclosed ... a plastic cell

VII. Put questions to the following sentences.

1. The term *computer* is used to describe a device made up of a combination of electronic and electromechanical components.
2. Software is the term used to describe instructions that tell the hardware how to perform a task.
3. The basic job of the computer is the processing of information.
4. Computers accept information in the form of instructions called a program and characters called data.
5. The computer is expected to perform mathematical and logical operations and give out the results.
6. The data is raw material while information is organized, processed, refined and used for decision making.
7. The computer is used to convert data into information.
8. It is also used to store information in the digital form.

Translation

VIII. Translate the sentences with the conjunctions *unless, while, though, if.*

1. A body in motion would continue to travel in a straight line forever unless some force was applied to stop it.
2. *Unless* you seize a handrail, you will keep moving due to your being a "body" in motion.
3. *While* being a student, Newton was greatly interested in the discoveries which had been made before.
4. *Though* conducted with great care, the test did not give the expected results.
5. *Unless* stopped by some external force, the body will keep moving due to inertia.
6. *While* making experiments, Newton discovered the law of inertia.
7. *If* emitted by a strong source of light, the rays would cast bright light on the distant objects.

Revision

IX. Translate the following sentences into English.

1. Говорят, что они хорошо знают китайский язык.
2. Говорили, что он знает несколько восточных языков.
3. Говорят, что он пишет новую пьесу.
4. Полагают, что они находятся на пути в Москву.
5. Считают, что он опытный инженер.

6. Ожидали, что он прибудет вечером.
7. Сообщают, что делегация уехала из Лондона.
8. Кажется, он хорошо знает английский язык.
9. Погода, по-видимому, улучшается.
10. Случилось так, что я был там в это время.
11. Вероятно, они придут скоро.
12. Маловероятно, что они прибудут завтра.
13. Они, несомненно, приедут на конференцию.
14. Он, несомненно, вернётся скоро.

Text 3. PROGRAMMING LANGUAGES

"First things first: the very first language
a programmer should learn is English."
Stig Hemmer

A programming language is a composition of vocabulary and a set of grammatical rules for instructing a computer to perform specific tasks. Each language has a unique set of keywords (words that it understands) and a special syntax for organizing program instructions.

Machine languages are the languages that the computer actually understands. They are the least complex and the closest to computer hardware programming languages. They consist entirely of numbers, and only numbers, — memory addresses and operation codes. Each different type of CPU (Central Processing Unit) has its own unique machine language.

Lying between machine languages and high-level languages are assembly languages. Assembly languages, or assemblers, are similar to machine languages, but they are much easier to program in because they allow a programmer to substitute names for numbers: ones and zeros and enable them to use meaningful names for instructions. In fact, the first assembler was simply a system for representing machine instructions with simple mnemonics.

The term *programming language* most often refers to high-level languages, such as BASIC, C, C++, COBOL, FORTRAN, Ada, Pascal, etc. High-level programming languages are more complex than assemblers and much more complex than machine languages. They all fall into two major categories: imperative languages and declarative languages.

Imperative languages describe computation in terms of a program state and statements that change the program state. Imperative programs are a sequence of commands for the computer to perform. The earliest imperative languages were the machine languages of the original computers. In these languages, instructions were very simple. FORTRAN, Formula translation, developed at IBM starting in 1954, was a compiled language that allowed named variables, complex expressions, subprograms, and many other features now common in imperative languages.

Declarative programming languages stand in contrast to imperative languages. Whereas imperative languages give the computer a list of instructions to execute in a particular order, declarative programming describes to the computer a set of

conditions and relationships between variables, and then the language executor (an interpreter or compiler) applies a fixed algorithm to these relations to produce a result. The advantage of declarative languages is that programs written in them are closer to the program specification. Programming, therefore, is at a higher level than in the imperative languages.

Phonetics

I. Read the following words according to the transcription.

assembly [ə´semblɪ] - ассемблер, язык ассемблера

mnemonics [nɪ´mɔniks] - мнемоника

FORTRAN [´fɔːtræn] - ФОРТРАН - сокр. от FORmula TRANslator

COBOL [´kəubɔl] - КОБОЛ - сокр. от Common Business Oriented Language - язык программирования для коммерческих и деловых задач

ADA [´eidə] - Automated Data Acquisition - автоматизированное получение данных

PASCAL [pæ´skæl] - язык Паскаль

imperative [ɪmˈperətɪv] - императивный

declarative [dɪˈklærətɪv] - декларативный

Comprehension check

II. Answer the following questions.

1. How is a programming language defined?
2. What are machine languages?
3. What are assembly languages?
4. What are high-level languages characterized by?
5. What is the function of imperative languages?
6. What does declarative programming consist in?
7. Is a higher level of programming provided by imperative or declarative languages?

III. Complete the following sentences.

1. A programming language is ...
2. Machine languages are the languages that ...
3. Each different type of CPU has its own ...
4. Lying between machine languages and high-level languages are ...
5. Most often the term *programming language* refers to ...
6. Imperative programs are a sequence of ...
7. Programming in the imperative languages is at a higher level ...

Vocabulary

IV. Give derivatives of the following words.

To specify, to declare, to execute, to assemble, to compile, program, to express, to represent, to instruct, to describe, similar, to perform, to apply, to specify, organization, to vary, to interpret, to produce, to differ, development, entire, to mean.

V. Find in the text English equivalents to the following Russian words and word-combinations.

Императивный язык программирования, декларативный язык программирования, ассемблер, программный язык высокого уровня, машинный язык, символика (команд), код операций, адрес памяти, набор ключевых слов, последовательность команд, подпрограмма, функциональные требования программы, свод правил, значения переменных, исполнитель, преимущество, составитель программы.

VI. Match the synonymous forms.

1. similar	a) to collect
2. complex	b) first
3. to assemble	c) like
4. original	d) basic
5. major	e) to be divided into
6. fundamental	f) structure
7. to fall into	g) to use instead of
8. composition	h) to make smth. possible
9. to substitute	i) symbolics
10. to enable	j) complicated
11. mnemonics	k) to create
12. to develop	l) main

Grammar

VII. Insert prepositions where necessary: *of, on, into, for, at, in, to***.**

1. A monitor is responsible … conveying information … the user.
2. A system unit is a box made … metal or plastic.
3. A mouse contains … least one button.
4. Different drives may be installed … a computer.
5. There are two types … processor: slotted and socket.
6. Memory is a temporary storage place … data.
7. The mouse controls the movement … the pointer … the screen.
8. All computer components are either contained … or attached … the motherboard

Translation

VIII. Translate the following sentences with complex conjunctions *both … and*; *either ... or; neither ... nor (как .... так и; или ... или; ни ... ни)*.

1. *Both* Godel's result *and* the new discoveries require the construction of a model.
2. *Both* imperative *and* declarative languages refer to high-level programming languages.
3. This equation has *either* the root equal to zero *or* no solution at all.
4. *Neither* the axiom of choice *nor* the continuum hypothesis had been proved.
5. A programmer is expected to define *both* the problem *and* the means of solving it.

6. *Either* the program failed, *or* the instruments of measurement were unreliable.
7. *Both* scientists *and* engineers took part in the construction of the first computers.
8. In the early ages, people used *either* objects *or* fingers in counting.
9. In the past, people understood *neither* the nature of light *nor* the way it travelled through space.
10. *Both* radium *and* uranium are rare elements that break down by themselves.
11. *Neither* radio broadcasting stations *nor* radar sets can operate without radiant energy waves.
12. *Both* Newton's mechanics *and* Einstein's theory of relativity are used in the study of astronomy and the movement of celestial bodies.
13. *Both* physics *and* mathematics add to our understanding of the world around us.
14. Modern engineering demands *both* a sound training in general sciences *and* profound knowledge of the computer.

IX. Translate the sentences paying attention to the use of the Present Perfect Continuous Tense.

1. I have been working on the program for a month.
2. I have been studying Mathematics for over 10 years.
3. He has been learning English for two years.
4. My friend has been programming for ages.
5. They have been investigating this strange phenomenon for a long time, but they haven't found any reasonable explanation so far.
6. How long have you been experimenting with this new device?
7. I have been looking for the dictionary since morning, and I still hope to find it.

Revision

X. Translate the following sentences into English focusing on Gerund and Participle I.

1. Я помню, что читал эту книгу.
2. Он настаивал, чтобы они пошли туда немедленно.
3. Благодарю вас за то, что вы пришли.
4. Он вошёл в комнату, не заметив её.
5. Эту книгу стоит прочесть.
6. Плавание - хорошее физическое упражнение.
7. Нет смысла идти туда сегодня.
8. Перед отъездом в Лондон я зашёл к брату.
9. Зная английский язык хорошо, он переводил газетные статьи без словаря.
10. Когда я вошёл в комнату, я отдал письмо женщине, сидевшей у окна.
11. Я поднял журнал, лежавший на полу.
12. Приехав на вокзал, я позвонил сестре.
13. Он сидел в кресле, читая газету.
14. Переходя мост, мы увидели Джона, разговаривавшего с пожилым мужчиной.
15. Прожив в Британии несколько лет, учёный вернулся на родину.

Text 4. COMPUTER VIRUSES

A virus is a piece of software designed and written adversely to affect your computer by altering the way it works without your knowledge or permission. In more technical terms, a virus is a segment of program code that implants itself into one of your executable files and spreads systematically from one file to another.

Computer viruses must be written and have a specific purpose. Usually, a virus has two distinct functions: it spreads itself from one file to another without your knowledge and implements the damage planned by the perpetrator. This could include erasing a disk, deleting your files, corrupting your programs or just creating havoc on your computer.

Troyan Horses, (or Backdoors) are one of the viruses of which there are now more than one thousand in circulation (including modifications and variants). They pose a real threat to any user who hasn't taken adequate precautions to protect their data.

The name *Troyan Horse* derives itself from a page in Greek history when the Greeks had laid siege to the fortified city of Troy for over ten years. Their spy, a Greek called Sinon, offered the Troyans a gift in the form of a wooden horse and convinced them that by accepting it, they would become invincible. The horse, though, was hollow and was occupied by a contingent of Greek soldiers. When they emerged in the dead of night and opened the city gates, the Greeks swarmed in, slaughtered its citizens and subsequently pillaged, burnt and laid waste to the city.

In the IT environment, the Troyan Horse acts as a means of entering the victim's computer undetected and then allowing a remote user unrestricted access to any data stored on the user's hard disk drive whenever he or she goes online. In this way, the user gets burnt and like the unfortunate citizens of Troy, may only discover the fact when it is too late. These types of viruses were originally designed as a means of self-expression by gifted programmers. The viruses made the system lock up or caused loss of data on the user's machine.

Phonetics

I. Read the following words according to the transcription.

virus [ˈvaɪərəs] - вирус
adversely [ædˈvɜːslɪ] - *зд.* преднамеренно, с враждебным намерением
havoc [ˈhævək] - опустошение
Troyan [ˊtrɔjən] - троян, троянская программа
segment [ˈsegmənt] - часть
implement, *v* [ˈɪmplɪmənt] - осуществлять
delete, *v* [dɪˈliːt] - удалить
contingent [kənˈtɪnʤənt] - отряд
siege [siːʤ] - осада
slaughter, *v* [ˈslɔːtə] - убивать
subsequent [ˈsʌbsɪˌkwənt] - последующий
pillage [ˈpɪlɪʤ] - грабёж, мародёрство

Comprehension check

II. Answer the following questions.

1. How is a virus defined?
2. What episode in Greek history is the virus *Troyan Horse* associated with?
3. Where do computer viruses come from?
4. Who were they originally designed by?
5. What is the damage inflicted by the virus on the computer?

III. Complete the following sentences.

1. A virus is a segment of program code that ...
2. A virus implements the damage planned by ...
3. The Greeks had laid siege to the fortified city of Troy for over ...
4. The Troyan Horse allows a remote user access to ...
5. These types of viruses were originally designed ...
6. The user may only discover that fact ...
7. The viruses cause loss of ...
8. Computer viruses must be written and ...
9. They pose a real threat to any user who ...

Vocabulary

IV. Match the synonymous forms.

1. to convince smb.	a) to alter
2. to take steps to protect one's data	b) aim
3. to change	c) to make smb. believe
4. purpose	d) to take precautions
5. talented	e) unconquerable
6. invincible	f) gifted
7. unfortunate	g) to endanger
8. to pose a threat	h) unlucky
9. to give a present	i) to emerge
10. to come out	j) to offer a gift
11. undetected	k) to kill
12. to slaughter	l) unnoticed

V. Find in the text the English equivalents to the following Russian words and word-combinations.

блокировать (систему), разграбить (город), опустошить, по имени, средство самовыражения, неограниченный доступ, войти в Интернет, быть созданным, быть в обращении (в ходу), воздействовать, распространяться, исполнитель преступления, приводить в полный беспорядок, повредить программу, стереть диск, ликвидировать файлы, причинить вред, иметь определённую цель, храниться на жёстком диске, принять соответствующие меры предосторожности.

Grammar

VI. Complete the sentences matching its parts from the two columns.

1. The longer we waited	a) the more I liked him
2. The more I got to know him	b) the more impatient he became
3. The earlier we leave	c) the more you want
4. The more you practice your English	d) the faster you'll learn
5. The longer the telephone call	e) the sooner we'll arrive
6. The more you have	f) the more you have to pay

VII. Choose the appropriate Present Tense (*the right column***) for each English verb (***the left column***).**

1. has read	a) Present Progressive
2. is reading	b) Present Perfect
3. had read	c) Present Simple
4. have been reading	d) Past Perfect
5. reads	e) Present Perfect Progressive

VIII. Choose the preposition to be used (*or not be used at all*) **after each verb listed below**. **Translate the verbs.**

1. to insist	a) of
2. to depend	b) from
3. to avoid	c) on
4. to succeed	d) in
5. to deny	e) -
6. to rely	
7. to approve	
8. to prevent	

IX. Insert the proper verbs from exercise VI and translate the sentences into Russian.

1. They (*настаивали*) on our coming.
2. This company (*преуспела*) in producing personal computers.
3. He (*одобрил*) of using modern methods of investigation.
4. You should (*избегать*) working without any breaks at all.
5. Nothing could (*помешать*) him from going there.

Translation

X. Translate the following sentences into Russian paying attention to the meanings of the words *the former … the latter – первый … последний***.**

1. Fundamental and applied sciences are commonly distinguished, *the former* are interested in fundamental laws of nature, *the latter* in their practical application.
2. The subject of applied mechanics may be divided into statics and dynamics; *the former* deals with bodies in equilibrium, *the latter* with bodies in motion.

3. There are two kinds of motion: rectilinear and curvilinear, *the former* is the motion of a particle along a straight line*, the latter* is the motion along a curved path.

Revision

XI. *Participle I* or *Participle II?* Translate the sentences into English.

1. Он показал мне список предметов, изучаемых студентами второго курса.
2. Она зашила порванный рукав своего платья.
3. Ответ, полученный от наших партнёров, очень удивил нас.
4. Вопросы, обсуждавшиеся на собрании в прошлом месяце, теперь решены.
5. Человек, сидящий у окна, брат моего друга.
6. Имея много времени, мы решили пойти в театр.
7. Она смотрела на ребёнка, игравшего в компьютерную игру.
8. Катаясь вчера на коньках, он упал и повредил ногу.
9. Книги, прочитанные в детстве, кажутся старыми друзьями.
10. Имея такой хороший словарь, ты сможешь легко перевести эту статью.
11. Мы сидели в саду, разговаривая о нашей поездке на юг.
12. Капитан стоял на мостике, отдавая приказы морякам.
13. Все студенты, принимающие участие в соревновании, должны прийти в спортзал в 6 часов.
14. Все работы, написанные студентами, уже проверены преподавателем.
15. Я ещё не просмотрел все журналы, присланные нам из Москвы.
16. Покажите мне список студентов, изучающих английский язык.

Text 5. COMPUTERS IN SCIENCE

Computers are, perhaps, the most useful tools that have ever been invented by mankind. They are used to count our votes, figure our bank accounts, help plan new buildings and bridges, guide our astronauts through space and assist management in its everyday decisions. The dynamic introduction of the computer has changed man's information needs entirely. Man has developed methods of compiling and analyzing large quantities of data with a minimum amount of human intervention. Technological advances in all fields have been dynamic and extensive. The methods of applying data processing systems to information needs are boundless. With each new application, data processing systems can be used to help man increase his productivity and advance civilization further. It's a giant step forward in man's utilization of science and knowledge as a means of progress.

What can computers do for the scientist? Now weather scientists are able to work out astronomical number of calculations for *predicting weather changes*. They are even working on a mathematic model of the world's weather that may some day enable us *to make accurate weather forecasts* a year or more ahead of time.

In *medicine* computers are helping researchers test drugs by extrapolating the information gained in limited trials, so that large scale tests will not only be safer, but will yield far more useful information. Computers are helping doctors *make diagnoses* by winnowing down the information a doctor has to go through to arrive at a valid conclusion.

Biochemists are using computers as a sort of *mathematical microscope*, in delving into the secret of the living cell; they have found a physical limit to the information they can obtain with their instruments. By using computers, they have already obtained and are beginning to construct an accurate picture of the giant molecules that are the building blocks of all living things.

In *astronomy*, computers, of course, serve as computational workhorses, figuring out the exact positions and orbits of planets, stars and other heavenly bodies.

With the growing importance of radio telescope, computers have been especially valuable in analyzing the patterns of signals received from outer space, separating the meaningful signals from the electronic roar of background "noise" that accompanies them. *Space technology* would be almost unthinkable without the power of the computer. This is an area of science that requires the combined knowledge of all other sciences - physics, chemistry, thermodynamics, electronics, mathematics, even psychology. Only computers can bring this large amount of information under control to make it serve our efforts.

