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Изучая электронную технику

Пособие по развитию навыков чтения на английском языке
для студентов 1-го курса ФКП, ФРЭ, ФТК БГУИР
дневной формы обучения

Studying Electronics Engineering

Reader for First Full time Year Student of the Computer-aided Design,
Radioengineering and Electronics,
Telecommunications Faculties

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Целью пособия является развитие навыков чтения и понимания научно-технической литературы на материале текстов по специальности с выходом на устную и письменную речь.

Пособие состоит из 7 разделов, каждый из которых включает краткий тематический словарь, систему лексико-грамматических упражнений, тексты и задания к ним. Тексты взяты из Encyclopedia Britannica, обработаны и сокращены. При составлении грамматической части использовались следующие пособия: Virginia Evans. Round-up. English Grammar, Michael Vince. Intermediate Language Practice, Michael Vince. Advanced Language Practice.

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UNIT I

Part I. GRAMMAR STUDY

PRESENT TIME

A. Explanations

Basic Contrasts:
Present Simple
and Present
Continuous

1. Present Simple generally refers to :
Facts that are always true
*Water **boils** at 100 degrees Celsius.*
Habits
*British people **drink** a lot of tea.*
States
*I **don't like** gangster films.*
Repeated/habitual actions (especially with frequency adverbs: often, usually, always, etc.)
*He always **does** his homework.*
2. Present Continuous generally refers to actions which are in progress at the moment. These can be temporary:
*I'm **staying** at a hotel until I find a flat.*
They can be actually in progress:
*The **dog is sleeping** on our bed!*
Or they can be generally in progress but not actually happening at the moment:
*I'm **learning** to drive.*

State verbs and event (action or dynamic) verbs

1. State verbs describe a continuing state, so do not usually have a continuous form. Typical examples are:

believe, belong, consist, contain, doubt, fit, have, know, like, love, matter, mean, own, prefer, understand, seem, suppose, suspect, want, wish

2. Some verbs have a stative meaning and a different active meaning. Typical examples are: *be, depend, feel, have, measure, see, taste, think, weigh, etc.*

Compare these uses:

State

Jack is noisy.

They have a Ford.

I think I like you.

This fish tastes awful.

Event

Jack is being noisy.

They are having an interesting talk.

I'm thinking about my new job.

I'm just tasting the fish.

*I feel you are wrong. I'm feeling terrible.
 The bag weighs a ton. We are weighing the baby.
 It depends what you I am depending
 mean. on you.*

The differences in 2 apply to all tenses, not just to present tenses.

Advanced Language Practice

Other uses of
Present Continuous

1. Temporary or repeated actions. This use emphasizes a temporary or repeated habitual action.

*My car has broken down, so I **am walking** to work these days. **Are you enjoying** your stay here?*

2. Complaints about bad habits

*You **are always complaining** about my cooking!*

Other possible adverbs are:

constantly, continually, forever

3. With verbs describing change or development

*Things **are getting** worse!*

*More and more people **are giving up** smoking.*

Other uses of
Present Simple

1. Making declarations

Verbs describing opinions and feelings tend to be state verbs.

*I **hope** you'll come to my party. I **bet** you don't know the answer.*

2. Headlines

These are written in a 'telegram' style, and references to the past are usually simplified to Present Simple.

*Ship **sinks** in midnight collision.*

3. Instructions and itineraries. Instructions and recipes can be written in Present Simple instead of in imperative forms. This style is more personal.

*First you **roll out** the pastry.*

Itineraries are descriptions of travel arrangements.

*On day three we **visit** Stratford -upon-Avon.*

4. Summaries of events. Plots of stories, films, etc., and summaries of historical events use Present Simple (and Present Perfect) tenses.
May 1945: The war in Europe comes to an end.
*...At the end of the play both families **realize** that their hatred has caused the deaths of the lovers...*
5. Historic present in narrative and 'funny stories'.
*...So then the second man **asks** the first one why he **has** a banana in his ear and the first one **says**...*

B. Formation

The Present Simple Tense

Affirmative		Negative			Interrogative		
I	work	I	do not	work go	Do	I	work go?
You	go	You	don't		Does	you	
He	works	He	does		Do	he	
She	goes	She	not	she			
It		It	doesn't		it		
We	work	We	do not	work go	Do	we	
You	go	You	don't			you	
They		They				they	

Pronunciation of -(e) s ending

[s] after voiceless consonants	[z] after voiced consonants and vowels	[iz] after verbs ending in -ge, -sh, -ss, -s, -ch, -se
puts, writes, sits	Reads, buys, gives	changes, dresses, pushes, loses, watches

The Present Continuous Tense

Affirmative			Negative			Interrogative		
I	am	work- ing	I	am not	work- ing	Am	I	work- ing?
You	are		You	are not		Are	you	
He	is		He	is not		Is	he	
She		She	(isn't)	she				
It			It		it			
We	are	work- ing	We	are not	work- ing	Are	we	
You			You	(aren't)			you	
They			They				they	

Spelling of words ending in -ing

+ ing	-ie -> + ing	-e -> + ing	double consonant + ing
listen	dying	making	travelling
doing	lying	having	getting

Time Expressions Used With:

Present Simple – every day/week/month/year, in the morning/evening/afternoon, on Mondays, at night, as usual, as a rule (can be in initial or end positions of the sentence); usually, normally, generally, always, often, seldom, rarely, never, sometimes (before the main verb, but after *to be*).

Present Continuous – now, at the moment, at present, nowadays, today, tonight, soon (can be in initial or end positions of the sentence); always, still (after *to be*).

C. Practice

I. Read and study the following questions and answers.

1. Is Mary reading at the moment? – Yes, she is.
2. Do you always read much, Frank? – Yes, I do. I like reading.
3. Jack plays football every day, doesn't he? – No, he doesn't. He seldom plays football. He often plays tennis.
4. The students are still conducting their experiment, aren't they? – No, they aren't. They are having a break.
5. What are you doing this evening? – I'm going to the party.
6. What do you do every evening? - I watch TV or listen to some music or read something.
7. Does Ted go to his office by bus or on foot? – He normally goes on foot, but on Mondays he goes by bus as a rule.
8. Are the boys watching television or reading now? – They are reading now. They never watch TV at this time.

II. Put the verbs into the 3-d person singular.

Approach, establish, perform, surround, demonstrate, supply, manufacture, mix, try, place, weaken, retain, avoid, contribute, amplify, signify, do, allow, vary, flood, be, discover, polish, change, utilize, range, encompass, cross.

III. Add -ing to the following verbs.

Equip, access, transmit, start, generate, experience, repel, supplement, insert, initiate, range, try, amplify, vary, follow, discover, manufacture, pass, play.

IV. Make the following affirmative sentences negative and interrogative.

1. Electronics deals with the emission, behaviour, and effects of electrons.
2. Electronics encompasses an exceptionally broad range of technology.
3. Such devices as transistors, integrated circuits, lasers, and optical fibres are results of research in electronics.
4. Nowadays electronic industry is manufacturing a wide array of electronic consumer, industrial, and military products.

5. These products range from cellular radiotelephone systems and videocassette recorders to high-performance supercomputers and sophisticated weapons systems.
6. The world is in the midst of an electronic revolution at least as significant as the industrial revolution of the 19th century.
7. Computer-aided design tools facilitate the designing of parts that have complex shapes.
8. Electronics is getting more and more essential, for example, in telecommunications.
9. Electronic controls for industrial machines and processes have a dramatic effect on productivity and quality of various goods.

V. Make the following interrogative and negative sentences affirmative.

1. Digital techniques don't allow the intermingling of voice, television, and computer signals into one very rapid series of pulses on a single channel.
2. The electronics engineers don't regenerate perfect digital pulses after they become attenuated with distance.
3. Do computer-controlled machines receive instructions directly from the design tools?
4. Are computerized indexes of scientific and technical journals becoming accessible from centralized services over telephone lines?
5. The engineer doesn't get new techniques from digital audio and video disc technology.

VI. Respond to the following questions using: every day/week/month/year, in the morning/evening/afternoon, on Mondays, at night, as usual, as a rule, usually, normally, generally, always, often, seldom, rarely, never, sometimes.

Model: Ted often reads much. And they?

They always read much.

1. The students always speak English at the English lessons? And we?
2. I often translate technical texts. And Tom?
3. They go to the university in the evening. And Kate?
4. We seldom conduct experiments in our electronic lab? And Victor?
5. Alice rarely works in this office? And you?
6. We sometimes do our home-work in the reading room. And Alex?
7. On Sundays he gets up late. And you?

VII. Respond to the following questions using: now, at the moment, at present, nowadays, today, tonight, soon, always, still.

Model: Helen is reading her book now. And the kids?

They are reading their books at the moment.

1. Victor is listening to the news at present. And the students?
2. They are going to the university today. And Jack?
3. The students are writing their final test soon. And you?
4. He is still fixing the refrigerator. And they?

5. You are always coming late! And Peter?
6. Now I'm finishing the research. And you?
7. Ted is browsing in the Internet currently. And you?

D. Advanced Language Practice

VIII. Compare the use of the Present Continuous and the Present Simple Tense forms.

1. What are you doing Jane? Are you still looking for your gloves? You are always losing your things!
2. What does he do for a living? - He sings and plays the guitar.
3. I'm learning to drive a car. Next month I am getting my driving license.
4. Tom drives very well. He is always very careful when driving.
5. You are being naughty these days, Billy!
6. We usually grow tomatoes in our garden but this year we are not growing any.
7. Do you understand the problem they are discussing?
8. It is snowing all day. It often snows at this time of the year.
9. Mike doesn't speak English, does he? – Listen to him! What language is he speaking?
10. The Moon goes round the Earth.
11. The family is having lunch now.
12. How many meals a day do you usually have?
13. Don't worry. He is coming back soon.
14. Skill comes with practice.
15. Ted comes from the USA.
16. He is getting stronger.
17. He drinks a litre of milk every day.
18. Milk contains a lot of vitamins. - I agree, but it tastes awful.
19. He is tasting the sauce, it may need some salt.
20. Ellen is having a party at the moment.
21. Marlon Brando acts brilliantly in this film.

IX. Choose the most appropriate words underlined.

1. I haven't decided about whether to buy a new car or a second-hand one. But I think about it/ I'm thinking about it.
2. All right. You try to fix the television! But I hope/I'm hoping you know what you're doing.
3. Every year I visit/I'm visiting Britain to improve my English.
4. It's time we turned on the central heating. It gets/it is getting colder every day.
5. You're Mary, aren't you? I recognize/I am recognizing you now.
6. What's the matter? Why do you look/ are you looking at me like that?
7. The film 'War and Peace' is very long. It lasts/it is lasting over four hours.
8. I can see from what you say that your mornings are very busy. But what do you/are you doing in the afternoons?

9. I'm buying a new flat soon. My old one doesn't suit/isn't suiting us.
10. That must be the end of the first part of the play. What happens now/is happening now?

X. Choose the most suitable word or phrase to complete each sentence.

1. What exactly ...? a) *is this job involving?* b) *does this job involve?*
2. ...that we have been here for six months already! a) *do you realize* b) *are you realizing*
3. Terry is in bed. He ...flu. a) *has* b) *is having*
4. I ...with you completely. a) *agree* b) *am agreeing*
5. I ...this car. Do you want to buy it? a) *sell* b) *am selling*
6. What ... of Ted's new book? a) *do you think* b) *are you thinking*
7. Jill ...always... a) *interrupts* b) *is interrupting*
8. What ...? a) *does this word mean* b) *is this word meaning*
9. More and more people ...cars. a) *own* b) *are owning*
10. How much ...this piece of meat ...? A) *does weigh* B) *is weighing*
11. I...hard, and this means spending a lot of time in the library. a) *study* b) *am studying*

XI. Choose the appropriate adverbial of time.

1. David...stays in his office till six o'clock (always/ tonight).
2. It's getting cold...(every winter/now).
3. They are having some financial problems...(as a rule/ nowadays).
4. Carol ...reads a lot and is extremely well informed (rarely/usually).
5. The company is looking for people with experience...(as usual/now).
6. I don't go swimming very much ...(as a rule/last year).
7. What do you usually do (in the afternoon/this afternoon)?

XII. Fill in with Present Simple or Continuous.

Ted: Hello, Dad. I'm in London now. It...(rain) and I...(not/have got) any money to take a taxi.

Bob: What...(you/want) me to do about it?

Ted: Could you come and pick me up?

Bob: Ted, you...(always/ask) me to do this! I...(get) tired of it.

Ted: Please, Dad. I am tired and hungry. My evening classes ...(start) at 7.00 and I have to be there on time. Can't Mum come and get me?

Bob: The Smiths ...(visit)us tonight and she is busy in the kitchen. She ...(bake) a cake at the moment.

Ted: Please, Dad. I...(ask) you to do this for me one last time. The success of my presentation today ...(depend) on you.

Bob: OK. I'll be there in half an hour. But this is the last time. I... (mean) it!

XIII. Identify any possible errors in these sentences, and correct them if necessary.

1. I'm depending on you, so don't make any mistakes!
2. Is this total number including the new students?

3. Excuse me, but do you wait for someone?
4. These potatoes are tasting a bit funny.
5. How are you feeling today?
6. I look forward to hearing from you.
7. I have feeling that something goes wrong.
8. What's that you are eating?
9. Are you hearing from Wendy these days?
10. You are being rather mean about this.

Part II. TEXT STUDY

A. Vocabulary Exercises

Word List

Nouns and noun phrases

1. access - доступ
2. array - целый ряд; большое количество; масса; множество
3. circuit - цепь, схема, (IC)
integrated circuit – интегральная схема, микросхема
4. device - прибор, устройство
5. fibre - волокно, жилка
optical fibre – оптическое волокно, световод
6. impact - воздействие, влияние
7. performance - 1. работа, действие, исполнение;
2. (рабочая) характеристика; эксплуатационные данные

Verbs and Verbal Phrases

1. apply - 1. применять, прилагать, прикладывать
2. касаться, относиться (to)
2. attenuate - истощать, ослаблять
3. constitute - образовывать
4. convert - превращать
5. deal with (past, p.p. dealt) - иметь дело с кем-либо
6. encompass - 1. окружать; 2. содержать, заключать (в себе)
7. experience - испытать, узнать по опыту
8. facilitate - облегчать, продвигать
9. intermingle - смешивать(ся), перемешивать(ся)
10. manufacture - производить
11. range - простирается (от... до); колебаться (в известных пределах)
12. regenerate - восстанавливать, регенерировать
13. utilize - использовать, утилизировать

Adjectives

1. apparent - видимый, очевидный, явный
2. cellular - клеточный, ячеистый, сотовый
cellular telephone – сотовый телефон
3. consumer - широкого потребления (о товарах)

4. exceptional - исключительный, необычный
5. intricate - запутанный, сложный
6. pervasive - распространяющийся, проникающий
7. sophisticated - современный, стоящий на уровне современных требований

I. *Repeat and translate into Russian the following words*

a) *with one stress or the stress on the first syllable*

circuit, fibre, impact, access, deal, utilize, range, constitute, cellular, intricate, physics, technical, science, integrated, volume, digital

b) *with the stress on the second syllable*

array, performance, apply, encompass, convert, facilitate, experience, attenuate, regenerate, exceptional, consumer, sophisticated, pervasive, apparent, effect, electron

c) *with two or more stresses*

intermingle, manufacture, optical fibre, integrated circuit, scientific, fundamental, mathematics, engineering, radiotelephone, high-performance

II. *Study the following words and choose*

a) *nouns*

1. apply, application, applied, applicable, applicant, appliance;
2. significance, significant, significative, signify, signification;
3. electronic, electronics, electronically, electronicize, electron;
4. breadth, broad, broaden, broadly.

b) *adjectives*

1. physics, physicist, physical, physic;
2. facility, facilitate, facilitation, facile;
3. science, scientist, scientific, scientifically;
4. except, exception, excepting, exceptive, exceptional.

III. *Match the words with their definitions*

- | | |
|------------------|--|
| 1. circuit | a. strong impression or effect |
| 2. impact | b. change from one form into another |
| 3. access | c. closed path for an electric current |
| 4. apply | d. make practical use |
| 5. manufacture | e. vary between limits |
| 6. sophisticated | f. clearly seen or understood |
| 7. apparent | g. complex, with the latest improvement and refinements |
| 8. range | h. produce goods on a large scale by machinery |
| 9. convert | i. right, opportunity or means of reaching, using or approaching |

IV. Arrange the words of the two groups in pairs

a) with similar meaning:

- | | |
|----------------|------------------------|
| 1. encompass | a. relations |
| 2. intricate | b. weaken |
| 3. exceptional | c. complicated |
| 4. attenuate | d. fast |
| 5. intermingle | e. out of the ordinary |
| 6. constitute | f. make easy |
| 7. facilitate | g. establish |
| 8. deal with | h. mix together |
| 9. rapid | i. surround |

b) with contrary meaning

- | | |
|---------------|----------------|
| 1. broad | a. regress |
| 2. advance | b. strengthen |
| 3. motion | c. producer |
| 4. different | d. narrow |
| 5. consumer | e. complicate |
| 6. facilitate | f. unimportant |
| 7. attenuate | g. the same |
| 8. essential | h. simple |
| 9. complex | i. rest |

V. Use the word in brackets to form a word that fits in the space

1. During the 1970s and 1980s, companies around the world ... electronics to improve the quality of consumer goods, such as stereo systems and video games. (appliance)
2. The 1990s computers, ... via telephone lines, had made instant worldwide communications a reality. (to work)
3. Other ... innovations also reshaped modern life during the 1970s and 1980s. (electron)
4. Soon after, many companies developed pocket-sized machines that were more ... than the first generation of electronic calculators. (power)
5. Some ... typewriters are equipped with disk drivers and screen monitors. (electron)
6. The amount of memory a typewriter can retain depends on the ... and thus the cost of the machine. (to sophisticate)
7. Dedicated computers are routinely used in thousands of ... ranging from calculators to airplanes. (to produce)
8. In computers the most ... used form of storage is the magnetic disk. (wide)

B. Texts and Text Exercises

TEXT A

1. *Study the text and try to understand all details.*

ELECTRONICS

Electronics is a branch of physics that deals with the emission, behaviour, and effects of electrons (as in electron tubes and transistors) and with electronic devices.

Electronics encompasses an exceptionally broad range of technology. The term originally was applied to the study of electron behaviour and movement. It came to be used in its broader sense with advances in knowledge about the fundamental nature of electrons and about the way in which the motion of these particles could be utilized. Today many scientific and technical disciplines—including physics, chemistry, materials science, mathematics, and electrical and electronic engineering—deal with different aspects of electronics.

Research in these fields has led to the development of such key devices as transistors, integrated circuits, lasers, and optical fibres. These in turn have made it possible to manufacture a wide array of electronic consumer, industrial, and military products. These products range from cellular radiotelephone systems and videocassette recorders to high-performance supercomputers and sophisticated weapons systems. By the mid-1980s the electronics industry was the largest manufacturing industry in the United States. Japan and the industrialized nations of Western Europe also had flourishing electronics industries, while various developing countries—including South Korea, Taiwan, and Israel—experienced significant advances as well.

The impact of electronics on modern life has been pervasive. It can be said that the world is in the midst of an electronic revolution at least as significant as the industrial revolution of the 19th century. Evidence of this is apparent everywhere.

Electronics is essential, for example, in telecommunications. An ever-increasing volume of information is transmitted in digital form. Digital techniques, in which signals are converted into groups of pulses, allow the intermingling of voice, television, and computer signals into one very rapid series of pulses on a single channel that can be separated at the receiving end and reconstituted into the signals originally sent. Because the digital pulses can be regenerated perfectly after they become attenuated with distance, no noise or other degradation is apparent at the receiving end.

Electronic controls for industrial machines and processes have made possible dramatic improvements in productivity and quality. Computer-aided design tools facilitate the designing of parts that have complex shapes, such as aircraft wings, or intricate structures, such as integrated circuits. The

production of designs of this sort is done by computer-controlled machines that receive instructions directly from the design tools.

Access to knowledge has been made far easier by computerized indexes of scientific and technical journals, which are accessible from centralized services over telephone lines. These central databases are being supplemented by new techniques derived from digital audio and video disc technology, which provide locally, and at low cost, access to vast amounts of information in text and graphic form.

II. Read the text and find English equivalents of the following words and word combinations.

Электронная лампа, необычайно широкая область, первоначально, поведение электрона, интегральная схема, оптоволокно, в свою очередь, товары широкого потребления, современные системы вооружения, по крайней мере, цифровая технология, резкое улучшение, средства автоматизированного проектирования, сложные структуры, доступ к знаниям, центральные базы данных.

III. Read the text and answer the questions.

1. What is electronics? 2. Why did the term electronics acquire a wider meaning? 3. What branches of science are connected with electronics? 4. What devices made it possible to produce not only videocassette recorders but also high-performance supercomputers? 5. In 1980s electronics industries weren't developed at all in the industrialized European countries, were they? 6. In what field of engineering is electronics of great importance? 7. In what form is most of information sent at present? 8. Does it take much time to obtain information now?

IV. Say whether the following statements are true or false.

1. Electronics studies electronic phenomena, devices and systems. 2. Nowadays electronics is out of relation to chemistry. 3. In 1980 the US electronics industry was underdeveloped. 4. The electronic revolution is less important than the industrial revolution of the 19th century. 5. In digital techniques signals are mixed on a single channel. 6. Productivity and quality in industry were greatly improved thanks to electronics. 7. At present the only opportunity of getting information is over telephone lines.

V. Complete the following sentences choosing the most suitable variant.

1. Manufacturing of many electronic products became possible thanks to the invention of
 - a) high-performance supercomputers;
 - b) transistors, ICs and other electronic devices;
 - c) sophisticated weapons systems.
2. In digital techniques signals are changed into
 - a) groups of pulses;
 - b) voice;

- c) electric current.
- 3. There is no noise at the receiving end
 - a) because of the perfect regeneration of the digital pulses;
 - b) because the digital pulses become attenuated with distance;
 - c) because the digital pulses can be separated at the receiving end.
- 4. It became easier to design complex shapes and structures with the help of
 - a) industrial machines;
 - b) machine-tools;
 - c) computer-aided design tools.
- 5. Obtaining information was facilitated by
 - a) telephone lines;
 - b) scientific and technical journals available;
 - c) computerization.

