

V. a) Read and translate the questions. b) Read and translate the text. c) Find answers to the questions in the text:

1. What enables people to communicate with each other over long distances?
2. What part of the telephone is pressed to our ear?
3. What part do we speak into?
4. What is the transmission of oscillations?
5. Must the frequency of oscillations be constant or must it vary?
6. How many parts does the transmitter consist of?
7. How does the resistance of the granules change?
8. How does the number of contacts change?
9. What parts does current pass through?
10. What does the sound pressure on the diaphragm vary?
11. What is the frequency of oscillations produced by sound waves?

### TEXT

Telephony is widely used in everyday life. By means of a telephone people can communicate with each other at a distance of thousands of kilometres.

When speaking over the telephone, we press the receiver to our ear. We speak into the microphone or transmitter.

The transmission of sounds over a distance is the transmission of oscillations. The frequency of the transmitted oscillations must be constant.

The microphone or transmitter (Fig. 5) consists of microphone housing *A*, carbon chamber *B*, carbon diaphragm *C*, carbon granules *D*, insulating spacer *E*, and conductor *F*.

The current passes through the diaphragm, carbon chamber and carbon granules. The sound pressure on the diaphragm varies the pressure on the granules of carbon. These granules either make more contacts and decrease the resistance of the granules, or make fewer contacts and increase the resistance.

Sound waves produce oscillations of the same frequency as those of the sounding body. At this both the transmitter resistance and the current in the circuit will change.

VI. Give the English equivalents of the Russian words given in brackets:

1. (Прибор) for reproducing sounds is called a telephone.
2. (Как) the microphone (так и) telephone are

connected to a common circuit. 3. The transmitter (состоит из) six parts. 4. More contacts (уменьшают) the granule resistance. 5. The sound pressure (меняет) the pressure on the granules. 6. (Сопротивление) of the granules either increases or decreases. 7. (Частота) of the oscillations must be constant. 8. (Давление) on the granules varies.

### § 3. Receiver

I. Practise the following words from the text:

cap	колыто	телефона	variable	['veəriəbl]	перемен-
coil	катушка,	виток	ный		
steel	сталь		therefore	['ðeəfə:]	поэтому, следо-
to vibrate	[vaɪ'breɪt]	вибриро-	ваательно		
vary, vary	менять		magnet	['mæɡnɪt]	
to house	[haus]	вмещать, по-	position	[pə'ziʃn]	
местить			plastic	['plæstɪk]	

II. Read and translate these word combinations:

1. plastic caps; 2. variable current; 3. constant current; 4. steel wire; 5. diaphragm positions; 6. oscillation frequency; 7. magnet coils; 8. transmitter frequency

III. Mind the difference in the attributes:

1. varying current—variable current; 2. housed parts—housing cap; 3. transmitting devices—transmitted frequency; 4. reproducing coil—reproduced sounds; 5. changed frequency—changing position; 6. received energy—receiving parts

IV. Translate the following sentences:

1. The receiver consists of...  
— electromagnet coils.  
— a steel magnet.  
— a diaphragm.
2. A variable current...  
— passes through the magnet's coils.  
— changes the diaphragm position.
3. These parts are housed in a plastic cap.
4. The frequency of the oscillation is the same as that of the transmitter; therefore the same sounds are reproduced by the receiver.

V. a) Read and translate the questions. b) Read and translate the text. c) Find answers to the questions in the text:

1. What is the receiver connected to?
2. What parts does the receiver consist of?
3. What parts are housed in a plastic cap?
4. What current changes the position of the diaphragm?
5. What is the frequency of the oscillations?
6. Why does the diaphragm vibrate?
7. Why does the receiver reproduce the same sounds which are spoken into the microphone?

### TEXT

The varying current passes through the receiver connected to a network. The receiver consists of electromagnet coils, a steel magnet, and a diaphragm. The diaphragm, magnets, and coil are housed in a plastic cap. When speaking over the telephone, the cap of the receiver is pressed to the ear.

A variable current passing through the magnet's coils changes the position of the diaphragm: it makes it vibrate. The frequency of these oscillations is the same as that of the transmitter. Therefore, the receiver reproduces the same sounds which are spoken into the microphone.

VI. Give the English equivalents of the Russian words given in brackets:

1. (Переменный ток) passes through the magnet's coils.
2. The parts of the receiver (помещены) in a plastic cap.
3. We (прижимаем) the cap to the ear.
4. The resistance (меняется).

### § 4. Telephone Set Protection

I. Practise the following words from the text:

fuse [fu:z] предохранитель	to need нуждаться (в)
protection защита	to protect защищать
to serve [sɜ:v] служить, обслуживать	to overheat перегреться
жидкость	блок

II. Read and translate these word combinations:

1. power line;
2. protector unit;
3. ground conductor;
4. carbon protector device;
5. power contact current;
6. metal-sheathed cables

III. Translate the following sentences:

1. Fuses...
  - serve as protectors.
  - protect the protector blocks.
  - are not used with insulated wires.
2. Power contact current may overheat either the protector or its ground part.
3. A protector unit serves as protection.

IV. a) Read and translate the questions. b) Read and translate the text. c) Find answers to the questions in the text:

1. Why do telephone sets need protection?
2. Why is a fuse an important part of a protector block?
3. What parts does a protector unit consist of?
4. What units serve as protection devices?
5. What current may overheat the protector?

### TEXT

Lines serving telephone sets may have contacts with power lines or with lightning. Therefore telephone sets and their lines need protection, and protector units serve as protection devices.

Usually a protector unit consists of carbon protector blocks connected between each wire of the line and the ground. Fuses are also used on the protector blocks; they protect protector blocks against power contact currents. A fuse is an important part of protector blocks, without it power contact currents may overheat the protector or its ground conductor. Sometimes fuses are not used. A fuse is not used if the building is served by insulated wires that are connected to metal-sheathed cables on the line pole.

V. Give the English equivalents of the Russian words given in brackets:

1. Fuses (защитатор) the protector blocks against power contact currents.
2. Carbon protector blocks protect (телефонные линии).
3. The protector and (его заземление) may be overheated.