The potential of using computers in *education* and the *training of specialists* is enormous. Computers extend our abilities and allow us to make more rational decisions faster. It is especially important in extreme situations, at the time of emergency and disaster. Computer models of people's behaviour in panic moments help rescuers make adequate decisions and save lives. *Artificial intelligence* is another promising field of knowledge which is unimaginable without the computer.

The achievements of computers in all fields of knowledge have been fantastic. The tremendous storage capacities and rapid processing of data have produced the valuable information necessary for research in the unknown areas of science. Scientific research has moved into the foreground of human activity. In both pure and applied sciences, computers are being used to increase man's thinking power - and to increase the time he can spend thinking.

Phonetics

I. Read the following words according to the transcription.

entirely [ɪnˈtaɪəlɪ] - полностью
utilization [ˌjuːtɪlaɪˈzeɪʃn] - использование
astronomical [ˌæstrəˈnɒmɪkəl] - астрономический
accurate [ˈækjurɪt] - точный
extrapolate, *v* [ɪkˈstræpəˌleɪt] - экстраполировать
diagnosis [ˌdaɪəgˈnəʊsɪs] - диагноз
molecule [ˈmɒlɪkjuːl] - молекула
biochemist [ˈbaɪəʊˈkemɪst] - биохимик
psychology [saɪˈkɒlədʒɪ] - психология

Comprehension check

II. Answer the following questions.

1. How have man's information needs been changed with the introduction of the computer?

2. What can computers do for meteorologists?
3. What are the prospects of using computers in medicine?
4. How do biochemists benefit from the use of computers?
5. What is the use of computers in astronomy like?
6. Are computers useful in developing space technology?
7. What is the potential of using computers in the sphere of education?
8. What is the role of computers in both pure and applied sciences?

Vocabulary

III. Find in the text the English equivalents to the following Russian words and word-combinations.

Большие массивы данных, шаг вперёд, системы обработки данных, вычисления, делать точный прогноз погоды, экстраполировать, проводить испытания лекарственных средств, ставить диагноз, отбирать информацию, сделать правильное заключение, математический микроскоп, ставить под контроль большие объёмы информации, чрезвычайная ситуация, стихийное бедствие, компьютерная модель поведения, принимать решения, теоретические и прикладные науки.

IV. Match the synonyms.

1. tremendous	a) fast
2. rapid	b) enormous
3. to accompany	c) to surpass
4. to exceed	d) to go with
5. various	e) to perform
6. to execute	f) diverse
7. to predict	g) to display
8. to exhibit	h) to forecast
9. rational	i) common
10. to obtain	j) reasonable
11. smart	k) to gain
12. general	l) intelligent
13. to delay	m) to compel
14. to force	n) to postpone

Grammar

V. Choose the appropriate Future Tense (*the right column***) for each English verb (***the left column***).**

1. will read	a) Future Perfect Active
2. shall have read	b) Future Simple Active
3. will be reading	c) Future Progressive Active
4. will be read	d) Future Perfect Progressive Active
5. shall have been reading	e) Future Perfect Passive
6. will have been read	f) Future Simple Passive

VI. Complete the sentences) using the information given in brackets *(First Conditionals).* **Begin each sentence with the words:** *If the computer industry continues to grow…*

Model: Students (to take courses on home computers).
If the computer industry continues to grow, students will probably take courses on home computers.

1. Universities (to be abandoned).
2. Work (to be done at home).
3. Cities as we know them (to become a thing of the past).
4. Books (to become obsolete).
5. News from magazines (to be available even before it is printed).
6. People (to become more isolated).
7. People (to expect friends to respond as computers do).
8. Medical diagnoses (be done by computers).
9. Tiny computer implants containing a great deal of information (to be placed into the brain).
10. Computers (to replace workers).

VII. Complete the sentences using the correct form of the verb (*Second Conditionals).*

Model: If I were in London, I would go to the British Museum.

1. If I had enough money, I (*to buy*) the latest computer model.
2. It's obvious that if there were no computers, the progress of civilization (*not to be)* so rapid.
3. If they had more powerful computers, they (*to achieve*) much better results.
4. If I were a genius …
5. If my father were a tycoon of computer industry …
6. If my girlfriend were a hacker …
7. If I had $ 100,000 to spend in three days …
8. If somebody stole my computer …

VIII. Put questions to the following sentences.

1. Computer programs of the future will probably be quite different from those in use today. (*General question*)
2. It will be an interesting future – waiting for each new development and marveling at each new advance in data processing. (*Special question: a why- question*)
3. Every home could have a built-in communications system, similar to cable television. (*Special question: a what-question)*)
4. A built-in communications system will allow the user to have the world's information at his immediate disposal without leaving his home. (*Special question*)
5. Programming as we know it may cease to exist. (*General question*)

Translation

IX. Translate the following sentences into Russian paying attention to the prepositions *with* **and** *by.*

1. *By* using computers, biochemists are making a study of the building blocks of all living things.
2. *With* the growing use of computers, great progress is being made in the field of space exploration.
3. *By* combining the knowledge of different sciences, researchers may considerably advance the development of space technology.
4. *With* each new application of data processing systems, man advances civilization further.
5. *With* the help of computers, scientists manage to bring large amounts of information under control.
6. *By* making computer models of people's behaviour, scientists help rescuers arrive at rational decisions.

X. Translate the following sentences paying attention to the use of the Present Perfect Tense.

1. Biochemists *have found* a physical limit to the information they can obtain with their instruments.
2. Computers *have been* especially valuable in analyzing the signals from outer space.
3. Scientific research *has moved* into the foreground of human activity.
4. The achievements of computers in all sciences *have been* fantastic.
5. The object of this text *has been* to show the application of computers in various spheres.

Revision

XI. *Infinitive* or *Gerund*? Open the brackets and use the correct form to complete the sentence.

1. I would rather not *(to tell*) them about it.
2. It was difficult *(to refuse*) his request.
3. It is no good (*to do*) that.
4. You had better (*to go*) there at once.
5. Do you have any objection (*to sign*) this document?
6. He said he would sooner *(to stay) at home.*
7. It isn't worth while (to go) there.
8. I don't mind (*to walk*).
9. She enjoyed *(to sit)* in the sun.
10. I look forward (*to go)* on leave.
11. He made me (*to read*) the book.
12. I let him *(to go*) there.
13. He was made *(to do)* it.
14. I have no desire *(to go)* there.

15. It's useless (*to try*) to make him change his mind.

Text 6. THE INTERNET

The Internet is one of the words that are most commonly used nowadays. Wherever you were and whatever you did, you could hear it mentioned once or even several times a day.

So what is the Internet? Why has this global network suddenly appeared? How many people use it? In what directions does the Internet develop? The answers to these questions allow experts to develop this extremely important communication system which is connected with the three stages of computer development.

1. The era of the *Black box* (1939 – 1970). At that time, computers were an enormous collection of electronic lamps, transistors or integrated circuits. They also filled huge black metal boxes. If you smoked or raised your voice, they wheezed and stopped. Most of them were manufactured by the IBM firm.

2. The era of *personal computers* (1970 – 1990). The invention of microcircuits and new operational systems resulted in the fact that computers became cheaper, smaller in size and faster, i.e. they needed less time to perform larger amounts of work. Miniaturization and improvement of program maintenance placed computers at the disposal of small businesses and families. By the end of this period, the majority of people used the programs of the Microsoft firm.

3. The era of the WorldNet (1992). The new communication facility became popular when operators started sending messages to each other to exchange new ideas and to discuss general scientific problems. It was called *e-mail.* With time, *e-mail, Skype* and *Social Networks* became the most wide-spread Internet services.

Nowadays, the Internet is the largest communication network in the world involving millions of users all over the world. However, it is very difficult to define the exact number of users since there is no management and no authority operating this network. It is sometimes called a big information *dump.* Yet, it is developing fast and there is no denying the fact that the Internet is extremely useful in our day-to-day life.

Phonetics

I. Read the following words according to the transcription.

microcircuit [ˈmaɪkrəu˛sɜːkɪt]] - микросхема, чип
integrated [ˈɪntə˛greɪtɪd] - интегрированный
manufacture, *v* [˛mænjuˈfækʧə] - производить
miniaturization [˛mɪnɪʧəraɪˈzeɪʃn] - миниатюризация
authority [ɔːˈθɔrɪtɪ] - руководство; орган управления

Comprehension check

II. Answer the following questions.

1. How many stages of computer development is the Internet connected with?
2. What were the main disadvantages of the early computers?
3. When did computers become faster and smaller in size?

4. What is the third stage of computer development characterized by?
5. Why is it difficult to define the exact number of Internet users?

Vocabulary

III. Match the antonyms.

1. huge	a) local
2.global	b) tiny
3. expensive	c) to lower
4. to raise	d) cheap
5. majority	e) approximate
6. exact	f) minority
7. suddenly	g) enlargement
8. miniaturization	h) to prohibit
9. to allow	i) gradually
10. improvement	j) particular
11. to send	k) to underestimate
12. general	l) to receive
13. to overestimate	m) deterioration

IV. Find in the text English equivalents to the following Russian words and word-combinations.

Сеть, электронная почта, интегрированный, этапы развития, обмениваться, операционная система, социальные сети, посылать сообщения, выполнять большие объёмы работы, в распоряжении, охватывать миллионы пользователей, информационная "свалка", невозможно отрицать, развивать, руководство, чрезвычайно важный, изобретение, привести к чему-либо, минимизация объёма, улучшение, производить, определять, обсуждать.

V. Give derivatives of the following words.

To maintain, to define, miniature, to develop, to deny, person, to invent, to communicate, difficult, advantage, science, to integrate, to improve, to collect, to use.

Grammar

VI. Fill in the gaps with appropriate prepositions: *of, in, by, for.*

When Charles Babbage, a professor… Mathematics…Cambridge University, invented the first calculating machine…1812, he couldn't imagine the situation we are in today. Nearly everything we do is controlled…computers, the complicated descendants… his simple machine.

Computers are used more and more often…the world today…the simple reason that they are far more efficient than human beings. They have much better memories, and they can store much information. No man alive can do 50.000 sums…one second, but a computer can. ...fact, computers can do many…the things we do, but faster and better. They can predict the weather, play chess, write poetry and even compose music.

VII. Define the grammatical tense of the verbs in the following sentences.

A

1. The students work in the laboratory twice a week.
2. They have been writing a composition for two hours.
3. I have just received an e-mail letter from my foreign colleague.
4. The man who is making a report is our research supervisor.
5. I'll ask him a question after he has finished speaking.
6. The results will be discussed after the experiment is completed.
7. When I came into the room, they were discussing something.
8. It was raining hard when I left the house.
9. My brother has been teaching Physics to University students since 2005.
10. We'll be waiting for you in the reading-hall.

B

1. How long had they been doing the test by that time?
2. By the end of the year, they will have been living here for over 3 years.
3. My friend had been ill for three days when I learnt about it.
4. Did you know that he had failed the exam?
5. He promised he would phone us when he arrived in Moscow.
6. My sister will have been writing the book for 2 years by that time.
7. By last September, she had been working in the office for 10 years.
8. They will have built the house by the beginning of June.
9. She said they would be repairing the kitchen the following Sunday.

Translation

VIII. Translate the sentences paying attention to the forms of the Infinitive after modal verbs.

1. The frequency must have been increased.
2. They couldn't have used the material in the construction of the device.
3. The scientists must be investigating the properties of the crystal.
4. The limit of performance might have been achieved.
5. They may be testing various types of lasers.
6. Small frequency shifts may have been detected.
7. Low-loss optical fibers must have been developed at this research center.
8. Chemists and biologists must have been working on the problem together.
9. Can he have forgotten to turn off the power supply?

IX. Translate the sentences from Russian into English using the Infinitive.

1. Известно, что биохимики используют компьютер как своеобразный математический микроскоп.
2 . Новым компьютерам требовалось меньше времени для выполнения больших объёмов работ.
3. Ожидается, что возможности человека будут увеличиваться.

4. Чтобы добиться успеха в космических технологиях, необходимо объединить знания в области химии, физики, термодинамики, электроники и математики.
5. Использовать компьютер – значит сократить время решения задачи.
6. Считается, что компьютер – одно из самых полезных изобретений человечества.
7. Учёные пользовались электронной почтой с целью обмена информацией и обсуждения достигнутых результатов.

X. Translate the following word-combinations.

the punched card principle
input and output equipment
high speed card readers and printers
repair and maintenance time
computer equipment
air conditioning
communication facility
program maintenance
communication network
computer development
Internet services
small businesses
data processing
weather scientists
weather changes
large scale tests
repair time.

Revision

XI. Open the brackets and use the correct form of the verb to complete the sentence.

1. She said that Don (*to tell*) her that he (*to go*) to the Crimea next summer.
2. I was surprised that you (*not to tell*) them that you (*to intend)* to go to St. Petersburg.
3. He promised that he (*to tell*) you about my request.
4. She said that she (*to come*) in the evening.
5. He said he *(to be*) strong enough to take part in the competition.
6. He drew a plan of the village so that she *(can)* find his house easily.
7. He said he would call me as soon as he (*to come*) home.
8. They asked me whether I (*to be*) there the next day.
9. When I asked him whether he (*to intend to go*) there, he answered that he ... (*not*) (*he answered in the negative*).
10. When I asked her if she (*to want*) to see the new film, she answered that she ... (*she answered in the affirmative*)

Text 7. INFORMATICS

The term *informatics* is of French origin. It appeared in the early 70-s as a hybrid of two words: *information* and *automatics* and was used for denoting a special field of automated information processing in society.

Informatics is a general term pertaining to the study of information systems. The following three points are essential for the understanding of the general meaning of the word *informatics*:

1. *Informatics* deals with any information system, that is, automated systems, living organisms, social organisms, social organisations, etc.

2. It may also be referred to natural and social sciences and engineering.

3. *Informatics* considers information systems from all points of view (from the logical point of view, paying special attention to information and processing, from the physical point of view, taking into account the ways of information system realization, i. e. information carriers and processing equipment).

Informatics is both a fundamental and applied science. It has to do with the laws and methods of accumulation, transmission and processing of information by means of computers.

The aim of fundamental investigation in the field of *Informatics* is, firstly, to obtain generalized knowledge of any information system; secondly, to determine the common characteristics of its structure and functioning. Applied investigations help to work out recommendations concerning the functioning of information systems.

Informatics is closely linked with philosophy and mathematics using the notion of mathematical model, mathematical logic and the theory of algorithms. It is also connected with linguistics by means of the theory of formal language and systems of signs, as well as the theory of information and cybernetics.

Informatics covers all spheres of man's intellectual activity connected with computer application. The main types of man's intellectual activities studied by *Informatics* are mathematical modeling, algorithmization, programming, computation experiments, and problem solving. *Informatics* also deals with programming and operating systems, database management systems, computer graphics, and artificial intelligence.

The new branch of industry called *informatics industry* is based on the practical application of *Informatics*. It includes computer equipment, means of communication, management and mass information.

Phonetics

I. Pronounce the following words according to the transcription.

automatics [ˌɔːtəˈmætɪks] - автоматика
automated [ˈɔːtəˌmeɪtɪd] - автоматизированный
carrier [ˈkærɪə] - носитель
processing [ˈprəʊsesɪŋ] - обработка данных
accumulation [əˌkjuːmjʊˈleɪʃn] - сбор
algorithm [ˈælgəˌrɪðm] - алгоритм

cybernetics [ˌsaɪbəˈnetɪks] - кибернетика
artificial [ˌɑːtɪˈfɪʃəl] - искусственный
linguistics [lɪŋˈgwɪstɪks] - лингвистика
algorithmization [ˌælgərɪðmaɪˈzeɪʃn] - алгоритмизация
database[ˈdeɪtəbeɪs] - база данных

Comprehension Check

II. Answer the following questions.

1. What is the origin of the term *informatics* and how was it applied in the early seventies?
2. What kinds of information systems does informatics deal with?
3. Can it be referred to sciences and engineering?
4. From what points of view does informatics consider the existing information systems?
5. What kind of science is informatics?
6. How is informatics related to computers?
7. What are the aims of fundamental investigation in the field of informatics?
8. What sciences is informatics closely linked with?
9. What notions of mathematics are used by informatics?
10. How is it connected with linguistics?
11. What are the main spheres of man's intellectual activities studied by informatics?
12. What does *informatics industry* include?

III. Read the following definitions of Informatics, compare them focusing on the differences and do the task given below.

1. *Informatics* is a basically new machine-based technology of information collection concerned with all manifestations, transmission, processing and use, a technology which is capable of providing major improvements to the key areas of social practice, above all, planning and management. It is expanding into an industry of its own which is of importance to the whole economy.

2. *Informatics* as a science studies the processes and laws of information communication, distribution, processing and conversion, as well as the laws underlying the performance of various other information handling operations (coding, decoding, memorizing, storage, extraction, display, matching, production or generation, use, etc.)