VI. *Develop the following ideas. Use the words and word combination provided in the brackets.*

- 1. Electronics deals with many disciplines. (originally, the term, extensive knowledge, describe, wider meaning, electrical and electronic engineering)
- 2. Research in different branches of science has led to the invention of key devices in electronics. (great number of, optical fibres, ICs, to produce, cellular radiotelephone systems, high-performance supercomputers, to be developed, electronics industries, to be influenced by, to be as important as)
- 3. Electronics is essential in telecommunication. (to be transmitted, groups of pulses, to be changed, on a single channel, to intermingle, to be separated at the receiving end, to convert into original signals, to improve the quality of signals received)
- 4. Electronics improved productivity and quality. (to facilitate, computer-aided design tools, complex structures and shapes)
- 5. Access to knowledge has been made far easier. (centralized services, to find indexes, central databases, in graphic and text form)

VII. *Make an outline of the text*

VIII. *Speak about the significance of electronics*

TEXT B

I. *Read the following text and entitle it.*

The working principles of electronics can be demonstrated by tracing the history of radio tubes and photoelectric cells. The history began in 1883, when Thomas Edison found that the heated filament in his incandescent lamp gave off material that blackened the inside of the bulb. This was called the Edison effect, and it led to the development of the modern radio tube. In the Edison effect, also called thermionic emission, heat supplies some electrons in the

filament with at least the minimal energy to overcome the attractive forces holding them in the structure of the metal. This discharge of electrons is widely used as a source of electrons in conventional electron tubes—for example, in television picture tubes.

In 1887 Heinrich Hertz, while trying to prove the existence of radio waves, discovered the photoelectric effect. If polished metal is given a negative charge and then is flooded with ultraviolet radiation, it steadily loses the charge. Some chemical elements such as cesium and selenium are sensitive to visible light. This discovery led to photoelectric cells.

The development of the radio tube began in 1904, when John A. Fleming of England produced the Fleming valve, which today is called a diode, meaning “two electrodes.” He started by heating a filament (also called a cathode) in a vacuum tube with “A-circuit current.” The heat drove electrons out of the filament and into surrounding space.

If nothing more happened, the first electrons to escape would soon have formed a negative space charge that would have kept others from being driven out because like charges repel. Fleming avoided this by placing a plate in the tube and connecting the plate and filament through an outside B circuit. The electrons driven from the filament then crossed the tube to the plate and followed the circuit back to the filament.

Fleming next placed a battery in the B circuit. The battery was used to supply electrons—that is, negative charges—to the filament, or cathode, and draw them from the plate, or anode, leaving a positive charge. Electrical heating drove electrons steadily from the filament and sent a strong current through the B, or plate, circuit. The strength of the current depends partly upon the heat and partly upon the voltage from the battery.

This device could be used as a radio detector. The changing voltages created by radio signals in an antenna circuit are placed on the filament and plate. The changes produce corresponding changes in the strength of the plate current, which is used to reproduce the signal in the receiving apparatus.

In 1906 the American inventor Lee De Forest transformed the diode into a device that he called an audion, the modern name of which is triode. He did this by inserting a grid of fine wire mesh between the filament and the plate.

If variable voltages from an antenna circuit are placed on the filament and the grid, they cause variations in the flow of electrons to the plate. Moreover, the variations in current are much stronger than those caused by the voltage of the incoming signal acting alone. Thus the triode amplifies, or strengthens, the signal.

Because the tube uses free electrons only and has no mechanical moving parts, it responds within a few microseconds, or millionths of a second, to any change placed upon it. It can be made sensitive to changes of less than a millionth of a volt. Resulting changes in the plate current can be amplified by passing the signal through more tubes.

The vacuum tube became the basis of radio, television, and computers, the latter first developed at the end of World War II in 1944 and 1945. The invention of the transistor in 1947 initiated a radical reduction in the size of electronic circuits and in their power requirements. The later development of the integrated circuit set into motion the continuing miniaturization of all electronic devices, which has at the same time greatly increased their speed and computing power.

Notes

radio tube – электронная лампа
filament – нить накала
incandescent lamp – лампа накаливания
photoelectric cell – фотодиод

II. *Answer the following questions on the contents of the text.*

1. What discovery led to the modern radio tube? 2. When was the photoelectric effect discovered? 3. What does the Fleming valve consist of? 4. What does a triode differ from a diode? 5. When did the first computers appear?

III. *Read the text again and be ready to speak on the following problems:*

- Thomas Edison's discovery.
- The development of radio tube.
- Lee De Forest's contribution to the development of electronics.
- Major steps of electronics history.

UNIT 2

Part I. GRAMMAR STUDY

FUTURE TIME

A. Explanations

Basic contrasts:
will, going to, present continuous

1. *Will* is normally known as the predictive future, and describes known facts, or what we suppose is true.

I'll be late home this evening.

The company will make a profit next year.

This can also take the form of an assumption:

That'll be Jim at the door.

This means that I suppose it is Jim.

2. *Will* is also used to express an immediate decision:
I'll take this one.

3. *Be going to* describes intentions or plans. At the moment of speaking the plans have already been made.

I'm going to wait here until Carol gets back.

Going to is also used to describe an event whose cause is present or evident.

*Look at that tree! It's **going to** fall.*

Decisions expressed with *going to* refer to a more distant point in the future.

4. Present continuous describes fixed arrangements, especially social and travel arrangements, a time reference is usually included.
5. Contrasts between *going to* and *will* may be a matter of speakers' preference. The first two examples in 1 would not seem inappropriate if *going to* was used, possible because the sense of the cause is present in the speaker's mind.

Future
continuous

1. This describes an event which will be happening at a future point.

*Come round in the morning. I'll **be painting** the kitchen.*

2. It can also describe events which are going to happen anyway, rather than events which we choose to make happen.

*I won't bother to fix a time to see you, because I'll **be calling** into the office anyway several times next week.*

3. In some contexts future continuous also sounds more polite than *will*.

***Will you be going** to the shops later? If you go, could you get me some potatoes?*

4. It can also be used to refer to fixed arrangements and plans.

*The band **will be performing** live in Paris this summer.*

Future
perfect

1. This has both simple and continuous forms, and refers to time which we look back at from a future point.

*In two years' time I'll **have finished** this book.*

*By the end of the month, I'll **have been working** for this firm for a year.*

2. It can also be used to express an assumption on the part of the speaker.

*You **won't have heard** the news, of course.*

This means that I assume you have not heard the news.

Other ways
of referring
to the future

1. *Is/are to be*

This is used to describe formal arrangements.

*All students **are to** assemble in the hall at 9.00.*

2. *Be about to, be on the point of, be due to*

Be about to and *be on the point of* both refer to the next moment.

*I think the play is **about to** start now.*

*Mary **is on the point of** resigning.*

Be due to refers to scheduled times.

*The play **is due to** start in five minutes.*

*Ann's flight **is due at** 6.20.*

3. Present simple and present perfect.

Present simple is used to refer to future time in future time clauses.

*When we **get** there, we'll have dinner.*

Present perfect can also be used instead of present simple when the completion of the event is emphasized.

*When we've **had** a rest, we'll go out.*

4. Present simple is also used to describe fixed events which are not simply the wishes of the speaker.

*Tom **retires** in three years.*

Similarly, calendar references use the present simple.

*Christmas **is** on Tuesday next year.*

*It's all go – next week I **have** my operation; then the week after that I go on holiday...*

Other future references

1. *Hope*

This can be followed by either present or future tenses.

*I hope it **doesn't** rain.*

*I hope it **won't** rain.*

2. Other verbs followed by *will*.

Most verbs of thinking can be followed by *will* if there is future reference.

These include: *think, believe, expect, doubt*.

*I **expect** the train will be late.*

*I **doubt** whether United will win.*

3. *Just/just about to*

Just can be used to describe something on the point of happening.

*Hurry up! The train **is just leaving/just about to leave**.*

4. *Shall*

The use of *shall* for first person in future reference is generally considered to be restricted in British English and possibly declining in use. For some speakers, *shall* is used in formal speech and in written language.

B. Formation

The Future Simple Tense

Affirmative			Negative			Interrogative		
I You He She It	will	work	I You He She It	will not (won't)	work	will	I You He She It	work?
We You They	will	work	We You They	will not (won't)	work	will	We You They	work?

The Future Continuous Tense

Affirmative			Negative			Interrogative		
I You He She It	will be	working	I You He She It	will not be (won't)	working	Will	I You He She It	be working?
We You They	will be	working	We You They	will not be (won't)	working	Will	We You They	be working?

The Future Perfect Tense

Affirmative			Negative			Interrogative		
I You He She It	will have	worked	I You He She It	will not have (won't)	worked	Will	I You He She It	have worked?
We You They	will have	worked	We You They	will not have (won't)	worked	Will	We You They	have worked?

Time Expressions Used with

will/be going to

tomorrow, tonight, next week/month/year, in two/three etc. days, the day after tomorrow

Future

Continuous

soon, in a week/month/year, at five o'clock, at noon, at midnight, at that moment, all day long, all the time, the whole evening, from five till six

Future Perfect

before, by, by then, by the time, by five o'clock, by Saturday, by the end of the year, until (is used only in negative sentences with this tense)

C. Practice

I. Read and study the following sentences.

1. Next year I'll be 18.
2. I think she'll have finished the essay by Saturday.
3. I'll phone you as soon as I arrive.
4. I'll be working in the library at 10 tomorrow
5. It looks like rain, I'll take my umbrella then.
6. Look at the clouds! Isn't it going to rain?
7. My dad is flying to London tonight.
8. What are you going to do at Christmas?
9. The film starts at 2 p.m.

II. Make the following affirmative sentences negative and interrogative.

1. She will have finished by 8 o'clock.
2. Julia is seeing her dentist this week.
3. The plane reaches Paris at 9.15.
4. We'll be sunbathing in Hawaii this time next week.
5. Look at the sky! It is going to rain.
6. He'll probably buy the dress.
7. Since it's getting dark, I'll turn on the light.
8. She'll have worked here for ten years by the end of this month.
9. I'm sure he'll pass the test.

III. Make the following interrogative and negative sentences affirmative.

1. I won't have retired till the year 2020.
2. Carl will always remember this birthday, won't he?
3. What are you going to do on Sunday?
4. What will you be doing tomorrow evening?
5. What will you say if you see her?
6. What are you doing tonight?
7. She won't take English lessons twice a week.
8. Will he be meeting us at the station?
9. They won't be reading the whole evening.

IV. Put the verbs in brackets into Future Indefinite, Future Continuous or Future Perfect.

1. I (to wait) for you at five o'clock tomorrow.
2. I am sure that they (to complete) their work by May.
3. At 3 o'clock tomorrow I (to have) an English lesson.
4. Tomorrow at this time you (to sail) down the Moskva River.
5. I hope it (to stop) raining by five o'clock.
6. I hope the next mail (to bring) news from home.
7. She (to return) from the library at six o'clock.
8. I not (to work) at eight o'clock. I (to finish) my homework by that time.
9. At what time you (to be) here?
10. What you (to do) at eight o'clock? I (to work) on my report.

V. Fill in: by or until.

1. We'll have finished cooking...the time the guests arrive.
2. They won't have built the shed...Friday.
3. She'll have worked here for ten years...the end of this month.
4. You'll have saved enough money to buy a car...Christmas.
5. Will you have done your homework...tomorrow? No, I won't have done it...Friday.
6. Have they built their house yet?
No, they won't have built it...the end of May.
7. Are you seeing Tom tonight?
No, I will have left...the time he gets here.
8. What time will they have finished painting your room? They will have finished...7 o'clock, I hope.

VI. Put the verb given into a form of will, going to or present continuous. More than one answer may be possible.

Model: Have you heard the news?

Harry (join) is joining/is going to join the Army.

1. I think our team (probably win).
2. Look out! You (hit)...that three!
3. I (go)...to Manchester at the end of next week.
4. Our teacher (give)...us a test tomorrow.
5. In fifty years' time, most people (probably ride)...bicycles to work.
6. Careful! You (knock)...that jug off the table!
7. I'm sorry I can't meet you tonight. I (go out)...with my parents.
8. According to the weather forecast, it (snow)...tomorrow.
9. Sorry to keep you waiting. I (not be)...long.

VII. Choose the correct word or phrase underlined in each sentence.

1. Stop teasing the dog, or it's biting/ it'll bite you.
2. Jane won't stop/won't have stopped talking all the time.
3. Wait for me. I'll be/I'll have been ready in a moment.
4. Where will you work/will you be working in ten years' time?
5. Don't forget to turn off the lights before you are leaving/leave.
6. What time does your train leave/will your train leave?
7. We will have moved/will be moving to our new house on Tuesday.
8. Please stay in your seats until the bell will ring/rings.

D. Advanced Language Practice

VIII. Study the use of Future Forms.

1. I'll be having lunch with John tomorrow as usual.
2. Will Tom be staying with you this Easter?
3. They will have made a decision by Friday.
4. I'm sure you'll have a wonderful holiday.

5. He is going to take a few days off next week.
6. The men are delivering the furniture tomorrow.
7. We'll be sailing around the islands this time next month.
8. The bus for Cambridge departs in an hour.
9. I think I'll go home now.

IX. Choose the most appropriate words underlined.

1. I doubt if they are/will be on time.
2. We can't get into the office until Ann arrives/will arrive with the key.
3. If we go/will go to France in the summer, we'll visit the islands.
4. I'm not sure when I go/'ll go on holiday this year.
5. Excuse me, Mary. Will you be going/Will you go to the library this morning?
6. I don't think I'll have finished/'ll finish these exercises by 3 o'clock.
7. If I have/will have enough money, I'll buy a new bicycle.
8. I will have finished/will finish my exams by the end of August.
9. I'm sure he'll understand/'s going to understand if you explain it to him clearly.
10. I'm sorry, I promise I'll stay/'ll be staying out of trouble in the future.
11. I've already told you why I can't see you tonight. I am having/'ll have guests.

X. Put the verb in brackets into a suitable tense.

1. What...(you give) Nick for his birthday? Have you decided yet?
2. It's very hot in here. I think I...(faint).
3. I've pressed the red button now what...(I do)?
4. It...(not be) long before Doctor Brown is here.
5. By the end of the week we...(decide) what to do.
6. What...(you do) this Saturday evening? Would you like to go out?
7. It's only a short trip I...(be) back in an hour.
8. By the time you get back Billy...(leave).
9. In twenty four hour's time...(I relax) on my yacht.

XI. Choose the most appropriate continuation for each sentence.

1. Don't worry about the mistake you made nobody
 - a) will notice
 - b) is noticing
 - c) will be noticing
2. You can try asking Ted for help but
 - a) it won't do you any good
 - b) it's not doing you any good
 - c) it won't be doing you any good
3. Can you send me the results as soon as you
 - a) hear anything?
 - b) are hearing anything?
 - c) will have heard anything?
4. I'm sorry dinner isn't ready yet, but it

- a) is going to be ready in a minute
 - b) will have been ready in a minute
 - c) will be ready in a minute
5. You can borrow this calculator, I
- a) am not going to need it
 - b) won't have been needing it
 - c) am not needing it
6. According to the latest forecast, the tunnel
- a) will be finished next year
 - b) will have been finished next year
 - c) is finishing next year
7. It's no use phoning David at the office, he
- a) will be leaving
 - b) is leaving
 - c) will have left

XII. Choose the most appropriate word or phrase underlined.

1. Bye for now. I'll see you in two weeks' time/two weeks later.
2. Carol will be retiring soon/already.
3. By twenty four hours/this time tomorrow I'll be in London.
4. I can't leave on Monday I won't be ready until then/by then.
5. I'm sure Harry will be here before long/after a while.
6. I should be back by the time/at the time the film begins.
7. Please call me the moment/exactly when you hear any news.
8. I'll be back after a few minutes/in a few minutes.
9. I'm sure that everything will be all right at the end/in the end.

XIII. Use the different tense-forms to express future actions in English.

1. They (to open) an exhibition here next year.
2. Our guests (to arrive) by the 11.50 train.
3. Take a warm coat. It's very cloudy. I think it (to snow).
4. I (to take) my driving test on Wednesday.
5. I think she (to hear) all about it by the time I (to see) her.
6. It's Jane's birthday in August. She (to be) sixteen.
7. If you (to come) tonight, I am sure you (to have) much fun.
8. She (to go) to college if she (to do) well in her exams.

Part II. TEXT STUDY

A. Vocabulary Exercises

Word List

Noun and Noun Phrases

- | | |
|-----------------------------------|-------------------------|
| 1. amplification | - усиление |
| 2. beam | - луч |
| 3. before the turn of the century | - в конце прошлого века |

4. capacity	- мощность, нагрузка, производительность
5. duration	- продолжительность
6. emission	- эмиссия (излучение)
7. fuel	- топливо
8. fulfilment	- выполнение, осуществление
9. heat	- тепло, теплота
10. installation	- установка, сборка
11. lead	- свинец
12. substance	- вещество
13. sword of heat	- огненный меч
14. tool	- инструмент, орудие, средство
15. treatment	- обработка
16. weapon	- оружие

Verb and Verbal phrases

1. conduct	- вести проводить
2. disintegrate	- распадаться на составные части
3. encode	- кодировать
4. invade	- вторгаться
5. stand for	- символизировать, означать
6. stimulate	- возбуждать, индуцировать
7. suggest	- предлагать, советовать
8. vaporize	- испарять(ся)
9. vary	- менять, изменять

Adjectives

1. heat-resistant	- теплостойкий
2. mysterious	- таинственный
3. simultaneous	- одновременный
4. single	- одиночный

I. Repeat and translate into Russian the following words:

- a) with the stress on the first syllable;
century, vaporize, weapon, stimulate, substance, vary, treatment, scientist, physicist, current, practice, difficulty
- b) with the stress on the second syllable;
fantastic, mysterious, sophisticated, intensive, capacity, emission, fulfilment, encode, invade, conduct, suggest
- c) with two or more stresses.
amplification radiation, simultaneous, unamenable, installation, thermonuclear, communication

II. Study the following words and choose

a) nouns

1. reality, real, realistic, realize.
2. intense, intensity, intensive, intensification
3. resistant, resist, resistance, resistive

4. developing, development, developed, develop
5. provide, providing, provision, provided

b) English equivalents

1. устанавливать – installment, installation, install
2. различие, разница – differ, difference, different
3. распадаться – disintegrator, disintegration, disintegrate
4. применимый – application, applicable, apply
5. укреплять – strong, strength, strengthen
6. эффективно – efficient, efficiency, efficiently
7. усилитель – amplification, amplifier, amplify
8. связь – communicate, communicative, communication
9. передавать – transmission, transmitter, transmit

III. Match the words with their definitions.

- | | |
|------------------|--|
| 1. heat | a. a line of light that shines from an object such as a torch or the sun |
| 2. duration | b. a piece of information or a request that you send to someone or leave for them when you cannot speak to them directly |
| 3. tool | c. an object such as a gun, a knife, or a missile, which is used to kill or hurt people in a fight or a war |
| 4. weapon | d. a narrow beam of concentrated light that is used especially for cutting very hard materials and in surgery |
| 5. sophisticated | e. made using advanced and complex methods |
| 6. beam | f. warmth or the quality of being hot |
| 7. message | g. the length of time during which something happens or exists |
| 8. satellite | h. an object which has been sent into space in order to collect information |
| 9. laser | i. any instrument or piece of equipment that you hold in your hands in order to help you to do a particular kind of work |

IV. Arrange the words of the two groups in pairs

a) with similar meaning

- | | |
|------------------|----------------|
| 1. rapidly | 1. requirement |
| 2. sophisticated | 2. almost |
| 3. conduct | 3. carry out |
| 4. demand | 4. quickly |
| 5. approximately | 5. complex |
| 6. fulfil | 6. possibility |
| 7. opportunity | 7. realize |

8. application	8. as well
9. also	9. use
<i>b) with contrary meaning</i>	
1. further	1. incapable
2. integrate	2. powerful
3. cooling	3. limitless
4. outside	4. inside
5. powerless	5. uncontrolled
6. controlled	6. heating
7. limited	7. disintegrate
8. capable	8. nearer
9. single	9. numerous

Use the words in brackets to form a word that fits in the space

1. Laser is one of the most sophisticated ... of man. (to invent)
2. Physicists have developed large laser installations to conduct physical experiments in ... thermonuclear fuel with laser beams.(to heat)
3. The ... of a laser can be rapidly changed to encode very complex signals. (to intensify)
4. Laser represents the ... of one of the mankind's oldest dreams of technology .(to fulfil)
5. There are projects to use laser for long distance (to communicate)
6. By the end of 2000 laser had become one of the main ... tools. (technology)
7. The laser beam must heat the fuel to the ... temperature. (to require)
8. Lasers may be used for ... of energy to space stations. (to transmit)
9. ... in many countries are working at a very interesting problem. (science)
10. There also exists an idea to use laser for solving the problem of controlled thermonuclear. (to react)

B. Texts and Text Exercises

TEXT A

1. *Study the text and try to understand all details.*

LASER

In the "War of Worlds" written before the turn of the century H. Wells told a fantastic story of how Martians almost invaded our Earth. Their weapon was a mysterious "sword of heat". Today Wells' sword of heat has come to reality in the laser. The name stands for light amplification by stimulated emission of radiation.

Laser, one of the most sophisticated inventions of man, produces an intensive beam of light of a very pure single colour. It represents the fulfilment of one of the mankind's oldest dreams of technology to provide¹ a light beam intensive enough to vaporize the hardest and most heat-resistant materials. It can indeed make lead run like water, or, when focused, it can vaporize any

substance on earth. There is no material unamenable² to laser treatment and laser will have become one of the main technological tools.

The applications of laser in industry and science are so many and so varied as to suggest magic³. Scientists in many countries are working at a very interesting problem: combining the two big technological discoveries of the second half of the 20-th century – laser and thermonuclear reaction – to produce a practically limitless source of energy. Physicists of this country have developed large laser installations to conduct physical experiments in heating thermonuclear fuel with laser beams. There also exists an idea to use laser for solving the problem of controlled thermonuclear reaction. The laser beam must heat the fuel to the required temperature so quickly that the plasma does not have time to disintegrate. According to current estimates, the duration of the pulse has to be approximately a thousand-millionth of a second. The light capacity of this pulse would be dozens of times greater than the capacity of all the world's power plants. To meet such demands in practice scientists and engineers must work hard as it is clear that a lot of difficulties are to be encountered on route⁴.

The laser's most important potential may be its use in communications. The intensity of a laser can be rapidly changed to encode very complex signals. In principle, one laser beam, vibrating a billion times faster than ordinary radio waves, could carry the radio, TV and telephone messages of the world simultaneously. In just a fraction of a second, for example, one laser beam could transmit the entire text of the Encyclopedia Britannica.