## VI. Read and translate the text using a dictionary:

### Communications Systems Protection

Communications systems protection is the protection of wire communication systems equipment and services. This protection includes the electrical protection of lines and station equipment.

Wire communication systems usually need protection against high voltages and currents from lightning and magnetic storms. These systems include a group of wires separated by insulation of low dielectric strength.

Protective devices for communication systems generally have the form of protector blocks and fuses. The protector blocks consist of two small carbon electrodes separated by a small distance. These electrodes are connected together, so as to connect each set of protector blocks between the conductor to be protected and the grounded sheath of a cable or a grounding electrode at the equipment location. The breakdown voltage of the protector is always much lower than the dielectric strength of the equipment and cables being protected.

Overhead lines of communication circuits supported on wooden poles may consist of open wires or metal sheathed cables. Lightning does not usually damage the wire; damage to auxiliary equipment is minimized by means of protective devices. Cable is more easily damaged by lightning. Therefore protective devices are used on the cable and its auxiliary equipment.

## § 5. From the History of Telephony

### I. Practise the following words from the text:

field [fi:ld] поле	to cause [kə:z] вызывать, причинять
trunk телефонная сеть	to separate ['seperet] отделять (ср)
switchboard [switʃ, bɔ:d] коммутатор	to 'limit
simple [sɪmpl] простой	to induce [ɪn'dju:s]
complex ['kɒmpleks] сложный	automatic [ɔ:tə'mætɪk]
auxiliary [ɔ:g'zɪljəri] вспомогательный	'problem задача, проблема
original [ə'rdʒɪnəl] первоначальный	central ['sentrl]
to in'vent изобретать	

### II. Read and translate these word combinations:

1. simple unit;
2. complex device;
3. magnetic field;
4. simple system;
5. central problem;
6. interconnection

- problem; 7. long distance offices; 8. intercity transmission lines; 9. automatic switchboard; 10. connecting trunk; 11. auxiliary equipment; 12. original sounds
- ### III. Translate the following sentences:

1. The first telephone...
  - was invented in the 19th century.
  - had a very simple construction.
  - had only two main parts.
2. The telephone of later construction...
  - was more complex.
  - had the main parts and auxiliary elements.
  - had separate transmitters and receivers.
  - was linked to a switchboard.
3. Sound waves...
  - strike the diaphragm.
  - cause the diaphragm to vibrate.
  - pass to the other telephone.
4. Today telephone connection service uses...
  - dial switching systems.
  - connecting trunks.

### IV. a) Read and translate the questions. b) Read the text. c) Find answers to these questions in the text:

1. What was the construction of the first telephone?
2. What was the construction of the later telephone?
3. When was the telephone invented?
4. When were wire telephone sets interconnected automatically?
5. By what devices are central offices connected to long-distance offices?
6. For what kind of telephone service are dial switching systems used?

## TEXT

The telephone was invented in 1876. Speech transmission in those days was limited to a distance of a few miles and the construction of the first telephone was simple. A wire with a ground provided the connection. The main parts were a transmitter and a receiver. Fig. 6 shows this simple telephone circuit in which only one device serves as both transmitter and receiver. Sound waves strike the diaphragm and cause it to vibrate. The vibration of the diaphragm changes the magnetic field, inducing electric waves of varying voltage and current. These

waves pass to the distant telephone where the changes produced in the magnetic field cause the diaphragm to reproduce the original sound.

Later development of the telephone changed its construction, it became more complex. Transmitters and receivers were separated. Auxiliary elements were used in its circuit to provide for better transmission of speech.

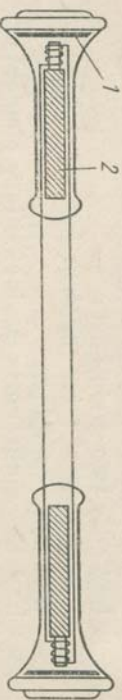


Fig. 6. Elementary telephone circuit:  
1 — diaphragm; 2 — permanent bar magnet.

The need to connect any two of a large number of telephone sets led to the development of a switchboard in 1878. The advantage of a central switching office with a switchboard was very great.

In 1889 telephone sets were interconnected automatically. Further development improved the switching system and more complex telephone constructions were used. The number of telephones to be interconnected increased and large cities needed more switchboard offices. Therefore the interconnection problem was of great importance. Central offices grew in number.

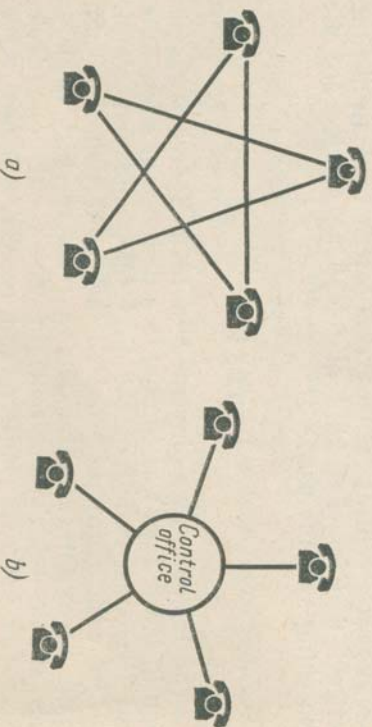


Fig. 7. Two ways of interconnecting five telephones:  
(a) all direct; (b) all switched.

Today central offices are connected to long-distance offices by connecting trunks. Long-distance offices are interconnected by intercity trunks.

Dial switching systems are now used in most countries of the world for local service and in many countries for intercity service.

V. Give the English equivalents of the Russian words given in brackets:

1. Invention of (коммутатор) was a great advance.
2. The first telephone was (простой).
3. (Вспомогательные) elements were used in the later construction.
4. The main parts of the telephone (были отделены).
5. The interconnection (задача) was of great importance.
6. Long-distance offices are interconnected by intercity (телефонная сеть).