Choose the right answer

1. Informatics is viewed from the point of view of practice rather than theory in
   a) definition 1 b) definition 2
2. The rules governing information operations and processing are of special interest in
   a) definition 1 b) definition 2
3. Informatics focuses on information process management in
   a) definition 1 b) definition 2

4. Informatics is considered to be a science rather than an industry in

a) definition 1 b) definition 2

5. Informatics is concerned with improvement of social practice in

a) definition 1 b) definition 2

6. The importance of the theoretical aspect of information operations and processing is of special interest in

a) definition 1 b) definition 2

Vocabulary

IV. Pick out international words from the text *Informatics* and give their Russian equivalents.

V. Find in the text English equivalents to the following Russian words and word-combinations:

обозначать, изучать, рассматривать, принимать во внимание, с точки зрения, фундаментальное исследование, тесно связанный, охватывать все сферы умственной деятельности человека, решение проблем, компьютерная графика, применение, искусственный интеллект, теоретическая (фундаментальная) и прикладная наука, обращать особое внимание на, определять общие характеристики структуры и функционирования информационных систем.

VI. Complete the following sentences using the words given below:

a) to consider, b) to deal with, c) to be closely linked with, d) to cover, e) to denote, f) concerning

1. Informatics ... information systems.
2. It ... information systems from the logical and physical points of view.
3. Informatics ... all spheres of man's intellectual activity.
4. It is ... philosophy and mathematics.
5. Applied informatics works out recommendations ... the functioning of information systems.
6. The word *informatics* was used ... a special field of automated information processing.

Grammar

VII. Complete the gap with appropriate preposition and translate the following text *(of, from, with, on, to, in).*

Informatics deals ... transforming information. Information is a combination ... signals or data which a certain system receives ... the environment (input information), transmits ... the environment (output information) or stores (internal information). Informatics is based ... the use of computing equipment and is composed ... 3 closely connected parts: computers, programs and algorithms. Informatics, as well as mathematics, is applied ... various sciences. It does not study

or create material objects and processes, but provides other sciences ... methods ... investigation.

Translation

VIII. Choose the correct translation of the Russian phrases paying attention to the Subjective Infinitive Constructions.

1. Сообщили, что движение изменилось ….	a) They reported that the change of the motion …. b) The motion is reported to have changed …. c) The motion was reported to have changed ….
2. Полагают, что проблему решат ….	a) They assumed that to solve this problem …. b) The problem is assumed to be solved …. c) To solve this problem they assume ...
3. Ожидали, что объект движется ….	a) The object was expected to move …. b) They expected the object moved …. c) As they expected the object to move …
4. Говорили, что человек представляет ….	a) The man represented …. b) The man was said to represent …. c) The man is said to represent ….
5. Известно, что теория применяется на практике ….	a) They applied theory in practice. b) Theory was applied in practice. c) Theory is known to be applied in practice.

IX. Translate the following sentences paying attention to the use of the Past Perfect Continuous Tense.

A

1. I had been working on the project for a month by that moment.
2. They had been doing the research for half a year before they obtained a very important result.
3. They had been discussing the problem for an hour when the seminar was interrupted and an important announcement was made.

4. By the time the problem was solved the researchers had been experimenting with a number of materials for about two months.
5. He had been trying to get the secretary on the office phone for over 10 minutes when she finally answered the call.
6. The boys were out of breath. They had been running.
7. When he returned, he looked very red from the sun. He had been lying in the sun too long.
8. How long had you been waiting when the train finally arrived?

B

1. Дождь шёл уже два часа, когда я вышел из дому.
2. Она работала уже три часа, когда мы возвратились.
3. Его сестра жила в Москве уже три года, когда началась война.
4. Он чувствовал себя усталым, так как работал над составлением программы в течение нескольких часов.
5. Я работал над докладом уже несколько дней, когда мне на глаза случайно попалась одна очень интересная статья.
6. Хотя солнце светило, было ещё холодно, так как в течение двух часов шёл сильный дождь.
7. Я уже полчаса пытался дозвониться до своего бывшего одноклассника, когда он позвонил мне сам.

Revision

X. Open the brackets focusing on the types of conditional sentences.

1. If I (*to see)* him tomorrow, I (*to ask him about it*).
2. If my brother (*to have*) time now, he (*to help)* them.
3. If I (*to know*) his address, I (*to write*) to him.
4. If I were in St. Petersburg now, I (*to go)* to the Hermitage.
5. If she were not busy, she (*to call)* us.
6. If you had left home earlier, you *(not to be)* late for the lecture.
7. We have very little time left. If we (*not to hire*) a taxi, we *(to be)* late for the performance.
8. Look! If we (*not to hurry*), we (*to miss*) the train.
9. You could have done it if you (*to try*).
10. You might have found him there if you (*to call*) at five o'clock.
11. If I *(to be)* free next Sunday, I (*to go*) to the Exhibition Hall.
12. If he had worked harder, he (*to pass)* the exam.
13. If you knew English better, you (*to translate*) the text without difficulty yesterday.
14. If I were you, I (*to take)* a course in cooking.
15. If I had not got stuck in a traffic jam, I *(to come*) to the lessons on time.

Text 8. INFORMATION TECHNOLOGY

Information technology (IT) is the use of computers to store, retrieve, transmit, and manipulate data, or information, often in the context of a business or other enterprise. IT is considered to be a subset of information and communications technology (ICT). An information technology system (IT system) is generally an information system, a communications system or, more specifically speaking, a computer system – including all hardware, software and peripheral equipment – operated by a limited group of users.

Humans have been storing, retrieving, manipulating, and communicating information since the Sumerians in Mesopotamia developed writing in about 3000 BC, but the term *information technology* in its modern sense first appeared in a 1958 article published in the *Harvard Business Review*; the authors Harold J. Leavitt and Thomas L. Whisler wrote: "The new technology does not yet have a single established name. We shall call it information technology (IT)." Their definition consists of three categories: techniques for processing, the application of statistical and mathematical methods to decision-making, and the simulation of higher-order thinking through computer programs.

The term is commonly used as a synonym for computers and computer networks, but it also encompasses other information distribution technologies such as television and telephones. Several products or services within an economy are associated with information technology, including computer hardware, software, electronics, semiconductors, internet, telecom equipment, and e-commerce.

Based on the storage and processing technologies employed, it is possible to distinguish four distinct phases of IT development: pre-mechanical (3000 BC – 1450 AD), mechanical (1450 – 1840), electromechanical (1840–1940), and electronic (1940 – the present), including the most recent period.

Phonetics

I. Pronounce the following words according to the transcription.

manipulate, *v* [məˈnɪpjʊleɪt] - управлять
Mesopotamia [ˌmesəpəˈteɪmɪə] - Месопотамия
Sumerians [suːˊmɪərɪənz] - шумеры
enterprize, *v* [ˈentəˌpraɪz] - предприятие
encompass, *v* [ɪnˈkʌmpəs] - включать
process, *v* [ˊprəʊsəs] - обрабатывать
phase [ˊfeɪz] - этап; период
commerce [ˈkɒmɜːs] - торговля

Comprehension Check

II. Answer the following questions.

1. How is Information technology defined?
2. What is an information technology system generally and specifically speaking?

3. When did the history of handling information begin?

4. When and how did the term *information technology* first appear?

5. What three categories does the definition offered by Levitt and Whistler embrace?

6. What other information distribution technologies does it apply to?

7. What products and services are associated with information technology?

8. What are the four phases of IT development?

Vocabulary

III. Match the following.

1. backup 2. interface 3. kernel 4. microkernel 5. node 6. point-to-point 7. router 8. task manager 9. to route 10. to verify 11. worm 12. channel	a) the lowest level layer at the core of an operating system b) end point of a network connection c) the hardware or software that connects two systems and allows them to communicate with each other d) a minimal computer operating system kernel e) to move data from node to node on a network f) a self-replicating computer program g) a path for the transmission of data h) a direct link between two objects in a network i) an electronic device that links different networks or parts of a network j). the process of storing a copy of data on a storage k) to check for accuracy l) a program used to provide information about the processes and programs running on a computer

IV. Define the meaning of the following abbreviations.

1. DBMS 2. LAN 3 OCR 4. RTOS 5. ATM	a) asynchronous transfer mode (interconnects two or more local area networks) b) a real-time operating system c) database management d) local area network (a network connecting computers in a building) e) optical character recognition

V. Complete the sentences with the following words and word-combinations.

"a task", the kernel, Task Management, the execution of application software tasks, task delays and time-outs, RAM memory, add-on operating system components

1. Each separate “chunk” (часть) of software is called a ...
2. ... is the part of an operating system that provides the most basic services to application software running on a processor.
3. The most basic category of kernel services is ...
4. The Task Scheduler controls ... , and can make them run in a very timely and responsive fashion.
5. Most RTOS kernels also provide some basic Timer services, such as ...
6. Dynamic Memory Allocation services allow tasks to “borrow” chunks of ... for temporary use in application software.
7. In addition to kernel services, many RTOSs offer a number of optional ...

VI. Match the following.

1. retrieve	a) принятие решений
2. transmit	b) чётко различимый
3. manipulate	c) компания
4. decision-making	d) передавать
5. enterprise	e) осуществлять выборку
6. semiconductors	f) распространение
7. higher-order thinking	g) оперировать
8. distinct	h) обрабатывать
9. distribution	i) мышление высшего порядка
10. process, *v*	j) полупроводники
11. power	k) использовать
12. exabyte	l) администрация сети
13. to deploy	m) экзабайт, квадриллион килобайт
14. network administration	n) источник питания

Grammar

VII. Identify the gerund in each of the following sentences.

1. Programming is the process of preparing, testing, correcting instructions for a computer.
2. Logical operations consist of comparing, selecting, sorting, matching and determining.
3. After performing calculations, a computer displays some result.
4. His being a bright programmer is a well known fact.
5. He saw the operator having made the machine operate.
6. Debugging a program is hard work.
7. One of the benefits of buying a system is that it has detailed documentation with it.

8. By performing different kinds of operations on a computer, people solve a lot of different problems.

VIII. Transform the sentences following the model.

Model: Saying *no* to people is hard → It's hard to say *no* to people.

1. Using colored chalk is more effective.
2. Memorizing all of these relations is very difficult.
3. Distinguishing the elements of a set from the "non elements" is essential.
4. Determining the exact image in that case is impossible.
5. Selecting two points on a line, labeling them and referring to the line in this way is more convenient.
6. Having a more simplified system of notation is desirable.
7. Identifying the meaning of an expression from the context is not always easy.
8. Giving your full name is compulsory.
9. Dividing the segment into three parts is permissible.

IX. Answer the questions following the model.

Model: – What would you do to draw a straight line? (*to use a ruler*)
– I would use a ruler to draw a straight line.

1. What would you do to solve this problem? (*find the value of the unknown)*
2. What would you suggest for improving the situation? (*some modification*)
3. What would you do to be sure of the calculation? (*to check the result*)
4. What would you suggest for evaluating this formula? (*to make use of logarithms)*
5. What would you do to pass the exam successfully? (*to work harder*)
6. What would you do to travel abroad next summer? (*to save money and brush up my English)*
7. Who would you consult to start your own business? (*an experienced business person and a lawyer)*

Translation

X. Read and translate the following sentences.

1. The terms *data* and *information* are not synonymous. Anything stored is *data*, but it only becomes *information* when it is organized and presented meaningfully.

2. *Data transmission* has three aspects: transmission, propagation, and reception. It can be broadly categorized as *broadcasting*, in which information is transmitted unidirectionally downstream, or *telecommunications*, with bidirectional upstream and downstream channels.

3. Massive amounts of data are *stored* worldwide every day, but unless it can be analysed and presented effectively, it essentially resides in what have been called *data tombs*: data archives that are seldom used.

4. *Data mining* is the process of discovering interesting patterns and knowledge from large amounts of data. It is the field that emerged in the late 1980s to address the issue of data tombs.

5. In an academic context, IT may be defined as undergraduate degree programs that prepare students to meet the computer technology needs of business, government, healthcare, schools, and other kinds of organizations.

6. IT specialists resume responsibility for selecting hardware and software products appropriate for an organization's computer users.

7. The responsibilities of those working in a company's IT department include network administration, software development and installation and management of an organization's technology life circle, by which hardware and software are maintained, upgraded and replaced.

Revision

XI. Translate the sentences focusing on the position of the adverbs.

1. Я обычно очень устаю, когда работаю весь день без отдыха.
2. Эти туристы, возможно, американцы.
2. Она никогда не приходит домой так поздно.
3. Он категорически отказался отвечать на вопрос (*flatly*).
4. Я там не был в последнее время (*lately).*
5. Сегодня я, возможно, приду домой поздно.
6. Его только что попросили принять участие в эксперименте.
7. Мне часто приходится ходить туда.
8. Я всегда могу доказать, что это так (*true*).
9. Вы уже прочли текст?
10. Он всегда щедр.
11. Я раньше не замечал этого.
12. В последнее время мы его не видели.
13. Ты достаточно хорошо знаешь английский язык, чтобы читать эту книгу в оригинале.
14. Я тоже его не видел.
15. Мы оба были удивлены, когда узнали об этом.
16. В его работе слишком много ошибок.
17. Ей всегда приходится спешить утром, потому что она встаёт поздно.
18. Мы все уезжаем завтра.

Text 9. INFORMATION SECURITY

Information security, sometimes shortened to infosec, is the practice of protecting information by mitigating information risks. It is part of information risk management and it involves preventing or reducing the probability of unauthorized use, disclosure, disruption, deletion, modification, inspection, recording or devaluation. Information security's primary focus is the balanced protection of the confidentiality, integrity and availability of data (also known as the CIA triad). This is largely achieved through a structured risk management process that involves:

- Identifying information and related assets, plus potential threats, vulnerabilities and impacts;
- Evaluating the risks;
- Deciding how to address or treat the risks i.e. to avoid, mitigate, share or accept them;
- Where risk mitigation is required, selecting or designing appropriate security controls and implementing them;
- Monitoring the activities, making adjustments necessary to address any issues, changes and improvement opportunities.

To standardize this discipline, academics and professionals collaborate to offer guidance, policies, and industry standards on password, antivirus software, firewall, encryption software, legal liability, security awareness and training, and so forth. This standardization may be further driven by a wide variety of laws and regulations that affect how data is accessed, processed, stored, transferred and destroyed. However, the implementation of any standards and guidance within an entity may have limited effect if a culture of continual improvement isn't adopted.

History

Since the early days of communication, diplomats and military commanders understood that it was necessary to provide some mechanism to protect the confidentiality of correspondence and to have some means of detecting tampering. Julius Caesar is credited with the invention of the Caesar cipher which was created in order to prevent his secret messages from being read should a message fall into the wrong hands; however, for the most part protection was achieved through the application of procedural handling controls. Sensitive information was marked up to indicate that it should be protected and transported by trusted persons, guarded and stored in a secure environment or strong box. As postal services expanded, governments created official organizations to intercept, decipher, read and reseal letters (e.g., the U.K.'s Secret Office, founded in 1653).

In the mid-nineteenth century, more complex classification systems were developed to allow governments to manage their information according to the degree of sensitivity. The end of the twentieth century and the early years of the twenty-first century saw rapid advancements in telecommunications, computing hardware and software, and data encryption. The availability of smaller, more powerful and less expensive computing equipment made electronic data processing within the reach of small business and the home user. These computers quickly became interconnected through the Internet.

The rapid growth and widespread use of electronic data processing and electronic business conducted through the Internet, along with numerous occurrences of international terrorism, fueled the need for better methods of protecting the computers and the information they store, process and transmit. The academic disciplines of computer security and information assurance emerged along with numerous professional organizations, all sharing the common goals of ensuring the security and reliability of information systems.

Phonetics

I. Pronounce the following words according to the transcription.

devaluation [ˌdiːvæljʊˈeɪʃn] - обесценение
triad [ˈtraɪæd] - триада
cipher [ˈsaɪfə] - шифр
procedural [prəˈsiːʤ(ə)rəl] - процедурный
occurrence [əˈkʌrəns] - случай

Comprehension Check

II. Answer the following questions.

1. How is information security defined?
2. What is the essence of the CIA triad?
3. What is the structured risk management process comprised of?
4. What does standardization of the risk management process involve?
5. What is an important condition of a successful implementation of information risk management?
6. How was confidentiality of correspondence secured in the past?
7. What processes have caused the need for better methods of protecting information in contemporary society?

III. Complete the following sentences.

1. Information security is sometimes shortened to ...
2. Information is protected by ...
3. Julius Caesar is credited with the invention of ...
4. Sensitive information was marked up to indicate that it should be ...
5. As postal services expanded, governments created ...

Vocabulary

IV. Match the terms with their definitions

1. recognition 2. illegible 3. sloppy 4. ambiguous 5. accuracy 6. sophisticated	a) having more than one meaning, so that it is not clear which is intended b) very cleverly designed and very advanced, working in a complicated way c) the ability to do something in an exact way without making a mistake d) difficult or impossible to read e) not done carefully or thoroughly f) the ability of a computer to recognize voices, shapes etc.

V. Match the following.

1. confidentiality 2. integrity 3. availability	a) избегать b) уязвимость c) программное обеспечение для

4. vulnerability 5. impact 6. to implement 7. firewall 8. to avoid 9. encryption software 10. legal liability 11. security awareness 12. entity 13. outsourcing 14. to mitigate	шифрования d) правовая ответственность e) влияние f) понимание важности безопасности g) доступность h) сохранность, целостность (данных) i) уменьшать, минимизировать j) привлечение сторонних ресурсов k) файервол (межсетевой экран) l) осуществлять m) организация, компания n) конфиденциальность, секретность (информации)

VI. Match the English terms with their Russian equivalents.

1. DSSPs (Data Space Support Platforms) 2. DBMS (Database Management System) 3. abstraction 4. catalog and browse 5. search and query 6. local store and index 7. the discovery component 8. the source extension component	a) система управления базами данных b) абстракция c) компонент расширения источников d) каталог и просмотр e) компонент раскрытия f) платформы поддержки пространств данных g) локальное хранение и индексирование h) поиск и запрашивание

Grammar

VII. Open the brackets using the proper degree of comparison.

1. Microkernels – long discarded as unacceptable because of their (*low*) performance compared with monolithic kernels – might be making a comeback due to their potentially (*high)* reliability, which many people now regard as (*important)* than performance.
2. There are four different approaches that researchers are using to make future operating systems (*reliable and secure*).
3. The (*conservative)* approach, Nooks, is designed to improve the reliability of existing operating systems such as Windows and Linux.
4. Nooks maintains the monolithic kernel structure, with hundreds or thousands of procedures linked together in a single address space in kernel mode, but it focuses on making device drivers – the core of the problem – (*dangerous)*.
5. The (*radical)* approach comes from an unexpected source – Microsoft Research.
6. ... (*reliable)* operating systems are being developed by researchers.
7. In two other approaches legacy operating systems are replaced with (*reliable and secure*) ones.

