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Московской области
«Авиационный техникум имени В.А. Казакова»



Цикловая комиссия общеобразовательных и
естественнонаучных дисциплин

УЧЕБНО – ПРАКТИЧЕСКОЕ ПОСОБИЕ
Сборник текстов для чтения по радиотехнике
с лекенко-грамматическим сопровождением.

по дисциплине «Иностранный язык»

для студентов 2 курса

специальности 11.02.01 Радиоаппаратостроение

РАССМОТРЕНО
на заседании предметно-цикловой
комиссии общеобразовательных и
естественнонаучных дисциплин

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Протокол № 11

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Цикловая комиссия общеобразовательных и естественнонаучных
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Введение

Данное пособие предназначено для студентов второго курса специальности «Радиоаппаратостроение».

Целью пособия является развитие у студентов навыков чтения и понимания научно-технической литературы на материале текстов научно-популярного характера и подготовка студентов к чтению и пониманию оригинальной технической литературы по специальности на 2 - 4 курсах. Также пособие ставит задачу развить у студентов необходимые навыки устного общения на английском языке в объёме материала, предусмотренного программой. С этой целью даны разнообразные упражнения лексического и грамматического характера.

Пособие состоит из 10 уроков. Каждый урок включает в себя основной текст (А) и дополнительный (В).

На базе текста А разработаны предтекстовые и послетекстовые упражнения, даны технические термины, встречающиеся в тексте и их перевод на русский язык. Послетекстовые упражнения ставят цель снять лексико-грамматические трудности при чтении текста.

Текст В предназначен для чтения и перевода на русский язык и для краткой передачи содержания текста на английском языке.

Кроме того, в конце каждого урока студентам предлагается тема для обсуждения проблем, рассмотренных в текстах А и В.

Тексты составлены на основе оригинальной английской и американской научно-технической литературы.

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UNIT I PIONEERS OF RADIO

Text A Scientists and Businessmen

Pre-text exercises

Exercise 1. Read the following words and try to remember them

alternator - генератор переменного тока

alternating-current machinery - машины переменного тока

amateur (“ham”) radio – любительское радио

amplify - усиливать (электрический сигнал, звук)

asset- ['æset] - имущество

call handoff and frequency reuse –передача вызова и повторное использование частоты

carrier pigeon - ['kæriə 'pi:dʒɪn] почтовый голубь

cellular phone - сотовый телефон, мобильный телефон

chief scientist - руководитель исследовательских и опытных

подразделений; руководитель исследовательских работ

coil - катушка

competitor- [kəm'petitə] - конкурент

continuous-wave transmitter- передатчик непрерывной волны

develop - разрабатывать

dynamo ['daɪnəməʊ] - динамомашинa, генератор

Learn abbreviations

AM *om amplitude modulation* - амплитудная модуляция

AT&T Inc. (*American Wireless Telephone and Telegraph*) - американский транснациональный телекоммуникационный конгломерат

CDMA (*Code Division Multiple Access, a generic term denoting a wireless interface based on code division multiple access technology*) – сеть CDMA, многостанционный доступ с кодовым разделением каналов, МДКР

FCC (*Federal Communication Commission*) - Федеральная комиссия связи

FM *om frequency modulation* - частотная модуляция

GHz *om Giga Hertz* - гигагерц

MA *om Massachusetts* [ˌmæsə'tʃu:sɪts] – Массачусетс

PCS *om personal communication service* - персональная служба связи (США)

QUALCOMM - компания по разработке и исследованию беспроводных средств связи, расположенная в Сан-Диего, Калифорния, США.