## § 6. Transmitting Pictures by Telephone

I. Practise the following words from the text:

light [laɪt] свет	картина,	to generate [dʒenəreɪt] порождать, производить
picture [ˈpɪktʃə] картинка	превращать, увеличивать	to amplify [ˈæmplɪfaɪ] усиливать, увеличивать
to convert [kənˈvɜ:t] превращать	прикладывать	to apply [əˈplaɪ] прикладывать
to appear [əˈpɪə] появляться	фотографировать	'filter photograph [ˈfɒltəʊgræf]
to rotate [rouˈteɪ] вращаться	документ	document [ˈdɒkjumənt]
to pick up [pɪkʌp] подниматься, подхватывать	отражать	to reflect [rɪˈfleks]

II. Read and translate these word combinations:

1. rotating mechanism;
2. reflected light;
3. reproduced picture;
4. applied current;
5. receiving end;
6. transmitting end;
7. generated sounds;
8. amplified voltage;
9. amplifying device;
10. generated frequency;
11. pictures produced by transmitting sound signals;
12. converting the signals back into the picture;
13. passing reflected light through a filter;
14. converting the voltage into sound;
15. transmitting the sound over the telephone;
16. reconverting the sound into an electronic signal;
17. applying the voltage to a drive mechanism;
18. reproducing the transmitted pictures

III. Translate the following sentences:

1. The apparatus...  
— transmits pictures by telephone.

- sends signals to the receiving end.
- converts sound signals into pictures.

2. Optical devices...
  - begin rotation.
  - pick up reflected light.
3. A photocell...
  - receives reflected light.
  - generates signals.

IV. a) Read and translate the questions. b) Read and translate the text. c) Find answers to these questions in the text:

1. What part of the apparatus converts sound signals into pictures?
2. What device picks up reflected light?
3. What element in the apparatus generates signals?
4. What part of the apparatus reproduces the transmitted picture?
5. At what part does the reproduction appear?

### TEXT

Pictures can be transmitted over telephone by sound signals. A new apparatus does this by "looking" at a picture and sending what it sees over the telephone to an apparatus at the receiving end, which then converts the sound signals back into the picture.

At the transmitting end, the photograph, picture or document is put into the apparatus. At the receiving end the reproduction appears on paper. Usually a photograph takes six minutes to be received and reproduced.

In the apparatus optical devices begin rotating and picking up reflected light which passes through a filter. This is how the apparatus works.

V. Give the English equivalents of the Russian words given in brackets:

1. The receiver (превращает) the sound signals into the picture.
2. The reproduction of the transmitted picture (повляется) on paper.
3. Light (отражается) and (проходит) through a filter.
4. After amplifying the signal produces (переменное) voltage.

### TEST EXERCISES

I. Choose the proper words and word combinations. Translate the sentences into Russian:

1. (a receiver, a telephone) includes both a telephone and a microphone.
2. The receiver (is pressed, is linked)

to our ear. 3. The frequency of the transmitted oscillations must (change, be constant). 4. The transmitter (consists of, includes) a carbon chamber and a conductor. 5. The coils, magnets, and diaphragm are (housed in, linked to) a plastic cap. 6. The carbon granules either make more contacts and (increase, decrease) the resistance or make fewer contacts and (increase, decrease) the resistance. 7. The first telephone had (a simple construction, a complex construction). 8. The transmitter and the receiver are (the main parts, the auxiliary parts) of the telephone. 9. The development of a switchboard was (an advantage, a disadvantage). 10. The telephone (was developed, was invented) in 1876. 11. Sound waves (cause, induce) vibrations of the diaphragm. 12. Sound waves (leave, strike) the diaphragm.

II. What devices are described in the texts?

1. The device consists of coils, a magnet, and a diaphragm. These parts of the device are housed in a plastic cap. When a variable current passes through the magnet's coils is changes the position of the diaphragm. The diaphragm begins to oscillate.
2. One device serves as both transmitter and receiver.

Sound waves strike the diaphragm and cause it to vibrate. These vibrations change the magnetic field. Electric waves of varying voltage are induced. Changes induced in the magnetic field cause the diaphragm to reproduce the original sound.

III. a) Give the proper attributes to the nouns. b) Give nouns to the attributes:

Model: transmission equipment  
Nouns: housing, problem, frequency, coil

Model: considerable number

Attributes: variable, transmitting, simple, auxiliary

IV. Give as many attributes as possible to the words: current, frequency, position.

V. Answer the following questions:

1. What was the construction of the first telephone?
2. When was the telephone invented?
3. Can pictures be transmitted by telephone?
4. What elements does the projector unit consist of?

## Chapter IV RADIO

Chapter IV deals with radio, its construction, and its use.

### § 1. Radio Communication

I. Practise the following words from the text:

amplifier [ˈæmplɪfɪə] усиливатель	to differ (from) [ˈdɪfə] отли-
transfer [ˈtrænsfɜː] передача	чаться (от)
reception [rɪˈsepʃn] прием	since [sɪns] так как
range [reɪndʒ] диапазон	
speed скорость	antenna [ænˈtenə]
space пространство	component [kəmˈpəʊnɪnt]
tube [tuːb] лампа	program [ˈprəʊɡræm]
necessary [ˈnesəsəri] необходимый	process [ˈprəʊses]
to travel [trævl] путешество-	demodulate [dɪˈmɒdjuleɪt]
вать	

II. Read and translate these word combinations:

1. high frequency; 2. high frequency energy; 3. signal transmission; 4. low speed; 5. low frequency energy; 6. radio frequency energy; 7. transmitting range; 8. necessary components; 9. radio receiver; 10. bad reception; 11. transmitting antenna; 12. radio amplifier; 13. oscillatory circuits; 14. speed of sound; 15. wave direction; 16. vibration number; 17. wave components; 18. wave modulation

III. Build word combinations from the words given below:

Model: energy, high-frequency—high-frequency energy  
What? energy, process, component, part, tube, range, speed, direction

What kind of? high-frequency, radio-communication, necessary, main, electron, transmitting, high, different

IV. Read and translate the following sentences:

1. The necessary components of a transmitter are: a high-frequency oscillator, an amplifier, and electron tubes.
2. Electron tubes...
  - amplify currents.
  - give greater transmitting range.
  - give better reception.
3. A receiver...
  - receives high-frequency energy.
  - demodulates it.

4. Radio waves...
  - travel through space.
  - differ from other wave forms.
  - travel at high speed.
  - travel in different directions.