8. Finally, in (*radical*) approach, a type-safe language, a single address space, and formal contracts are used to carefully limit what each module can do.

VIII. Study the table of the following Greek and Latin borrowings.

1. Analysis – analyses	анализ – анализы
2. Antenna – antennae	антенна – антенны
3. Appendix - appendices	приложение – приложения
4. Axis – axes	вал, ось – валы, оси
5. Hypothesis – hypotheses	гипотеза – гипотезы
6. Basis – bases	база, основа – базы
7. Synopsis – synopses	краткое содержание
8. Thesis – theses	тезис – тезисы
9. Crisis – crises	кризис – кризисы
10.Datum – data	данная величина – данные
11.Diagnosis – diagnoses	диагноз, установление причин – диагнозы
12.Stimulus – stimuli	стимул – стимулы
13.Stratum – strata	слой, пласт – слои, пласты
14.Nucleus – nuclei	ядро – ядра
15.Alumnus – alumni	выпускник – выпускники
16.Alumna – alumnae	выпускница - выпускницы
17.Radius – radii	радиус - радиусы
18.Medium – media	средство - средства
19.Memorandum – memoranda	меморандум – меморандумы
20.Curriculum – curricula	программа – программы
21.Phenomenon – phenomena	явление, феномен – явления
22.Criterion – criteria	критерий – критерии
23.Vortex – vortices	вихрь – вихри
24.Matrix – matrices	матрица – матрицы
25.Index – indices	индекс – индексы
26.Formula – formulae	формула – формулы
27.Syllabus – syllabi	программа - программы

IX. Use the words from the table above in the plural form in the sentences given below.

1. *This phenomenon* is very interesting from the point of view of its origin.
2. The professor asks to explain *this thesis*.
3. *An alumnus* of our University is well known in the world.
4. Is *a crisis* in computing possible?
5. I have no *stimulus* to do this research.
6. The *index* of this *matrix* is unknown.
7. You can find an *appendix* at the end of the book.
8. Is there any *medium* to enhance this development?
9. Any student can derive *this formula.*

10. They offered a *hypothesis* that can't be disproved.

X. Convert each of these statements into the Passive Voice.

1. We propose the development of Data Space Support Platforms for the data management field.
2. The researchers place data spaces and DSSPs in the context of existing systems.
3. We can distinguish some properties of data space systems.
4. Our desktops typically contain some structured data (e.g., spreadsheets).
5. A scientific research group may be monitoring a coastal ecosystem through weather stations, shore and buoy-mounted sensors and remote imagery.
6. Two of the main services that a DSSP will support are search and query.
7. A DSSP will also support updating data.
8. A participant may require an independent metadata repository.
9. A DSSP offers several interrelated services on the dataspace, some of which are generalizations of components provided by a traditional DBMS.
10. A DSSP does not assume complete control over the data in the dataspace.

Translation

XI. Translate the following sentences paying attention to passive voice and non-finite verb forms *(the gerund, the participle, the infinitive)*

1. Early electronic computers, such as Colossus, made use of punched tape, a long strip of paper on which data was represented by a series of holes, a technology now obsolete.
2. The development of transistors in the late 1940s at Bell Laboratories allowed a new generation of computers to be designed with greatly reduced power consumption.
3. It was not until 1645 that the first mechanical calculator capable of performing the four basic arithmetical operations was developed.
4. The electromechanical Zuse Z3, completed in 1941, was the world's first programmable computer, and by modern standards one of the first machines that could be considered a complete computing machine.
5. Colossus, developed during the Second World War to decrypt German messages, was the first electronic digital computer.
6. Although it was programmable, it was not general-purpose, being designed to perform only a single task.
7. It also lacked the ability to store its program in memory; programming was carried out using plugs and switches to alter the internal wiring.
8. The first recognizably modern electronic digital stored-program computer was the Manchester Baby, running its first program on 21 June 1948.
9. Each of the four different attempts to improve operating system reliability focuses on preventing buggy device drivers from crashing the system.
10. In the Nooks approach, each driver is wrapped in a software jacket to carefully control its interactions with the rest of the operating system.

11. Using pattern-matching technology, Optical Character Recognition (OCR) translates the shapes and patterns of machine-made characters into corresponding computer codes.

12. Intelligent Character Recognition (ICR) converts hand printed characters to their machine print equivalents, representing a significant step forward in technology when compared to older OCR (Optical Character Recognition) systems that only read machine print.

13. ICR (Intelligent Character Recognition) software is based on the science of neural networks that behave like the human brain when processing information.

14. Hand printed characters are created by humans, so understanding and interpreting the patterns of human writing is far more complicated than converting simple machine print, because no two people ever write identical characters.

15. Working with high quality machine print, OCR (Optical Character Recognition) provides recognition accuracy of nearly 100 percent (99.9 %).

XII. Translate the sentences into English.

1. Это явление сейчас изучается.
2. Причины поломки еще не установлены.
3. Анализ показал, что операционная система является ненадежной и незащищенной.
4. Я считаю, что гипотеза о возможном возвращении к микроядрам в операционных системах вполне оправдана.
5. Эти формулы были выведены еще в прошлом веке.
6. Каковы критерии надежности операционной системы?
7. Эти данные были получены до того, как их запросили.
8. Меморандум подписали неделю назад.
9. Это средство не может быть применено в данной ситуации.
10. Тезисы по данному научному труду будут написаны к концу месяца.

Revision

XIII. Transform the sentences using Perfect Participle Active.

Model: *As he had lived* in London for many years, he knew the city very well.
Having lived in London for many years, he knew the city very well.

1. As he had passed the exams successfully, he was given a grant.
2. After he had collected enough material, he started writing the first chapter of his course paper project.
3. After he had received the email, he rang up the director.
4. As he had made no mistakes, he was given a very good mark.
5. After she had read the text, she started doing the exercises.
6. After they had carried out the experiment, they arranged a discussion.
7. As he had worked very hard, he achieved very good results.
8. After she had written the article, she had it published in a well-known journal.
9. After they had completed the investigation, they gathered to check the results.

10 As he had written a very interesting paper, he went to an international conference in Vienna.
11. As I had seen the film, I took part in the discussion.
12. As I had not been invited, I did not go to the party.
13. After they had analysed the results of the experiment, they knew how to remedy the situation.
14. As he had done all that he had planned, he left the city at once.

XIV. Fill in the blanks with prepositions where necessary (*in, on, of, with, about, along, to, by, upon, at).*
1. Archimedes was the greatest mathematician, physicist and engineer ... antiquity.
2. He was born ... the Greek city ... Syracuse ... the island ... Sicily ... 287 B.C.
3. Roman historians have related many stories ... Archimedes.
4. Once he was asked to determine the composition ... the golden crown ... the King of Syracuse, who thought that the goldsmith had mixed base metal ... the gold.
5. The story goes that when the idea how to solve this problem came to his mind, he became so excited that he ran ... the streets naked shouting "Eureka, eureka!"
6. Comparing the weight ... pure gold ... that ...the crown when it was immersed ... water and when not immersed, he solved the problem.
7. Archimedes was obsessed ... science, and his ideas were 2000 years ahead ... his time.
8. When Syracuse was taken ... the Romans, a soldier ordered Archimedes to go ... the Roman general, who was said to admire his genius.
9. ... that moment, Archimedes was absorbed ... the solution ... a problem.
10. ... his refusal to fulfill the order, he was killed ... the soldier.
11. Archimedes laid the foundations ... mechanics and hydrostatics and made a lot ... discoveries.
12. He added new theorems ... the geometry ... the sphere and the cylinder, stated the principle ... the lever, and discovered the law ... buoyancy.

Writing
Write an essay covering the following points.
1. The increasing need for information security nowadays.
2. The impact of information leakage on a person's fate in the political and social life of modern society.
3. Information security matters as viewed in films, novels, games, etc.
4. Measures to be taken to make information protection more effective.
5. Your own measures of precaution.
6. Everyday information security occurrences in the life of the people you know.
7. Your feelings as to the future of information security questions. Is it possible to solve them once and for all? Will they be less acute in the future?

PART III. HISTORY OF TELECOMMUNICATIONS

Communicating over long distances has been a challenge throughout history. In ancient times, runners were used to carry important messages between rulers and other important people. Other forms of long-distance communication included smoke signals, chains of searchlights and flags to send a message from one tower to another, carrier pigeons, and horses.

Modern telecommunications began with the discovery that electricity can be used to transmit a signal. For the first time, a signal could be sent faster than any other mode of transportation. The first practical telecommunications device to make use of this discovery was the telegraph.

Text 1. THE TELEGRAPH

As early as in the mid-1800s, the telegraph delivered the first inter-city, transcontinental, and transoceanic messages in the world. The telegraph revolutionized the way people communicated in by providing messages faster than any other communication means provided at the time.

The first practical electromagnetic telegraph was created in the USA in 1837 by Samuel F.B. Morse. In partnership with Alfred Vail, Morse managed to commercialize the technology with the financial support of the U.S. Government. In 1843, Morse built a demonstration telegraph link between Washington, D.C., and Baltimore, Maryland. On May 24, 1844, the network was inaugurated for commercial use with the message, "What hath God wrought!"

Telegraph use quickly spread; the first transcontinental link was completed in 1861 between San Francisco, California, and Washington, D.C. Railroad companies and newspapers were the first major telegraphy users. Telegraph lines were constructed parallel to railroad beds. Telegraphy helped the railroads manage traffic and allowed news organizations to distribute stories quickly to local newspapers. Within a few years, several telegraph companies were in operation, each with its own network of telegraph wires. Consolidation occurred in the telegraph industry (as it has in numerous telecommunications industries), and by the 1870s, the Western Union Telegraph Company emerged as the dominant operator.

Phonetics

I. Pronounce the following words according to the transcription.

telegraph [ˈtelɪˌgrɑːf] - телеграф
transcontinental [ˌtrænskɔntɪˈnentl] - трансконтинентальный
tranceoceanic [ˌtrænsəʊʃɪˈænɪk] - трансокеанский
commercialise [kəˈmɜːʃəˌlaɪz] - коммерциализировать
telegraphy [tɪˊlegrəfi] - телеграфия

Comprehension Check

II. Answer the following questions.

1. How did people communicsate over long distances in the early ages?

2. When and where was the first electromagnetic telegraph created?
3. Who were the first major telegraphy users?
4. How did telegraphy help the railroads?
5. What telegraph company emerged as the dominant operator?

Vocabulary

III. Match the following.

1. support	a) устанавливать связь
2. to emerge	b) поддержка
3. to complete a link	c) трудная задача
4. to provide messages	d) передавать сигнал
5. to manage traffic	e) распределять
6. to inaugurate (*a network*)	f) железнодорожные пути
7. challenge	g) действовать
8. to transmit a signal	h) объединение
9. dominant operator	i) многочисленный
10. to be in operation	j) управлять движением
11. railroad beds	k) появиться
12. consolidation	l) открыть, ввести в эксплуатацию
13. distribute	m) передавать сообщения
14. numerous	n) главный оператор

IV. Give derivatives of the following words.

Commercial, discover, transmit, transport, deliver, revolution, provide, inaugurate, distribute, operate, technology, construct, use, organize.

Grammar

V. Put questions to the following sentences.

1. In ancient times, runners were used to carry important messages between rulers and other important people.
2. The telegraph revolutionized the way people communicated in by sending messages faster than any other communication means provided at the time.
3. Modern telecommunications began with the discovery that electricity can be used to transmit a signal.
4. Telegraphy helped the railroads manage traffic and allowed news organizations to distribute stories quickly to local newspapers.

Revision

VI. Open the brackets using the correct verb form (*conditionals*).

1. We understood that if the system (*to crash*), we (*to lose*) all our latest data.
2. We knew that the experiment *(give)* more reliable results if we (*to prepare*) it with greater care.
3. He (*to agree)* to these conditions provided that you *(to increase*) his salary by 20%.

4. If they *(to send*) us the material, we *(to get*) all the necessary information for our project.
5. We (*to solve*) the problem if you (*to give*) us more time.

VII. Translate the following sentences into English.

1. Он сказал, что придёт.
2. Она спросила, приду ли я.
3. Жаль, что я не на концерте.
4. Я видел, как он садился в автобус.
5. Он предложил пойти в кино.
6. Я с нетерпением ожидаю поездки на юг.
7. Так как не было носильщиков, нам пришлось нести багаж самим.
8. Поскольку вы выполнили свою работу, вы можете отдохнуть.
9. Они медленно шли по лестнице, как будто они несли что-то тяжёлое.
10. Хотя было только девять часов вечера, улицы были пустынны.
11. Если он здесь, то он, вероятно, работает в библиотеке.
12. Они отдадут ему ваше письмо, если он зайдёт к ним завтра.
13. Попросите её подождать, если она придёт раньше назначенного времени.
14. Если бы он мог придти сегодня вечером, мы были бы очень рады.

Text 2. THE TELEPHONE

In 1876, the American inventor Alexander Graham Bell ushered in a new era of voice and sound telecommunication when he uttered to his assistant the words, "Mr. Watson, come here; I want you," using a prototype telephone. Bell received the patent for the first telephone, but he had to fight numerous legal challenges to his patent from other inventors with similar devices. Bell was able to make his prototype telephone work and attract financial backers, and his company grew. The telephone was a vast improvement over the telegraph system, which could only transmit coded words and numbers, not the sound of a human voice. Telegraph messages had to be deciphered by trained operators, written down, and then delivered by hand to the receiving party, all of which took time. The telephone transmitted actual sound messages and made telecommunication immediate. Improved switching technology (the technology used to transfer calls from one local network to another) meant individual telephones could be connected for personal conversations.

The first commercial telephone line was installed in Boston, Massachusetts, in 1877. Early telephones required direct connections to other telephones, but this problem was solved with telephone exchange switches, the first of which was installed in New Haven, Connecticut, in 1878. A telephone exchange linked telephones in a given area together, so a connection between the telephone and the exchange was all that was needed. Telephones were much more convenient and personal than telegrams, and their use quickly spread. By 1913, telephone lines from New York City to San Francisco had been established, and by 1930, radio signals could transmit telephone calls between New York and London, England. Eventually, long-distance telephone service in the United States was consolidated into one

company, the *American Telephone and Telegraph Company* (now known as *AT&T Corp.*), which was a regulated monopoly.

Phonetics

I. Pronounce the following words according to the transcription.

prototype [ˈprəʊtəˌtaɪp] - прототип, прообраз
patent [ˈpeɪtənt] - патент
decipher, *v* [dɪˈsaɪfə] - расшифровывать
install [ɪnˈstɔːl] - устанавливать
monopoly [məˈnɒpəlɪ] - монополия

Comprehension Check

II. Answer the following questions.

1. When was a prototype telephone first used?
2. What was the advantage of the telephone over the telegraph?
3. Where was the first telephone line installed?
4. How were early telephones connected?
5. How did telephones compare with telegrams?
6. How did radio signals promote the development of the telephone?
7. What long-distance telephone company was established in the United States?

Vocabulary

III. Find the English equivalents in the text to the following Russian words and word-combinations.

1. голосовая и звуковая телекоммуникация
2. прототип телефона
3. получить патент на телефон
4. изобретатели
5. многочисленные юридические проблемы
6. подобные устройства
7. телефонный коммутатор
8. передавать закодированные слова и цифры
9. телеграфные сообщения
10. расшифровывать
11. занимать много времени
12. переводить звонки с одних линий на другие
13. установить линию телефонной связи
14. междугородная или международная связь

Grammar

IV. Put questions to the following sentences.

1. Bell had to fight numerous legal challenges to his patent from other inventors with similar devices.

2. He was able to make his prototype telephone work and attract financial backers, and his company grew.

3. Telegraph messages had to be deciphered by trained operators, written down, and then delivered by hand to the receiving party, all of which took time.

4. Eventually, long-distance telephone service in the United States was consolidated into one company, the *American Telephone and Telegraph Company* (now known as *AT&T Corp.*), which was a regulated monopoly.

V. Turn Active Infinitive into Passive Infinitive.

Model: a) to make - to be made; b) to have made - to have been made

	a	b
1. to receive		
2. to improve		
3. to decipher		
4. to deliver		
5. to transmit		
6. to transfer		
7. to connect		
8. to exchange		
9. to install		
10. to establish		
11. to consolidate		
12. to regulate		

Revision

VI. Translate the following sentences into English.

1. Я дал ему мой учебник, чтобы он смог выучить урок.

2. Вам не придётся ждать. К этому времени документы будут проверены и подписаны.

3. Погода была такая плохая, что рейс был отложен.

4. Она сидела позади меня, так что я не мог видеть выражения её лица.

5. Не кричите на него.

6. На что вы намекаете?

7. Что было потом?

8. Мы были против этого предложения.