Besides, there are projects to use lasers for long distance communication and for transmission of energy to space stations, to the surface of the Moon or to planets in the solar system. Project have also been suggested to place lasers aboard Earth satellites nearer to the Sun in order to transform the solar radiation into laser beams, with this transformed energy subsequently transmitted to the Earth or to other space bodies. These projects have not yet been put into effect⁵, because of the great technological difficulties to be overcome and therefore the great cost involved. But there is no doubt that in time⁶ these projects will be realized and the laser beam will begin operating in other space as well.

Notes

1. unamenable – неподдающийся
2. as to suggest magic – можно принять за чудо
3. on route – на пути
4. put into effect – осуществлять

II. Read the text and find English equivalents of the following words and word combinations.

средство, усиление, свет, эмиссия, нагрев, топливо, распад, проводить, теплостойкий, обработка, установка, возбуждать (индуцировать), выполнение, инструмент, продолжительность, менять, оружие, передавать

III. *Read the text and answer the questions.*

1. What does the word "laser" mean?
2. What is laser: is it a device or some phenomenon?
3. Who was the first to write about laser?
4. What can laser do?
5. Where can it be used?
6. What other uses of laser do you know?
7. What is its principle of operation?
8. What light is produced by a laser?
9. What can be done by means of a laser?
10. What prevents putting into effect the projects to use laser more widely in space?

IV. *Say whether the following statements are true or false.*

- 1) Laser means "light amplification by stimulated emission of radiation"
- 2) Laser produces an intensive beam of light
- 3) In the next few years laser will become one of the main technological tools
- 4) Martians almost invaded the Earth before the turn of the century
- 5) Laser and thermonuclear reaction can produce a limited source of energy
- 6) The laser beam heats the fuel so quickly that the plasma disintegrates
- 7) There are project to transform lunar radiation into beams
- 8) The laser beam will begin operate in outer space

Complete the following sentences choosing the most suitable variant.

1. Laser produces
 - a) an intensive beam of light
 - b) hundreds of operations a second
 - c) integrated circuits
2. The laser's most important potential may be its use ...
 - a) in telephone
 - b) in broadcasting
 - c) in communications
3. Laser has become one of
 - a) the most complex signals
 - b) the most heat resistant materials
 - c) the main technological tools
4. There also exists an idea to use laser for solving the problem of
 - a) controlled thermonuclear reaction
 - b) using electricity in devices
 - c) detecting signals

V. *Develop the following ideas. Use the words and word combinations provided in the brackets.*

1. Laser is a very important invention of man (intensive, produce, beam, pure, single, beam, colour).
2. Laser is widely used in science and industry (scientists, problem, works, combine, technological, two, big, discovery).
3. Laser may be used in communications (intensity, change, laser, complex, encode, signal).
4. Lasers will be used for transmission of energy to space stations (long distance communication, the Moon, solar system, surface).

VI. *Make an outline of the text.*

VII. *Speak about the significance of lasers.*

TEXT B

I. *Read the following text and entitle it.*

One of the most interesting developments in telecommunication is the rapid progress of optical communication where optical fibers are replacing conventional wires and cables. Just as digital technologies greatly improved the telephone system, optical communication promises a considerable increase in capacity, quality, performance and reliability of the global telecommunication network. New technologies such as optical fibers will increase the speed of telecommunication and provide new, specialized information service. Voice, computer data, even video images, will be increasingly integrated into a single digital communication network capable to process and transmit virtually any kind of information.

It is a result of combining two technologies: the laser, first demonstrated in 1960, and the fabrication 10 years later of ultra-thin silicon fibres which can serve as light wave conductors. With the further development of very efficient lasers plus continually improved techniques to produce thin silica of incredible transparency, optical systems can transmit pulses of light as far as 135 kilometers without the need for amplification or regeneration.

At present high-capacity optical transmission systems are being installed between many major US cities at a rapid rate. The system most widely used now operates at 147 megabits (thousand bits) per second and accommodates 6,000 circuits over a single pair of glass fibres (one for each direction of transmission). This system will soon be improved to operate at 1.7 gigabits (thousand million bits) per second and handle 24,000 telephone channels simultaneously.

A revolution in information storage is underway with optical disk technology. The first optical disks appeared in the early 1970-s. They were and are used to record video films, but in a continuous spiral rather than digitally.

The first digital optical disks were produced in 1982 as compact disks for music. They were further developed as a storage medium for computers. The

disks are made of plastics coated with aluminum. The information is recorded by using a powerful laser to imprint bubbles on the surface of the disk. A less powerful laser reads back the pictures, sound or information. An optical disk is almost indestructible and can store about 1000 times more information than a plastic disk of the same size.

The latest optical disk development is a system which enables computer users to record their own information on a glass or plastic disk coated with a thin film of tellurium. Such a disk can store 200 megabytes (200 million characters).

Besides, it is reported that an optical equivalent of a transistor has been produced and intensive research on optical electronic computers is underway at a number of US companies as well as in countries around the world.

It is found that optical technology is cost-effective and versatile. It finds new applications every day – from connecting communication equipment or computers within the same building or room to long-distance transcontinental, transoceanic and space communications.

II. *Answer the following questions on the content of the text.*

1. What are optical fibers replacing?
2. What kind of systems are being installed at present?
3. When did the first optical disks appear?
4. When were the first digital optical discs produced?
5. What can you say about optical technology.

III. *Read the text and be ready to speak on the following problems:*

- a) the rapid progress of optical communication;
- b) the further development of very efficient lasers;
- c) the first digital optical disks;
- d) optical technology finds new applications.

UNIT 3

Part I. GRAMMAR STUDY

PAST TIME

A. Explanations

Basic

contrasts: past
simple and past
continuous

1. Past simple generally refers to:

Completed actions

*I got up, **switched** off the radio, and **sat** down again.*

Habits

*Every day I **went** to the park.*

States

*In those days, I **didn't like** reading.*

2. Past continuous (progressive) generally refers to:
Actions in progress (often interrupted by events)

*I **was drinking** my coffee at the time.*

*While I **was opening** the letter, the phone **rang**.*

Background description in narrative

*I entered the office and looked around. Most people **were working** at their desks, but Jane **was staring** out the window and **pretending** to write something at the same time.*

Changing states

*The car **was getting** worse all the time. One of the headlights **was gradually falling off**, and the engine **was making** more and more funny noises.*

Past perfect simple and continuous

1. Past perfect simple is used when we need to make clear that one event in the past happened before another event in the past.

*Sue left at 7.00. We arrived at her house at 8.30. When we **arrived** at Sue's house, she **had left**.*

It may not be necessary to use past perfect simple if we use *before* or *after* to make the time clear.

*Sue **left** her house **before** we arrived.*

*We arrived at Sue's house **after she left**.*

Although both are correct, many speakers still prefer to use past perfect simple in this case.

*Sue **had left** her house **before** we arrived.*

*We arrived at Sue's house **after she had left**.*

2. Past perfect continuous (progressive).

The contrasts between past simple and past continuous can be made in past perfect tenses for events further back in the past.

*I **had been living** in a bed-sitter up to them.*

*While I **had been talking** on the phone, Jimmy **had escaped**.*

*The whole place was deserted, but it was obvious that someone **had been living** there. **They'd been cooking** in the kitchen for a start, and they **hadn't bothered** to clear up the mess.*

Used to would

1. *Used to* describes a habit or state in the past. There is not a present form.

Used to often makes a contrast between a habit in the past and a habit we have now.

*I **used to** have long hair when I was younger.*

*I **used to** play tennis, but now I play football.*

Question form: **Did you use to?**

Negative: ***I didn't use to.***

Pronunciation

Used is pronounced [ju:st]. This is different from the past tense of the verb use, pronounced [ju:zd].

Note that some grammars make *used to* an unchangeable form, and accept the written forms *Did you used to?* and *I didn't used to.*

2. *Would* can be used to describe repeated actions in the past. It is often used in descriptive writing.

*On winter days, we **would** all sit around the fire and tell stories.*

Note that *would* cannot be used for states.

*I **used to own** a motorbike.*

*I **would own** a motorbike. (Would is not possible here.)*

Advanced Language Practice

Other uses
of past
continuous

1. Repeated actions – criticism

With a frequency adverb, this use is similar to the use of present continuous to express annoyance.

*When Jane was at school, she **was always losing** things.*

2. Past continuous is not used to describe general habitual actions, without the sense of criticism mentioned above. Past simple is used for this meaning.

*When I lived in London, I **walked** through the park every day.*

Other uses
of past
perfect
simple

1. Note that it is not necessary to use past perfect simple just because an event happened a long time ago. We use past simple.

*The Chinese **built** the Great Wall over two thousand years ago.*

2. With realize.

*When I got home I **realized** I had lost my wallet.*

3. With verbs of thinking:

Think, know, be sure, remember, suspect, understand, etc.

*I thought I'd **seen** the film before, but I hadn't.*

*David knew he **had seen** her somewhere before.*

*Ellen was sure she **hadn't locked** the door.*

*The inspector suspected that the thief **had used** a special key.*

Unfulfilled
past events

1. These describe events intended to take place, but which did not happen.

I was going to phone you, but I forgot.

I was thinking of going to Italy this year, but I haven't decided.

I was about to do it, but I started doing something else.

Jack was to have taken part, but he fell ill.

- The contrasting past event is often understood.
How are you? I was going to phone you...(but I didn't).
- Polite forms
These are common with *wonder*.
I was wondering if you wanted to come to the cinema.

B. Formation

The Past Simple Tense

Affirmative			Negative				Interrogative		
	regular	Irregular							
I	finished	Wrote	I	didn't	finish	write	Did	I	finish? write?
You			You					you	
He			He					he	
She			She					she	
It			It					it	
We			We					we	
You			You					you	
They			They					they	

Pronunciation of -ed ending

[t] after voiceless consonants	[d] after voiced consonants and vowels	[id] after verbs ending in [t], [d]
asked, worked, washed	listened, loved, enjoyed	wanted, depended

Spelling of words ending in -ed

+ ed →	-e- - → +d →	consonant + -y -ie	Double the final consonant (verbs ending with one vowel and one consonant)
walk <u>e</u> d → lik <u>e</u> d	lov <u>e</u> d enjoy <u>e</u> d	try tri <u>e</u> d cry cri <u>e</u> d	regret – regret <u>t</u> fit - fit <u>t</u>

The Past Continuous Tense

Affirmative	Negative	Interrogative
-------------	----------	---------------

I You He She It We You They	Was Were was working were	I You He She It We You They	wasn't weren't wasn't working weren't	Was Were Was Were	I You He She It We You They	working?
--	---	--	--	------------------------------------	--	----------

The Past Perfect Tense

Affirmative		Negative		Interrogative		
	regular	Irregular				
I You He She It We You They	had asked had written	I You He She It We You They	hadn't asked hadn't written	Had	I You He She It We You They	asked? written?

The Expressions Used With:

Past Simple – last day/week/month/year, ago, in September 1995, yesterday, the day before yesterday, yesterday morning (afternoon, evening), the other day, etc.

Past Continuous – at ... o'clock yesterday, from 5 till 6 yesterday, the whole evening, etc.

C. Practice

1. Choose the correct word or phrase from each pair underlined.

- While I washed/**was washing** my hair, the phone rang/ringed.
- How did you felt/did you feel yesterday afternoon?
- When I reached/was reaching home I received/was receiving David's phone call.
- Last summer I was going swimming/went swimming every weekend.
- When the dog bit/was biting Laura's leg, she screamed/was screaming.
- We sang/sung some songs and then ate/eat some sandwiches.
- When you fell/felt over the cliff, what happened/was happening next?
- While Mary washed up/was washing up, she broke/was breaking a cup.

- i) I didn't see/didn't saw where the bus-stop was, so I was missing/missed the bus.
- j) What did you do/were you doing when I phoned/was phoning you last night? There was no reply.

II. Rewrite each sentence according to the instructions given.

- a) I enjoyed the concert. (negative) *I didn't enjoy the concert.*
- b) Sue liked the party. (question)
- c) You ate all the bread. (question)
- d) Did Tom spend a lot? (affirmative).....
- e) I felt well yesterday. (negative)
- f) Ann didn't buy a car. (affirmative).....
- g) They won the prize. (question)
- h) Paul doesn't speak Polish. (affirmative)
- i) I paid all the bills. (negative)
- j) Ruth made a mistake. (question)

III. Complete each sentence with a suitable expression from the list. You can use an expression more than once.

ago	in	last week	at	when	while
-----	----	-----------	----	------	-------

- a) Two burglars broke into the house *while* we were watching television.
- b) I met an old friend of mine in the city center.
- c) What were you doing the police officer knocked on the door?
- d) Jan met Sarah half-past eight outside the cinema.
- e) Dick was preparing lunch, he cut his finger badly.
- f) I first came to this town more than twenty years
- g) Jim was studying to be a doctor he met Sally.
- h) Tony bought his first motorbike 1992.
- i) did you start playing basketball?
- j) Most of the young people left this village a long time

IV. Put each verb given into either past simple or past continuous.

- a) When Harry (wake up) *woke up*, we (tell) *told* him the good news.
- b) Where (you leave) your wallet when you (go) swimming?
- c) Everyone (wait) for the concert to begin when a message (arrive)
- d) When Tom (finish) his letter, he (take) it to the post office.
- e) Pam (want) a relaxing holiday, so she (choose) to stay on a small island.
- f) When I (study) abroad, my parents (phone) me every week.
- g) I (find) my lost pen while I (look for) my pencil sharpener.
- h) Ann (watch) television when Julie (arrive)
- i) When the lights (go out), I (lie) in bed reading.
- j) When you (go) to the new Chinese restaurant, what (you eat)

V. Underline the error or errors in each sentence. Rewrite the sentence.

- a) When we had ate lunch, we were sitting in the garden.

When we had eaten lunch, we sat in the garden.

b) While I looked for my keys, I remembered I left them at home.
.....

c) Anna had used to play badminton when she had been at school.
.....

d) When I got into bed, I was falling asleep immediately.
.....

e) When I was finally finding the house, I was knocking at the door.
.....

f) After Jill was giving Nick his books, she went home.
.....

g) Maria would live in Sweden when she was a child.
.....

h) I was using to get up early when I had gone sailing.
.....

i) The Vikings had sailed to North America a thousand years ago.
.....

j) Sue was sure she was seeing the tall man before.

Advanced Language Practice

VI. *Choose the most suitable words underlined.*

a) When you passed the town hall clock, did you notice/were you noticing what time it was?

b) Last night my neighbours were shouting/would shout for hours and I couldn't get to sleep.

c) When you lived in London, did you use to travel/were you travelling by bus?

d) Everyone was having a good time, although not many people danced/were dancing.

e) –Excuse me, but this seat is mine.

–I'm sorry, I didn't realise/hadn't realised that you were sitting here.

f) Jill didn't eat/hadn't eaten all day, so she was really hungry at this point.

g) –Paul has forgotten to book the tickets I'm afraid.

–He was always doing/would do something like that!

h) It took a while for me to notice, but then I did. Everyone stared/was staring at me. What had I done wrong?

i) Nobody bothered to tell me that the school decided/had decided to have a special holiday that Friday.

j) I was trying/tried to get in touch with you all day yesterday. Where were you?

VII. *Put each verb in brackets into a suitable tense. All sentences refer to past time. Suggest alternative tenses if necessary where the past perfect or another tense might be possible.*

- a) I realised that someone was *stealing* (steal) my wallet when I *felt* (feel) their hand in my jacket pocket.
- b) When I (phone) Helen last night she (wash) her hair and she (not finish) when I finally (get to) her house.
- c) Peter (offer) me another drink but I decided I (drink) enough.
- d) Nobody (watch), so the little boy (take) the packet of sweets from the shelf and (put) it in his pocket.
- e) I (not realise) that I (leave) my umbrella on the bus until it (start) to rain.
- f) At school I (dislike) the maths teacher because he (always pick) on me.
- g) Wherever Marion (find) a job, there was someone who (know) that she (go) to prison.
- h) It was only much later I (find out) that during all the time I (write) to my pen friend, my mother (open) and reading the replies!
- i) I (not understand) what (go on). Several people (shout) at me, and one (wave) a newspaper in front of my face.
- j) I (know) I (do) well in my exams even before I (receive) the official results.

VIII. Decide whether the tense underlined is suitable or not in the context given. If you decide it is unsuitable, write a correction.

- a) The train (1) ground to a halt at a small station miles from London, and it (2) became apparent that the engine (3) had broken down. Everyone (4) was getting their cases down from the luggage racks, and we (5) were waiting on the platform in the freezing wind for hours until the next train (6) had turned up.
- | | |
|---------------|----------|
| 1) (suitable) | 4) |
| 2) | 5) |
| 3) | 6) |
- b) The other strange thing about our neighbour Mrs. Black was that she (1) would never go out if it was raining. She (2) used to look up at the sky whenever (3) it was getting cloudy, and as soon as even the smallest drop of rain (4) was falling she (5) had scuttled back into her house and (6) was locking herself in her bedroom!
- | | |
|---------------|----------|
| 1) (suitable) | 4) |
| 2) | 5) |
| 3) | 6) |
- c) Inspector Gorse (1) was in touch with Thames Valley Police six months before Professor Dowson (2) was disappearing, because the Professor's wife Jean (3) would write to him, accusing her husband of plotting to murder her. And now it was the Professor who (4) disappeared. Gorse (5) considered what his next step should be when the phone rang. It was Sergeant Adams from Thames Valley. A fisherman (6) discovered a body

in the Thames near Reading, and it fitted the description of the Professor.

- | | |
|------------------------|----------|
| 1) (<i>had been</i>) | 4) |
| 2) | 5) |
| 3) | 6) |

IX. Put each verb in brackets into a suitable past tense. Only use the past perfect where this is absolutely necessary.

This time last year I (1) *was cycling* (cycle) in the rain along a country road in France with a friend of mine. We (2) (decide) to go on a cycling holiday in Normandy. Neither of us (3) (go) to France before, but we (4) (know) some French from our time at school and we (5) (manage) to brush up on the basics. Now we (6) (wonder) if we (7) (make) the right decision. We (8) (plan) our route carefully in advance, but we (9) (forget) one important thing, the weather. It (10) (rain) solidly since our arrival and that night we (11) (end up) sleeping in the waiting room at a railway station. Then the next morning as we (12) (ride) down a steep hill my bike (13) (skid) on the wet road and I (14) (fall off). I (15) (realise) immediately that I (16) (break) my arm, and after a visit to the local hospital I (17) (catch) the next train to Calais for the ferry home. Unfortunately my parents (18)..... (not expect) me home for fortnight, and (19) go away on holiday. So I (20) (spend) a miserable couple of weeks alone, reading *Teach Yourself French*.

X. Complete these sentences with use(d) to + a suitable verb.

1. The pubs aren't very good nowadays, but they *used to be good* when we were young.
2. The young people don't work hard, but they when we were young.
3. I rarely dance now, but I remember how we together.
4. I don't play cricket any more, but I remember how we at the college.
5. Carol a hotel receptionist but she works in a bookshop now.
6. She never newspapers but she reads a newspaper every day now.
7. She a dog, but it died two years ago.
8. She tea but she likes it now.
9. My brother to a lot of parties but he hasn't been to a party for ages.

XI. Mary has found a new job. How is her life different? Use: "used to" or "didn't use to"

Before

She worked in a café.
She stayed in England.
She didn't earn much money.
She walked to work.
She didn't get up early.

Now

She works as an air-hostess.
She travels all the time.
She earns a lot of money.
She drives to work.
She gets up early.

e.g. *Mary used to work in a café, but now she works as an air-hostess.*

XII. Fill in "used to" or "would".

- I. I ...(1)... live in a small house in the country when I was a little girl. I ...(2)... get up every day at 7 o'clock and get ready for school. My mother ...(3)... get our breakfast ready and then she ...(4)... walk to the bus stop with us and wait for the school bus to pick us up. The bus ...(5)... be on time. We stayed at school until 3.00 p.m. and then we ...(6)... catch the bus home again. In the afternoon we ...(7)... walk home alone because mother didn't pick us up. She ...(8)... work in an office, but she stopped working last year and now she stays at home.
- II. Last week I was going to visit an old house where we ...(9)... play as children, but I didn't have the time. We ...(10)... go there every weekend and play cowboys and Indians. We ...(11)... love it. My friend was going to buy it and turn it into a hotel or so he ...(12)... say, but of course he didn't.

XIII. In each sentence decide whether one or both of the alternative tenses given are appropriate.

- a) In those days, I always used to get up/got up early in the morning.
(both appropriate)
- b) When I got to the cinema Jack had been waiting/was waiting for me.
- c) We would always have/were always having breakfast in bed on Sundays.
- d) Mary was always falling/always fell ill before important examinations.
- e) My sister used to own/would own a motorcycle and sidecar.
- f) Pay no attention to Dave's remarks. He wasn't meaning/didn't mean it.
- g) I felt awful after lunch. I ate/had eaten too much.
- h) Brenda left/had left before I had time to talk to her.
- i) The explanation was simple. In 1781 HMS Sovereign on her way back from India had sighted/sighted an empty boat drifting off the African coast.
- j) Pauline has changed a lot. She didn't always use to look/wasn't always looking like that.

XIV. Rewrite each sentence so that it contains the word or words in capitals. Do not change the words in any way.

- a) I intended to call you yesterday, but I forgot. GOING
I was going to call you yesterday, but I forgot.
- b) We used to spend Sunday afternoons working in the garden. WOULD
.....
- c) Paul had the irritating habit of marking trouble. ALWAYS
.....
- d) Diana wasn't always as rude as that. BE
.....
- e) I felt happy about the improvement in Jean's condition. BETTER
.....