V. a) Read and translate the questions. b) Read the text. c) Find answers to the questions in the text:

1. Which device produces high-frequency energy?
2. Which device receives radio waves? 3. What are the necessary components of radio? 4. What are the necessary parts of a transmitter? 5. What components increase the transmitting range? 6. What device sends out waves in different directions?

### TEXT

Radio communication is the transfer of high-frequency energy from the transmitter to the receiver without wires.

Radio is a device that transmits and receives signals and programs by electromagnetic waves. Since the process of radio communication includes transmission and reception of signals, the necessary components of radio are a transmitter and a receiver.

The transmitter is a device that produces radio-frequency energy. The main parts of a transmitter are a high-frequency oscillator including an oscillatory circuit and one or more amplifiers.

In modern transmission electron tubes are used to amplify currents and give greater transmitting range and better reception.

The receiver is a device that receives waves sent out by a transmitter. Radio receiver demodulates these waves and they are heard as speech, music, or signals.

Electric oscillations are produced in the antenna of the transmitter. They travel in all directions.

Radio waves are electric waves of very high-frequency; they travel through space at the speed of light. They differ from other wave forms only in frequency (number of vibrations per second). Fig. 8 shows waves being sent out in all directions from a transmitting antenna.

VI. Give the English equivalents of the Russian words given in brackets:

1. Each device has some (необходимые части) and some (вспомогательные части). 2. Radio waves travel in

(всех направлениях). 3. Radio waves travel through (пространство). 4. (Электронные лампы) amplify currents.

## § 2. Crystal Radio Set

I. Practise the following words from the text:

rectifier [ˈrɛktɪfəɪə]	выпрямитель	to rectify [ˈrɛktɪfəɪə]	вы-
audio [ˈɔːdiəʊ]	звуковой, низ-	прямлять	
кии		the ... the чем ... тем	
alternating [ˈɔːlɪtəːnɪŋ]	пере-	amplitude [ˈæmpɪtɪtʃuːd]	
менный		crystal [ˈkrɪstl]	
to establish [sɪˈæblɪʃ]	устанав-	station [ˈsteɪʃn]	
ливать		operation [ˌɔːpəˈreɪʃn]	
in order to для того чтобы			

II. Read and translate these word combinations:

1. crystal radio set; 2. alternating current; 3. rectified current; 4. audio frequency rectified current; 5. oscillatory circuit; 6. audio frequency; 7. constant amplitude signal; 8. radio set operation

III. Translate the following sentences:

1. Current in the rectifier...  
 — is not an alternating current.  
 — is rectified current.  
 — is audio frequency rectified current.

2. An alternating current...  
 — should be rectified.  
 — is established in the microphone.

3. In order to produce oscillations an oscillatory circuit is used.

4. The more energy is received by a radio set, the better its operation is.

IV. Build word combinations from the words given below:

Model: radio set, crystal—crystal radio set  
 current, alternating—alternating current

What? current, circuit, frequency, signal  
 What kind of? rectified, audio frequency rectified, oscillatory, audio, constant amplitude

V. a) Read and translate the questions. b) Read and translate the text. c) Find answers to the questions in the text:

1. What kind of current is established in the microphone and antenna circuits? 2. What kind of current

cannot pass through the telephone coils? 3. What kind of current passes through the telephone and produces oscillations? 4. What device sends out a constant amplitude signal? 5. What device should be connected to the circuit in order to reproduce the transmitted sounds? 6. By what means is the antenna grounded? 7. By what means is the transmitted sound reproduced?

## TEXT

Radio waves start travelling when a transmitter sends out a constant amplitude signal at a very high frequency. Radio waves are travelling but the transmitter makes no sound.

A microphone is connected to the circuit of the transmitting antenna (Fig. 8). When we speak into the microphone its resistance varies with the audio frequency. An alternating current is established in the microphone and antenna circuits and its frequency is the same as the audio frequency. Oscillations of the same frequency are induced in the antenna and the oscillatory circuit of a receiver. These oscillations are in fact a high-frequency current.

In order to reproduce the transmitted sound, this current modulated by audio frequency should be sent through a telephone. The high-frequency alternating current cannot pass through the telephone coils.

In order to reproduce the transmitted sounds, a detector or rectifier should be connected to the telephone circuit. It passes the current only in one direction. Therefore, the current in the rectifier and telephone circuits will not be alternating current but rectified current.

The audio frequency rectified current passes through the telephone and produces oscillations. These oscillations will reproduce the sounds produced at the transmitting station.

The device called a crystal radio set uses the energy induced in the receiving antenna. Its operation will be

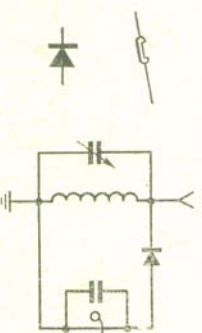


Fig. 8. Crystal radio set

the better, the more energy is received by its oscillatory circuit. The oscillatory circuit is also provided with a ground. It is important for good operation of the receiver. The antenna should be grounded by means of a switch.

VI. Give the English equivalents of the Russian words given in brackets:

1. (Переменный ток) is established in the microphone.
2. (Для того чтобы) reproduce the transmitted sounds, a rectifier is used.
3. An alternating current frequency is the same as the (звуковая) frequency.
4. An audio frequency rectified current (устанавливается) in the device.
5. (Чем) more complex the construction of a radio set (тем) better it operates.

### § 3. High-Frequency Current

I. Practise the following words from the text:

area [ˈeəriə] пространство, площадь	to charge зарядить
charge [tʃɑ:dʒ] заряд	to consider [kənˈsɪdə] рассмотреть
capacitance [kəˈpæsɪtəns] емкость	to flow [fləʊ] течь, проходить
plate пластинка	to store [stɔː] накапливать, запасать
'positive положительный	to range достигать, простираться
'negative отрицательный	ся
'movable [ˈmɔːvəbl] подвижный	idea [aɪˈdiə]
'stationary неподвижный, постоянный	cycle ['saɪkl]

II. Read and translate these word combinations:

1. sound oscillations; 2. charged capacitors; 3. metal plate; 4. stationary plates; 5. power source; 6. variable capacitor; 7. positive charges; 8. movable plates; 9. alternating current

III. Translate the following sentences:

1. The smaller the area of the plates the less the capacitance.
2. The simpler the construction of an apparatus the simpler its operation.
3. The greater the number of plates the higher the capacitance.