9. Он спросил меня, где я живу.

10. Сестра сказала, что она уезжает в Москву на следующей неделе.

11. Девушка ответила, что она всегда встаёт в шесть часов.

12. Он считает, что его друг должен посоветоваться с врачом.

13. Они хотели узнать, будет ли у них словарный зачёт на следующем занятии.

14. Мой приятель поинтересовался, какова цена автомобиля.

Text 3. BROADCASTING

Telephones and telegraphs are point-to-point systems of telecommunications, but with the invention of the radio, point-to-multipoint signals could be sent through a central transmitter to be received by anyone possessing a receiver. This began a revolution in wireless telegraphy that would later result in broadcast radios that could transmit actual voice and music.

Radio and wireless telegraph communication played an important role during World War I (1914-1918), allowing military personnel to communicate instantly with troops in remote locations. United States president Woodrow Wilson was impressed with the ability of radio, but he was fearful of its potential for espionage use. He banned nonmilitary radio use in the United States as the nation entered World War I in 1917, and this stifled commercial development of the medium. After the war, however, commercial radio stations began to broadcast. By the mid-1920s, millions of radio listeners tuned in to music, news, and entertainment programming.

Television got its start as a mass-communication medium shortly after World War II (1939-1945). The expense of television transmission prevented its use as a two-way medium, but radio broadcasters quickly saw the potential for television to provide a new way of bringing news and entertainment programming to people.

The number of radio broadcasts grew quickly in the 1920s, but there was no regulation of frequency use or transmitter strength. The result was a crowded radio band of overlapping signals. To remedy this, the U.S. government created the Federal Communications Commission (FCC) in 1934 to regulate the spreading use of the broadcast spectrum. The FCC licenses broadcasters and regulates the location and transmitting strength, or range, stations have in an effort to prevent interference from nearby signals.

Phonetics

I. Pronounce the following words according to the transcription.

transmitter [trænsˈmɪtə] - передатчик
personnel [ˌpɜːsəˈnel] - персонал, личный состав
espionage [ˈespɪəˌnɑːʒ] - шпионаж
medium [ˈmiːdɪəm] - средство
remedy, *v* [ˈremɪdɪ] - исправлять

Comprehension Check

II. Answer the following questions.

1. What invention caused a revolution in wireless telegraphy?
2. What could be transmitted by broadcast radios besides actual voice?
3. How were radio and wireless telegraph used during World War I?
4. What event stifled the commercial development of radio?
5. When did commercial radio stations begin to broadcast?
6. What programs did radio listeners enjoy?
7. When did television get its start as a mass-communication medium?
8. Was the advantage of television quickly recognized?

9. Why did radio broadcasting need government regulation?
10. What body was established to regulate the use of the broadcast spectrum?

Vocabulary

III. Match the following.

1. central transmitter 2. espionage use 3. to ban nonmilitary radio use 4. two-way medium 5. wireless telegraphy 6. point-to-point systems of telecommunications 7. to broadcast 8. remote location 9. military personnel 10. frequency 11. news and entertainment programming 12. transmitter range 13. overlapping of signals 14. interference from nearby signals	a) двухточечные системы телекоммуникаций b) центральный трансмиттер (передающее устройство) c) беспроводная телеграфия d) новостные и развлекательные программы e) военнослужащие f) удалённая дислокация g) запретить использование радио гражданскому населению h) диапазон вещания i) двустороннее средство связи j) наложение сигналов друг на друга k) использование с целью шпионажа l) помехи от других сигналов m) транслировать n) частота

IV. Find in the text instances of the use of non-finite verb forms and give their translation.

V. Transform the sentences using the Passive Voice forms.

1. Broadcast radios could transmit actual voice and music.
2. Radio and wireless telegraph communication played an important role during World War I.
3. President Wilson banned nonmilitary radio use in the United States as the nation entered World War I.
4. The decree stifled commercial development of the medium.
5 Television provided a new way of bringing news and entertainment programming to people.
6. The government did not regulate frequency use and transmitter strength.
7. The U.S. Government created a special committee to regulate the work of the broadcasting stations.

Revision

VI. Open the brackets choosing the right form.

1. The secretary said, "We'll send you a message as soon as the ship (*arrives)*."
2. He remarked that he would be glad if you (*to visit)* him in the evening.

3. Should I (*to see*) her, I'll tell her that you would like to talk to her.
4. Go immediately, or you (*to be*) late for the train.
5. He went to Moscow (*on/for*) three weeks.
6. The watch is made (*from/of*) gold.
7. Cheese is made (*of/from*) milk.
8. I've borrowed a thousand roubles *(of/from*) my brother.
9. It didn't take them long to build the house. It was built *(for/in)* three months.
10. Divide this number *(in/by)* six.
11. Never judge *(by/on)* appearances.
12. I bought this book *(on/for*) 300 roubles.

Text 4. INTERNATIONAL TELECOMMUNICATIONS NETWORKS

In order to provide overseas telecommunications, people had to develop networks that could link widely separated nations. The first networks to provide such linkage were telegraph networks that used undersea cables, but these networks could provide channels for only a few simultaneous communications. Shortwave radio also made it possible for wireless transmissions of both telegraphy and voice over very long distances.

To take advantage of the capability of satellites to provide telecommunications service, companies from all over the world pooled resources and shared risks by creating a cooperative known as the *International Telecommunications Satellite Organization*, or *Intelsat*, in 1964. Transoceanic satellite telecommunications first became possible in 1965 with the successful launch of *Early Bird*, also known as *Intelsat 1*. Intelsat 1 provided the first international television transmission and had the capacity to handle one television channel along with 240 simultaneous telephone calls.

Intelsat has expanded and diversified to meet the global and regional satellite requirements of over 200 nations and territories. In response to private satellite ventures entering the market, the managers of Intelsat have sought to convert the cooperative into a corporation better able to compete with these emerging companies. A separate cooperative known as the *International Mobile Satellite Organization* (*Inmarsat*) primarily provides service to oceangoing vessels, but it has expanded operations to include service to airplanes and users in remote land areas not served by cellular radio or wireline services. Inmarsat also seeks to become a private corporation, because of competition from private satellite ventures.

Phonetics

I. Pronounce the following words according to the transcription.

linkage [ˈlɪŋkɪʤ] - связь
simultaneous [ˌsɪm(ə)lˈteɪnɪəs] - одновременный
cooperative [kəʊˈɒpərətɪv] - товарищество
diversify, *v* [daɪˈvɜːsɪˌfaɪ] - диверсифицировать
requirement [rɪˈkwaɪəmənt] - требование
primarily [ˈpraɪmərɪlɪ] - первоначально

cellular [ˈseljʊlə] - сотовый
venture [ˈventʃə] - предприятие

Comprehension Check

II. Answer the following questions.

1. What were the first networks to provide overseas communications?
2. What organisation was set up in order to use satellites in telecommunications service?
3. When did transoceanic satellite telecommunications become possible?
4. How many nations were able to use satellite telecommunications?
5. What corporation was established to provide service to oceangoing vessels, airplanes and users in remote land areas?

Vocabulary

III. Match the following.

1. linkage	a) телекоммуникационная связь с отдалёнными территориями
2. simultaneous communication	b) подводный кабель
3. to take advantage of	c) связь
4. to expand	d) одновременная коммуникация
5. to diversify	e) коротковолновое радио
6. satellite telecommunications	f) воспользоваться преимуществами
7. cellular radio	g) объединить ресурсы
8. private venture	h) делить риски
9. to compete	i) спутниковая телекоммуникация
10. undersea cable	j) коммерческое предприятие
11. to share risks	k) распространяться
12. overseas telecommunications	l) разносторонне развиваться
13. shortwave radio	m) конкурировать
14. wireline communications	n) сотовая система радиосвязи
15. to pool resources	o) проводная связь

Grammar

IV. Put questions to the following sentences.

1. Transoceanic satellite telecommunications first became possible in 1965 with the successful launch of *Early Bird*, also known as *Intelsat 1*.
2. In order to provide overseas telecommunications, people had to develop networks that could link widely separated nations.
3. To take advantage of the capability of satellites to provide telecommunications service, companies from all over the world pooled resources and shared risks by creating a cooperative known as *Intelsat*, in 1964.

Translation

V. Translate from English into Russian.

1. A network, or communications network, is a system of interconnected computers, telephones, or other communications devices that can communicate with one another and share applications and data.

2. Computers of all sizes and types are interconnected by telecommunications networks so that they can carry out their information processing assignments.

3. Telecommunications control software consists of programs that control telecommunications activities and manage the functions of telecommunications networks.

Revision

VI. Open the brackets using the correct verb form.

1. They asked me why I (*to come*) so late.
2. Tom (*to drive*) for ten years.
3. John always (*to live*) in London.
4. How long you (*to know*) George?
5. The Chinese (*to invent)* printing.
6. I don't know her husband. I never (*to meet*) him.
7. They (*to play)* for half an hour when it started raining.
8. This time next year I *(to be)* in Spain.
9. Where we *(to go*) this evening?
10. What you *(to think*) about?

VII. Translate the following sentences into Russian.

1. He must have forgotten about it.
2. I don't know where she is. She may have gone to London.
3. They ought to have gone there.
4. You could have helped him.
5. He cannot have done it.
6. Can he have said it?
7. You could have asked him about it. Why didn't you do it?
8. He said that she might have lost their address.
9. You ought to have done it yesterday.
10. You needn't have come so early
11. He was to have come yesterday.
12. I intended to have finished my work last night.
13. I hoped to have met him there.
14. He seemed to have done it on purpose.

Text 5. CURRENT DEVELOPMENTS

Personal computers have pushed the limits of the telephone system as more and more complex computer messages are being sent over telephone lines, and at rapidly increasing speeds. This need for speed has encouraged the development of digital

transmission technology. Innovations in fiber-optic technology keep up with the growing use of personal computers for telecommunications. The latest generations of cellular telephones, pagers, and televisions also benefit from the speed and clarity of digital telecommunications.

Telecommunications and information technologies are merging and converging. This means that many of the devices that we associate with only one function may evolve into more versatile equipment. This convergence is already happening in various fields. Some telephones and pagers are able to store not only phone numbers but also names and personal information about callers. Advanced phones with keyboards and small screens have been developed that can access the Internet and send and receive e-mail. Personal computers can now access information and video entertainment and are, in effect, becoming a combined television set and computer terminal. Television sets, which we currently associate with broadcast and cable-delivered video programming, are able to gain access to the Internet through add-on appliances. Future modifications and technology innovations may blur the distinctions between appliances even more.

Convergence of telecommunications technologies trigger changes in the content available and the composition of the content provider. Both television and personal computers are incorporating new multimedia, interactive, and digital features. For example, an entertainment program might have on-screen pointers to World Wide Web pages containing more information about the actors. In the near term, before the actualization of a fully digital telecommunications world, devices like modems will still be necessary to provide an essential link between the old analog world and the upcoming digital one.

Phonetics

I. Pronounce the following words according to the transcription.

associate, *v* [əˊsəuʃɪeɪt] - ассоциировать
versatile [ˈvɜːsətaɪl] - разнообразный
convergence [kənˈvɜːʤəns] - слияние
appliance [əˈplaɪəns] - устройство
multimedia [ˌmʌltɪˈmiːdɪə] - мультимедийный
analog [ˈænəlɒg] - аналоговый
digital [ˈdɪʤɪtl] - цифровой

Comprehension Check

II. Answer the following questions.

1. How have personal computers affected the telephone system?
2. Innovations in what technology made digital telecommunications possible?
3. What is the result of the merging of telecommunications and information technologies?
4. The functions of what devices do personal computers combine?
5. With the help of what devices do TV sets gain access to the Internet?

6. How does convergence of telecommunications technologies cause changes in the content and composition of the content provider?

Vocabulary

III. Match the following.

1. digital telecommunications	a) последние поколения сотовых телефонов
2. fiber-optic technology	b) сливаться
3. the latest generations of cellular telephones	c) развиваться
4. to merge	d) волоконно-оптическая технология
5. to evolve	e) цифровая телекоммуникация
6. access to the Internet	f) новейшие телефоны
7. advanced phones	g) доступ в Интернет
8. in effect	h) приставки
9. add-on appliances	i) по сути
10. to blur the distinctions	j) вызывать изменения
11. to trigger changes	k) стереть различия
12. in the near term	l) контент-провайдер
13. content provider	m) в ближайшее время

Grammar

IV. Complete the gaps with appropriate prepositions (*to, of, on, from, into, including, by, in).*

1. Telecommunications is being revolutionized by a change ... analog ... digital network technologies.

2. Telecommunications has always depended ... voice-oriented analog transmission systems designed to transmit the variable electrical frequencies generated ... the sound waves ... the human voice.

3. However, local and global telecommunications networks are rapidly converting ... digital transmission technologies which transmit information ... the form ... discrete pulses, as computers do.

4. This provides significantly higher transmission speeds, the movement ...larger amounts ... information, greater economy, and much lower error rates than analog systems.

5. ... addition, digital technologies, ... ISDN (Integrated Services Digital Network), will allow telecommunications networks to carry multiple types ... communications (data, voice, video) ... the same circuits.

T*ranslation*

V. Translate the following sentences into Russian.

1. Another major trend in telecommunications technology is a change in communications media.

2. Many telecommunications networks are switching from copper wire-based media (such as coaxial cable) and land-based microwave relay systems to fiber optic lines and communications satellite transmissions.

3. Fiber optic transmission, which uses pulses of laser generated light, offers significant advantages in terms of reduced size and installation effort, vastly greater communication capacity, much faster transmission speeds, and freedom from electrical interference.

4. Satellite transmission offers significant advantages in speed and capacity for telecommunications.

5. Telecommunications is the sending of information in any form (e.g., voice, data, text, and images) from one place to another using electronic or light-emitting media.

6. *Data communications* is a more specific term that describes the transmitting and receiving of data over communication links between one or more computer systems and a variety of input/output terminals.

7. The terms *teleprocessing, telematics,* and *telephony* may also be used since they reflect the integration of computer-based information processing with telecommunications and telephone technologies.

8. All forms of telecommunications now rely heavily on computers and computerized devices.

9. For this reason, the broader term *telecommunications* can be used as a synonym for data communications activities.

10. Telecommunications networks enhance collaboration and communication among individuals both inside and outside an organization.

Revision

VI. Open the brackets using the correct tense forms of the following conditional sentences.

1. If you (*to see)* your cousin, give him my love.
2. If I (*to have*) an opportunity, I would go to the Art museum.
3. If I were you, I (*to talk)* to your parents.
4. If they had stayed at home, the robbers (*not to break*) into there house.
5. If you (*to leave*) home earlier, you wouldn't have been late for the lesson.
6. If we hadn't got stuck in the traffic jam, we (*not to miss)* the train.
7. If we (*to hire*) a taxi, we would have arrived at the airport on time.
8. If he *(to be)* honest, we would have told the truth.
9. If I *(to have*) money, I would buy the presents now.
10. If I were free now, I (*to spend*) my time with my family.

PART IV. SUPPLEMENTARY TEXTS

I. ASTRONOMY

Text 1. GALAXIES

The Universe contains many millions of stars in space. Vast collections of stars, known as galaxies, stretch out into space far beyond the visibility of the most powerful telescopes.

Galaxies exist in various shapes and sizes. The majority may be classed according to their shape as spiral, elliptical or irregular galaxies. The Milky Way, the galaxy in which our own solar system occurs, is of the spiral type. Seen in the night sky as a haze of white light stretching from the horizon, it is in fact a collection of perhaps 100,000 million stars. Our own Sun is not in the centre of it, but near the edge. The Milky Way is also known to astronomers as the Galaxy.

Some of the patches of light which can be seen in the sky are not so much galaxies as patches of incandescent (glowing) gas which may in time become stars.

The origin of the Universe and its galaxies is not known. Some astronomers believe that matter is being continually created, though others believe that the Universe started by the explosion of concentrated matter. Both theories are difficult to prove.

Asteroids. An asteroid is a small or minor planet which circles the Sun. The distance from the Sun of such an asteroid varies greatly as it moves in its path around the Sun. There are many thousands of asteroids moving round the Sun between the orbits of Mars and Jupiter.

Most asteroids are very small, less than 20 miles in diameter. The largest is Ceres, which measures some 480 miles across. It is thought by some scientists that the origin of these minor planets is to be found in the breaking-up of a much larger body many thousands of years ago. A characteristic feature of many of the asteroids is that their orbits are elongated ellipses.

I. Pronounce the following words according to the transcription.

galaxy [ˊgæləksi] - галактика
spiral [ˊspɑiərəl] - спиральный, винтообразный
horizon [həˊrɑizn] - горизонт
astronomer [əsˊtrɔnəmə] - астроном
incandescent [ˊinkænˊdesnt] - раскалённый
asteroid [ˊæstərɔid] - астероид
diameter [dɑiˊæmitə] - диаметр
Ceres [ˊsiəriːz] - Церера (карликовая планета, единственная в поясе астероидов)
orbit [ˊɔːbit] - орбита
elongated [ˌiːlɔŋˊgeitid] - вытянутый, удлинённый
ellipse [iˊlips] - эллипс

Comprehension Check

II. Answer the following questions.

1. What are galaxies?
2. How are galaxies classified according to their shape?
3. What is the type of the galaxy our solar system occurs in? What is it called?
4. How many types is it supposed to contain?
5. What other name is the Milky Way known as?
6. What are the theories explaining the origin of the Universe? Has any of them been proved so far?
7. What is an asteroid?
8. What do asteroids move around?
9. What is the name of the largest asteroid?
10. What is the shape of many of the asteroids orbits?