- f) I wasn't very keen on sport in those days. USE

 g) I might possibly go to the theatre tonight. WAS

 h) I had to go past your house so I decided to drop in. PASSING

 i) Susan booked out before we got to her hotel. BY THE TIME

 j) What did you do at the moment of the explosion? WHEN

Part II. TEXT STUDY

A. Vocabulary Exercises

Word list

Nouns and Noun Phrases

- | | |
|-----------------------|--------------------------|
| 1. account | отчет, счет |
| 2. band | полоса частот |
| 3. bundle | жгут, связка, пучок |
| 4. coaxial | коаксиальный кабель |
| 5. exchange | обмен |
| 6. existence | существование |
| 7. filament | нить накала |
| 8. frequency | частота |
| 9. medium | средство, способ |
| 10. message | сообщение, послание |
| 11. network | сеть, оптическое волокно |
| 12. optical fiber | оптическое волокно |
| 13. repeater station | ретрансляционная станция |
| 14. satellite | спутник |
| 15. spread | распространение |
| 16. wire transmission | проводная передача |

Adjectives

- | | |
|------------|---------------------------------|
| 1. huge | огромный, громадный, гигантский |
| 2. various | различный, разный |

Verbs and Verbal Phrases

- | | |
|---------------|------------------------------|
| 1. assume | принимать |
| 2. carry | передавать, проводить |
| 3. convert | превращать |
| 4. dial | набирать номер (по телефону) |
| 5. encode | шифровать, кодировать |
| 6. process | обрабатывать |
| 7. require | требовать |
| 8. supplement | дополнять |
| 9. tie | связывать |
| 10. transmit | передавать |

Adverbs

- | | |
|--------------------|--|
| 1. enormously | чрезвычайно, крайне, очень |
| 2. increasingly | все больше и больше, все в большей и большей степени |
| 3. instantly | немедленно, незамедлительно |
| 4. instantaneously | мгновенно, моментально |

I. Repeat and translate into Russian the following words

a) with one stress or the stress on the first syllable:

tie, band, bundle, filament, frequency, medium, message, network, satellite, spread, huge, various, carry, dial, supplement, instantly.

b) with the stress on the second syllable:

account, exchange, existence, assume, convert, encode, process, require, transmit, enormously, increasingly

c) with two or more stresses:

coaxial cable, optical fiber, repeater station, wire transmission, instantaneously

II. Match the words with their definitions.

- | | |
|---------------|---|
| 1. filament | a) any manmade object launched from and revolving around the earth |
| 2. encode | b) a fine wire with a high resistance; it is heated by the passage of an electric current, it is used in electric-light bulbs. |
| 3. dial | c) very great in size, quantity, extent, etc. |
| 4. supplement | d) call by means of a telephone |
| 5. tie | e) at once |
| 6. process | f) a conductor for a high electric current; it consists of several wires twisted together and covered with insulating material such as rubber, plastic or cloth |
| 7. instantly | g) to carry out a process on data for a particular purpose, may be carried by a person, or by a computer. |
| 8. huge | i) to convert (a message, document, etc.) from plain text into code |
| 9. satellite | j) make an addition or additions to |
| 10. cable | k) to make a connection |

III. Arrange the words of the two groups in pairs

1. with similar meaning:

- huge, various, require, supplement, tie, existence, carry, convert, data, instantaneously, transmit, change, consist, use, by means of.
- with the help of, alter, send, enormous, information, different, connect, apply, compose, conduct, immediately, being, addition, demand, transform

2. with contrary meaning:

- transmit, various, tie, wide, thin, include, allow, encode, rapidly.
- separate, exclude, receive, slowly, decode, similar, forbid, narrow, thick.

IV. Choose

a) a noun

1.	a) transmit	b) transmission	c) transmitting	d) transmitted
2.	a) communication	b) communicate	c) communicated	d) communicating
3.	a) assuming	b) assumption	c) assumed	d) assume
4.	a) conductor	b) conduct	c) conducting	d) conducted

b) an adverb

1.	a) increased	b) increase	c) increasing	d) increasingly
	a) add	b) added	c) additionally	d) additional

c) participle II

1.	a) transform	b) transformation	c) transformed	d) transforming
2.	a) conversion	b) converted	c) converting	d) convert
3.	a) send	b) sending	c) sent	d) sends
4.	a) ties	b) tie	c) tied	d) tying

V. Form the necessary part of speech and fill in the gaps

1. After 1975, however, a new ... of telecommunications began (to transform).
2. Wire lines can be ... to transmit voice frequencies, telegraph messages and television programs (to use).
3. ... broadcasting consist of AM, FM, and TV broadcasting for general public use (commerce).
4. At videoconferences the ... can see as well as hear each other (to participate).
5. ... they carry encoded data ranging from business accounts to medical data (additional).
6. Videoconferencing became ... popular with businesses (to increase).
7. An international ... called Intelsat finished the global links in the satellite telecommunications networks (to organize).

B. Texts and Text Exercises

Text A

1. Study the text and try to understand all the details.

TELECOMMUNICATION

Communication ties together the parts of a society just as the nervous system ties together the parts of an individual. From earliest times, when the only form of communication was speech, to the present, when electronic signals carry information instantly to practically any point on Earth, communication has been the way people have organized their cooperative activities. In the modern world there are two main types of communications media. One type consists of the mass media—such as television, radio, newspapers, and magazines—in which organizations send messages to a large number of people. The other type consists of direct, point-to-point communications—telephone, telegraph, data transmission, and postal service.

Of these, the electronic media (all but the postal service) are termed telecommunications.

Telecommunication first came into existence with the development of the telegraph in the 1830s and 1840s. For the first time, news and information could be transmitted great distances almost instantaneously. The invention of the telephone in 1876 by Alexander Graham Bell fundamentally transformed telecommunications. The telephone system assumed its modern form with the development of dial phoning and its spread during the middle decades of the 20th century.

After 1975, however, a new transformation of telecommunications began. The technology used to carry information changed radically. At the same time ordinary telephone and telegraph traffic was enormously supplemented by huge masses of computer data, as millions of computers were tied together into global networks.

In most cases telecommunications systems transmit information by wire, radio, or space satellite. Wire transmission involves sending electrical signals over various types of wire lines such as open wire, multi pair cable, and coaxial cable. These lines can be used to transmit voice frequencies, telegraph messages, computer-processed data, and television programs. Another somewhat related transmission medium that has come into increasingly wider use, especially in telephone communications, is a type of cable composed of optical fibers. Here electrical signals converted to light signals by a laser-driven transmitter carry both speech and data over bundles of thin glass or plastic filaments.

Radio communications systems transmit electronic signals in relatively narrow frequency bands through the air. They include radio navigation and both amateur and commercial broadcasting. Commercial broadcasting consists of AM, FM, and TV broadcasting for general public use.

Satellite communications allow the exchange of television or telephone signals between widely separated locations by means of microwaves—that is, very short radio waves with wavelengths from 4 inches to 0.4 inch (10 centimeters to 1 centimeter), which correspond to a frequency range of 3 to 30 gigahertz (GHz), or 3 to 30 billion cycles per second. Since satellite systems do not require the construction of intermediate relay or repeater stations, as do ground-based microwave systems, they can be put into service much more rapidly.

Modern telecommunications networks thus not only send the traditional voice communications of telephones and the printed messages of telegraphs and telexes, they also carry images—the still images of facsimile machines or the moving images of video—television transmissions used in videoconferences in which the participants can see as well as hear each other. Additionally they carry encoded data ranging from the business accounts of a multinational corporation to medical data relayed for analysis by physicians thousands of miles from a patient.

II. *Read the text and answer the questions.*

1. What does communication tie?
2. How many types of communications media are there in the world?
3. Who fundamentally transformed telecommunications?
4. What was ordinary telephone and telegraph traffic enormously supplemented by?
5. What does wire transmission involve?
6. How do electrical signals carry speech and data in optical fibres?
7. Do radio communications systems include amateur broadcasting?
8. What are microwaves?
9. Why can satellite systems be put into service much more rapidly?
10. What can modern telecommunications networks send?

III. *Find the English equivalents of the following words and word combinations.*

Мгновенно передавать информацию, средства массовой информации, посылать сообщения, принимать современный вид, дополнять, огромные массивы компьютерных данных, сеть, коаксиальный кабель, проводная передача, частота, оптоволоконный кабель, пучки, преобразовывать в световые сигналы, полоса частот, позволять обмен, длина волны, ретрансляционная станция, дополнительно.

IV. *Say whether the following statements are true or false.*

1. Electronic signals carry information to practically any point on the Earth.
2. Mass media send messages to a large number of people.
3. All mass media including postal service are called telecommunications.
4. Telecommunications first appeared with the development of telegraph in the 1830s and 1840s.
5. The technology used to carry information slightly changed after 1975.
6. Radio communications systems transmit electronic signals in extremely wide frequency bands through the air.
7. Satellite communications permit the exchange of signals by means of microwaves.
8. Satellite stations require the construction of ground-based microwave systems.
9. The still images of facsimile machines or the moving images of video can also be carried by modern telecommunications networks.
10. Modern telecommunications networks transmit only coded data.

V. *Complete the following sentences choosing the most suitable variant.*

1. One type consists of the mass media such as
 - a) television, radio, newspapers, and magazines.
 - b) telephone, telegraph, data transmission.
 - c) television, telephone, telegraph and postal service.
2. The telephone system assumed its modern form with the development of ... during the middle decades of the 20th century.

- a) telegraph traffic
 - b) dial phoning
 - c) facsimile machines
3. In most cases telecommunications systems transmit information by
 - a) open wire, telexes, or faxes.
 - b) coaxial cable, optical fibers, or global networks.
 - c) wire, radio, or space satellite.
 4. Radio communications systems include
 - a) radio navigation, radio location and communication
 - b) radio navigation and both amateur and commercial broadcasting
 - c) radio detection, TV broadcasting and video television transmissions
 5. In optical fibres electrical signals converted to light signals by a laser-driven transmitter carry
 - a) both encoded data and still images of facsimile machines
 - b) both voice frequencies and printed messages
 - c) both speech and data

VI. *Develop the following ideas. Use the words provided in the brackets.*

1. Communication is the nervous system of our society (any point of the globe; to carry information; to tie together; two types; to transmit; communications media)
2. The origin of telecommunication (great distances; telecommunication; instantly; telegraph; the invention of the telephone; to change; A.G. Bell)
3. The development of telecommunication (wire transmission; radically; speech; enormous masses; technology; computer data; to transmit; coaxial cable; to change; optical fibres; to supplement; global networks)
4. Radio communications systems (public use; band; electronic signals; frequency; to transmit; narrow; commercial broadcasting).
5. Satellite communication (microwaves; television or telephone signals; not to require; repeater stations; to put into operation; to exchange; wavelengths from 4 inches to 0.4 inch; more quickly; frequency range of 3 to 30 GHz).
6. Modern telecommunications networks (business accounts; participants; to carry images; voice communications; to send; telegraph; traditional; telephones; videoconferences; to see and hear; printed messages; medical data; telexes; encoded data.

VII. *Make an outline of the text.*

VIII. *Speak on*

1. The importance of communication in the modern world and its types.
2. The origin and the development of telecommunication.
3. Different communications systems.
4. Modern telecommunications networks.

Text B

1. Read the text and entitle it.

Any system that can transmit encoded information by signal across a distance may be called a telegraph. The word was coined in about 1792 from the Greek words *tele*, “far,” and *graphein*, “to write,” but the principle is much older. The earliest forms of telegraphy were probably smoke, fire, and drum signals. By about 300 BC Greeks had devised a method of alphabetic signaling using large vases visible from a distance. Letters were signified according to the positions of vases in a grid of rows and columns. A similar system was used by medieval prisoners tapping signals between cells, using grids.

In the late 18th century optical telegraphs were invented by Claude Chappe in France and by George Murray in England. Called semaphores, they relayed messages from hilltop to hilltop with the aid of telescopes. Chappe's system used a vertical timber holding a movable crossbar with indicators at each end that could assume various configurations like a signalman with flags. Murray's system used a large tower-mounted box with six panels that opened and closed in different coded combinations.

Rapid development of telegraph systems came with the discovery that electric impulses could be used to transmit signals along a wire. Among the many electric systems devised was the needle telegraph. This was based on Hans Christian Oersted's discovery in 1819 that an electric current in a wire caused a magnetized needle next to the wire to deflect. The five-needle telegraph - patented by William Fothergill Cooke and Charles Wheatstone in London in 1837—utilized this principle with a panel imprinted with letters and numerals to which the five needles pointed singly or in pairs. It was widely used in Great Britain, especially for railroad signaling.

The development of the electromagnet about that time provided Samuel F.B. Morse with a way to transmit and receive electric signals. Together with Alfred Vail, his partner from 1837, Morse developed the simple operator key—something like a single typewriter key—which when depressed completed an electric circuit and sent an electric pulse to a distant receiver. This was originally a device that embossed a series of dots and dashes on a paper roll. About 1856 a sounding key was developed; skilled operators could listen to what the key “said” and write the messages directly. Telegraph systems quickly spread across Europe and the United States and soon resulted in mergers and associations such as the Western Union Telegraph Company in 1856.

With growing telegraph traffic, refinements were necessary. The duplex circuit, developed in Germany, made it possible for messages to travel simultaneously in opposite directions on the same line. Thomas Edison devised a quadruplex system in 1874 that permitted four messages to travel at once, two going in each direction. The most revolutionary system was invented

by Jean-Maurice-Émile Baudot. His time-division multiplex, invented in 1872, consisted of a brush arm that traveled around a copper ring divided into equal sectors. In each sector there were five segments capable of receiving electric impulses and corresponding to a five-level code. As the brush arm moved in its circle, it picked up a code number from one sector and then the next and so on. As many messages as there were sectors could be sent simultaneously. The Baudot code is still used in some modern teletype machines.

By the end of the 19th century, the world was crisscrossed by telegraph lines, including numerous cables across the Atlantic Ocean. Some early telegraphs using keyboards and type wheels could produce tapes of printed messages, which were long used in stock-exchange tickers. In 1903 Donald Murray of England combined Baudot's time-division multiplex system and its five-level code with a system for punching tape devised by Wheatstone to produce a system that transmitted page-form telegrams.

The invention of the telephone made a new range of technology available to telegraphy, particularly in the field of high-speed information transmission. Other significant developments in telegraphy include the use of microwave radio links to carry up to 1,800 channels in a single circuit. Satellite transmission is now widely used for international telegraphy, as are the high-frequency radio bands. Many modern telegraph terminals consist of teleprinters using the American Standard Code for Information Interchange (ASCII), a seven-pulse code capable of producing 128 alphabet, number, and control signals.

II. Answer the following questions.

1. What system can be called a telegraph?
2. What is the origin of this word?
3. What methods of signaling were used in ancient times?
4. Who and when invented optical telegraphs?
5. What contributed to the rapid development of telegraph systems in the 19th century?
6. What was Samuel Morse's role in the development of telegraph?
7. What refinements were made with growing telegraph traffic?
8. Whose code is still used in some modern teletype machines?
9. Who produced a system that transmitted page-form telegrams?
10. What significant developments are used in telegraphy nowadays?

III. Speak about.

- a) The earliest telegraph systems used;
- b) Scientists and inventions made by them in this field in the 18th and 19th centuries;
- c) The refinements that were necessary for the development of telegraph in the 19th century;
- d) The latest technologies and investigations available to telegraphy.

UNIT 4

Part I. GRAMMAR STUDY

PRESENT PERFECT

A. Explanations

Present
perfect
simple

1. Present perfect simple refers to:

Recent events, without a definite time given. The recentness may be indicated by *just*.

We've missed the turning.

I've just seen a ghost!

Indefinite events, which happened at an unknown time in the past. No definite time is given.

Jim has had three car accidents. (up to the present)

Indefinite events which may have an obvious result in the present.

I've twisted my ankle. (that's why I'm limping)

With state verbs, a state which lasts up to the present.

I've lived here for the past ten years.

A habitual action in a period of time up to the present.

I've been jogging every morning for the last month.

2. Contrasts with past simple.

Past simple is used with time expressions which refer to definite times. The time may be stated or understood.

Compare:

I've bought a new car. (indefinite)

I bought a new car last week. (definite)

I bought the car after all. (implied definite: the car we talked about)

Choice between past and present perfect for recent events may depend on the mental attitude of the speaker. This in turn may depend on whether the speaker feels distant in time or place from the event.

I've left my wallet in the car. I'm going back to get it.

Here the speaker may be about to return, and feels that the event is connected with the present.

I left my wallet in the car. I'm going back to get it.

Here the speaker may feel separated in time from the event, or be further away.

Present
perfect
continuous

1. Present perfect continuous (progressive) can refer to a range of meanings, depending on the time expression used and the context.

A state which lasts up to the present moment

I've been waiting for you for three hours!

An incomplete activity

I've been cleaning the house but I still haven't finished.

To emphasize duration

I've been writing letters all morning.

A recently finished activity

I've been running. That's why I look hot.

A repeated activity

I've been taking French lessons this year.

2. Contrasts with present perfect simple.

There may be little contrast when some state verbs are used.

How long have you lived here?

How long have you been living here?

Some verbs (especially *sit, lie, wait, and stay*) prefer the continuous form. There may be a contrast between completion and incompleteness, especially if the number of items completed is mentioned.

Completed: emphasis on achievement

I've ironed five shirts this morning.

Incomplete, or recently completed: emphasis on duration

I've been ironing my shirts this morning.

Time expressions with present perfect

Meaning with present perfect tenses is associated with certain time expressions.

Contrast with past simple may depend on the choice of time expression.

Past simple: referring to a specific time

yesterday, last week, on Sunday

Present perfect simple:

since 1968 (the beginning of a period of time)

already (indefinite past)

Many time expressions are not associated with a specific tense.

I haven't seen Helen recently.

I saw Jim recently.

B. Formation

The Present Perfect Tense

Affirmative	Negative	Interrogative
-------------	----------	---------------

I You	have worked have gone	I You	have not haven't	worked gone	Have	I You	worked? gone?
He She It	has worked has gone	He She It	has not hasn't	worked gone	Has	He She It	worked? gone?
We You They	have worked have gone	We You They	have not haven't	worked gone	Have	We You They	worked? gone?

C. Practice

I. Use the verbs to make a form of the present perfect simple.

- What's the matter? (you cut)*Have you cut*....yourself?
- The ship (not sink).....but it's in a dangerous condition.
- (your sisters write).....to you yet?
- I (have).....a headache ever since lunchtime.
- Nadia (never see).....any Chinese films.
- Someone (steal).....Mr. Grant's bike.
- The passengers are tired because they (not sleep)all night.
- I'm afraid we (just break).....your window.
- David (not win).....a prize this time, I'm afraid.
- (you ever eat).....Spanish food? It's great!

II. Put a time word or phrase from the list into each space

yet for since often ever
never already so far just always

- Carlos has lived in the city centre.....*since*.....1996.
- Thanks for the present! I've.....wanted a pet goldfish!
- Have you.....drunk pineapple juice? It's fantastic!
- I've.....heard some fantastic news! I've passed my exams!
- Hurry up! Haven't you finished.....? You are a slow-coach!
- Nina has worked in this company.....five years.
- I've.....been on a big ship before. It's an interesting experience!
- We're very busy today.we've sold over a hundred bikes.
- I've.....passed this building, but this is the first time I've been inside.
- Can I have a different book? I've.....read this one.

III. Complete the second sentence so that it has a similar meaning to the first sentence.

- We started working here three years ago.
We ...*have worked here for*.....three years.
- This is the first time I've been on a plane.
I.....before.
- That's strange! My pen isn't here!

- That's strange!.....disappeared!
- d) Nicky and Jan aren't at this school any more.
Nicky and Jan.....this school.
- e) I saw a friend of yours a few moments ago.
I.....a friend of yours.
- f) I'm still writing my letters.
I.....my letters yet.
- g) Is this your first visit to South America?
Have.....before?
- h) Oh bother! My wallet is still in the car.
Oh bother! I.....my wallet in the car.
- i) It's a long time since we spoke to your sister.
We.....to your sister for a long time.
- j) Is Anna still asleep?
Has.....up yet?

IV. Choose the correct word or phrase underlined in each sentence.

- a) I live here/I have lived here since the end of last year.
- b) Someone has just stolen/has just been stealing my bicycle.
- c) I'm afraid the last train left/has left an hour ago.
- d) Yesterday I lost/I have lost my wallet.
- e) Thank you for your offer, but I've decided/I decided not to accept.
- f) Take your umbrella with you. It's started/It started raining.
- g) We're enjoying our trip. We have visited/visited two countries so far.
- h) I'm standing here/I've been standing here for hours and I feel tired.
- i) This has been/was a busy day and it isn't over yet!
- j) I feel really tired. We went/have been to a party last night.

V. Put each verb given into either present perfect simple, past simple or present simple.

- a) Last week I (lose)...lost...my scarf, and now I (just lose) ...have just lost...my gloves.
- b) I (work).....for Blue Bank at the moment but I (decide).....to change jobs.
- c) We (be).....here for hours. Are you sure we (come).....to the right place?
- d) (you see).....my calculator? I'm sure I (leave)it here earlier.
- e) We (have).....some coffee after that and then (catch).....the bus home.
- f) I (never eat).....octopus, but once on holiday I (eat).....some squid.
- g) I (hope).....you aren't a vegetarian. I (cook)you some lamb chops.
- h) Recently a lot of young people (take up).....in-line skating.

- i) When we (reach).....the cinema, there (not be)any tickets left.
- j) Please come quickly! Nick (have).....an accident, and he (go).....to hospital.

Advanced Language Practice

VI. Choose the most appropriate tense underlined

- a) I can't believe it, inspector. You mean that Smith stole/has stolen/has been stealing money from the till all this time!
- b) You three boys look very guilty! What did you do/have you done/have you been doing since I left/have left the room?
- c) Why on earth didn't you tell/haven't you told me about that loose floorboard? I tripped/have tripped over it just now and hurt myself.
- d) It's a long time since I saw/have seen/have been seeing your brother Paul. What did he do/has he done/has he been doing lately?
- e) I can't believe that you ate/have eaten/have been eating three pizzas already! I only brought/have only brought them in fifteen minutes ago!
- f) Don't forget that you didn't see/haven't seen Mrs. Dawson. She has waited/has been waiting outside since 10.30.
- g) What did you think/have you thought of Brighton? Did you stay/Have you stayed there long?
- h) I feel really tired. I weeded/have weeded/have been weeding the garden for the last three hours and I didn't rest/haven't rested for a single moment.

VII. Complete each sentence a) to j) with an appropriate ending from 1) to 10). Do not use an ending more than once.

- | | |
|---|---------------------------------|
| a) I haven't been feeling very well... | 1) ...time and time again. |
| b) I went to the dentist's... | 2) ...all my life. |
| c) I've lived here... | 3) ...so far. |
| d) Don't worry. I haven't been waiting... | 4) ...for the time being. |
| c) I've written two pages... | 5) ...for the past hour or two. |
| f) I waited outside your house... | 6) ...yet. |
| g) I've warned you about this... | 7) ...till half past eight. |
| h) I haven't made a decision... | 8) ...for a while. |
| i) The repair worked... | 9) ...the other day. |
| j) I've decided to believe you... | 10) ...long. |

VIII. Choose the most appropriate phrase for each situation.

- a) The price of petrol has risen/has been rising by 15% over the past year.