4. A charged capacitor...

— is a power source.

— has a potential difference across its plates.

— stores electric energy.

5. Alternating current frequency...

— ranges from hundreds to millions of cycles per second.

6. A capacitor with stationary plates and movable plates is called a variable capacitor.
7. The plates of a capacitor are charged positively and negatively; the greater the area of the plates the greater is the capacitance.
8. Current flows through a wire connecting the plates of a charged capacitor.

IV. Build word combinations from the words given below:

Model: plate, metal—metal plate

What? source, plates, charge

What kind of? power, movable, stationary, positive, negative

V. a) Read and translate the questions. b) Read the text. c) Find answers to the questions in the text:

1. How are currents with frequencies of millions of cycles per second called? 2. How is a device storing electric charges called? 3. How is the property to store electric energy called? 4. How is a capacitor with stationary and movable plates called? 5. Why is a charged capacitor a power source? 6. Why does an electric field appear between positive and negative plates of a capacitor?

### TEXT

During sound transmission, current flowing in telephone wires changes with the frequency of sound oscillations. The frequency of sound oscillations ranges from 50 to 10,000 cycles. The currents of these frequencies are called audio or low-frequency currents.

Radio transmission is based on the use of alternating currents with frequencies of hundreds, thousands, and even millions of cycles per second. These currents called high-frequency currents, are produced by means of an oscillatory circuit. This circuit consists of a coil and a capacitor.

In order to have a general idea about electric oscillations in an oscillatory circuit, let us consider a capacitor. Capacitor is a device in which electric charges are stored. A simple capacitor consists of two metal plates separated by an insulator. When one of the plates is



charged positively and the other negatively, an electric field appears between them.

A charged capacitor is a power source, since there is a potential difference across its plates. If the plates of a charged capacitor are connected by a wire, a current will flow in it for some time.

The property of a capacitor to store electric energy is called its electric capacitance or capacitance. It is the greater, the greater the area of its plates and the closer they are to each other.

Variable capacitors are used when the capacitance of a capacitor connected to the circuit should be changed. A variable capacitor consists of a system of stationary and movable plates. When the capacity is changed, movable plates enter the spaces between the plates or leave them increasing the capacitance of the device or decreasing it.

VI. Give the English equivalents of the Russian words given in brackets:

1. (Переменные) capacitors consist of stationary plates and movable plates. 2. Current (протекает) through this circuit only in one direction. 3. A capacitor (накапливает) electric charges. 4. The plates of a capacitor are charged (положительно и отрицательно).

#### § 4. Texts for Reading and Translation

I. Read the texts and translate them using a dictionary:

1

When electric oscillations are produced in the antenna it begins radiating radio waves, which travel in all directions.

These radio waves induce in the antenna of a receiver oscillations of the same frequency as those in the antenna of the transmitter.

The antenna receives only a small part of energy produced by the transmitter, but the oscillations produced in the antenna can be amplified. They are amplified if an oscillatory circuit is connected to the antenna circuit. Its coil and capacitor should be selected so that the circuit is tuned to the transmitter. Oscillations are amplified by the receiving oscillator circuit. The receiving cir-

cuit is tuned to the frequency of the transmitter by means of a variable capacitor.

There are many transmitting stations in the world nowadays. They all operate simultaneously, but their waves differ in frequency. By tuning a radio set to a definite frequency one can hear the necessary radio station.

2

High-frequency oscillators are part of every transmitting radio station.

A high-frequency oscillator is an oscillatory circuit of a device for producing high-frequency current. It also includes electronic tubes which replenish energy in oscillatory circuits. Oscillations in a circuit are very rapid if the capacitance is small. A high-frequency circuit is established in the oscillatory circuit, the frequency of which depends on the capacitance of the capacitor, on the number of turns and the size of the coil. The greater the number of turns, the greater the capacitance and the smaller the frequency of the capacitor. The frequency of oscillations can be changed by using a variable capacitor in the circuit.

II. What are the texts about? Give titles to them.

#### § 5. From the History of Radio Invention

I. Practise the following words from the text:

scientist [ˈsaiəntɪst]	ученый	to invent [ɪnˈvent]	изобретать
discharge [dɪʒɑːdʒ]	разряд	nowadays [ˈnaʊədəz]	(в) наше время
way [weɪ]	путь, способ	Russia [ˈrʌʃə]	
ray [reɪ]	луч	code [kəʊd]	код
the very sameɪ, тот самый		'hint	подсказка
to find, found, found	нахо- дить	radius — radii	

II. Read and translate these word combinations:

1. way of receiving; 2. way of transmitting; 3. Morse code signals; 4. world's first receiver; 5. the very first radio set; 6. the very first invention; 7. meetings of scientists; 8. world's first wireless telegram; 9. range of reception

### III. Translate the following sentences:

1. A. Popov, the great Russian scientist...
  - invented the radio.
  - demonstrated a device called a storm indicator.
  - found a way of transmitting Morse code signals.
  - sent the very first world's wireless telegram.
2. Radio waves travel along radii, as rays of light do.

### IV. a) Read and translate the questions. b) Read the text. c) Find answers to these questions in the text:

1. What device did A. Popov invent? 2. What device did A. Popov demonstrate? 3. When was the radio invented? 4. When was the world's first wireless telegram sent? 5. When was a storm indicator demonstrated to a group of scientists?

### TEXT

Radio was invented in Russia. The world's first receiver was built in 1895 by the great Russian scientist Alexander Popov. There were no transmitters then, therefore his receiver could only pick up signals produced by lightning discharges during a thunder-storm. Popov demonstrated a device called a storm indicator at a meeting of scientists in St. Petersburg on May 7, 1895. This day is marked now as Radio Day.