Text 2. MARS, THE RED PLANET

Of all the planets in the solar system the planet Mars is probably the one which stimulates the greatest interest and which poses some interesting problems to the observers. In one curious way, this planet differs from all the others. Each and every one of these planets presents itself in a suitable position for study every year, or at intervals of approximately every 12 months.

This is not the case with the planet Mars, for this planet presents itself for study at intervals of about 2 years and 2 months (780 days). A "day" on Mars is about 24 ½ hours. The Martian year is 687 days: it takes 687 of our days for Mars to complete one revolution about the Sun.

However, because Mars travels more slowly than the Earth, it takes 780 days before the two bodies come into line. When the Earth and the planet Mars are in a line with the Sun, and on the same side of it, then Mars is in opposition and so at its best position for study.

Mars is a little over half the size of the Earth and it has a diameter of about 4,200 miles. As this planet is rather small, it can be observed easily only around the times of opposition, when it is near the Earth. These oppositions occur about every 2 years and 2 months.

Mars has a very elliptical orbit and opposition distances can vary from 62 million to 35 million miles. A favourable opposition, when Mars is as close to the Earth as it can be, takes place every 15 or 17 years.

Man's knowledge of Mars comes not only from the use of powerful telescopes but also from the use of unmanned spacecraft. Since 1962, spacecrafts have been travelling great distances in space to photograph and collect data about Mars and other planets. The pictures and the information are then sent back to the Earth by means of radio and television signals.

I. Pronounce the following words according to the transcription.

Mars [mɑːz] - Марс
solar [ˊsəulə] - солнечный

stimulate [ˊstimjuˌleit] - вызывать, возбуждать
curious [ˊkjuəriəs] - странный, курьёзный
approximately [əˊprɔksiˌmitli] - приблизительно
telescope [ˊteliˌskəup] - телескоп
distance [ˊdistəns] - расстояние
photograph [ˊfəutəˌgrɑːf] - фотография

Comprehension Check

II. Answer the following questions.

1. Which of the planets is of the greatest interest to the observers?
2. At what intervals do the other planets present themselves in a suitable position for study?
3. How does Mars differ from the other planets in this respect?
4. How long is a *day* on Mars?
5. Does Mars travel faster than the Earth?
6. When is Mars at its best position for study?
7. Is Mars bigger or smaller than the Earth?
8. What is the shape of Mars' orbit?
9. How often is Mars the closest to the Earth?
10. What does man's knowledge of Mars come from?
11. What are the means by which the information about Mars is sent back to Earth?

Text 3. THE MOON

Everyone has seen the Moon shining brightly in the sky on a clear night. The Moon is our natural satellite because it revolves in an orbit around the Earth. On the average, it is about 240,000 miles away. This is a short distance when we think of the vast distances between planets.

The Moon is a rather large satellite with a diameter of a little more than 2,000 miles. Since the Moon is quite close to the Earth, scientists have studied it very carefully. We have learned that there is no water on the Moon, and it has no atmosphere. The surface of the Moon has steep mountains and deep valleys. There are also large flat plains, which early astronomers thought were "seas", and large circular craters scattered on the surface.

The surface of the Moon remains rugged and forbidding because there is no atmosphere. As a result, there is no weather to wear down the rocks. As the Moon revolves around the Earth, sunlight strikes its surface, and we see its reflected light on the Earth. Since the Moon revolves around the Earth in our month, it takes a little over a week for the Moon to move one-quarter of the distance around in its orbit.

The Moon rotates on its axis and revolves around the Earth once each 27 ⅓ days. However, since the Earth and the Moon are both moving around the Sun, it takes the Moon a little over two more days to catch up with the new position of the Earth. Hence, for an observer on the Earth, it is 29 ½ days between the one new Moon and the next. Automatic stations, satellites and space laboratories have begun a new period in the exploration of the Moon.

I. Pronounce the following words according to the transcription.

satellite [ˊsætəˌlɑit] - спутник
revolve, *v* [riˊvɔlv] - вращаться
valley [ˊvæli] - долина
surface [ˊsəːfis] - поверхность
rugged [ˊrʌgid] - неровный
atmosphere [ˊætməˌsfiə] - атмосфера
rotate, *v* [ˊrəuˌteit] - вращаться
axis [ˊæksis] - ось
automatic [ˌɔːtəˊmætik] - автоматический
astronaut [ˊæstrəˌnɔːt] - астронавт, космонавт
exploration [ˌeksplɔːˊreiʃən] - исследование

Comprehension Check

II. Answer the following questions.

1. What is the Moon with respect to the Earth?
2. How far is the Moon away from the Earth?
3. Is the Moon large or small as satellites go?
4. What is known to scientists about the Moon?
5. What is the surface of the Moon like? Why is it so?
6. Why do we see the Moon's reflected light on the Earth?
7. How long does it take the Moon to revolve around the Earth?
8. How is the Moon explored by man?

III. Name the international words used in the text.

II. REMARKABLE PEOPLE

Read the texts and answer the questions following them.

Text I. ISAAC NEWTON (1642 – 1727)

Isaak Newton, an outstanding English physicist and mathematician came from a farming family and studied mathematics at Cambridge . He became a professor of Cambridge at the age of 26. He was especially strongly influenced by Euclid's geometry and by Cartesian philosophy.

Newton was forced to leave Cambridge when it was closed because of the plague, and it was during that period that he made some of his most significant discoveries. He suggested that a particle, if released, would spiral in to the center of the Earth and proceeded to work out the mathematics of orbits, but did not publish his calculations. Halley, an outstanding astronomer and an acquaintance of Newtons, had been trying hard to convince him that it was necessary and finally persuaded him to expand and publish them. Newton devoted the period from August, 1684 to spring, 1686 to this task, and the result became one of the most important and influential works on physics of all times: *Philosophiae Naturalis Principia Mathematica*

(Mathematical Principles of Natural Philosophy) (1687), often shortened to *Principia Mathematica* or simply *the Principia*. Newton opened his *Principia* with definitions and the three laws of motion now known as Newton's laws (laws of inertia, action and reaction, and acceleration proportional to force).

When he put down on paper the results of his twenty years' scientific thinking, and published his *Principia,* Newton was already 42 years old. Halley not only insisted that Newton should publish his work, but also paid for the publication out of his own pocket. It might be said that if Halley had done no more than that, he would have been remembered by many generations to come.

Newton invented a scientific method which was truly universal in its scope. He presented his methodology as a set of four rules for scientific reasoning. These rules were stated in the *Principia* and were truly revolutionary. By their application, Newton formulated the universal laws of nature with which he was able to solve many problems of his day. Following his rules of analysis, we proceed from compounds to ingredients, and from motions to the forces producing them; and in general from effects to their causes, and from particular causes to more general ones.

Newton formulated the classical theories of mechanics, optics, the theory of sound and invented calculus though he did not publish his work on calculus as soon as he had made the discovery and later had to dispute over the priority with the famous mathematician Leibniz.

In Optics (1704), Newton observed that white light consisted of different colours, each characterized by a unique refractivity, and proposed the corpuscular theory of light. Newton also formulated a system of chemistry. In this corpuscular theory, “elements” consisted of different arrangements of atoms, and atoms consisted of small, hard, billiard ball-like particles.

Newton was the first to define and systematize experimental procedures. His methodology produced a neat balance between the theoretical and experimental parts and between the mathematical and mechanical approaches. Newton mathematized all of the physical sciences, reducing their study to universal and rational procedure which marked the beginning of the age of Reason.

The basic principles of investigation set down by Newton have lived practically without alteration until modern times. In the years since Newton's death, they have brought about the results that even Newton himself could not have imagined. Newton's methodology forms the foundation on which the technological civilization of today rests.

The Latin inscription on Newton's tomb proclaims: "Mortals! Rejoice at so great an ornament to the human race!"

I. Pronounce the following words according to the transcription.

persuade, *v* [pəˈsweɪd] - убеждать
spiral [ˈspaɪərəl] - двигаться по спирали
methodology [ˌmeθəˈdɒlədʒɪ] - методология
proceed, *v* [prəˈsiːd] - продолжать
ingredient [ɪnˈgriːdɪənt] - часть

systematize, *v* [ˈsɪstəmə˛taɪz] - систематизировать
experimental [ɪk˛sperɪˈmentl] - экспериментальный
mathematize, *v* [ˊmæθəmə˛tɑɪz] - математизировать
procedure [prəˈsiːʤə] - операция
tomb [tuːm] - надгробный памятник

Comprehension Check

II. Answer the following questions.

1. What is Isaac Newton known in history as?
2. What University did he study at?
3. How old was he when he made some of his most significant discoveries?
4. What are Newton's three laws of motion?
5. Who persuaded Newton to publish his great work known as *Principia*?
6. What was the role of the scientific method invented by Newton?
6. What theories did Newton formulate?
7. What is the importance of Newton's methodology nowadays?
8. Has Newton's genius been acknowledged by humanity?

Text 2. KONRAD ROENTGEN (1845-1923)

In the closing month of 1895, the world was such as this: there was no radio, the cinema was only one year old, the first motor-cars had just appeared and the population thought they were horseless monsters. At that very time, there appeared an announcement that a German professor, Wilhelm Konrad Roentgen, had discovered a new kind of rays. The rays were invisible, they could pass through skin and flesh, through clothes, but the cast shadows of the bones could be seen on a photographic plate.

Doctor Wilhelm Konrad Roentgen came to his discovery working with cathode ray tubes of Joseph Thompson Crookes, who was very much interested in the composition and possibilities of cathode rays discovered by him. Scientists thought these rays were valuable only for scientific research. But Crookes's cathode ray tubes played a very important role in Roentgen's discovery of his all-penetrating rays.

On this particular day, Roentgen was working in his darkened laboratory. Interested in the fact that Crookes's cathode rays caused certain chemicals to glow in the dark when they were brought close to the window through which the rays were emerging, Roentgen decided to find the reason for it.

Cathode rays could not penetrate the thin black cardboard in which Roentgen enclosed his Crookes tube. But as he switched on the current to his tube to make sure that his black box was light-proof, the scientist was puzzled again when he noticed a strange glow at the far corner of his laboratory bench. He switched on the current again and again, and every time he saw a glow. At last, he was sure that the glow had come from a small fluorescent screen which was lying there. What mysterious unknown rays caused this fluorescent effect? Roentgen found out that this effect was not due to the cathode rays; these unknown rays were able to penetrate the air much more easily than the cathode rays, they came through his light-proof cardboard box

and all sorts of opaque materials which he placed between the source of the new rays and the fluorescent screen. These X-rays, as he called them, passed through wood, thin sheets of aluminum, the flesh of his own hand, and some other materials. One more detail attracted the scientist's attention: X-rays were completely stopped by the bones of his hand. When he had tested their effect on photographic plates, he saw that they were darkened on exposure to the X-rays.

Roentgen's discovery contributed much to the benefit of science. The first science to realize its importance was medicine. But medicine is only one field of their wide application. X-ray examination has found application in various kinds of industrial processes.

I. Pronounce the following words according to the transcription.

Roentgen [ˊrentgən] -Рентген
photographic [ˌfəʊtəˈgræfɪk] - фотографический
cathode [ˈkæθˌəʊd] -катодный
penetrate, *v* [ˈpenəˌtreɪt]- проникать
opaque [əʊˈpeɪk] - светонепроницаемый
fluorescent [ˌflʊ(ə)ˈres(ə)nt] - люминесцентный
aluminum [əˈluːmɪnəm] - алюминий

Comprehension Check

II. Answer the following questions.

1. What was the world like at the end of 1895?
2. What were the characteristics of the rays discovered by Konrad Roentgen?
3. What role did Crookes's cathode ray tubes play in Roentgen's discovery of his all-penetrating rays?
4. What characteristic of Crookes's cathode rays aroused his special interest?
5. Why was he surprised seeing a glow at the far corner of his laboratory bench?
6. Were the newly discovered rays more powerful than the cathode ray tubes?
7. What did he call the unknown rays?
8. What could the X-rays penetrate and what were they completely stopped by?
9. How did photographic plates react to the X-rays?
10. What science was the first to realize the importance of the X-rays?
11. Where else are they widely applied?

Text 3. MIKHAIL LOMONOSOV (1711-1765)

Lomonosov was a great man. It was he who founded the first Russian University and he himself was our first University.

A.S. Pushkin

Mikhail Vasilyevich Lomonosov (November 19 [O.S. November 8] 1711 – April 15 [O.S. April 4] 1765) was a Russian polymath, scientist and writer, who

made important contributions to literature, education, and science. Among his discoveries were the atmosphere of Venus and the law of conservation of mass in chemical reactions. His spheres of science were natural science, chemistry, physics, mineralogy, history, art, philology, optical devices and others. Lomonosov was also a poet and influenced the formation of the modern Russian literary language.

Lomonosov's father was a peasant fisherman, and his mother was a deacon's daughter. The boy's thirst for knowledge was insatiable and learning was his passion.

He spent every spare moment with his books, but for many years the only books he had access to were religious texts.

When he was nineteen, Lomonosov went to Moscow on foot, because he was determined to "study sciences". He was admitted into the Slavic Greek Latin Academy. In Moscow, Lomonosov lived on three kopecks a day, eating only brown bread and kvass, but he made rapid progress scholastically and completed a twelve-year study course in five years. In 1736, among 12 best graduates, he was awarded a scholarship at St Petersburg Academy. He plunged into his studies and was rewarded with a four-year grant to study abroad, in Germany, first at the University of Marburg and then in Freiberg.

Lomonosov returned to Russia in June 1741, and a year later, he was named an Adjunct of the Russian Academy of Sciences in the Physics department. In 1745, he was made a full member of the Academy, and named Professor of chemistry. In 1745, he established the Academy's first chemistry laboratory. Eager to improve Russia's educational system, in 1755, Lomonosov joined his patron Count Ivan Shuvalov in founding Moscow University. In 1756, Lomonosov tried to replicate Robert Boyle's experiment of 1673. He concluded that the commonly accepted *phlogiston theory* was false. Anticipating the discoveries of Antoine Lavoisier, he wrote in his diary: "Today I made an experiment in hermetic glass vessels in order to determine whether the mass of metals increases with the impact of pure heat. The experiments – of which I append the record in 13 pages – demonstrated that the famous Robert Boyle was deluded, for without access of air from outside, the mass of the burnt metal remains the same". Lomonosov, together with Lavoisier, is regarded as the one who discovered the law of mass conservation.

He stated that all matter is composed of corpuscles – molecules that are "collections" of elements – atoms. In his dissertation *Elements of Mathematical Chemistry* (1741, unfinished), the scientist gives the following definition: "An element is a part of a body that does not consist of any other smaller and different bodies ... corpuscle is a collection of elements forming one small mass." In a later study (1748), he uses the term *atom* instead of *element*, and *particula* (particle) or *molecule* instead of *corpuscle*.

He regarded heat as a form of motion, suggested the wave theory of light, contributed to the formulation of the kinetic theory of gases, and stated the idea of conservation of matter in the following words: "All changes in nature are such that inasmuch is taken from one object insomuch is added to another. So, if the amount of matter decreases in one place, it increases elsewhere. This universal law of nature embraces laws of motion as well, for an object moving others by its own force in fact

imparts to another object the force it loses" (first articulated in a letter to Leonhard Euler dated 5 July 1748, rephrased and published in Lomonosov's dissertation "Reflexion on the solidity and fluidity of bodies", 1760).

In 1760, Lomonosov was elected a Foreign Member of the Royal Swedish Academy of Sciences. In 1764, he was elected Foreign Member of the Academy of Sciences of the Institute of Bologna. In 1764, Lomonosov was appointed to the position of the State Councillor which was of Rank V in the Russian Empire's Table of Ranks.

Lomonosov died of pneumonia on 4 April (O.S.), 1765 in Saint Petersburg, in the fifty-fourth year of his age. Shortly before his death, he had been visited by the Empress Catherine II. On the day following the scientist's death, his home library and all his papers were sealed by G. Orlov on the order of the Empress and removed to the Winter Palace where they were tracklessly lost. Possibly, as it is believed nowadays, the removal of the papers was caused by the fear of their getting into the wrong hands.

Lomonosov is widely and deservedly regarded as the "Father of Russian Science", though many of his scientific accomplishments were relatively unknown outside Russia until long after his death and gained proper appreciation only in the late 19th and, especially, in the 20th centuries.

I. Pronounce the following words according to the transcription.

polymath [ˈpɒlɪˌmæθ] - эрудит, учёный-универсал
Venus [ˈviːnəs] - Венера
access [ˈækses] - доступ
adjunct [ˈædʒʌŋkt] - адъюнкт
patron [ˈpeɪtrən] - покровитель
phlogiston [flɒˈdʒɪstən] - флогистон, огненная субстанция
kinetic [kaɪˈnetɪk] - кинетический
Antoine Lavoisier [ˊæntwɑːn ləvˊwɑːziə] - Антуан Лавуазье
molecule [ˈmɒlɪˌkjuːl] - молекула
corpuscle [ˈkɔːpəs(ə)l] - корпускула
fluidity [fluːˈɪdɪtɪ] - текучесть
Leonhard Euler [ˊlenərd ˊoɪlər] - Леонард Эйлер
accomplishment [əˊkʌmpliʃment] - достижение, успех
Bologna [bəˈləʊnjə] - Болонья

Comprehension Check

II. Answer the following questions.

1. What spheres of science did Lomonosov major in?
2. What was his social background?
3. What was the dominant feature of his personality that showed even in his childhood years?
4. What education did Lomonosov get?
5. What law did he discover disproving the phlogiston theory?