WWI (*stands for World War I*) - Первая мировая война

electrical engineer - инженер-электрик

emergency assistance - неотложная помощь, срочная помощь

establish - установить, создать

heterodyne ['het(ə)rəʊdaɪn] – гетеродинный

high-vacuum television receiver tube – высоковакуумная электронная трубка

induction coil - индукционная катушка, индуктор

inventor- изобретатель

lab - лаборатория

navies – военно-морские силы (ВМС)

open-core transformer - трансформатор с незамкнутым сердечником

originally - первоначально, сначала

parentage - ['peərəntɪdʒ] происхождение

power grid - единая энергосистема

prove - доказывать

reallocate -перераспределять

receive - получать

regenerative circuit- регенеративная цепь

reliable- надежный

success - успех, достижение

transmitt- передавать

MIND!

early - ранний

in the early 1980s – в начале 80-х

early in the year — в начале года

as early as - еще

at the turn of – в конце

original-originally - истинный; настоящий, подлинный; оригинальный / первоначально, изначально; сначала

wide – widely - широкий, обширный, большой / в значительной степени, широко

widely used; widely considered

virtual - virtually - возможный, виртуальный, воображаемый / фактически, практически, в сущности; поистине

wireless - wirelessly - радио, радиосвязь; радиовещание, беспроводной, беспроводный / беспроводным способом

like - likely - аналогичный, подобный, вероятный, возможный / вероятно

Exercise 2. Read the text and try to understand all details.

If success has many fathers, then radio is one of the world's greatest successes. Perhaps one simple way to sort out this multiple **parentage** is to place those who have been given credit for “fathering” radio into groups.

The Scientists:

Henirich Hertz— was the first German physicist, who **proved** that you could **transmit** and **receive** electric waves wirelessly. Although Hertz **originally** thought his work had no practical use, today it is recognized as the fundamental building block of radio and every frequency measurement is named after him (the Hertz).

Nikola Tesla—was a Serbian-American **inventor** who discovered the basis for most **alternating-current machinery**. In 1884, a year after coming to the United States he sold the patent rights for his system of alternating current dynamos, transformers, and motors to George Westinghouse. He then **established** his own **lab** where he invented, among other things, the Tesla coil, an induction coil widely used in radio.

Ernst Alexanderson—born in Sweden, this remarkable inventor developed the first alternator to make transmission of speech (as opposed to the dots and dashes of telegraphs) possible. It is said that this holder of 344 patents “virtually invented everything General Electric did in the field of **AM, FM**, and TV.”

Reginald Fessenden—this Canadian spent much of his working life in the U.S. where he **developed** a way to combine sound and radio carrier waves. His first effort to transmit this mixed signal— to a receiver where the carrier wave would be removed and the listener could hear the original sound— failed. However, in 1906, using Alexanderson's Alternator, Fessenden made the first long range transmission of voice from Brant Rock, MA.

Edwin Armstrong—this WWI Army officer, Columbia University engineering professor, and creator of FM radio invented the **regenerative circuit**, the first amplifying receiver and **reliable continuous-wave transmitter**; and the super **heterodyne circuit**, a means of receiving, converting and amplifying weak, high-frequency electromagnetic waves. His inventions are considered by many to provide the foundation for **cellular phones**.

The Businessmen:

Guglielmo Marconi—this Italian creator spent most of his working life in England where he introduced many of the first uses of wireless telegraphy to European navies. His radio apparatus is widely considered to be the reason that over 700 people survived the Titanic disaster in 1912— instead of dying as they likely would have if ships at sea were still using **carrier pigeons** to communicate over great distances.

Lee DeForest—credited with being the “father of American radio.” DeForest was a direct **competitor** to Marconi at the turn of the century (1899), when he was the **chief scientist** at the U.S.’s first radio firm—American Wireless Telephone and Telegraph—until Marconi took over the company’s **assets** in 1912 after a series of financial scandals. Although he held 300 patents, DeForest’s greatest technological contribution is considered to be his 1906 “Audion” vacuum tube.