Soon Alexander Popov found a way of transmitting Morse code signals. In 1896 he sent the world's first wireless telegram over a distance of 250 m, and four years later the range of transmission was increased to 50 km. Ever since, thanks to the work of many scientists of the world, the methods of transmission and reception have been constantly improved. Nowadays radio communication has no limits.

The very first apparatus for radio communications was called wireless telegraph or wireless telephone. Later a shorter word "radio" (from Latin "radius"—ray) was taken. The word is used because electromagnetic or radio waves travel from a radio station along radii, just as rays of light at the speed of 300,000 km/sec.

### V. Read and translate the text using a dictionary:

### Radio Today

Radio is a special kind of long-distance electrical communications. It makes possible to send different signals such as dots and dashes of the Morse code (radio-telegraphy), speech and music (radio telephony), images of objects and films (television). Radio helps us to maintain contact with ships, with aircraft in flight or a spacecraft. Radio helps us to detect an aircraft flying high above the clouds (radio location, or radar) and measure the distance to it.

The Soviet space stations photographed, on a command transmitted by radio from the Earth, the hidden side of the Moon and sent its pictures back to the Earth.

Daily radio programmes include lectures, reports, and concerts. Radio is a powerful means of spreading knowledge.

### VI. Give the English equivalents of the Russian words given in brackets:

1. Meetings of (ученья) take place every year. 2. Radio was a great (исобретение). 3. (Диалазон) of transmission is constantly increasing. 4. (Лучи) of light travel at the (скорость) of 300,000 km/sec. 5. (Самый) first radio set was invented in Russia.

### TEST EXERCISES

#### 1. Choose the proper words and word combinations. Translate the sentences into Russian:

1. Radio communication is the transfer of (low-frequency energy, high-frequency energy).
2. The (main, auxiliary) components of a radio set are a transmitter and a receiver.
3. Electron tubes are used (to decrease, to increase) transmitting range.
4. Electric oscillations travel (in all directions, in one direction).
5. Radio waves differ from other waves in (frequency, speed).
6. The frequency of sound oscillations (ranges, changes) from 50 to 10,000 c/s.
7. Currents with frequency of thousands of cycles are called (low-frequency, high-frequency) currents.
8. In a capacitor electric charges are (generated, stored).
9. Metal plates in a capacitor are (separated, connected) by an insulator.
10. The capacitance of a capacitor is the greater (the smaller the area of its plates is, the greater

The area of its plates is). 11. Variable capacitors are used when the capacitance should be (changed, constant). 12. Crystal radio set is a (complex, simple) device. 13. A (rectified, alternating) current is established in the microphone. 14. A transmitter sends out a (variable amplitude signal, constant amplitude signal) at a (high, low) frequency. 15. The (less, more) energy is received by the oscillatory circuit, the (worse, better) is the radio set operation.

## II. What device is described?

It consists of metal plates separated by an insulator. Electric charges are stored in it. The greater the area of the plates the more charges it stores.

III. a) Give the proper attributes to the nouns. b) Give nouns to the attributes:

*Nouns:* range, direction, circuit, plates, capacitor

*Attributes:* low-frequency, audio frequency, positive, long-distance, the very first

IV. Give as many nouns as possible to the attributes: variable, low, modern.

## V. Answer the following questions:

1. Which device produces radio frequency energy?
2. In what do radio waves differ from other waves?
3. What is the function of an antenna? 4. How was the first radio set called?

## Chapter V TELEVISION

Chapter V deals with television. You will read about black-and-white (monochromatic) television and colour television.

### § 1. Television System

#### I. Practise the following words from the text:

aerial ['æəriəl] антенна	to accompany [ə'kæmpni] сопровождать
channel ['tʃæniəl] канал	to employ [ɪm'plɔɪ] использовать
carrier ['kæəriə] несущая	вать, употребить
image ['ɪmɪdʒ] изображение,	
образ	
separate ['seprɪt] отдельный	television [ˌtelɪ'vɪʒn]
simultaneous [ˌsɪmltə'neɪs]	camera ['kæmərə]
одновременный	impulse ['ɪmpʌls]
proper ['prɒpə] соответствующий	

## II. Read and translate these word combinations:

1. sound channel; 2. picture channel; 3. television system; 4. optical image; 5. video amplifier; 6. picture carrier; 7. high-frequency carrier; 8. frequency modulated transmitter; 9. low-frequency carrier; 10. video-frequency carrier; 11. proper amplification

## III. Translate the following sentences:

1. In a television system...
  - two transmitters are employed.
  - the sound accompanies the image.
  - optical image is converted into impulses.
  - proper amplification is necessary.
2. The video signal...
  - modulates the high-frequency carrier.
  - is radiated into space.
  - is radiated by the aerial.
3. The video amplifier amplifies electrical impulses.
4. The sound transmitter is frequency-modulated. This frequency-modulated sound transmitter is in use.
5. The picture carrier is amplitude-modulated. This amplitude-modulated picture carrier is in use.

IV. a) Read the questions. b) Read the text. c) Find answers to these questions in the text:

1. What transmitters are employed in a television system? 2. What transmitter transmits the sound? 3. What accompanies the image? 4. What part of the system converts the optical image into electrical impulses? 5. What part of the system amplifies electrical impulses? 6. By what element of the system is the video signal radiated into space?

## TEXT

In a television system two separate transmitters are employed—one for the sound channel and the other for the picture channel. The sound transmitter is frequency-modulated and simultaneously transmits the sound which accompanies the image. Each transmitter has its own antenna.

The image being televised is received by the television camera, which converts electrical impulses into optical impulses. These electrical impulses are amplified by

the video or picture amplifier. After proper amplification, the video signal modulates the high-frequency carrier of the television transmitter and is radiated into space by the aerial. The picture carrier is amplitude-modulated.

V. Give the English equivalents of the Russian words given in brackets:

1. A television system (использует) a sound channel and a picture channel. 2. Optical (образ) is converted by the television camera. 3. The video signal modulates the high-frequency (несущая). 4. The picture and the sound are transmitted (одновременно).