- b) No wonder you are overweight! You have eaten/You have been eating chocolates all day long!
- c) I've read/I've been reading *War and Peace* this morning.
- d) Doesn't this room look better? I've put/I've been putting some posters up on the walls.
- e) Don't disappoint me! I've counted on you/I've been counting on you.
- f) Don't forget your pills today. Have you taken them/Have you been taking them?
- g) Who has worn/has been wearing my scarf?
- h) I think there's something wrong with your motorbike. It's made/It's been making some very funny noises.
- i) Jack has asked/has been asking for a pay-rise three times this year.
- j) I've been phoning/I've phoned Ann all evening, but there's no reply.

IX. Choose the most appropriate word or phrase underlined.

- a) It's a long time since/when I last saw you.
- b) I've seen Bill quite often lately/from time to time.
- c) Have you spoken to the director beforehand/already?
- d) I've lived in the same house for years/for ever.
- e) I've read the paper now/still.
- f) Diana has bought a computer two years ago/since then.
- g) Nothing much has been happening by now/so far.
- h) I've finished reading her new book at last/this evening.
- i) Sue bought a CD player last week and she's been listening to music ever since/for a while.
- j) Sorry, but I haven't got that work finished already/yet.

X. Put each verb in brackets into either the past simple, present perfect simple or present perfect continuous

Ever since the day I (1) decided (decide) to move to London, I (2) (worry) whether the decision I (3) (take) was the right one. As I (4) (already sell) my house and (5) (arrange) a new job, it is too late to change my mind. However, since then I (6) (hear) a lot of negative things about living in the capital, and lately some of them (7) (begin) to bother me. I (8) (grow up) in a fairly small town and I (9) (spend) all of my life there. I (10) (always want) to live in a big city and so when my company (11) (offer) me a job in their London office, I (12) (grab) at the chance. But according to a program I (13) (just hear) on the radio, more and more people (14) (stop) working in London recently, and a lot of large companies (15) (choose) to move away from the centre. Of course I (16) (tell) my parents that I'm moving and they (17) (accept) my decision, but when I (18) (tell) my friends they (19) (seem) rather shocked. Since then I (20) (hope) secretly that the company would tell me that the move was off!

Part II. TEXT STUDY

A. Vocabulary Exercises

Word List

Nouns and noun phrases

1. array - множество, матрица, решетка, периодическая структура, сетка, *вчт* массив
2. beat - бой, биение
3. circuit - цепь, схема
- integrated circuit - интегральная схема
- circuitry - схемы, схемотехника
4. fidelity - верность передачи или воспроизведения, верность звуковоспроизведения
- high fidelity - высокая верность (звуковоспроизведения)
5. gripper - схват (робота), захватное устройство (робота)
6. interference - вмешательство, помеха
7. oscillator - осциллятор, генератор
- oscilloscope - осциллоскоп
8. pendulum - маятник
9. record - запись
10. response - ответ, реакция, отклик
11. welding - сварка

Adjectives

1. actual - действительный, фактический, подлинный, существующий, настоящий
2. axial - осевой
3. complex - сложный, комплексный
4. fast - скорый, быстрый
- ultrafast - сверхскорый
5. internal - внутренний
6. invaluable - неоценимый, бесценный
7. sophisticated - сложный
8. vast - обширный, просторный, громадный, огромный
9. versatile - разносторонний, многосторонний, универсальный
10. voluminous - огромный

Verbs and Verbal Phrases

1. amplify - усиливать
2. assemble - собирать, монтировать
3. convert - превращать; переводить
4. determine - определять
5. highlight - выделять, заострять внимание
7. magnify - увеличивать
8. manufacture - изготавливать

- | | |
|----------------|--------------------------------------|
| 9. pack | - упаковывать, набирать, заполнять |
| 10. prevent | - предотвращать, препятствовать |
| 11. range | - располагать в ряд |
| 12. supplement | - дополнять, пополнять |
| 13. tie | - связывать, привязывать, завязывать |
| 14. tune | - настраивать, ~out устранять |

Adverbs

- | | |
|----------------|---|
| 1. efficiently | - умело, эффективно, производительно, продуктивно |
| 2. exactly | - точно, ровно |

I. Repeat and translate into Russian the following words

- a) *with one stress or stress on the first syllable:*
beat, circuit, fiber, gripper, pendulum, wave, welding, actual, axial, vital, carry, range, tie, tune;
- b) *with the stress on the second syllable:*
fidelity, response, internal, invaluable, control, convert, determine, manufacture, prevent, transmit, efficiently, exactly;
- c) *with two or more stresses:*
interference, oscillator, sophisticated, versatile, voluminous, amplify, magnify.

II. Match the words with their definitions.

- | | |
|----------------|---|
| 1. circuit | a) hit repeatedly |
| 2. beat | b) one of the slender threads of which many animal and vegetable growths are formed, e.g. cotton, wood, nerves, muscles |
| 3. fiber | |
| 4. fidelity | |
| 5. oscillator | c) clothed path for an electrical current |
| 6. pendulum | d) device for producing electric oscillations |
| 7. response | e) accuracy, exactness |
| 8. complex | f) answer, reaction |
| 9. internal | g) difficult to understand or explain |
| 10. voluminous | h) weighted rod hung from a fixed point so that it swings freely, esp. one to regulate the movement of a clock |
| | i) great in quantity; occupying much space |
| | j) of or in the inside |

III. Arrange the words of the two groups in pairs.

- a) *with similar meaning*
Complex, to highlight, to amplify, to control, to determine, to magnify, response, to manufacture, to supplement, fast, vast, versatile, voluminous.

To draw attention to, sophisticated, to strengthen, to direct, to define, to increase, answer, to produce, to add, rapid, extensive, many-sided, huge.

b) *with contrary meaning.*

Fast, internal, invaluable, sophisticated, vital, voluminous, to amplify, to assemble, to magnify, to pack, to prevent, to tie, exactly, efficiently.

To weaken, simple, slow, to take to pieces, to reduce, to unpack, to promote, to untie, approximately, external, valuable, small, unimportant, inefficient.

IV. *Study the following words and choose.*

a) *nouns*

1. a) actual; b) act; c) actuality; d) actualize
2. a) amplify; b) amplification; c) amplifier; d) amplified
3. a) carry; b) carrier; c) carriage; d) carried
4. a) guide; b) guidance; c) guided; d) guiding
5. a) vast; b) vastness; c) vastly; d) vastitude
6. a) vital; b) vitalize; c) vitality; d) vitalization
7. a) volume; b) voluminous; c) volumetric; d) voluminosity

b) *adjectives*

1. a) axe; b) axial; c) axle; d) axled
2. a) pendulum; b) pendant; c) pendulous; d) pendulate
3. a) control; b) controller; c) controllable; d) controllability
4. a) determine; b) determinate; c) determinable; d) determination.
5. a) magnify; b) magnificence; c) magnificent; d) magnification.
6. a) prevent; b) preventive; c) prevention; d) preventor
7. a) transmitter; b) transmit; c) transmissible; d) transmitting
8. a) tune; b) tuneful; c) tuned d) tuner

V. *Form the necessary part of speech and fill in the gaps.*

1. Integrated circuits are extremely ... because they perform hundreds of different functions (versatility).

2. Most ICs perform ... or logic manipulations in devices (calculate).

3. In radio and television ... a primary function of circuits is the amplification of weak signals (receive).

4. ... other radio or television stations, filter circuits are frequently used (to tune out).

5. In industry the computer has become an invaluable tool ... industrial operations (control).

6. Scientists use electronic computers ... extremely complex calculations (performance).

7. ICs are used in the engines of almost all new cars to use fuel ... (efficient).

8. Complex circuits are ... when used in space such as on board space shuttles (vitality).

9. Electronic computers and navigation equipment control the ... of nuclear weapons (to denote).

B. Texts and Text Exercises

- 1. Study the text and try to understand all details.*

TEXT A

Integrated circuits are extremely versatile because a single basic design can be made to perform hundreds of different functions, depending on the wiring of the circuits and the electronic programs or instructions that are fed into them. Most ICs perform calculations or logic manipulations in devices ranging from hand-held calculators to ultrafast supercomputers that can perform billions of calculations per second.

There are many other functions, however, that can be done with electronic circuitry. In radio and television receivers a primary function of circuits is the amplification of weak signals received by the antenna. In amplification a small signal is magnified to a large signal that is used to drive other circuits such as the speakers of a radio.

In many cases this amplification is performed with the help of oscillator circuits. Such circuits have a natural period or cycle of electrical current, similar to the natural beat of a pendulum. When driven by external signals of the same period, such as the transmission from a particular radio channel, the oscillator circuit increases its amplitude of oscillation.

To tune out other radio or television stations also received by a single antenna, filter circuits are frequently used. Such filters strongly reduce the signals at all but a single frequency, preventing interference among channels in a receiver.

These and other basic circuit types are used in a vast array of electronic devices. Consumer electronics, a field that was first developed in the 19th century with the invention of the phonograph, now includes radios, television sets, high-fidelity stereo systems, tape recorders, calculators, video games, and personal computers. Most of these devices contain one or more integrated circuits. Electronic controls have also been added to many electrical appliances such as dishwashers, washing machines, ovens, and food processors.

In industry and trade the computer, made up of from one to several thousand integrated circuits, has become an invaluable tool, controlling industrial operations and keeping track of voluminous business records. When connected to mechanical arms and grippers, electronics is the brain of the industrial robot that has come into increasingly widespread use for painting, welding, and assembling products that range from automobiles to watches.

Scientists use electronic computers to perform extremely complex calculations such as determining exactly the course of distant space probes;

the probes themselves are packed with electronic instruments and communications equipment. Electronic instruments are used on Earth for scientific measurements and in the electronics industry itself to test equipment as it is manufactured. The oscilloscope, for example, is used to diagnose problems in electronic circuits, through a comparison of expected test patterns with actual results.

In the field of medicine electronic diagnostic instruments have given physicians a much clearer view of the human body than ever before. Computerized axial tomography (CAT) scanners, which are a sophisticated form of X-ray machines, use computers to analyze X rays and produce three-dimensional views of internal organs. Nuclear magnetic resonance (nmr) scanners analyze the response of the body's chemicals to radio waves and magnetic fields, producing maps of the body's biochemistry and clearly highlighting areas of disease.

Virtually all modern communications rely on electronics. Electronic circuits switch telephone calls both on Earth and in communications satellites. Satellite electronics systems amplify and retransmit television and radio communications. Computers are tied together by electronic networks.

Conventional electronics is now supplemented in communications by optoelectronics, the use of laser light carried by optical fibers to transmit information at high speed. Laser pulses are modulated by electronic signals, and the light at the other end of the fiber many kilometers away is converted back into electronic signals by photo detectors.

II. Find English equivalents of the following words and word combinations.

Прибор, амплитуда, вычисление, потребитель, печь, записи, сборка, курс, космический зонд, оборудование, измерения, образец, магнитное поле, заболевание, челнок, ракета.

III. Read the text and answer the questions.

1. Why are integrated circuits extremely versatile?
2. What functions do ICs perform?
3. What circuits have a natural period similar to the natural beat of a pendulum?
4. What do filter circuits do?
5. What does consumer electronic include?
6. What functions does electronic computer perform in industry, trade and science?
7. What are the examples of the use of electronic diagnostic instruments in medicine?
8. How are electronic circuits used in modern communications?
9. What is used in the engines of almost all new cars?
10. What has come to be central in modern warfare and preparations for war?

IV. *Say whether the following statements are true or false.*

1. In radio or television receivers a secondary function of circuits is the amplification of weak signals received by the antenna.
2. In amplification a large signal is magnified to a small signal.
3. Amplification isn't performed with the help of oscillator circuits.
4. Filter circuits are frequently used to tune out other radio or television stations.
5. The computer controls industrial operations and keeps track of voluminous business records.
6. Electronic instrument diagnosing problems in electronic circuits is the amplifier.
7. Computerized axial tomography scanners produce four-dimensional views of internal organs.
8. Electronic circuits switch telephone calls both on Earth and in communications satellites.
9. Complex circuits and computers assisting pilots in flying aircraft are used on board space shuttles.
10. Nearly two thirds of the cost of advanced US fighter aircraft is in the sophisticated electronic equipment.

V. *Complete the following sentences choosing the most suitable variant.*

1. Integrated circuits are extremely
a) simple b) versatile c) large
2. Amplification of weak signals is performed with the help of
a) scanner circuits b) oscillator circuits c) filter circuits
3. Filter circuits are used
a) to increase the signals b) to tune out radio or television stations c) to interfere in the channels in a recover
4. Consumer electronics was first developed....
a) in the 20th century b) in the 19th century c) in the 21st century
5. Many electrical appliances have got
a) displays b) scanners c) electronic controls
6. The device used to diagnose problems in electronic circuits is called
a) calculator b) oscilloscope c) laser
7. Television and radio communications are amplified and retransmitted by
a) satellite electronics systems b) navigation system
c) television system
8. Laser light is carried by
a) optical fibers b) wires c) sound signals

VI. *Develop the following ideas. Use the words provided in the brackets.*

1. The use of ICs in radio and television receivers (amplification, weak signal, to magnify to a large signal, oscillator circuits, the natural beat of a

- pendulum, a natural period of electric current, to tune radio or TV stations, filter circuits).
2. The use of ICs in consumer electronics (vast array of electronic devices, phonograph, radio and television sets, high-fidelity stereo systems, tape recorders, personal computers, contain, electrical appliances, to add, washing machines ovens, food processors).
 3. The use ICs in science (to perform complex calculations, determining the course of distant space probes, to be packed with, electronic instruments and communications equipment, measurements, to test equipment, oscilloscope, to diagnose problems in electronic circuits, test patterns, actual results).
 4. ICs in medicine (diagnostic instruments, a clearer view of the human body, computerized axial tomography scanners, to analyze X rays, to produce three-dimensional views of internal organs, scanners, to produce maps of the body's biochemistry, to highlight areas of disease).
 5. The role of electronics in transportation (in the engines of new cars, to control, to use fuel efficiently, to assist pilots in flying aircraft, on board space shuttles).
 6. Electronics in warfare (advanced fighter aircraft, electronic radar, weapons control, automated missiles, navigation equipment, to guide ballistic nuclear missiles, to control, the denotation of nuclear weapons).

1. Read the text and decide on a suitable title for it.

TEXT B

Despite the importance of these other types of electronic devices, semiconductor-based circuits are the essential features of modern electronic equipment. These circuits are not made up of individual, separated components as was once the case. Instead, thousands of tiny circuits are embedded in a single complex piece of silicon and other materials called an integrated circuit (IC).

The manufacture of integrated circuits begins with a simple circular wafer of silicon a few inches across. Designers have produced drawings of exactly where each element in the finished circuits is to go. Usually these diagrams are themselves made with the help of computers. Photographs of the diagrams are then reduced in size many times to produce a photolithographic mask. The wafers are first coated with a material called a photoresist that undergoes a chemical change when exposed to light. Light shone through the mask onto the photoresist creates the same pattern on the wafer as that on the mask. Solvents then etch away the parts of the resist exposed to light, leaving the other parts intact.

After this another layer of material—for example, silicon doped with some impurities—is laid down on top of the wafer, and another pattern is etched in by the same technique. The result of several such operations is a multilayered circuit, with thousands of tiny transistors, resistors, and conductors created in the wafer.

The wafer is then broken apart along prestressed lines into dozens of identical square or rectangular chips—the finished integrated circuits.

During the 1970s and 1980s advancing technology reduced the size of individual circuit elements by a factor of two every two years, leading in the same period to a fourfold increase in the number of elements that can fit on a chip. This rapid increase in the power of the chips and the simultaneous rise in their speed allowed the development of microprocessors. Microprocessors, which are at the heart of millions of personal and home computers, pack the same computing power into a tiny chip a fraction of an inch on a side that 20 years earlier would have been provided by a computer that filled a whole room and cost many millions of dollars.

Individual chips are mounted on carriers with several dozen connector leads emerging from them. These, in turn, are soldered together onto printed circuit boards that may contain many dozens of chips. In large computers the boards themselves are mounted into large racks and again connected together.

By the mid-1980s integrated circuits made with the most advanced technology could carry as many as a million individual transistors, each only a few microns on a side. (A micron is a thousandth of a millimeter, or 0.00004 inch.) Many electrical engineers and scientists believe that the ultimate limits of size in these circuits might soon be reached.

It was expected that the circuit elements would become too small and contain too few individual atoms to be manufactured reliably. To continue the reduction in size and cost of microcircuits, new principles of operation may be required, perhaps involving specially designed organic molecules.

II. *Answer the following questions.*

1. What does the manufacture of integrated circuits consist of?
2. When did advancing technology reduce the size of individual circuit elements by a factor of two every two years?
3. What allowed the development of microprocessors?
4. What do microprocessors comprise?
5. What could integrated circuits carry by the mid-1980s?
6. What is necessary to continue the reduction in size and cost of microcircuits?

III. *Give an outline of the text in 3-5 sentences.*

UNIT 5

Part I. GRAMMAR STUDY

PASSIVE VOICE

A. Explanations

Basic uses The passive is used:

- of the 1. when the agent (the person who performs the action) is
passive unknown, unimportant or obvious from the context.

My bike was stolen two days ago. (unknown agent)

*The robbers **have been arrested**.* (by the police-obvious agent)

2. to make a statement sound more polite or formal.

*My new dress **has been burnt**.* (It's more polite than saying "You've burnt my new dress")

3. when the action is more important than the agent – as in news reports, formal notices, instructions, processes, headlines, advertisements etc.

*Taking pictures **is not allowed**.* (notice)

*Mr. Whittaker **is being treated** for shock.* (news report)

4. when you put emphasis on the agent.

*Hamlet **was written** by Shakespeare.*

Note: we use the Passive only with transitive verbs (verbs which take an object).

They built that museum in 1892. That museum was built in 1892.

Advanced Language Practice

Other uses
of the passive

1. Agent and instrument. We use by + agent to say who or what did the action. We use with + instrument or material to say what instrument or material the agent used.

*He **was knocked down by** a car. (the car did the action)*

*The garden **was dug with** a spade. (the spade is the instrument the agent used)*

2. Most verbs with an object (transitive verbs) can be made passive. Common verbs are not used in the passive except: *become, fit (be the right size), get, have, lack, let, like, resemble, suit.*

3. Verbs with two objects. Some verbs such as *offer, ask, tell, give, send, teach, pay, etc* can have two object, so it is more usual to begin the passive sentence with the person.

Active

They didn't offer Ann the job.

*Ann **wasn't offered** the job. (more usual) The job **wasn't offered** to Ann. (less usual)*

When a prepositional object of the active sentence is used as the subject of the passive sentence, the preposition is placed directly after the main verb.

Active: *We sent for the doctor.*

Passive: *The doctor **was sent for**.*

4. The following verbs and verbal phraseological units are particularly often used in the passive:
- a) Verbs with prepositions: act on (upon); agree on (upon); approve of; arrive at; deal with; depend on (upon); hear of (about); insist on (upon); listen to; look after; look for; refer to; rely on (upon); speak of (about); send for; touch upon etc.
 - b) Verbal phraseological units: catch hold of; do away with; lose sight of; make application of; made use of; pay attention to; put an end to; take advantage of; take care of; make fun of etc.
5. After modal verbs (will, can, may etc) we use be + past participle or have been + past participle.
- They may close down the supermarket. (Active)*
*The supermarket may **be closed down**. (Passive)*
They may have reported the bank robbery. (Active)
*The bank robbery may **have been reported**. (Passive)*
6. Make, hear, see, help are followed by a to + Infinitive in the passive.
- They made me apologize – I **was made to** apologize.*
7. The verbs believe, expect, feel, hope, know, report, say, think etc can be used in the following passive patterns:
- a) it + passive + that clause (impersonal construction)
 - b) subject (person) + passive + to – infinitive (personal construction)
- People say she is rich.*
***It is said** that she is rich.*
***She is said to be** rich.*

B. Formation

The passive is formed by using the appropriate tense of the verb to be (is, are, was, were, has been etc) + past participle.

	Active Voice	Passive Voice
Present Simple Present	They repair cars.	Cars are repaired .
Continuous	They are repairing the car.	The car is being repaired .
Past Simple	They repaired the car.	The car was repaired .
Past Continuous	They were repairing the car.	The car was being repaired .
Future Simple	They will repair the car.	repaired .
Present Perfect	They have repaired the car.	The car will be repaired .

Past Perfect Future Perfect	They had repaired the car. They will have repaired the car.	The car has been repaired . The car had been repaired .
Perfect Infinitive	She ought to have repaired the car.	The car will have been repaired .
Modals + be + p.p.	You must repair this car.	The car ought to have been repaired . The car must be repaired .

C. Practice

I. Read and translate the following sentences into Russian.

1. A new type of computing equipment is being produced at our plant.
2. Waves are carried in all directions from the vibrating body.
3. The laboratories of our university are equipped with modern devices.
4. The research will be conducted over a period of five months.
5. The equations were solved by the machine.
6. This theory has been used for analyzing the experimental data.

II. Add –ed to the following verbs.

Design, operate, contain, produce, receive, conduct, carry, transmit, invent, discover, convert, regulate, accumulate, react, use vibrate, record, apply, alter, introduce, improve, relate.

III. Make the following affirmative sentences negative and interrogative.

1. Sounds are produced by the vibration of matter.
2. We were provided with the necessary literature.
3. This experiment was being carried out under low pressure.
4. The information has been based on the data received from a computer.
5. By the end of the year a large variety of semiconductor devices will have been produced.
6. Mendeleev's periodic table has been accepted as a universal law of nature.

IV. Make the following interrogative and negative sentences affirmative.

1. Were the participants of the conference shown the photographs made in outer space?
2. The results of this investigation can't be relied upon.
3. Is Einstein's theory of relativity often referred to by a great number of researchers?
4. The first live transmission was not made by John Logic Baird, the TV pioneer, in 1924.
5. Have many different devices been created in order to improve the performance of communications?
6. The experiment will not have been completed by the end of the week.

V. Turn the following sentences from Active into Passive.

Model: Scientists use crystals in electronic devices. Crystals are used in electronic devices.

1. Solar batteries generate electricity.
2. I'll inform you about the new discovery.
3. Scientists developed several types of lasers.
4. The student was carrying out this experiment for twenty minutes.
5. Electronics has made a rapid progress.
6. Scientists are using the energy of atom in various spheres of life.
7. They'll have finished their work by lunchtime.
8. My friend had prepared the report before we spoke to you.
9. They listened to the lecturer attentively.

VI. Turn the following sentences into Passive in two ways.

Model: They gave him a watch when he retired.