6. What scientific terms did he introduce?
7. What theories did he suggest and contribute to?
8. How did Lomonosov formulate the idea of conservation of matter?
9. What honours was he conferred on?
10. What happened to Lomonosov's home library and scientific papers?
11. When did his scientific accomplishments gain proper appreciation?

Text 4. DMITRY MENDELEYEV (1834-1907)

Many scientists all over the world thought about the possibility of discovering some regularities in the properties of chemical elements. The first scientist who started the quantitative analysis of chemical elements known at that time was the French chemist Lavoisier. In this way, he set up the corner stone of the chemical science. The English chemist John Dalton followed his example, turning his attention to the quantitative analysis. His greatest contribution to science was, firstly, in assuming that different elements possess unlike atoms and, secondly, in investigating the weights of the atoms.

By the middle of the XIX century, chemical elements had been classified into two general groups: metals and non-metals. Studying their properties, chemists noticed some *borderline* elements possessing the properties of both metals and non-metals and came to a new concept, called *valence* – the relative capacity of atoms to combine with one another.

The new concept was universally adopted as a reliable means for classifying the properties of elements. The result was the creation of a numerical scale of valences of the elements that revealed an important phenomenon: some elements displayed similaries so strong that they seemed to belong to the same “family”. Using further the valence concept as a guide, scientists separated these groups exploring the extent of similarity. The English experimentator J. Newlands proposed a law, according to which properties are repeated at equal intervals when the elements are arranged in order of increasing atomic weight. However, Newlands succeeded in systematizing the properties of only a few elements.

It was the Russian scientist Dmitry Ivanovich Mendeleyev, a professor of St. Petersburg University, who built up a workable periodic classification of all then known elements, arranging them in a table. Mendeleyev gave the best statement of the Periodic law: “The properties of the elements are in periodic dependence upon their atomic weights”. The scientist correlated the whole chemistry of an element to the weight of its atom. Though there was no evidence that the atom was a composite body (it became known only thirty years later), the Table proved that the properties of the atoms were the source of all chemical properties of the ones.

Improving his Table, D.I. Mendeleyev predicted the properties of yet undiscovered elements, basing his prediction on the regularity of properties within the families of certain elements and on the dissimilarities between the neighboring elements. Proving Mendeleyev’s bold predictions, in 1875 the element gallium was discovered. It filled the gap immediately below zinc; in 1879 – scandium (below

calcium); in 1886 it was germanium that filled the second gap below zinc. By 1900, the Table became a part of chemical science.

At present, all the gaps are filled. The 101st element discovered by American scientists in 1951 was named *mendeleyvium* in honour of the great Russian scientist. D.I. Mendeleyev's Periodic Law is regarded as one of the most important achievements in the history of science, having won recognition all over the world. The Periodic Law has crossed national boundaries and has become the property of all nations, like the greatest discoveries of Newton, Copernicus, Lomonosov, Darvin, Einstein.

I. Pronounce the following words according to the transcription.

quantitative [ˈkwɒntɪtətɪv] - количественный
Lavoisier [ləvˊwɑːziə] - Лавуазье
valence [ˈveɪləns] - валентность
phenomenon [fɪˈnɒmə˛nən] - явление
similarity [˛sɪmɪˈlærɪtɪ] - сходство
experimentator [iks˛perɪmenˊteɪtə] - экспериментатор
gallium [ˈgælɪəm] - галлий
germanium [ʤɜːˈmeɪnɪəm] - германий
mendeleyvium [˛mendəˈliːvɪəm] - менделевий

Comprehension Check

II. Answer the following questions.

1. Who was the quantitative analysis of chemical elements started by?
2. What was Jon Dalton's contribution to the chemical science?
3. How had chemical elements been classified by the middle of the XIX century?
4. What important phenomenon was revealed in connection with a numerical scale of valences?
5. What law was proposed by J. Newlands?
6. What was the essence of Mendeleyev's discovery?
7. How was the Periodic Law formulated by Mendeleyev?
8. How did Mendeleyev predict the properties of yet undiscovered elements?
9. How were his predictions proved?
10. What is the importance of Mendeleyev's Periodic Law?

Text 5. ALBERT EINSTEIN (1879-1955)

Albert Einstein was born in Ulm, in the Kingdom of Württemberg in the German Empire, on 14 March 1879. His parents were Hermann Einstein, a salesman and engineer, and Pauline Koch. In 1880, the family moved to Munich, where Einstein's father and his uncle Jakob formed a company that manufactured electrical equipment.

Albert attended a Catholic elementary school in Munich, from the age of 5, for three years. At the age of 8, he was transferred to the Luitpold Gymnasium (now

known as the Albert Einstein Gymnasium), where he received advanced primary and secondary school education.

Einstein excelled at math and physics from a young age, reaching a mathematical level years ahead of his peers. At the age of 16, he enrolled in the four-year mathematics and physics teaching diploma program at Zurich Polytechnic.

After graduating in 1900, Einstein spent almost two frustrating years searching for a teaching post. He secured a job in Bern at the Federal Office for Intellectual Property, the patent office, as an assistant examiner, level III. Much of his work at the patent office related to questions about transmission of electric signals and electrical–mechanical synchronization of time, two technical problems that eventually led Einstein to his radical conclusions about the nature of light and the fundamental connection between space and time.

On 30 April 1905, Einstein completed his thesis and was awarded a PhD by the University of Zürich, with his dissertation *A New Determination of Molecular Dimensions*.

In that same year, which is called Einstein's *annus mirabilis* (miracle year), he published four groundbreaking papers, on the photoelectric effect, Brownian motion, special relativity, and the equivalence of mass and energy, which were to bring him to the notice of the academic world, at the age of 26. These four works contributed substantially to the foundation of modern physics and changed views on space, time, and matter.

By 1908, he was recognized as a leading scientist, and in 1921 he was awarded the Nobel Prize in Physics. His theory of general relativity made Einstein world-famous.

Einstein was praised not only as a scientist but also as an international peacemaker and activist. In February 1933, while on a visit to the United States, Einstein understood that he could not return to Germany, with the rise to power of the Nazis under Germany's new chancellor, Adolf Hitler. The new German government had passed laws barring Jews from holding any official positions, including teaching at universities. One German magazine included Einstein in a list of enemies of the German regime with the phrase, "not yet hanged", offering a $5,000 bounty on his head. In a subsequent letter to physicist and friend Max Born, who had already emigrated from Germany to England, Einstein wrote, "... I must confess that the degree of their brutality and cowardice came as something of a surprise." After moving to the US, he described the book burnings as a "spontaneous emotional outburst" by those who "shun popular enlightenment," and "more than anything else in the world, fear the influence of men of intellectual independence."

He had offers from several European universities, but in 1935 he arrived at the decision to remain permanently in the United States and apply for citizenship.

For Einstein, war was a disease, and he called for resistance to war. By signing the letter to Roosevelt, some argue he went against his pacifist principles. In 1954, a year before his death, Einstein said to his old friend, Linus Pauling, "I made one great mistake in my life - when I signed the letter to President Roosevelt recommending

that atom bombs be made; but there was some justification - the danger that the Germans would make them".

On 17 April 1955, Einstein experienced internal bleeding caused by the rupture of an abdominal aortic aneurysm. He refused surgery, saying, "I want to go when I want. It is tasteless to prolong life artificially. I have done my share; it is time to go. I will do it elegantly." He died in Princeton Hospital early the next morning at the age of 76, having continued to work until near the end.

During the autopsy, the pathologist of Princeton Hospital, Thomas Stoltz Harvey, removed Einstein's brain for preservation without the permission of his family, in the hope that the neuroscience of the future would be able to discover what made Einstein so intelligent. Einstein's remains were cremated and his ashes were scattered at an undisclosed location.

In a memorial lecture delivered on 13 December 1965, at UNESCO headquarters, nuclear physicist J. Robert Oppenheimer summarized his impression of Einstein as a person: "He was almost wholly without sophistication and wholly without worldliness ... There was always with him a wonderful purity at once childlike and profoundly stubborn. But still to all of us, the words Einstein and genius are synonymous".

I. Pronounce the following words according to the transcription.

Albert Einstein [ˊælbət ˊaɪnstaɪn] - Альберт Эйнштейн
Munich [ˈmjuːnɪk] - Мюнхен
excel, *v* [ɪkˈsel] - первенствовать
peers [ˈpɪəz] - ровесники
Zürich [ˊzʊ(ə)rɪk] - Цюрих
patent [ˈpeɪtənt] - патент
synchronization [ˌsɪŋkrənaɪˈzeɪʃn] - синхронизация
thesis [ˈθiːsɪs] - диссертация
the Nazis [ˊnɑːtsiːz] - нацисты
subsequent [ˈsʌbsɪˌkwənt] - последующий
regime [reɪˈʒiːm] - режим
pacifist [ˈpæsɪˌfɪst] - пацифист

Comprehension Check

II. Answer the following questions.

1. Where and when was Albert Einstein born?
2. What was his social background?
3. Where did he study?
4. Where did he work upon graduation?
5. How old was he when he published his four groundbreaking papers?
6. Where did he emigrate to when the Nazis came to power in Germany?
7. What was his attitude to war?
8. What did he consider to be a great mistake in his life?
9. Why did he refuse surgery in Princeton Hospital?

10. How did the famous nuclear physicist, Robert Oppenheimer, summarize his impressions of Einstein?

Text 6. ALEXANDER POPOV (1859-1906)

Alexander Popov, in full Aleksandr Stepanovich Popov, the inventor of radio, physicist and electrical engineer, was born on March 4 (March 16, New Style), 1859, in Turinskiye Rudniki (now Krasnoturinsk), the Perm region. Besides Alexander, there were 6 children in the family, and his godfather was St Iowan of Kronstadt.

Being the son of a village priest, he received his early education in ecclesiastical seminary school and planned to enter the priesthood. But in 1877, his interests changed to mathematics, and he entered the University of St. Petersburg, from which he graduated with distinction in 1883. His life as a student was not easy as he had to work as an electrician to provide for himself.

Joining the teaching faculty of the University of St Petersburg, he lectured in mathematics and physics in preparation for a professorship. His main interest soon changed to electrical engineering, however; and, because Russia in that period lacked colleges that taught the subject, he became an instructor at the Russian Navy's Torpedo School at Kronstadt (Kronshtadt), near St Petersburg, where students were trained to take charge of electrical equipment on Russian warships. The School had a good library and a well-equipped laboratory where he carried out his experiments.

On April 25 (May 7, New Style), 1895, he appeared before the St Petersburg Physicochemical Society and demonstrated the possibility of receiving and transmitting short and long signals at the distance of 64 metres by elecromagnetic waves with the help of a special portable device reacting to electrical oscillations, which became a crucial contribution to the development of wireless communication.

It was more than a year later, in June 1896, that the Italian inventor Guglielmo Marconi patented an analogous device and was immediately acknowledged by the Western world of science as the inventor of the radio. Unlike Popov, he had no previous publications on the subject and his description of the device completely coincided with that published by Popov in July 1895. The Russian people, as it often happened in the past, did not appreciate their countryman and admired and praised the foreign inventor together with the rest of the world. One can imagine what the great scientist might have felt hearing the misdirected words of gratitude and delight. It was only in 1901, at the 11th International Congress of scientists that Popov was acknowledged as the inventor of the radio, and even Marconi himself admitted Popov's priority. But Marconi's acknowledgement neither increased nor decreased Popov's fame. In many Western countries Marconi is still considered the inventor of the radio. In Germany the invention is associated with the name of Heinrich Herz, in France - with the name of E. Branly, who was the first to use the term *radio.* In the USA and some Balkan states, the priority is attributed to Nikola Tesla, in Belarus it is ascribed to Ya. O. Narkevich-Jodko. Many scientists admit that Popov was really the first, but his work was considered to be a military secret, and he could not write about it in detail. He shared the fate of many Russian inventors, but unlike some of them, he did not sell his invention abroad. He loved Russia and was working for the good of

his country. He once said: "I am Russian, and I have a right to give all my knowledge, my work, and all my achievements to my motherland alone. I am proud of being born a Russian man".

In 1987, Popov started experimenting with the use of radio telegraph on the ships of the Baltic Fleet. In 1898, he effected ship-to-shore communication over a distance of 10 km (6 miles). The distance was increased to about 50 km (30 miles) by the end of the following year. He was the first to use an antenna in the transmission and reception of radio waves.

Popov's radio transmitters were widely used on Russian ships. One of the first ships equipped with radio telegraph by Popov was the ice-breaker *Ermak.*

In the summer periods of 1889-1898, Popov was in charge of the main electrical power plant of Nizhny Novgorod Fare. He devoted all his spare time to the study of electromagnetic oscillations.

Unfortunately, the scientist was given remarkably little support by the Russian government. In 1901, he returned to St Petersburg as a professor at the Electrotechnical Institute, of which he was later elected president. He died of insult four years later, at the age of 46, on December 31, 1905, [Jan. 13, 1906] and was buried at the Volkov Cemetery in St Petersburg. On January 3, *Petersburg newspaper* wrote: "On the last day of the outgoing 1905 year, Russia lost one of its outstanding people. The President of the Electrotechnical Institute, A. S. Popov, died comparatively young, in the forty-seventh year of his age, after a life of tireless scientific research. Russia may be proud of him as the inventor of the wireless telegraph, though, unfortunately, he did not escape the evil fate of Russian inventors."

Nowadays A. Popov's name is known to all his countrymen, and the value of his invention cannot be overestimated. Many educational establishments, enterprises, institutes, streets, medals, diploma certificates, prizes, a ship, a small planet (№ 3074), and a crater on the other side of the Moon bear his name. Not less than 18 monuments have been erected to Popov in Russia and beyond its borders. Since 1945, the Popov Gold medal has been awarded for achievements in the development of radio electronics. 6 museums in different parts of Russia (St Petersburg, Yekaterinburg, Omsk, Krasnoturinsk, Kronstadt) are devoted to the memory of A. Popov and his famous invention.

In 1945, at the celebration of the 50th anniversary of A. Popov's invention, it was announced that in the future the 7th of May would be celebrated as the Day of the Radio. It has become, in fact, a professional holiday of all those connected with telecommunications, broadcasting and radiophysics.

Pronunciation Guide

I. Pronounce the following words according to the transcription.

physicist [ˈfɪzɪsɪst] - физик
ecclesiastical [ɪˌkliːzɪˈæstɪkəl] - духовный
Torpedo school [tɔːˈpiːdəʊ] - военно-морская минная школа
oscillation [ˌɒsɪˈleɪʃn] - колебание
physicochemical [ˌfɪzɪkəʊˈkemɪkl] - физико-химический

Marconi [mɑːˈkəʊnɪ] - Маркони
priority [praɪˈɒrɪtɪ] - первенство
associate, *v* [əˊsəuʃɪˌeɪt] - ассоциироовать

Comprehension Check

II. Answer the following questions.

1. What family was Alexander Popov born into?
2. What was his educational background?
3. What did he lecture on at the University of St Petersburg?
4. What was he most interested in?
5. Where did he work after he left the University?
6. What apparatus did he demonstrate on May 7, 1895?
7. Who was acknowledged as the inventor of the radio in 1896?
8. What is the evidence in favour of Popov's priority?
9. When was Popov acknowledged as the inventor of the radio?
10. What other names is the invention of the radio still associated with in the world of science?
11. Why did it happen so that Popov was not recognized as the sole inventor of the radio?
12. How did he express his attitude to the country he was born in?
13. What did Popov do for the Russian Fleet?
14. What work was done by the scientist in Nizhny Novgorod?
15. What Institute did he work at in 1901?
16. Was he properly supported by the Russian government?
17. What was written about him in the obituary upon his death?
18. How are people paying tribute to A. Popov today?

Text 7. KONSTANTIN TSIOLKOVSKY (1857-1935)

"The Earth is the cradle of mankind, but we cannot live forever in a cradle." This familiar quotation belongs to Konstantin Eduardovitch Tsiolkovsky who theorized many aspects of human space travel and rocket propulsion and played an important role in the development of the Soviet and Russian space programs.

He was born on September 17, 1857, in the village of Ijevskoe, Ryasan Province, Russia, in the family of a Polish forester who had emigrated to Russia. At the age of 10, he lost his hearing as a complication of scarlet fever. After that, he couldn't attend school, and he never received any formal education. His books were his teachers, and he read every book in his father's library. Later, Tsiolkovsky remembered that during all his life he tried to prove to himself and to others that he could improve his knowledge, even with his disability.

In 1873-1876 Konstantin Tsiolkovsky lived in Moscow. He went to the main Moscow libraries and in this way received his self-education. While in Moscow, Tsiolkovsky was tutored by the eccentric and brilliant Russian philosopher Nikolai Fedorovitch Fedorov, who was working in a Moscow library at the time, and gave Tsiolkovsky a place to work in the library. At the age of l7, while living in Moscow,

Tsiolkovsky dreamed about space flight inspired, probably, by the novels of Jules Verne. Since that time, he started thinking about space vehicle design. His great purpose was not simply to go into outer space, but to live in space civilization.

In 1876-1879 he lived in Vyatka and Ryasan. After passing his exams, he received his Teacher's Certificate, and went to work as a math teacher in Borovsk, Kaluga Province. Living in Borovsk, he began his scientific research in air balloon building, life in space, aerodynamics and philosophy.

In 1892-1935 he lived and worked in Kaluga. His moving to Kaluga was the result of his teaching promotion. It was here in Kaluga that he became a well-known scientist, wrote and published his theories of space flight and inter-planetary travels. In Kaluga, he wrote his Cosmic Philosophy, and dreamed about the future of humanity, including the eventual conquest of space and our leaving the cradle of the planet Earth for the stars.