VI. Read the text and translate it using a dictionary:

The antenna receives both the amplitude-modulated picture signals and the frequency-modulated sound signals that are transmitted on carriers. The carriers differ in frequency so that they may be separated in the receiver. The signals are passed to the radio frequency selector by means of which the necessary station is tuned in. The frequency-modulated signals of the sound channel and the amplitude-modulated signals of the video channel pass from the converter. These signals are amplified and separated by the circuit blocks. They reach the loudspeaker and the kinescope, respectively.

## § 2. Television System

(continued)

I. Practise the following words from the text:

stage каскад, ступень	to feed, fed, fed питать
band полоса	to correspond [/,kɔrɪs'pɒnd/]
loudspeaker [/'laʊd'spi:kə] гром- колонка	ответствовать
single единый, один	to synchronize [/'sɪŋkɹənaɪz/]
several несколько	characteristic [/,kærɪktɪ'stɪksɪk/]
intermediate [/'ɪntə'mi:diət] про- межуточный	special [speʃl]

II. Read and translate these word combinations:

1. video impulses; 2. video amplifier; 3. audio amplifier; 4. radio frequency stage; 5. detector output; 6. picture and audio signals; 7. picture and sound carrier; 8. high- and low-frequency signals; 9. separate intermediate frequency signals; 10. separate intermediate frequency amplifier channels

III. Compare the meanings of these word combinations:

1. superheterodyne conversion method—conversion method; 2. frequency signal—sound intermediate frequency signal; 3. wide band—wide-band frequency characteristics

IV. Read and translate the following sentences:

1. A television receiver includes tube circuits for receiving, amplifying, and synchronizing the signals. 2. A single antenna picks up the picture and audio signals. 3. Intermediate frequency signals correspond to the sound carrier and the video carrier. 4. Video signals appear in the output of the detector.

V. a) Read the questions. b) Read the text. c) Find answers to these questions in the text:

1. What kind of signals are picked up simultaneously by a single antenna? 2. What kind of carriers are converted by superheterodyne conversion method? 3. How many intermediate frequency amplifier channels are employed? 4. How many stages amplify the picture intermediate frequency signal? 5. When is the intermediate frequency signal demodulated? 6. Where is the video signal amplified?

## TEXT

The television transmitter sends out special signals. These signals are sent out in addition to the picture impulses. The signals synchronize the picture at the receiver with the picture picked up by the camera.

At the television receiver, the picture and audio signals are picked up simultaneously by a single antenna. The voltages induced in the receiving antenna are fed into the radio frequency stage of the receiver, and the picture carrier and the sound carrier are converted by superheterodyne conversion method into two separate intermediate frequency signals. One signal corresponds to the sound carrier and the other—to the video or picture carrier. Two separate intermediate frequency amplifier channels are employed, one for the picture signal and the other for the sound signal. The sound intermediate frequency signal is demodulated by a detector. After proper amplification by the audio amplifier, the sound signal is reproduced by the loudspeaker in the usual way.

The picture intermediate frequency signal is amplified by several stages having wide-band frequency characteristics and is then fed into the video (picture) detector, where the intermediate frequency signal is then demodulated. The video (picture) signal which appears in the output of the detector is then amplified in a video amplifier, which corresponds to the audio amplifier in a sound receiver. Only it must pass a much wider range of frequencies.

VI. Give the English equivalents of the Russian words given in brackets:

1. A (единная) антенна is used in the television receiver.
2. The picture (несущая) and the sound (несущая) are converted into two separate signals.
3. One of these signals (соответствующий) the video carrier.
4. The video signals (появляются) in the output of the detector.

VII. Read the text and translate it using a dictionary:

The television receiver includes tube circuits for receiving, amplifying, and synchronizing the signals, and a large cathode-ray tube called a kinescope. It converts the video impulses from the transmitting station into luminous spots on a fluorescent screen.

In the kinescope the amplified video signals are applied to the grid, and through it control the intensity of the electron beam.

### § 3. Colour Television

I. Practise the following words from the text:

beam луч	to choose, chose, chosen выбирать
grid сетка, решетка	to separate [ʹseparatʹ] отделять
gun трубка	respectively [rs'pektivʹ] соответственно
colour [ʹkɔlɔ] цвет	ответственно
density плотность	information [ʹinfɔ'meʹjɔn]
brightness яркость	diameter [daʹʂɪtɔr]
monochrome одноцветный	identical [aʹdentʹikɔl]
to react реагировать	intensity [ʹɪntensʹɪtʹ]
to contain [kɔn'teʹɪn]	содержать
в себе	

II. Read and translate these word combinations:

1. monochrome television;
2. colour information;
3. identical tubes;
4. beam density;
5. beam intensity;
6. red image components;
7. blue image components;
8. green image

picture components; 9. red light image; 10. blue image components; 11. green image picture components; 12. brightness information; 13. electron gun; 14. electron beam; 15. identical camera tubes; 16. beam intensity control; 17. red, green, and blue image components of a picture; 18. electron beam density; 19. identical colour camera tubes

III. Translate the following sentences:

1. Colour television contains... — brightness information and colour information. — identical camera tubes.
2. The output of the tubes reacts to the colour image.
3. An electron gun produces an electron beam.
4. The beam intensities are controlled by the voltage corresponding to the green, red, and blue components, respectively.

IV. a) Read and translate the questions. b) Read the text. c) Find answers to these questions in the text:

1. What basic components does colour transmission contain? 2. What images does a monochrome receiver receive? 3. What images does a colour receiver receive? 4. What components does an optical system separate in a colour camera? 5. How many components does an optical system concentrate? 6. How much is the diameter of an electron beam produced by an electron gun? 7. What component changes the electron beam density?

### TEXT

Colour television is the transmission and reception of images in full colour. The colour television system can produce programs both in colour on colour receivers and in black and white on monochrome receivers. Also, colour receivers receive monochrome pictures when they are being transmitted.

Colour transmission contains two basic components — brightness information, and colour information. Red, green, and blue are the colours that are chosen for colour television.

*Colour cameras.* In a colour camera an optical system separates the red, green, and blue image components of a picture and concentrates these three components in

separate but identical colour camera tubes. Thus, the output of one tube reacts to the red light image; another—to the green, and another—to the blue light image. *Colour kinescope.* In a monochrome kinescope a single electron gun produces an electron beam. The brightness is controlled by an electron grid, which changes the electron beam density.