- a) He was given a watch when he retired.
 - b) A watch was given to him when he retired.
1. They offered me a cup of tea.
 2. She will send you a fax.
 3. My friend is going to show me a new car.
 4. Someone paid the man USS 500 to do the job.
 5. They have offered him a new vacancy.

Advanced Language Practice

VII. Compare the use of the Active and Passive Voices.

1. The government will introduce new measures against crime.
2. The new hotel will be opened next year.
3. We measure energy in the form of heat.
4. The first-year students are not taught special subjects.
5. The police have arrested a 39-year-old mother of three for shop-lifting.
6. The customers are being served at the moment.
7. Hertz was the first to create electromagnetic waves.
8. While the experiment was carrying out nobody left the laboratory.
9. The scientists who are carrying out research into nuclear physics deal with the most difficult problems.
10. The construction of this television center will have been completed by the end of the next year.

VIII. Fill in "by" or "with".

1. The window was broken ... a hammer.
2. That novel was written ... O. Henry.
3. The first radio receiver was invented... A.Popov.
4. The pudding was made ... fruit and chocolate.
5. The tiger was shot ... a rifle.

6. The child was knocked down ... a car.
7. The church was built ... brick.
8. The village was attacked ... the enemy.

IX. Turn the following sentences into the Passive Voice as in the model.

Model: People expect him to win.

He is expected to win.

It is expected that he will win.

1. Journalists have reported that the President is ill.
2. Many people believe that the climate is changing.
3. They claim that this diamond is the largest in the world.
4. Everyone knows that the statement was untrue.
5. They should have sent you a receipt.
6. Everyone knows that he has been in prison.
7. People expect that she will win an Oscar.

X. Choose the most suitable word or phrase to complete each sentence.

1. The meeting ... yesterday because of the chairman's illness.
A) is postponed; B) was postponed
2. This problem by our joint efforts so far.
A) is being solved; B) has been solved
3. Two men at Marylabone Police Station tonight in connection with last week's armed robbery in Luton.
A) are being questioned; B) were being questioned
4. When we returned, the door
A) has been locked; B) had been locked
5. You a lot of questions at the interview.
A) will be asked; B) will have been asked
6. A lot of Japanese cars into Europe this year.
A) have been imported; B) had been imported
7. Some suggestions to improve the project
A) are made; B) were made
8. The supermarket manager was afraid that some of the food with poison.
A) had been injected; B) has been injected

XI. Put each verb in brackets into the Passive Voice.

1. The boxes (not pack) yet.
2. Your food (still prepare).
3. The cathedral (built) in the fourteenth century.
4. The first microprocessor the Intel 8088 (introduce) in 1979.
5. The second goal (score) by Hughes in the 41st minute.
6. If we don't hurry, all the tickets (sell) by the time we get there.
7. We had to go on holiday because our house (decorate).
8. The new ship (launch) next week.

Part II. TEXT STUDY

A. Vocabulary Exercises

Word List

Nouns and Noun Phrases

1. brand - сорт, фабричная марка
2. central processing unit – центральное процессорное устройство
3. delay - задержка, замедление
4. design - проект, конструкция
5. improvement – улучшение, усовершенствование
6. relationship - связь, отношение
7. splash - всплеск, бум

Verbs and Verbal Phrases

1. add - складывать, прибавлять
2. appear – появляться
3. execute - исполнять, выполнять
4. fabricate - изготавливать, производить
5. incorporate - включать в число
6. introduce - вводить, представлять
7. subtract – вычитать

Adjectives and Adverbs

1. amazing - удивительный, поразительный
2. complete – совершенный, полный, законченный
3. Familiar - хорошо знакомый, известный
4. Portable – портативный
5. Single – отдельный
6. Approximately – приблизительно

I. Repeat and translate into Russian the following words

a) with one stress or the stress on the first syllable

basic, brand, server, chip, heat, normal, execute, fabricate, portable, single, powerful, prior

b) with the stress on the second syllable

approximately, incorporate, relationship, computer, subtract, amazing, complete, appear, improvement, delay, design, machine

c) with two or more stresses

introduce, computation, manufacture, information, microprocessor, desktop, machine, understand, underground, engineer, engineering

II. Study the following words and choose nouns

1. a) execute b) exact c) executive d) execution
2. a) introduced b) introduce c) introducing d) introduction

- | | | | |
|------------------|---------------|-----------------|------------------|
| 3. a) relate | b) relative | c) relatively | d) relationship |
| 4. a) direct | b) direction | c) directly | d) directness |
| 5. a) completion | b) completely | c) completeness | d) complete |
| 6. a) using | b) uses | c) user | d) usage |
| 7. a) wondered | b) wonder | c) wonderful | d) wonderfully |
| 8. a) appear | b) appearance | c) disappear | d) disappearance |
| 9. a) process | b) processor | c) processing | d) procession |

III. Match the words with their definitions.

- | | |
|-----------------|--|
| 1. brand | a) perform operation |
| 2. execute | b) construct or manufacture |
| 3. fabricate | c) a special or characteristic kind |
| 4. computer | d) make whole or perfect |
| 5. portable | e) electronic device for storing and processing data |
| 6. design | f) one only |
| 7. single | g) a scheme of lines or shapes forming a pattern |
| 8. complete | h) convenient for carrying |
| 9. relationship | i) connection |

III. Arrange the words of the two groups in pairs.

a) with similar meaning

- | | |
|-----------------|----------------------|
| 1. type | a) perfect |
| 2. fabricate | b) connection |
| 3. complete | c) perform operation |
| 4. basic | d) fundamental |
| 5. execute | e) rate |
| 6. introduce | f) manufacture |
| 7. relationship | g) kind |
| 8. speed | h) bring into use |

b) with contrary meaning

- | | |
|------------------|---------------|
| 1. complete | a) powerless |
| 2. powerful | b) disappear |
| 3. appear | c) incomplete |
| 4. approximately | d) subtract |
| 5. add | e) exactly |
| 6. same | f) unfamiliar |
| 7. familiar | g) different |

IV. Choose the English equivalents of the given Russian words.

- | | |
|-------------------|---|
| 1. мощный | a) power, b) powerless,
c) proper, d) powerful |
| 2. основной | a) base, b) baseless,
c) basic, d) basement |
| 3. приблизительно | a) approximate, b) approximation,
c) approximative, d) approximately |
| 4. совершенный | a) complete, b) completely, |

5. ИЗГОТОВЛЯТЬ c) complex, d) completion
a) fabrication, b) fabric,
c) fabulist, d) fabricate
6. СВЯЗЬ a) relate, b) relationship,
c) relatively, d) relative

B. Texts and Text Exercises

TEXT A

- I. *Study the text and try to understand all details.*

MICROPROCESSOR HISTORY

The computer you are using to read this page uses a microprocessor to do its work. The microprocessor is the heart of any normal computer, whether it is a desktop machine, a server or a laptop. The microprocessor you are using might be a Pentium, a K6, PowerPC, a Sparc or any of the many other brands and types of microprocessors, but they all do approximately the same thing in approximately the same way.

A microprocessor – also known as a CPU or central processing unit – is a complete computation engine that is fabricated on a single chip. The first microprocessor was the Intel 4004, introduced in 1971. The 4004 was not very powerful – all it could do was add and subtract, and it could only do that 4 bits at a time. But it was amazing that everything was on one chip. Prior to the 4004, engineers built computers either from collections of chip or from discrete components (transistors wired one at a time). The 4004 powered one of the first portable electronic calculators.

The first microprocessor to make it into a home computer was the Intel 8080, a complete 8-bit computer on one chip, introduced in 1974. The first microprocessor to make a real splash in the market was the Intel 8088, introduced in 1979 and incorporated into the IBM PC (which first appeared around 1982). If you are familiar with the PC market and its history, you know that PC market moved from the 8088 to the 80286 to the 80386 to the 80486 to the Pentium to the Pentium II to the Pentium III to the Pentium 4. All of these microprocessors are made by Intel and all of them are improvements on the basic design of the 8088. The Pentium 4 can execute any piece of code that runs on the original 8088, but it does it about 5,000 times faster!

The following table helps you to understand the differences between the different processors that Intel has introduced over the years.

Name	Date	Transistors	Microns	Clock speed	Data width	MIPS
8080	1974	6,000	6	2 MHz	8 bits	0.64
8088	1979	29,000	3	5 MHz	16 bits, 8-bit bus	0.33
80286	1982	134,000	1.5	6 MHz	16 bits	1
80386	1985	275,000	1.5	16 MHz	32 bits	5
80486	1989	1,200,000	1	25 MHz	32 bits	20
Pentium	1993	3,100,000	0.8	60 MHz	32 bits, 64-bit bus	100
Pentium II	1997	7,500,000	0.35	233 MHz	32 bits, 64-bit bus	~300
Pentium III	1999	9,500,000	0.25	450 MHz	32 bits, 64-bit bus	~510
Pentium 4	2000	42,000,000	0.18	1.5 GHz	32 bits, 64-bit bus	~1,700

From this table you can see that, in general, there is a relationship between clock speed and MIPS. The maximum clock speed is a function of the manufacturing process and delays within the chip. There is also a relationship between the number of transistors and MIPS. For example, the 8088 clocked at 5 MHz but only executed at 0.33 MIPS (about one instruction per 15 clock cycles). Modern processors can often execute at a rate of two instructions per clock cycle. That improvement is directly related to the number of transistors on the chip.

Notes

MIPS (millions of instructions per second) - миллион инструкций в секунду

II. Find the equivalents of the following words and word combinations.
 приблизительно то же, центральное процессорное устройство, совершенный, на отдельном кристалле, изготавливать, настоящий бум на рынке, выполнять, связь, прежде, задержка.

III. Read the text and answer the questions.

1. What is a microprocessor?
2. The microprocessor known as a CPU is a complete computation engine that is fabricated on a single chip, isn't it?
3. What do you know about the first microprocessor? Describe its characteristic features.

4. What have you learned from microprocessor history?
5. Do you understand the difference between different processors introduced by Intel over the years?
6. What rate can modern processors execute at?

IV. Say whether the following statements are true or false.

1. A microprocessor is the heart of any normal computer.
2. The microprocessor known as CPU is a complete computation engine that is fabricated on a dozen of chips.
3. The first microprocessor was Intel 4004, introduced in 1973.
4. The 4004 was not very powerful – all it could do was add and subtract.
5. The first microprocessor which made a real splash in the market was the Intel 4004.
6. Modern processors can often execute at a rate of two instructions per clock cycle.

V. Complete the following sentences choosing the most suitable variant.

1. The microprocessor is the heart of ...
 - a) any normal computer
 - b) any computation engine
 - c) any vacuum tube
2. Central processing unit is a complete computation engine fabricated...
 - a) on a dozen of chips
 - b) on a single chip
 - c) on a square meter
3. The first microprocessor was Intel 4004, introduced in ...
 - a) 1971, b)1975, c)1998
4. The 4004 powered one of ...
 - a) the first portable electronic calculators
 - b) the second portable electronic calculators
 - c) the third portable electronic calculators
5. All these microprocessors are improvements of the basic design of the...
 - a) 8088, b)80286, c)80386
6. That improvement is directly related to the number of ...
 - a) IC on the chip
 - b) transistors on the chip
 - c) vacuum tubes on the chip

VI. Develop the following ideas. Use the word and word combinations provided in brackets.

1. The microprocessor forms the heart of a computer (brands and types, approximately complete computation engine, fabricate on a single chip)
2. The first microprocessor was introduced in 1971 (add and subtract, prior to, portable electronic calculators)

3. The microprocessor Intel 8088 made a real splash in the market (introduce, incorporate into, improvements on the basic design, execute)
4. Modern processors can execute at a rate of two instructions per clock cycle (improvement, is related to)

VII. *Make an outline of the text.*

VIII. *Speak about microprocessor history and its basic physical properties.*

TEXT B

I. *Read the following text and entitle it.*

Semiconductors have had a monumental impact on our society. You find semiconductors at the heart of microprocessor chip as well as transistors. Anything that's computerized or uses radio waves depends on semiconductors.

Today, most semiconductor chips and transistors are created with silicon. You may have heard expressions like "Silicon Valley" and the "silicon economy," and that's why – silicon is the heart of any electronic or computer device.

A diode is the simplest possible semiconductor device, and is therefore an excellent beginning point if you want to understand how semiconductors work.

Silicon is a very common element – for example, it is the main element in sand and quartz. If you look "silicon" up in the periodic table, you will find that it sits next to aluminum, below carbon and above germanium.

Carbon, silicon and germanium (which, like silicon, is also a semiconductor) have a unique property in their electron structure – each has four electrons in its outer orbital. This allows them to form nice crystals. The four electrons form perfect covalent bonds with four neighboring atoms, creating a lattice. In carbon, we know the crystalline form as diamond. In silicon, the crystalline form is a silvery, metallic-looking substance.

Metals tend to be good conductors of electricity because they usually have "free electrons" that can move easily between atoms, and electricity involves the flow of electrons. While silicon crystals look metallic, they are not, in fact, metals. All of the outer electrons in a silicon crystal are involved in perfect covalent bonds, so they can't move around. A pure silicon crystal is nearly an insulator – very little electricity will flow through it.

Notes

bond	-	соединение, связь
carbon	-	углерод
impact	-	воздействие, влияние
involve	-	вовлекать, включать в себя
lattice	-	решетка
pure	-	чистый

II. *Answer the following questions.*

- a) What elements are considered to be the main semiconductors?
- b) What part do they play in a computer technology?

III. Which of the following statements best expresses the main idea of the text.

1. You find semiconductors at the heart of microprocessor chips.
2. Silicon is the heart of any electronic or computer device.
3. Silicon has a unique property in its electron structure and this allows to form nice crystals.
4. A pure silicon crystal is nearly an insulator – very little electricity will flow through it.

IV. Render the main points of the text in 4-7 sentences.

UNIT 6

Part I. GRAMMAR STUDY

MODAL VERBS

A. Explanations

Use	Modal Verbs	Examples
Ability	can/be able to (ability in the present or future)	<i>I can pay you next week.</i> (usual) <i>I will be able to pay you next week.</i> (less usual)
	was able to (= managed to – ability in the past) is used for either repeated or single actions	<i>I was able to go on a trip round the city last week.</i> (single action)
	could (ability in the past) is more usual, than “was able to”; it is used in statements for repeated actions. However, with the verbs see, hear, smell, understand , etc., we normally use “could” for single actions.	<i>She could/was able to play the violin when she was six.</i> (repeated action) <i>I could smell something burning.</i> (single action) (not: I was able to smell ...)
	could/was able to can be both used in negations and questions for either repeated or single actions.	<i>She couldn't/wasn't able to pass her driving test.</i> (single action) <i>Were you able to/could you get to work yesterday?</i> (single action)
Possibility/Probability	may/might (=perhaps, very possible)	<i>He may/might be back before noon.</i> (It's possible)

	could (=possible)	<i>He could still be at home. (It's possible)</i>
	must (it is almost certain; I think)	<i>They look alike. They must be twins. (I think they are twins.)</i>
	can't (it doesn't seem possible; I don't think)	<i>You have been sleeping all day. You can't be tired.</i>
	Can he be? (Is it possible?)	<i>Can he still be at work? (Is it possible?)</i>
	ought to/should (=probable)	<i>Tom ought to/should pass his exams. (He will probably pass.)</i>
	Note: To express possibility in questions we don't use <i>may</i> . We use: <i>Can/could/might he? Is he likely to succeed? Is it likely that he will succeed?</i> (Is it possible that he will succeed?)	
Permission a) asking for permission	can (informal)/ could (more polite)	<i>Can/could I borrow your pen?</i>
	may (formal)/ might (more formal)	<i>May I use your phone? Might I see your driving license, please?</i>
b) giving/refusing permission	can (informal, giving permission) could is not used in the present to give permission	- <i>Can/could I use your phone?</i> - <i>Of course you can.</i> (not: of course you could)
	may (formal, giving permission)	<i>You may stay a little longer.</i>
	mustn't/can't (informal, refusing permission)	<i>You can't/mustn't enter the room.</i>
Request, offers, suggestions	can (request) could (polite request/suggestion) may (formal request)	<i>Can you help me, please?</i> <i>Could you make me some tea?</i> <i>May I have a glass of water?</i> (request) Compare: <i>May I open the window?</i> (asking for permission)
	would like (polite offer) would you like me to	<i>Would you like some more lemonade?</i>

	shall I/we (suggestion/offer)	<i>Shall I post this letter for you?</i> (offer) <i>Shall we buy him a present?</i> (suggestion)
	will (offer/request)	<i>I'll make you some coffee if you want.</i> (friendly offer) <i>Will you do me a favour?</i> (friendly request)
Advice	should/ought to (= it is the best thing to do; I advise you to)	<i>You should walk more.</i> (general advice)
	shall I (asking for advice)	<i>Shall I tell him the truth?</i> (Is it the right thing to do?)
	had better (It's a good idea – advice for a specific situation)	<i>You'd better see your dentist.</i> (It's a good idea)
Obligation/necessity	must (is used only in the present and future when the speaker decides)	<i>I must see a doctor soon.</i> (I decide it's necessary.)
	have to (is used when the necessity comes from outside the speaker or when others decide for him.)	<i>I have to wear glasses.</i> (The doctor says so; the doctor decides for me.)
	ought to (duty; it's the right thing to do but people don't always do it)	<i>We ought to respect the environment.</i> (But we don't always do it.)
	have got to (informal; it's necessary) is used on a single occasion.	<i>I've got to leave early today.</i>
	Need (=it's necessary) is followed by a passive full infinitive or an -ing form.	<i>Your hair needs to be cut.</i> <i>Your hair needs cutting.</i>
	Absence of necessity/prohibition	mustn't (prohibition; it's forbidden) can't (prohibition; you are not allowed) don't need to/don't have to/needn't (= it is not necessary in the present or future) didn't need to/have to (it wasn't necessary in the past and we may not know if the action happened or not)

B. Advanced Language Practice

I. Modal + be + -ing

She may be sleeping.

expresses an action in progress now.

II. Modal + have + past participle

He might have finished his work.

expresses a complete action in the past.

Use	Modal + perfect infinitive: explanations	Examples
Possibility	could + perfect infinitive (P.I.): is used for something which was possible but didn't actually happen.	<i>Don't drive so fast! You could have killed that boy. (Luckily, you didn't kill the boy)</i>
	may/might/could + P.I. perhaps something happened in the past.	<i>She looks miserable. She may/might/could have lost her job. (perhaps she has lost her job)</i>
Probability	ought to/should + perfect infinitive shows that we expected something to happen but we don't know if it happened or not.	<i>Has Nancy phoned yet? She ought to/should have phoned an hour ago. (We don't know whether she phoned or not)</i>
Logical assumptions	can't/couldn't + P.I. it is impossible that something happened in the past.	<i>She can't/couldn't have lost her way. (I don't think she's lost her way.)</i>
	must + perfect infinitive it's very probable that something happened in the past.	<i>She must have missed the train. (I think she has missed the train.)</i>
Advice/criticism	should/ought to + P.I. refers to something which was supposed to happen or is used to criticize an action.	<i>You should/ought to have gone to bed earlier last night (but you didn't) You shouldn't have eaten so much last night. (but you did)</i>
Absence of necessity	needn't + bare perfect infinitive we know that something happened in the past although it was not necessary.	<i>She needn't have bought any milk. There was a lot in the fridge. (I know she bought some milk but there was no need.)</i>

Duty	ought to + perfect infinitive it's the right thing to do but they do not always do it.	He ought to have been more tolerant. (It was the right thing to do but he didn't do it.)
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B. Expressions Similar to Modal Verbs

Be supposed to + infinitive means “should” but it expresses the idea that someone else expects something to be done. *I'm supposed to attend the seminar. (The manager expects me to do so. I should attend the seminar. It's a good idea because I might get some useful information.)*

Be to + infinitive means “must” but it expresses the idea that someone else demands something. *I am to be at the airport at 9.00. (My boss has told me to go there, so I can't avoid it.) I must be at the airport at 9.00. (if I don't go there, there will be no one to meet Mr. Jones who is coming tonight.)* **Be supposed to** and **be to** are used to express what someone expects about a previously arranged event. *The conference is supposed to/is to start tomorrow.* (It is scheduled.)

Be likely to means “may” (possibility). To express possibility in questions we don't use “may”. We use: *Is he likely to ...?, Is it likely that he ...?, Can he ...?, Could he ...?, Might he ...?. Is he likely to win the race? Is it likely that he will win the race? Could he win the race? Etc*

Would you mind is used to express polite, formal requests. *Would you mind lending me a hand?*

Let's .../How about ...?/Why don't we ...?/What about ...? are used to make suggestions. *Let's go for a ride. How about going for a ride? What about going for a ride?*

Would you like to/Would you like me to ...? (= Shall I ...?) are used when we offer to do something. *Would you like me to pick up your laundry? (Shall I pick up your laundry?)*

Be allowed to is used to express permission, to say what the rule is. *He was allowed to cross the border. (not: He could cross) Was he allowed to enter the building?*

D. Formation

1. Modal verbs take no –s in the third person singular except for *have to* and *need*.
2. They come before the subject in questions and take “not” after them in negations.
3. Modal verbs are followed by an infinitive without “to” (bare infinitive) except for *ought to* and *have to*.

Notes:

1. **Can** is the Present Simple form, **could** is the Past Simple. **Can** borrows the rest of its tenses from the verb phrase **be able to**.
e.g. *She hasn't been able to finish it yet.*

2. **May** is the Present Simple form, **might** is the past form (though it can be used for present situations too). **May** borrows the rest of its tenses from the verb phrase **be allowed to**.

e.g. *He **has not been allowed to** enter the building.*

3. **Must** is the Present Simple form. It borrows the rest of its tenses from the verb **have to**. To form questions and negation of **have to** we use **do/does** (Present Simple) and **did** (Past Simple)

e.g. *He **didn't have to** do the shopping yesterday.*

*You **don't have to** go to school today.*

***Does he have to** be at work on time?*

E. Practice

I. First identify the meaning of the modal verbs, then write a synonym.

(im)possibility – offer – advice – necessity – giving/refusing permission – ability in the past – absence of necessity – obligation – suggestion – (im)probability – prohibition

1. This must be Jack's house.
2. It can't be 7 o'clock already!
3. Shall I open the door for you?
4. You should buy a new car.
5. You can't leave before 12 o'clock.
6. You'd better wash that immediately.
7. He could play the piano when he was young.
8. She needn't wait for us.
9. There might be some apples left.
10. You must listen to your parents.
11. You've got to run to catch the bus.
12. He can't borrow my car.
13. Shall we dance?
14. You may come in now.