He was made a member of the Soviet Academy of Science in 1919 and earned international recognition for his ideas. He wrote over 500 scientific papers, and though he never created any rockets himself, he influenced many young Russian engineers and designers. Tsiolkovsky lived to see a younger generation of Russian engineers and scientists who began to make his visionary concepts reality. Among these was Sergey Korolev, who later became the Chief Designer of the Soviet space program. Korolev was one of his most outstanding followers.

Konstantin Tsiolkovsky, the father of cosmonautics, died in Kaluga at the age of 78 on September19, 1935.

Pronunciation Guide

I. Pronounce the following words according to the transcription.

astronautics [ˌæstrəˈnɔːtɪks] - космонавтика
eccentric [ɪkˈsentrɪk] - эксцентричный
Jules Verne [ˈʤuːəlz vɜːn] - Жюль Верн
vehicle [ˈviːɪkl] - корабль
baloon [bəˈluːn] - воздушный шар
Kaluga [kəˈlʊgə] - Калуга
aerodynamics [ˊɛərəʊdaɪˈnæmɪks] - аэродинамика
conquest [ˈkɒŋˌkwest] - покорение
cosmonautics [ˌkɒzməˈnɔːtɪks] - космонавтика

Comprehension Check

II. Answer the following questions.

1. What quotation made by Tsiolkovsky is known to all?
2. What was his social and educational background?
3. What was Tsiolkovsky's cherished dream?
4. What subject did he teach working at school?
5. What theories did he publish when he lived in Kaluga?
6. When was Tsiolkovsky recognized as a scientist of international calibre?
7. What was Tsiolkovsky's contribution to science?

III. SOME MORE FACTS ABOUT COMPUTERS

Text 1. COMPUTER GENERATIONS

First Generation Computers (1954-59) were rather bulky in size, required large amounts of air conditioning and repair time, too. The important advantages over the earlier machines were speed of calculation, use of the stored program, the ability to apply logical decisions to calculated results, various types of input and output equipment, magnetic tape, paper tape, the ability to modify its own program, etc.

Second Generation Computers (1959-64) replaced the vacuum tubes with the tiny transistor, thus requiring less power and offering greater reliability. High-speed card readers and printers were introduced. Symbolic programming was replacing machine language programming during this period. Random access devices were introduced. Repair and maintenance time was greatly reduced.

Third Generation Computers (1964-70) were characterized by advanced miniaturization and refinement of computer components. Greater compilers, newer and faster methods of input and output, optical scanners, magnetic ink character readers, data transmission over long distances, displays on video tubes, multiprogramming, tremendous storage capacities, remote terminals with access to central computers were the innovations introduced during this period.

Fourth Generation Computers (1970-1980) featured many changes in all sectors of the computer field. The concept of *Virtual Storage* increased the main storage capabilities of computers by allowing a computer to directly access outside storage devices as though they were part of the main storage. The minicomputer made spectacular advances during this period.

Fifth Generation. In the 1980s, very large scale integration (VLSI) computers, in which hundreds of thousands of transistors were placed on a single chip, became more and more common. The *shrinking* trend continued with the introduction of personal computers (PCs) used by individuals. By the late 1980s, some personal computers were run by microprocessors that could process about 4,000,000 instructions per second.

Pronunciation Guide

I. Pronounce the following words according to the transcription.

vacuum [ˈvækjʊəm] - вакуум
access [ˈækses] - доступ
maintenance[ˈmeɪntənəns] - техническое обслуживание
spectacular [spekˈtækjʊlə] - впечатляющий
microprocessor [ˊmaɪkrə(ʊ)ˈprəʊsesə] - микропроцессор

Comprehension Check

II. Answer the following questions.

1. What were the disadvantages of First Generation Computers?
2. What advantages did Second Generation Computers offer?
3. What were Third Generation Computers characterized by?

4. What changes did Fourth Generation Computers bring about?
5. What was the characteristic feature of Fifth Generation Computers?
6. How did the shrinking trend continue?
7. How many instructions per second could some personal computers process by the late 1980s?

Text 2. MICROPROCESSOR AS A CPU

We can also view the microprocessor as a primary component of a computer. Traditionally, the computer is represented in a block of components: Memory, Input, Output, and the Central Processor Unit (CPU), which consists of Arithmetic/Logic Unit (ALU) and Control Unit. The CPU contains various registers to store data, the ALU to perform arithmetic and logical operations, instruction decoders, counters, and control lines. The CPU reads instructions from the memory and performs the task specified. It communicates with input/output devices either to accept or to send data. These devices are also known as peripherals. The CPU is the primary and central player in communicating with devices such as memory, input, and output. However, the timing of the communication process is controlled by the group of circuits called the control unit. In the 1960s, the CPU was designed with discrete component on various boards. With the advent of the integrated circuit technology, it became possible to build the CPU on a single chip; this came to be known as microprocessor.

Pronunciation Guide

I. Pronounce the following words according to the transcription.

component [kəmˈpəʊnənt] - составная часть
arithmetic, *adj* [ˌærɪθˈmətɪk] - арифметический
decoder [diːˈkəʊdə] - декодер
peripherals [pəˈrɪf(ə)rəlz] - внешнее оборудование
discrete [dɪsˈkriːt] - отдельный
circuit[ˈsɜːkɪt] - схема

Comprehension Check

II. Answer the following questions.

1. What block of components is the computer traditionally represented in?
2. What does the CPU contain?
3. What is the function of the ALU?
4. What devices are called peripherals?
5. What is the role of the control unit?
6. How can a microprocessor be defined?

Text 3. INCREASE YOUR KNOWLEDGE OF COMPUTER VIRUSES

What is a virus? In 1983, the researcher Fred Cohen defined a computer virus as “a program that can “infect” other programs by modifying them to include a version of itself.” This means that viruses copy themselves, usually by encryption or by mutating slightly each time they copy. There are several types of viruses, but the

ones that are the most dangerous are designed to corrupt your computer or software programs.

Viruses can range from an irritating message flashing on your computer screen to eliminating data on your hard drive. Viruses often use your computer's internal clock as a trigger. Some of the most popular dates used are Friday the 13th and famous birthdays. It is important to remember that viruses are dangerous only if you execute (start) an infected program.

There are three main kinds of viruses. Each kind is based on the way the virus spreads.

1. Boot Sector Viruses - These viruses attach themselves to floppy disks and then copy themselves into the boot sector of your hard drive. (The boot sector is the set of instructions your computer uses when it starts up.) When you start your computer or reboot it, your hard drive gets infected. You can get boot sector viruses only from an infected floppy disk. You cannot get one from sharing files or executing programs. This type of virus is becoming less common because today's computers do not require a boot disk to start, but they can still be found on disks that contain other types of files. One of the most common boot sector viruses is called "Monkey", also known as "Stoned".

2. Program Viruses - These viruses (also known as traditional file viruses) attach themselves to programs' executable files. They can infect any file that your computer runs when it launches a program. When you start a program that contains a virus, the virus usually loads into your computer's memory. When the virus is in your computer's memory, it can infect any other program that is started. Among the well-known program viruses are "SKA" and "Loveletter."

3. Macro Viruses - these viruses attach themselves to templates that are used to create documents or spreadsheets. Once a template is infected, every document or spreadsheet you open using that program will also become infected. Macro viruses are widespread because they infect commonly used office applications and spread between PCs and Macintoshes. The commonest macro viruses are "Concept", "Melissa", and "Have a Nice Day".

Pronunciation Guide

I. Pronounce the following words according to the transcription.

virus [ˈvaɪərəs] - вирус
modify [ˈmɒdɪˌfaɪ] - модифицировать
eliminate [ɪˈlɪmɪˌneɪt] - удалять
executing [ˈeksɪˌkjuːtɪŋ] - действующий, выполняющийся
spreadsheet [ˈspredˌʃiːt] - электронная таблица

Comprehension Check

II. Answer the following questions.

1. How is a computer virus defined?
2. How do viruses copy themselves?
3. What are the most dangerous viruses designed for?

4. What damage can be done to the computer by the viruses?
5. What are the main kinds of viruses?
6. How can you get boot sector viruses?
7. Where can boot sector viruses be found?
8. How do program viruses work?
9. What do macro viruses infect?
10. What are the most common viruses called?

Text 4. PREVENTING A VIRUS

Here are some tips a professional computer specialist could give a beginning computer user.

•Purchase and install antivirus software, and update it frequently. Virus software can be obtained from a variety of sources.

• Most antivirus packages have a component that loads at computer startup and monitors files as you use them.

• Scan every file you receive: files from friends, programs from the Internet, e-mail attachments, and even shrink-wrapped software. Do not configure your e-mail program to launch your word processing program automatically when it receives an attachment.

• Scan every file you download from the Web before you install or read it.

• Be very careful about putting floppy disks from unknown sources into your computer. Be especially careful if the disk has been shared by several people. The more computer users have used the disk, the more likely it is to contain a virus.

• Back up all your data files on a regular basis.

• Make sure that you have the original disks or CD-ROMs for all your software.

Pronunciation Guide

I. Pronounce the following words according to the transcription.

purchase [ˈpɜːʧɪs]- покупать

frequently [ˈfriːkwəntlɪ] - часто

variety [vəˈraɪətɪ] - разнообразие

shrink-wrapped software [ˊʃriŋkˊræpt] - программные средства в пластиковой упаковке

configure [kənˈfɪgə] - настраивать, устанавливать

Comprehension Check

II. Answer the following questions.

1. How do most antivirus packages work?
2. What should be done with every file you receive?
3. What should be avoided when your (email) program receives an attachment?
4. What rule should be observed before installing or reading a file downloaded from the Web?
5. What should be remembered about the use of floppy discs?

6. How can loss of data files be prevented?

Text 5. RELIABILITY AND SECURITY

The worst offender when it comes to reliability and security is the operating system. Although application programs contain many flaws, if the operating system were bug free, bugs in application programs could do only limited damage. A few words about the relationship between reliability and security are to be said. Problems with each of these domains often have the same root cause: bugs in the software. A buffer overrun error can cause a system crash (reliability problem), but it can also allow a cleverly written virus or worm to take over the computer (security problem). Although we focus primarily on reliability, improving reliability can also improve security.

Current operating systems have two characteristics that make them unreliable and insecure: They are huge and they have very poor fault isolation. The Linux kernel has over two million lines of code; the Windows kernel is much larger. The large size of current operating systems means that no one person can understand the whole thing. Clearly, it is difficult to engineer a system well when nobody really understands it.

Operating systems do not have isolation between components. A modern operating system contains hundreds or thousands of procedures linked together as a single binary program running in kernel mode. Every single one of the millions of lines of kernel code can overwrite key data structures that an unrelated component uses, crashing the system in ways difficult to detect. In addition, if a virus or worm infects one kernel procedure, there is no way to keep it from rapidly spreading to others and taking control of the entire machine.

Fortunately, the situation is not hopeless. Researchers are endeavoring to produce more reliable operating systems. There are four different approaches that researchers are using to make future operating systems more reliable and secure: the Nooks project, the paravirtual machine approach, the multiserver approach and the language-based protection.

The most conservative approach, *Nooks,* is designed to improve the reliability of existing operating systems such as Windows and Linux. Nooks maintains the monolithic kernel structure, with hundreds or thousands of procedures linked together in a single address space in kernel mode, but it focuses on making device drivers – the core of the problem – less dangerous.

Nooks protects the kernel from buggy device drivers by wrapping each driver in a layer of protective software to form a lightweight protection domain, a technique sometimes called sandboxing. The wrapper around each driver carefully monitors all interactions between the driver and the kernel.

The Nooks project's goals are to protect the kernel against driver failures, recover automatically when a driver fails, and do all of this with as few changes as possible to existing drivers and the kernel.

Protecting the kernel against malicious drivers is not a goal.

The idea of *paravirtual machines* is to run a special control program, called a virtual machine monitor, on the bare hardware instead of an operating system. The virtual machine creates multiple instances of the true machine. Each instance can run any software the bare machine can.

This technique is commonly used to allow two or more operating systems, say Linux and Windows, to run on the same hardware at the same time, with each one thinking it has the entire machine to itself. The use of virtual machines has a well-deserved reputation for good fault isolation – after all, if none of the virtual machines even know about the other ones, problems in one machine cannot spread to others.

This concept can be adapted to protection within a single operating system, rather than between different operating systems.

The *multiserver operating systems* approach directly attacks the core of the problem: having the entire operating system run as a single gigantic binary program in kernel mode. Instead, only a tiny microkernel runs in kernel mode with the rest of the operating system running as a collection of fully isolated user-mode server and driver processes.

In the Minix 3 architecture, the microkernel handles, interrupts, provides the basic mechanisms for process management, implements interprocess communication, and performs process scheduling.

The most radical approach is that of *language-based protection* which comes from an unexpected source – Microsoft Research. In effect, the Microsoft approach discards the concept of an operating system as a single program running in kernel mode plus some collection of user processes running in user mode, and replaces it with a system written in new type-safe languages that do not have all the pointer and other problems associated with C and C++.

Thus, each of the four different attempts to improve operating system reliability focuses on preventing buggy device drivers from crashing the system.

It is not yet known which, if any, of these approaches will be widely adopted in the long run. Nevertheless, it is interesting to note that microkernels – long discarded as unacceptable because of their lower performance compared with monolithic kernels – might be making a comeback due to their potentially higher reliability, which many people now regard as more important than performance.

Pronunciation Guide

I. Pronounce the following words according to the transcription.

domain [dəˈmeɪn] - область, сфера

technique [tekˈniːk] - приём

endeavor, *v* [ɪnˈdevə] - пытаться

microkernel [ˈmaɪkrəʊˊkɜːnl] - микроядро

Linux [ˈlɪnəks] - семейство Unix-подобных операционных систем на базе ядра Linux

Comprehension Check

II. Answer the following questions.

1. What is the relationship between reliability and security?
2. Is the main damage caused by the operating system or by application programs?
3. What is the root cause?
4. What two characteristics make current operating systems unreliable and insecure?
5. What does the absence of isolation between components in operating systems result in?
6. What approaches are suggested to produce more reliable operating systems?

Text 6. MICROSOFT CORPORATION: HISTORY OF SUCCESS

Everyone has heard of Bill Gates, one of the richest and most successful people in the world. Microsoft, the business he started with a friend in 1975, has become the world's largest computer software company, and Gates was the world's youngest billionaire at the age of 31. His full name is William Henry Gates III, and he was born on 28th October, 1955, in Seatle, USA. At school, Bill soon showed that he was very intelligent, and especially good at Maths and Science. His parents decided to send him to Lakeside, the private school where he first began to use computers. The 13-year-old Bill Gates and his school friend Paul Allen were soon spending all their time writing programs and learning about computers instead of doing their schoolwork!

After finishing school in 1973, Bill went to Harvard, America's most famous university. The next year, he and Paul Allen wrote an operating program for the *Altair,* one of the world's first microcomputers. The two friends started Microsoft in 1975, and Gates left Harvard. Before long, Microsoft was a major business success. Since then, the company has continued to grow, producing most of the world's leading PC software.

One reason for his success is that Gates has always been very ambitious and hardworking. This has not left him much time for a normal personal life, but in 1994 he married Melinda French, a Microsoft employee, and in 1995 he wrote a best-selling book, *The Road Ahead*.

Bill has mixed feelings about spending so much time running Microsoft. "There are a lot of experiences I haven't had, but I do like my job," he says. When he does find time to relax, he likes puzzles, golf and reading about science. For such a rich person, his life is simple, and he spends little on himself and his family. When it comes to helping others, though, Gates is very generous. He has already given huge amounts of money to charity and says that he plans to give away almost all of his wealth when he retires.

Pronunciation Guide

I. Pronounce the following words according to the transcription.

billionaire [ˌbɪljəˈnɛə] - миллиардер

Seatle [sɪˈætl] - Сиэтл
generous [ˈʤenərəs] - щедрый
charity [ˈʧærɪtɪ] - благотворительность
retire [rɪˈtaɪə] - уйти в отставку

Comprehension Check

II. Answer the following questions.

1. What is Bill Gates famous for?
2. What is his educational background?
3. What was his main sphere of interests when he studied at school?
4. Who did he share his interest with?
5. Who did he cooperate with in writing an operating program for the *Altair*?
6. What company did he set up together with his friend?
7. Did it take them long to make the company large and successful?
8. What was one of the reasons for the success?
9. What is Bill Gates' attitude to his professional activity?
10. What does he do in his free time?
11. What does he plan to do with all his money?

Related Activities

I. Substantiate your answers to the following questions.

1. Do you believe it is possible to follow Bill Gates' example now?
2. Do you think it was easier to achieve success in the computer business in the past when competition was less severe?
3. Would you like to start your own computer company?
4. What are the advantages and disadvantages of running your own company?
5. What qualities are necessary for a Managing Director of a computer company?
6. Which would you prefer: to work for a big or small company? Why?
7. Which, in your opinion, is the mission of the computer: to bring people together or separate them?
8. Do you hope there will be more international contacts and student exchange programs in the future?
9. How can we benefit from international cooperation in the sphere of computer science, business and education?
10. Do you agree that in the time to come one of the characteristics of an educated person will be computer literacy?
11. How can robots change our life?
12. On what conditions does the computer have a bright future?

II. Sum up your answers in the form of an essay.

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АНГЛИЙСКИЙ ДЛЯ СТУДЕНТОВ, ИЗУЧАЮЩИХ РАДИОФИЗИКУ И КОМПЬЮТЕРНЫЕ НАУКИ

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