In a colour kinescope three electron guns produce three electron beams which are synchronized. The intensities of beam are controlled by the voltage corresponding to the green, red and blue components respectively of the colour picture.

V. Give the English equivalents of the Russian words given in brackets:

1. Colour transmission (содержит) two basic components.
2. (Выход) of one tube reacts to the red light image.
3. The electron grid changes the electron beam (плотность).
4. An electron (пушка) produces an electron (луч).
5. The voltage (соответствует) the green, red and blue components of the colour picture.

#### § 4. Colour Television

(continued)

I. Practise the following words from the text:

selective [sɪ'lektɪv]	избиратель-	vertical [ˈvɜːtɪkl]
ный		horizontal [ˌhɒrɪ'zɒntl]
incoming	входящий	amplitude [ˌæmplɪ'tjuːd]

II. Read and translate these word combinations:

1. frequency selective circuits;
2. amplitude selective circuits;
3. frequency and amplitude selective circuits;
4. brightness components;
5. vertical beam-synchronizing components;
6. brightness and colour components;
7. horizontal and vertical beam-synchronizing components

III. Translate the following sentences:

1. The frequency and amplitude selective circuits...
  - receive the incoming signal.
  - separate the horizontal and vertical beam-synchronizing components.
2. The red, green, and blue signal voltage components...
  - are obtained.
  - are applied to the three respective electron guns.
  - combine with the brightness components voltage.

IV. a) Read and translate the questions. b) Read the text. c) Find answers to these questions in the text:

1. What circuits does the incoming signal go through?
2. What components are separated in the colour receiver?
3. What colour components are obtained in the receiver?
4. To what parts of the kinescope are these components applied?
5. With what component do they combine?

#### TEXT

In the colour receiver the incoming signal goes through frequency and amplitude selective circuits. In these circuits the brightness component, the colour component and the horizontal and vertical beam-synchronizing components are separated. The brightness component is applied simultaneously to each of the three electron guns. The red, green, and blue colour signal voltage components are obtained and are applied to the three respective kinescope electron guns. They combine with the brightness components voltage to produce beam intensities which reproduce the original picture.

#### § 5. A Dialogue about Colour Television

I. Practise the following words from the text:

consumption [kən'sʌmʃn]	по-	provided that при условии если
требление, расход		to require [rɪ'kwaɪə]
installation [ɪnstə'leɪʃn]	устрой-	to consume [kən'sju:m]
ство		треблять
interchangeable [ɪntə'ʧeɪndʒəbəl]		to tune [tju:n]
взаимозменяемый		since [sɪns]
providing that при условии если		с тех пор как
		to provide обеспечить

II. Read and translate these word combinations:

1. television transmitter;
2. colour television transmitter;
3. colour video information;
4. main parts;
5. auxiliary parts;
6. additional parts;
7. special parts;
8. monochrome television receivers;
9. television installation;
10. colour television receiver installation;
11. ultra-high-frequency station;
12. power consumption;
13. colour images;
14. monochrome images

1. a television screen; a television receiver picture tube screen
2. colour television; colour television signal

411. Translate the following sentences:

1. The colour television receiver installation...
  - requires more servicing than the monochrome television receiver installation.
  - consumes one and one-half times as much power as the monochrome television receiver installation.
  - has some components interchangeable with those of the monochrome television installation.
2. The colour television receiver installation reproduces monochrome transmissions provided that it is tuned to the frequency of the monochrome transmitter.

### A DIALOGUE

- Q:** Can colour television signal be transmitted over the same distances as monochrome pictures?
- A:** Yes, the radio-frequency carrier frequencies in colour television transmission are the same as in black-and-white transmission. Colour video information in the signal being transmitted does not change the operational characteristics of the television receiver.
- Q:** Does the colour television receiver require more servicing than the monochrome receiver?
- A:** Yes. There are more tubes and a great many more components used in the colour television receiver. The greater the number of components the better the operational characteristics of the device. This is true of any device with a greater number of parts than another of identical character.
- Q:** Can monochrome television receivers be converted to receive colour broadcasts?
- A:** Practically speaking no. To convert a black-and-white receiver would require many special components since the colour tube and its auxiliary parts are very special. A special chassis for the additional parts would be necessary, plus additional tubes for the colour circuits plus 100 or so components.
- Q:** Does the colour television receiver consume more electrical power than the black-and-white receiver?
- A:** Yes, about one and one-half times as much power. It is logical that it should consume more electrical power because it contains more receiving tubes and cir-

cuits. The power consumption of a colour television receiver is between 300 and 400 watts, with from 150 to 250 watts consumption for a black-and-white unit. Colour images have some advantages which monochrome images do not have.

**Q:** Does a colour TV receiver require a special antenna or other elements as a part of the installation?

**A:** No. The colour television receiver parts are interchangeable with these of the monochrome television receiver installation now in use. The antenna used with a monochrome television receiver will be usable with the colour receiver, providing that the station or stations transmitting colour programs are the same as those which are transmitting monochrome pictures. If the colour receiver is to be used for the reception of a colour transmission from an ultra-high-frequency station and the monochrome receiver is to be used to receive programs from a very high-frequency station, an ultra-high-frequency antenna will be required. There are no such things as antennas specially designed for colour television reception.

**Q:** Does the colour television receiver reproduce monochrome transmissions?

**A:** Yes, it does provided that the colour television receiver is tuned to the frequency of the monochrome transmitter.

**Q:** Is the colour receiver more complicated for operation than the black-and-white receiver?

**A:** Yes. The colour receiver is much more complicated for operation than the black-and-white receiver.

IV. a) Read and translate the text using a dictionary. b) Find the answers to the following questions in the text:

1. Why may the cathode-ray tube be called a picture tube?
2. What are the main parts of the cathode tube?

### Picture-Reproducing Part

The picture-reproducing device is a cathode-ray tube, similar to the ordinary cathode-ray tube used in oscilloscopes. The cathode-ray tube may be called a picture tube, because the pictures are reproduced on the face of this tube. Without going into detail, we shall assume that it consists of a glass envelope, a source of electrons which