II. Choose the most suitable words underlined

- a) I don't think you could/should tell anyone yet.
- b) I couldn't/shouldn't possibly leave without paying.
- c) That mustn't/can't be the hotel Jane told us about.
- d) There are times when the traffic here can/could be really heavy.
- e) We are enjoying our holiday, though the weather could/must be better.
- f) You couldn't/shouldn't really be sitting here.
- g) You could/may be older than me, but that doesn't mean you're cleverer.
- h) I might/should suppose your job is rather difficult.
- i) No member of the association must/shall remove official documents from these promises without written permission.

III. Rewrite the sentences using the words given in bold type.

1. It isn't necessary to buy a ticket.

Need

2. I advise him to be more careful.

Ought

3. I think that's John's car.

Must

4. I don't think he is her brother.

Can't

5. He couldn't swim when he was five.

Able

6. It's possible that he will win the race.

Might

7. You are not allowed to play in their garden.

Mustn't

8. It wasn't necessary for them to repair their car.

Need.....

9. Shall I pour you another drink?

Would

10. It's not possible for you to eat so much.

Can't

11. Do you want me to open the window?

Shall

12. It's just possible she's still at work.

Could

13. Do you want me to help you with that?

Would

14. I don't think she is the woman who spoke to me.

Can't

15. We don't have to go shopping with Mum.

Needn't

16. I advise you to study harder.

Should

IV. Choose the sentence closest in the meaning to the sentence given.

1) It's possible that we'll know the answers tomorrow.

a) We may know all the answers tomorrow.

b) We should know all the answers tomorrow.

2) I don't think you should ring him now. It's rather late.

a) You might not ring him now. It's rather late.

b) You'd better not ring him now. It's rather late.

3) You needn't come if you don't want to.

a) You won't come if you don't want to.

b) You don't have to come if you don't want to.

4) I think it's wrong for you to work so hard.

a) You don't have to work so hard.

- b) You shouldn't work so hard.
- 5) Perhaps these are the keys.
 - a) These might be the keys.
 - b) These must be the keys.
- 6) I know. Why don't we go out to eat instead?
 - a) I know. We must go out to eat instead.
 - b) I know. We could go out to eat instead.
- 7) It would be quite wrong for us to lock the cat in the house for a week.
 - a) We'd better not lock the cat in the house for a week.
 - b) We can't lock the cat in the house for a week.

V. *Fill in the most suitable modal verb and translate the sentences.*

1. There is no hurry, he ... return the book to me tomorrow.
2. He... read Arabic when he was four.
3. My car ... to be repaired.
4. ... I give you a lift?
5. You ... follow the school rules.
6. She ... take a jacket. It's rather warm.
7. You ... drink more water. Your doctor recommends you.
8. I ... be right or I ... be wrong.
9. ... I borrow your book?
10. He ... be over forty. He looks younger.

VI. *Fill in the correct modal verb according to the speech situations.*

1. You ... eat so much. (advice)
2. I ... get up early on Sundays. (absence of necessity)
3. Children ... play football in the street. (prohibition)
4. ... I come in? (asking for permission)
5. ... I help you with the painting? (offer)
6. He ... put some petrol in the car. (necessity)
7. This ... be our stop. (probability)
8. ... I have a cup of tea, please? (request)
9. ... we visit Jane? (suggestion)
10. She ... be abroad now. (impossibility)

Advanced Language Practice

VII. *Choose the most suitable words underlined.*

- a) That can't have been/shouldn't have been Nick that you saw.
- b) You had to give/might have given me a hand!
- c) I caught a later train because I had to see/must have seen a client.
- d) I suppose Bill should have lost/might have lost his way.
- e) I don't know who rang, but it could have been/must have been Jim.
- f) It's a pity you didn't ask because I could help/could have helped you.
- g) It's your own fault, you can't have/shouldn't have gone to bed so late.

VIII. Rewrite each sentence so that it contains the word in capitals and so that the meaning stays the same.

- a) It wasn't very nice of you not to invite me to your party.
MIGHT
- b) Thank you very much for buying me flowers!
SHOULDN'T
- c) It wouldn't have been right to let you do all the work on your own.
COULDN'T
- d) I don't believe that you have lost your keys again!
CAN'T
- e) Perhaps they didn't notice the tyre was flat.
MIGHT
- f) A visa wasn't necessary after all.
NEED
- g) It's just not possible for the cat to have opened the fridge!
CAN'T
- h) School uniform wasn't compulsory at my school.
HAVE TO
- i) Mary was a talented violinist at the age of ten.
COULD

IX. Complete the comment at the end of each sentence.

- a) Pay no attention to what Martin said. He *can't have been* serious.
- b) The test was no problem at all. It easier, in fact.
- c) That was a lucky escape! We killed!
- d) Hello, I'm home early. I late at the office after all.
- e) The meat is a bit burnt. You cooked it for so long. I did tell you!
- f) There were plenty of tickets left for the concert. We them in advance.
- g) Sally got home at four o'clock this morning. The party really good!
- h) This homework is not as good as usual. I think you more time on it.

X. Put the most suitable modal verb in each space.

- a) I *could* have become a millionaire, but I decided not to.
- b) You ... have been here when Helen told the boss not to be so lazy.
- c) Peter wasn't here then, so he ... have broken your vase.
- d) I ... have bought that car, but I decided to look at a few others.
- e) Don't take a risk like that again! We ... have lost because of you.
- f) If you felt lonely, you ... have given me a ring.
- g) It's been more than a week! You ... have some news by now!
- h) We were glad to help. We ... have just stood by and done nothing.
- i) You really ... have gone to so much trouble!

XI. Correct any errors in these sentences if necessary.

- a) You mustn't have forgotten already.

- b) Paul shouldn't have been more helpful if had tried.
- c) Frances might not have understood what you said.
- d) You must have told me you had already eaten.
- e) I couldn't have managed without you.
- f) Fortunately I needn't have gone to the bank in person.
- g) Jim was so happy. You should have seen his face!

XII. Fill in a modal or a synonymous expression and the appropriate form of the verbs in brackets.

1. I'm getting fat. I really (try) to lose some weight, like the doctor said.
2. What a lovely day! (we/go) for a walk?
3. I'm not sure where Gary is. He (be) at the library.
4. That (not/be) Bill's car. He doesn't own one.
5. Tom (sleep) now but I'm not sure. Why don't you go and see?
6. Don't worry. You (not/dress) formally for the party.
7. If you wanted to borrow my car, you (ask) me.
8. You (not/smoke) in some public places.
9. I saw John in the town center this morning. He (not/go) to Spain yet.
10. I (attend) the conference as the boss expects me to do so.
11. People (treat) animals in a better way but they don't always do so.
12. They (announce) the winners on March 16th. It's scheduled.

Part II. TEXT STUDY

A. Vocabulary Exercises

Word List

Nouns and noun phrases

- | | |
|--------------------------|-------------------------------|
| 1. computer-aided design | - компьютерное проектирование |
| 2. host computer | - узловой компьютер |
| 3. message | - сообщение |
| 4. packet switching | - пакетная коммутация |
| 5. router | - маршрутизатор |
| 6. service provider | - поставщик сетевых услуг |
| 7. wire | - провод, телеграф |
| wireless | - 1. беспроводный; 2. радио |

Verbs and Verbal Phrases

- | | |
|------------------------------|---|
| 1. conduct transactions | - вести дела |
| 2. intercept | - перехватить |
| 3. knock out | - выводить из строя |
| 4. provide (smb. with smth.) | - 1) обеспечивать, 2) предоставлять, давать |
| 5. refine | - усовершенствовать |
| 6. resolve a problem | - решать проблему |
| 7. run (a network) | - руководить, управлять |
| 8. transmit | - 1) передавать; 2) отправлять, посылать |

Adjectives and adverbs

accurately	точно
available	1) доступный, имеющийся в распоряжении; 2) пригодный, полезный
drastically	решительно, радикально
fairly	1) довольно, в известной степени; 2) явно, совершенно
i.e. (id est, лат.) – that is	то есть
reliable	надежный
single	единственный

I. Repeat and translate into Russian the following words.

a) with one stress or the stress on the first syllable

user, data, message, necessary, router, specialist, network, concept, worldwide, wireless, distance, accurately, architecture, nuclear, constantly, service, drastically;

b) with the stress on the second syllable

available, design, provider, reliable, intercept, transaction, technology, encode, increase, alternative, security, transmit, commercial

c) with two or more stresses

computer-aided design, Chinese, information, service provider, destination, packet, switching, telecommunications

II. Study the following words and choose.

a) nouns

- 1) reliable, rely, reliability, relied
- 2) provided, provider, provide, provident, provision
- 3) use, usage, useful, used
- 4) design, designate, designed, designedly

b) adjectives

- 1) availability, avail, available
- 2) accessibility, access, accession, accessible
- 3) transmission, transmit, transmissible, transmitter
- 4) differently, differ, different, difference, differentiate

III. Match the words with their definitions.

- | | |
|---------------------|--|
| 1. host | a. to pass (from one person to another); |
| 2. net | b. ready to be used; which can be obtained; |
| 3. transmit | c. the company that maintains host computers which have an access to the Internet; |
| 4. message | d. make better; |
| 5. access | e. client / server computer through which most users experience their interaction with the Internet; |
| 6. service provider | f. to stop something as it is passing |

- | | |
|---------------|--|
| 7. route | g. way of getting to someone, somewhere |
| 8. available | h. groups of hardware and communication software dedicated to maintaining communication with other nets; |
| 9. refine | i. way to be followed to get destination |
| 10. intercept | j. news / information sent to someone |

IV. Arrange the words of the two groups in pairs.

a) with similar meaning

- | | |
|--------------|----------------|
| 1. route | a. information |
| 2. available | b. supply |
| 3. data | c. admittance |
| 4. provide | d. payment |
| 5. run | e. sent |
| 6. transmit | f. path |
| 7. fee | g. accessible |
| 8. access | h. manage |

b) with contrary meaning

- | | |
|--------------|---------------|
| 1. transmit | a. decrease |
| 2. reliable | b. wireless |
| 3. increase | c. make worse |
| 4. develop | d. cheap |
| 5. refine | e. receive |
| 6. wire | f. decode |
| 7. encode | g. sustain |
| 8. expensive | h. unreliable |

V. Use the word in brackets to form a word that fits in the space.

1. Special computers direct the data towards its ... (to destine).
2. A great variety of service are at the ... of the Internet users. (to dispose)
3. Nearly all the information sent over the Internet is ... without encoding. (transmission)
4. ... use of the network is increasing manifold. (commerce)
5. The Internet is a ... alternative to the expensive means of telecommunications. (reliability)
6. The ... of technical problems will take a lot of time. (to solve)
7. In many ... countries the Internet offers a reliable alternative to unreliable telecommunications systems of these countries. (development)

Texts and Text Exercises

TEXT A

1. Study the text and try to understand all details.

THE INTERNET

The Internet, a global computer network which embraces millions of users all over the world, began in the United States in 1969 as a military

experiment. It was designed to survive a nuclear war. Information sent over the Internet takes the shortest path available from one computer to another. Because of this, any two computers on the Internet will be able to stay in touch with each other as long as there is a single route between them. This technology is called packet switching. Owing to this technology, if some computers on the network are knocked out (by a nuclear explosion, for example), information will just route around them.

Most of the Internet host computer (more than 50%) are in the United States, while the rest are located in more than 100 other countries. Although the number of host computers can be counted fairly accurately, nobody knows exactly how many people use the Internet, there are millions, and their number is growing by thousands each month worldwide.

The most popular Internet service is e-mail. Most of the people, who have access to the Internet, use the network only for sending and receiving e-mail messages. However, other popular services are available on the Internet: reading USENET News, using the World-Wide Web, telnet, FTP and Gopher.

In many developing countries the Internet may provide businessmen with a reliable alternative to the expensive and unreliable telecommunications systems of these countries. Commercial users can communicate over the Internet with the rest of the world and can do it very cheaply. When they send e-mail messages, they only have to pay for phone calls to their local service providers, not for calls across their countries or around the world. But who actually pays for sending e-mail messages over the Internet long distances, around the world? The answer is very simple: a user pays his / her service a monthly or hourly fee. Part of this fee goes towards its hosts to connect to a larger service provider. And part of the fee got by the large provider goes to cover its cost of running a worldwide network of wire and wireless stations.

But saving money is only the first step. If people see that they can make money from the Internet, commercial use of this network will drastically increase. For example, some western architecture companies and garment centers already transmit their basic designs and concepts over the Internet into China, where they are worked and refined by skilled – but inexpensive – Chinese computer-aided-design specialists.

However, some problems remain. The most important is security. When you send an e-mail message to somebody, this message can travel through many different networks and computers. The data are constantly being directed towards its destination by special computers called routers. Because of this, it is possible to get into any of computers along the route, intercept and even change the data being sent over the Internet. In spite of the fact that there are many strong encoding

programs available, nearly all the information being sent over the Internet is transmitted without any form of encoding, i.e. “in the clear”. But when it becomes necessary to send important information over the network, these encoding programs may be useful. Some banks and companies even conduct

transactions over the Internet. However, there are still both commercial and technical problems which will take time to be resolved.

Notes

garment - одежда

II. Read the text and find English equivalents to the following words and word combinations.

Компьютерное проектирование, имеющийся в распоряжении, доступ в Интернет, предназначать, пакетная коммутация, вести дела, усовершенствовать, радиостанция, ненадежные системы телекоммуникации, передавать данные, коммерческое использование сети, то есть, поставщик сетевых услуг, поддерживать связь

III. Read the text and answer the questions.

1. What is the Internet? 2. What was the Internet originally designed for? 3. What does the term "packet switching technology" imply? 4. What does the Internet provide businessmen with? 5. Whom do you have to pay for sending e-mail messages? 6. Will the commercial use of the network increase or decrease? Why? 7. What is the most important problem in using the Internet? 8. Why are encoding programmes widely used in business?

IV. Say whether the following statements are true or false.

1. The number of the Internet users is growing each month worldwide. 2. The Internet was designed to survive a nuclear war. 3. Nearly all the information being sent over the Internet is encoded. 4. You have to pay for calls across your country or around the world when you send e-mail messages. 5. Some banks and companies are known to conduct transactions over the Internet. 6. The Internet began in the USA in 1989 as a military experiment.

V. Complete the following sentences choosing the most suitable variant.

1. The technology of the Internet is called
 - a) step-by-step switching
 - b) message switching
 - c) packet switching
2. Information sent over the Internet takes....
 - a) the shortest path available from one computer to another
 - b) the longest path available from one computer to another
 - c) any path available from one computer to another
3. If your messages sent are to be confidential you have to use
 - a) decoding programs
 - b) encoding programs
 - c) entertainment programs
4. The most important problem of e-mail service is
 - a) security

- b) cost
 - c) size
5. Most of the Internet host computers are in
- a) Belarus
 - b) Australia
 - c) the USA

VI. Develop the following ideas. Use the words and word combinations provided in the brackets.

1. The Internet was designed as a military experiment (survive a war, knock out, route, packet switching)
2. The number of users increases drastically (host computer, locate, count, exactly)
3. The most popular service is e-mail (have access to, provide, cheap, expensive, pay for phone calls, service provider, part of the fee, connect, cover its costs)
4. Commercial use of the network is growing worldwide. (make money, transmit designs and concepts, rework)
5. There are still various problems to be resolved. (security, travel, direct towards its destination, routers, intercept, encoding programs, conduct transactions, over the Internet)

VI. Make an outline of the text.

VIII. Speak about the worldwide use of e-mail service.

TEXT B

I. Read the following text and entitle it.

Millions of people around the world use the Internet to search for and retrieve information on all sorts of topics in a wide variety of areas including the arts, business, government, humanities, news, politics and recreation. People communicate through electronic mail (e-mail), discussion groups, chat channels and other means of informational exchange. They share information and make commercial and business transactions. All this activity is possible because tens of thousands of network are connected to the Internet and exchange information in the same basic ways.

The World Wide Web (WWW) is a part of the Internet. But it's not a collection of networks. Rather, it is information that is connected or linked together like a web. You access this information through one interface or tool called a Web browser. The number of resources and services that are part of the World Wide Web is growing extremely fast. In 1996 there were more than 20 million users of the WWW, and more than half the information that is transferred across the Internet is accessed through the WWW. By using a computer terminal (hardware) connected to a network that is a part of the Internet, and by using a program (software) to browse or retrieve information that is a part of the World Wide Web, the people connected to the Internet and

World Wide Web through the local providers have access to a variety of information. Each browser provides a graphical interface. You move from place to place, from site to site on the Web by using a mouse to click on a portion of text, icon or region of a map. These items are called hyper-links or links. Each link you select represents a document, an image, a video clip or an audio file somewhere on the Internet. The user doesn't need to know where it is, the browser follows the link.

All sorts of things are available on the WWW. One can use Internet for recreational purposes. Many TV and radio stations broadcast live on the WWW. Essentially, if something can be put into digital format and stored in a computer, then it's available on the WWW. You can even visit museums, gardens, cities throughout the world, learn foreign languages and meet new friends. And of course you can play computer games through WWW, competing with partners from other countries and continents.

Just a little bit of exploring the World Wide Web will show you what a much of use and fun it is.

Notes

retrieve – извлекать

recreation – развлечение

business transactions – коммерческие операции

broadcast live – передавать в прямом эфире

II. Answer the following questions on the contents of the text.

1. What is the Internet used for?
2. Why are so many activities such as e-mail and business transactions possible through the Internet?
3. What is the World Wide Web?
4. What does a user need to have an access to the WWW?
5. What are hyperlinks?
6. What are the basic recreational applications of the WWW?

III. Read the text again and be ready to speak on the following problems:

- a) a wide range of services provided by the Internet;
- b) facilities required to have an access to the WWW;
- c) recreation applications of the WWW.

UNIT 7

Part I. GRAMMAR STUDY

INDIRECT SPEECH AND REPORTING

Direct Speech is the exact words, someone said.

We use quotation marks in Direct Speech.

"I'll go to London," she said.

Indirect (Reported) Speech is the exact meaning of what someone said but not the exact words. We do not use quotation marks in Reported Speech.

She said she would go to London.

We can report: A. statements B. questions C. Commands, requests, suggestions.

Reported Statements

1. To report statements we use a reporting verb (say, tell, explain etc.) followed by a **that**-clause. In spoken English **that** may be omitted.

He said, "I feel sick". He said (that) he felt sick.

We use **tell** in Reported Speech when **tell** is followed by the person the words were spoken to.

She said to me, "I can't drive".

*She **said/told me** that she couldn't drive.*

2. Pronouns and possessive adjectives change according to the meaning.

He said, "I'll lend you my car."

He said he would lend me his car.

3. Time words and certain words change as follows depending on the time reference and the context:

now - then, at that time

ago – before

today – that day

last night etc – the

previous

night etc

tomorrow – the next day

here – there

yesterday – the day before

this – that

next week etc – the following/next week etc

these – those

4. When the reporting verb is in the past, the verb tenses of Direct Speech change as follows:

Present Simple

Past Simple/Present Simple (if the information is still true)

Present Continuous

Past Continuous

Present Perfect

Past Perfect

Past Simple

Past Perfect/Past Simple

Future

Conditional

Present Perfect Continuous

Past Perfect Continuous

"I like ice-cream," he said.

He said he likes/liked ice-cream. (still true)

"I am rich," he said.

He said he was rich. (but we know he isn't; not true)

5. There are no changes in verb tenses when the reporting verb is in the Present, Future or Present Perfect tense or when the sentence expresses something which is always true.

"The earth is a planet," he said.

He said the earth is a planet. (general truth)

6. The Past Continuous does not usually change.

"I was reading while my parents were watching TV," she said.

She said she was reading while her parents were watching TV.

Reported Questions

1. Word order in a reported question is the same as in a statement.

I said to her, "Have you lived here long?"

I asked her if she had lived there long.

2. We use: a) **ask + wh-word** (who, what etc) when the direct question begins with such a word,

b) **ask + if/whether** when the direct question begins with an auxiliary verb (do, has, can, etc).

3. Pronouns, possessive adjectives, tenses, time expressions etc change as in statements.

He said, "Did you have a nice time?"

He asked if/whether I had had a nice time.

Reported Commands/Requests/Suggestions

To report commands etc we use a reporting verb (advise, ask, suggest, beg, offer, order tell etc) followed by a to – infinitive, a not to – infinitive or an –ing form according to the construction of the introductory verb.

He said to me, "Come with me."

He told me to go with him.

He said, "Let's go out." He suggested going out.

Advanced Language Practice

1. Indirect Speech with modal auxiliaries.

If the reporting verb is in a past tense, modals change where there is a "past" equivalent.

will – would

may – might

can – could

Should changes to **would** if it is used as a first person of **would**.

"I should love to come."

She said (that) she would love to come.

Otherwise **should** remains unchanged.

"You should rest."

They said (that) I should rest.

Must can be reported as either **had to** or remain as **must** (when it denotes advice, order or supposition bordering on assurance).

She said to him, "You must be more careful."

She told him he must be more careful.

2. Indirect Speech with conditional sentences.

After a past tense reporting verb, real situations include tense changes.

"If we leave now, we'll catch the train."

I told him that if we left we'd catch the train.

In reported hypothetical situations, tense changes are not made if the event has reference to a possible future.

"If you came back tomorrow, I'd be able to help you."

She said that if I came back the next day, she'd be able to help me.

If the event is clearly hypothetical and impossible, time changes are made.

"If I had a spanner, I could fix this."

He said that if he had had a spanner he could have fixed it.

Hypothetical past conditional sentences do not change.

3. Many verbs describe a function, rather than report words.

"Look, if I were you I'd leave early."

She advised me to leave early.

Examples are:

admit complain warn etc.

advise invite

agree suggest

4. Some verbs describe actions.

"Hi, Dave, how are you?"

He greeted me.

Examples are:

accept, congratulate, decide, interrupt, introduce etc.

Practice

I. Analyse the use of tenses in the table and in the text.

He says	He said
1) that he works hard.	1) that he worked hard.
2) that he worked hard.	2) that he had worked hard.
3) that he will work hard.	3) that he would work hard.

The Job Interview

Boris had a job interview a few days ago at the Insurance Company. The interview lasted an hour and Boris had to answer a lot of questions.

First the interviewer asked Boris where he **had gone** to school and if he **had had** any special training. She also asked him where he **had worked**. Boris answered that he **had graduated** from a specialized English school and a financial college and **had worked** at the bank. Boris also mentioned that his English **was** good. He answered all the questions well and he hoped he **would get** a job at the company.

II. Analyse the examples of Indirect Speech in A. Then translate the sentences in B. Mind the rules of the sequence of tenses.

A.

- | | |
|---|---|
| 1. He says that he knows your friend. | He said that he knew your friend. |
| 2. She thinks that you passed your examination in physics. | She thought that you had passed your examination in physics. |
| 3. They know you will graduate from the Institute next year. | They knew you would graduate from the Institute the next year. |
| 4. The teacher asked if you can write English. | The teacher asked if you could write English. |
| 5. She wants to know whether you completed your work yesterday. | She wanted to know whether you had completed your work the day before. |
| 6. She says she has seen that magazine in our library. | She said she had seen that magazine in our library. |
| 7. We know that the young writer is working on a novel. | We knew that the young writer was working on a novel. |

B.

1. I did not know that my friend's son had failed in chemistry.
2. They thought I could drive a car.
3. The boy said he had scarcely enough money to return home.
4. I knew he was experimenting for hours.
5. They said that they had chosen their course and nothing could turn them from it.
6. We considered that she had already obtained her Master's degree in mathematics.
7. The student said that he could not translate the article without a dictionary.
8. I did not think that she would be refused a better room for her research.
9. He asks if he may keep this book as long as he needs it.
10. They told the child that the weather was fine and he could have a walk for two hours.
11. He asked how normal temperature was maintained in the underground.
12. He asked whether in the early days the trains had been driven by locomotives which burnt coal.
13. He said that entirely automatic driving would be developed.

III. Complete these sentences with *said*, *told* or *talked*.

Example: Tom...*said*...that he didn't like Brian.

1. Jack.....me that he was enjoying his new job.
2. Tom.....it was a nice restaurant but I didn't like it much.
3. The doctor.....that I would have to rest for at least a week.
4. Mrs. Taylor.....us she wouldn't be able to come to the next meeting.
5. Ann.....Tom that she was going away.
6. George couldn't help me. He.....to ask Jack.
7. At the meeting the chairman.....about the problems facing the company.
8. Jill.....us all about her holiday in Australia

IV. Turn from Direct into Reported Speech.

Example: "I've ordered a pizza for dinner," he said. *He said that he had ordered a pizza for dinner.*

1. "We must write a letter to our lawyer," she said.
2. "I will come tomorrow and fix the tap," the plumber said to them.
3. "This is the best holiday I've ever had," she said to her friend.
4. "Why did you say that to me?" she asked him.
5. "Don't speak to your father like that," she said to them.
6. "Could you show me where the manager's office is?" he asked the secretary.
7. "Take your books with you," she said to her son.

V. Turn from Direct into Reported Speech.

Example: "London is the capital of Great Britain," said the teacher.

The teacher said that London is the capital of Great Britain.

1. "I didn't break the window," said the little boy to his mother.
2. "Eat your dinner," she said to him.
3. "Have you seen this film?" Jane asked her friend.
4. "I had an argument with Tony yesterday," said Mary.
5. "The new guests will arrive tomorrow," explained the manager.
6. "Italy is hotter than England," said George.
7. "Where is the post office?" Ann asked the stranger.
8. "I might go hiking next week," Harry said.
9. "Don't eat with your fingers," the mother said to her children.

VI. Read a sentence and write a new sentence with the same meaning.

Examples: "Listen carefully", he said to us. He told us *to listen carefully.*

"Don't wait for me if I'm late", Ann said.

Ann said *not to wait for her if she was late.*

1. "Eat more fruit and vegetables", the doctor said.
The doctor said.....
2. "Read the instructions before you switch on the machine", he said to me.
He told.....
3. "Shut the door but don't lock it", she said to us.
She told.....
4. "Can you speak more slowly? I can't understand", he said to me.
He asked.....because.....
5. "Don't come before 6 o'clock", I said to him.
I told.....

VII. Write the exact words Miss Dent said to her students.

Miss Dent told her students not to talk when she's talking. She told them to give their homework to her at the end of each lesson. She asked them not to write on the desks. Then she told them to put their hands up if they had a

question. She also asked them not to eat in the classroom. She told them to write everything in pen and asked them to throw their rubbish into the wastepaper bin. Finally she told them not to leave the classroom without permission.

1. *Don't talk when I'm talking!*

VIII. In this exercise someone says something to you which is the opposite of what they said before. You have to answer **I thought, you said ...**

Example: "That restaurant is expensive." "I thought you said it wasn't expensive."

1. "Ann is coming to the party." "I thought you said she....."
2. "Bill passed his examination." "I thought you said....."
3. "I've got many friends." "I thought you said you....."
4. "Jack and Jill are going to get married."
"....."
5. "Tony works very hard."
"....."
6. "I want to be rich and famous."
"....."
7. "I'll be here next week."
"....."
8. "I can afford a holiday this year."
"....."

IX. Match each report 1. to 10. with the actual words spoken from a) to j).

1. Ann told me that I should take a holiday. (d)
 2. Ann expected me to take a holiday.
 3. Ann insisted that I should take a holiday.
 4. Ann invited me to take a holiday.
 5. Ann agreed that I could take a holiday.
 6. Ann reminded me to take a holiday.
 7. Ann proposed that I should take a holiday.
 8. Ann asked whether I would take a holiday.
 9. Ann reassured me that I could take a holiday.
 10. Ann preferred that I take a holiday.
-
- a) Would you like to come on holiday with me?
 - b) Don't worry. Of course you can take a holiday.
 - c) Don't forget to take a holiday, will you!
 - d) You should take a holiday.
 - e) Are you going to take a holiday?
 - f) It's all right by me if you take a holiday.

- g) Actually, I'd rather you took a holiday.
- h) I thought you were going to take a holiday.
- i) Taking a holiday would be a good idea.
- j) You really must take a holiday.

X. Turn from Direct into Reported Speech.

Example: "I've finished all my work," she said. She said (that) she had finished all her work.

1. "Why are you looking at me like that?" she asked him.
2. "Don't play with matches," his mother said.
3. "I've forgotten to bring my lunch with me," he said.
4. "Will you be at home soon?" she asked her husband.
5. "Go to bed!" Father said to the children.
6. "I'll clean the car tomorrow," Tim said to his father.
7. "Where have you been?" Gary asked his wife.
8. "I've been working for the same company since 1960," he said to me.
9. "Do you know Garfield?" she asked me.

Advanced Language Practice

XI. Turn the following sentences into Reported Speech.

1. "How shall I tell Tom the bad news?" she said. *She asked how she should tell Tom the bad news.*
2. "You must try my home-made pie," she said.
3. "Can I go home now?" he asked.
4. "May I call you by your first name?" he asked her.
5. "You can come in, but you mustn't make any noise," she said to him.
6. "What time shall we arrive in London?" he asked.
7. "She must try harder if she wants to succeed," he said.
8. "My father will be angry with me if he finds out," she said.
9. "You ought not to drive so fast," he said to her.
10. "They don't have to come if they don't feel like it," he said.
11. "You had better speak to the manager," she said to him.
12. "I may not be able to meet you at the airport," he said to her.

XII. Choose the most suitable word underlined.

Example: The government denied/refused that there was a crisis.

1. Jane said me/told me there was nothing the matter.
2. Peter persuaded me/insisted me to stay for dinner.
3. The director of studies advised me/suggested me to spend more time in the library.
4. Sheila explained me/warned me not to leave the heater on all night.
5. The chairperson mentioned us/reminded us that time was extremely short.
6. Bill answered them/replied them with a detailed description of his plans.
7. Michael and Sarah announced/reported that they were going to get married.

8. Paul accepted/expected that he had made a mistake, and apologized.
9. The manager confirmed/reassured that our room had been reserved.

XIII. Match each report 1. to 10. with the actual words spoken from a) to j).

1. Jim admitted that he might have taken it. (e)
2. Sue denied that she had taken it.
3. Harry doubted whether he had taken it.
4. Diana explained that she had taken it.
5. Bill insisted he had taken it.
6. Mary suggested that she had taken it.
7. Ted confirmed that he had taken it.
8. Ruth claimed that she had taken it.
9. Charles repeated that he had taken it.
10. Sally reassured us that she had taken it.

- a) No, I've definitely taken it.
- b) I don't think I took it.
- c) Don't worry, I've taken it. It's all right!
- d) What about me? Perhaps I took it?
- e) OK, perhaps I did take it after all.
- f) Yes, I took it. I took it, I tell you!
- g) Yes, that's quite correct. I took it.
- h) No, I certainly didn't take it, I can assure you.
- i) You may not believe me, but actually I took it.
- j) You see, it's like this. I've taken it.

XIV. Rewrite each sentence in Indirect Speech beginning as shown.

Example: "I wouldn't cook the fish for too long, Bill, if I were you," said Jean.

Jean advised Bill *not to cook the fish for too long*.

1. "Helen, would you like to come to lunch on Sunday?" said Mary.
Mary.....
2. "Well, in the end I think I'll take the brown pair," said the customer.
The customer finally.....
3. "Me? No, I didn't take Sue's calculator," said Bob.
Bob denied.....
4. "Don't forget to buy some milk, Andy," said Clare.
Clare reminded.....
5. "Look, I might not be able to come on Saturday," said David.
David told us.....
6. "Why don't you go and see "The Sound of Music" again, Brian?" I said.
I suggested.....
7. "No, you really must stay with us, Sophia," Ann said.
Ann insisted.....
8. "Make sure you don't take the A20 in the rush hour, Tim," said Jack.
Jack warned.....

9. "You are not allowed to smoke in your room, Dick," said his mother.
 Dick's mother.....

XV. Choose a reporting verb and turn the following from Direct into Reported Speech.

Advised, asked, ordered, suggested, explained, warned, promised, begged, offered, refused

Example: "I think you should take more exercise," the doctor said to me.

The doctor advised me to take more exercise.

1. "I will not answer your questions," the actor said to him.
2. "I really will phone this evening," he said.
3. "Do you know where I've put my hat?" he said to her.
4. "What have you bought me for Christmas?" the little boy said to his parents.
5. "Go to your room now and do your homework," the mother said to her son.
6. "You will be paid twice a month," her boss said.
7. "Would you like me to drive you into town?" she said to me.
8. "Let's go for a walk!" he said.
9. "Please let me come with you," she said to her mother.
10. "Let's play in the garden," Ted said.
11. "The sun is bigger than the earth," Mary said to the children.
12. "Don't go near the fire because it's dangerous," she said to her little daughter.
13. "Let's have steak for dinner," said Jane.
14. "I promise I'll write to you as soon as I arrive, Mary," said John.
15. "Please, don't shoot me!" he said to the robber.

XVI. Turn the following dialogue into Reported Speech.

A: Mum, please, will you let me stay at Sally's house tonight? *Ann begged her mother to let her stay at Sally's house that night but her mother refused.*

M: No, I won't.

A: Why?

M: The last time you stayed there, you stayed up late and you were too tired to go to school the next day.

A: That's true. But we won't do that again.

M: And you were both smoking cigarettes.

A: That's not true! I've never smoked in my life.

M: Well, all right then, you can go, but only if you promise to behave.

Part II. TEXT STUDY

A. Vocabulary Exercises

Word List

Noun and Noun Phrases

- | | |
|---------------------|--|
| 1. application | 1. применение, 2. приложение (например силы) |
| 2. disturbance | 1. возмущение, нарушение, 2. помехи |
| 3. frequency | частота |
| 4. means (s and pl) | средство, способ |
| 5. message | сообщение, сигнал, посылка |
| 6. source | источник, исток |
| 7. speed | скорость |
| 8. velocity | скорость |

Adjectives

- | | |
|-----------------|---|
| 1. celestial | небесный, астрономический |
| 2. cordless | с батарейным питанием |
| 3. considerable | значительный, важный |
| 4. instant | немедленный, безотлагательный |
| 5. remarkable | замечательный, удивительный, выдающийся |

Verbs and Verbal phrases

- | | |
|--------------|--|
| 1. arouse | пробуждать, вызывать, возбуждать |
| 2. observe | наблюдать, замечать |
| 3. occur | случаться, происходить |
| 4. perceive | воспринимать, ощущать |
| 5. predict | предсказывать |
| 6. propagate | распространяться, передаваться через среду |
| 7. radiate | исходить из центра, излучать |
| 8. relate | иметь отношение |
| 9. relay | транслировать, передавать сигналы, ретранслировать |
| 10. rotate | вращаться |
| 11. vary | менять(ся), разнообразить |

I. Repeat and translate into Russian the following words.

a) *with one stress or the stress on the first syllable:*

message, cycle, audio, light, vehicle, physicist, tube, rapidly, similar, cordless, energy, current, type, maximum, frequency, mobile, solar, chemical, guide, quasar, pulsar, neutron;

b) *with the stress on the second syllable:*

research, device, velocity, observe, prediction, occur, considerable, transmit, disturbance, detect, excitement, phenomenal, equipment, determine, perceive, produce, invention, remarkable, astronomy;

c) *with two or more stresses:*

application, entertainment, experimental, mathematically, electromagnetic, transatlantic, unobservable, garage – door (openers), radio-operated, communication, electronic, satellite, navigation, exploration, commemorate, oscillate, propagate, radiate, demonstrate

II. Study the following words and choose.

a) nouns

1. a) oscillator b) oscillatory c) oscillate d) oscillation
2. a) apply b) applied c) applicant d) appliance
3. a) disturbing b) disturb c) disturbed d) disturbance
4. a) operation b) operating c) operator d) operative
5. a) transmit b) transmission c) transmitter d) transmissible

b) adjectives

1. a) frequently b) frequentative c) frequent d) frequency
2. a) voice b) voiced c) voiceless d) voicelessly
3. a) observe b) observer c) unobservable d) observation
4. a) cycle b) cyclist c) cyclical d) cyclically
5. a) locate b) location c) locally d) local

III. Match the words with their definitions:

1. transmitter a) device which receives messages, radio programmes and transmits them with greater strength, thus increasing the distance over which they are carried.
2. satellite b) speed, quickness
3. technology c) place from which something comes or is got
4. research d) send out rays of light or heat
5. frequency e) transmit, extend the operation
6. radiate f) comparatively small body moving in orbit round a planet
7. propagate g) study, mastery and utilization of manufacturing and industrial methods
8. source h) number of repetitions in a given time
9. velocity i) investigation undertaken in order to discover new facts.
10. relay j) part of a telegraph or radio apparatus for sending out signals, messages, music, etc.

IV. Arrange the words of the two groups in pairs

a) with similar meaning

1. happen, speed, receive, devise, considerable, unobservable, spread, similar, show, detect, occupation, oscillate, cordless, join, observe
2. alike, vibrate, notice, propagate, wireless, piece together, demonstrate, velocity, profession, occur, obtain, important, perceive, invent, imperceptible

b) with contrary meaning

1. different, transmitter, earliest, inward, easy, absence, standing, finally, leave, low, near, rapidly, dim, visible, detailed

2. clear, return, unobservable, slowly, primarily, essential, distant, difficult, presence, similar, receiver, high, latest, moving, outward

V. Use the word in brackets to form a word that fits in the space.

1. During ... the transistor becomes heated. (to operate)
2. A ... antenna is a device that projects the radio frequency energy into space. (to transmit)
3. A transistor is ... of current, the vacuum tube, in contrast, ... of voltage. (to amplify)
4. A radio wave is a special ... of electric and magnetic forces. (to combine)
5. Many stations can operate in the same region without ... if their frequencies are different. (to interfere)
6. Listeners receive the station they want by tuning their ... to the station's frequency. (to receive)
7. The ... were always correct provided the necessary instruments were used (to measure)
8. The sky wave from a very ... transmitter can be reflected several times between the ionosphere and the Earth. (power)
9. There is a very important ... between frequency and wavelength (to relate)

B. Texts and Text Exercises

TEXT A

I. Study the text and try to understand all details.

RADIO

Early in the 19th century, Michael Faraday, an English physicist, demonstrated that an electric current can produce a local magnetic field and that the energy of this field will return to the current when the current is stopped or changed. James Clerk Maxwell, professor of experimental physics at Cambridge, in 1864 proved mathematically that any electrical disturbance could produce an effect at a considerable distance from the point at which it occurred and predicted that electromagnetic energy could travel outward from a source as waves moving at the speed of light.

At the time of Maxwell's prediction there was no known means of propagating or detecting the presence of electromagnetic waves in space. It was not until about 1888 that Maxwell's theory was tested by Heinrich Hertz, the famous German physicist, who demonstrated that Maxwell's predictions were true at least over short distances.

Radio aroused worldwide excitement in December 1901, when Guglielmo Marconi, the Italian physicist, received the first transatlantic radio signals in St. John's, Newfoundland, sent from a transmitter in England.

Radio messages and signals travel across space by way of electromagnetic waves. Light is another type of electromagnetic wave, as are

X rays, gamma rays, and cosmic rays. Since it is difficult for humans to perceive the action of these unobservable waves, electromagnetic wave action is often compared to that of water waves. Like water waves, radio waves also radiate away from a center. They can travel through the air and through a vacuum. Like light waves radio waves travel in straight lines at a velocity of about 300,000 kilometres (186,000 miles) per second and have amplitudes that vary cyclically with time; that is they oscillate from a zero amplitude to a maximum and back again. The number of times the cycle is repeated in one second is called the frequency in cycles per second, and the time taken to complete one cycle is sometimes called the period. To commemorate Heinrich Hertz a frequency of one cycle per second is called one hertz. The distance from one wave crest to the next is known as the wavelength. Wavelength and frequency are related. Dividing the speed of the electromagnetic wave by the wavelength gives the frequency.

From 1920 onward radio made phenomenal progress through research activities in Europe, North America, and Asia. The invention of the electron tube and later the transistor (1948) made possible remarkable developments.

Notes

squad car	полицейская машина
commemorate	отмечать, чтить память
crest	гребень, пик

II. Find the equivalents of the following words and word combinations.

Исходить из центра, вызвало всеобщий интерес, циклично варьируют по времени, воспринять действие этих невидимых волн, двигаться со скоростью света, частота оборотов в секунду, расстояние от гребня одной волны до гребня другой, средства передачи и обнаружения электромагнитных волн в пространстве, распространяться в воздушной среде и вакууме, разделить скорость электромагнитной волны на длину волны, колебаться от нулевой амплитуды до максимума и обратно.

III. Read the text and answer the questions.

1. What demonstrations did Michael Faraday make at the beginning of the 19th century?
2. What's the essence of Maxwell's prediction?
3. Why couldn't his theory be proved in those days?
4. When did radio signals cross the ocean?
5. What other types of electromagnetic waves can you name?
6. What is the speed of travel of radio waves?
7. In what way could you define the frequency and wavelength?
8. How are they related?
9. When did radio make phenomenal progress?

IV. Say whether the following statements are true or false.

1. Michael Faraday was the first to notice the existence of a local magnetic field produced by an electric current.
2. James Maxwell proved experimentally that electromagnetic energy could travel outward from a source.
3. Maxwell's theory was tested by Heinrich Hertz in 1888.
4. The first transatlantic radio signals were received early in the 20th century.
5. X rays, gamma and cosmic rays are not the type of electromagnetic waves.
6. The number of times the cycle is repeated in one second is called the period.
7. Dividing the frequency of the electromagnetic wave by the wavelength gives the speed.

V. Complete the following sentences choosing the most suitable variant.

1. Guglielmo Marconi, the Italian physicist, ... the first transatlantic radio signals in St. John's, Newf. (transmit, receive, detect, produce)
2. Electromagnetic energy can travel outward from a ... as waves moving at the speed of light. (point, way, field, source)
3. Maxwell's prediction was ... by Heinrich Hertz, the famous German physicist. (obtain, compare, send, test)
4. The energy of this field will ... to the current when the current is stopped or changed. (come back, occur, start, leave)
5. Heinrich Hertz demonstrated that Maxwell's predictions were (wrong, known, correct, considerable)
6. Wavelength and frequency are ... (relay, rotate, relate, remove)
7. The ... of the electron tube and later the transistor made possible remarkable developments. (find, discovery, invention, opening)

VI. Develop the following ideas. Use the words and word combinations provided in brackets.

1. The invention of the radio is the contribution of many scientists. (to attract everyone's attention, to show the existence of a magnetic field, to spread out from ..., radio waves bridge the Atlantic, no instrument for transmission or perception..., make an impression at a large distance, to compare them to light waves, Maxwell's ideas were checked...)
2. The nature of radio waves.
(different kinds of electromagnetic waves, to be transmitted across..., to achieve extraordinary results, the relationship between frequency and wavelength, to make one full cycle, to be propagated through ..., electromagnetic waves can't be perceived by man's senses, to be generated from a central position)

VII. Make an outline of the text.

VIII. Speak about the story of radio and its basic physical properties.

Text B

I. *Read the text. Answer the following questions.*

- a) What applications of the radio can you find in your home?
- b) What other applications of the radio apart from those mentioned in the text can you remember?

RADIO AND ITS APPLICATION

In the earliest practical application, radio was used primarily to exchange messages with ships at sea. Radio is still used for this purpose and for communication across oceans.

Television, one of the most popular forms of entertainment in the home, is actually a kind of radio. It uses special equipment for sending and receiving pictures in the form of radio signals. The television audio signals are received by equipment similar to that used in other forms of radio. Other home devices that use radio technology are cordless telephones, garage – door openers, and radio-operated toy airplanes and cars.

Radio technology has other uses outside the home. It provides a means of instant communication with moving vehicles such as taxicabs, service trucks, squad cars and motorcycles. Observers in airplanes can report traffic violations, accidents and traffic jams by radio to police officers on the ground. Many people in the medical profession have beepers – portable electronic devices used to page the person who carries it.

In radio telephones such as cellular mobile telephones, voice signals are sent across town or over long distances by high-frequency radio signals called microwaves. Land based microwave relay stations and communication satellites orbiting the Earth receive and transmit the microwave signals.

With radio to guide them, airplane pilots can fly through fog or storm and land safely at airports. Pilots and ship captains use radio navigation systems to determine their locations and stay on course.

Radio technology is also essential to space exploration. Space probes use radio waves to relay information about the solar system. Radio astronomy is used to detect celestial objects too distant and dim to be seen by optical telescopes. It can also be used to determine the chemical make up of stars and gas clouds and the speed and direction of moving stars. Using radio astronomy, quasars were discovered in the early 1960s. Pulsars, believed to be rapidly rotating neutron stars, were discovered later in the decade. With the information obtained scientists can piece together the puzzle of how the universe began.

II. *Give the main points of the text in 5-9 sentences.*

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