GENERAL RADIO TIMELINE

1885	Heinrich Hertz proved that electricity can be transmitted in waves. He conducted experiments electromagnetic in sending and receiving these waves during the late 1880s.
1885	Alexander Popov , a professor of physics, announced the invention of a system for wireless communications at a lecture at St Petersburg University in April 1885 and displayed the world’s first radio set. He was unable to publish his work though because he worked for a military institution. Italian Guglielmo Marconi conducted similar experiments at about the same time – his article was published in 1897. Unlike Popov’s, Marconi’s invention was commercialised fast, so they still argue in the West over who invented radio first.
mid-1870s	You cannot have a power grid without transformers. Transformers were invented, built and put into operation by Russian electrical engineer Pavel Yablochkov and physicist Ivan Usagin . It was Yablochkov who produced the “distribution of light” in the mid-1870s. The invention, which consisted of a transformer and condenser, was displayed in Paris and St Petersburg and, as early as 1882, the open-core transformer was patented in France by inventors Lucien Gaulard and Josiah Willard Gibbs.
1891	Radios (what we’d call ‘wireless telegraphs’ today) began to appear on ships at sea. This reduced the isolation of the ships thus improving both reliability and safety.
1892 to 1893	Nikola Tesla wirelessly transmitted electromagnetic energy. He made the first public

	demonstration of radio in St. Louis in 1893.
1896 to 1897	Guglielmo Marconi filed for patent protection of his radio apparatus. He established the Wireless Telegraph and Signal Company in 1897.
1899	The R.F. Matthews was the first ship to request emergency assistance wireless apparatus using a (Marconi's system).
1901	First transatlantic signal sent by Marconi from Ireland to Canada.
1902	Amateur (today known as " ham ") radio introduced to the U.S. via a <i>Scientific American</i> article on "How to Construct an Efficient Wireless Telegraphy Apparatus at Small Cost."
1906	Reginald Fessenden is the 1 st to transmit a program of speech and music.
1906	Lee DeForest produces the "Audion," a triode vacuum tube that allowed for amplification of radio signals.
1910	First radio transmission from an airplane.
1912	Federal regulation of American airwaves begins. Amateurs ['æmətə] had to be licensed; ships had to have a radio and trained operators.
1917	All U.S. radio stations not needed by the government are closed as WWI begins.
1918	Edwin Armstrong patented the Super Heterodyne Receiver <i>радиоприёмник с гетеродинамированием</i> based on work he did as an officer in the Army Signal Corps. [кэ:] <i>войска связи</i>
1923	Vladimir Zworykin was another Russian engineer whose inventions debuted in the United States. He came up with the main invention of the 20th century – electronic television. He applied for a television patent in the US in 1923. Six years later, he developed the kinescope, a high-vacuum television receiver tube , and two years later, he created the first transmitting device, which he called an iconoscope.
1927	The Federal Radio Commission <i>Федеральная комиссия по делам радиовещания</i> established to bring order <i>упорядочить</i> to chaotic [ker'ətik] airwaves.
1947	Cellular radio telephony <i>сотовая система радиосвязи</i> , with call handoff <i>переключение вызова</i> and frequency reuse <i>повторное использование частоты</i> , was conceived at Bell Laboratories.
1970	The FCC reallocated TV channels 70-83 for mobile radio services <i>мобильная радиослужба</i> .
1985	The FCC permitted spread spectrum <i>широкополосный спектр</i> , the technology of choice for many of today's digital, commercial cellular and PCS services.
1992	The FCC reallocated <i>перераспределять</i> spectrum <i>диапазон</i> at 2 GHz for emerging digital mobile services.
1995	The first cellular system using digital CDMA technology was commercially launched by QUALCOMM .

Post-text exercises

Exercise 3. Give Russian equivalents of the following words and word-combinations.

alternating current dynamos, transformers, and motors; electric waves, frequency measurement, alternating-current machinery, inventor, patent rights, induction coil, to combine sound and radio carrier waves, the first amplifying receiver, the first long range transmission of voice, high-frequency electromagnetic waves, European navies, contribution, vacuum tube, reliability and safety, amplification of radio signals, Federal regulation, airwaves, call handoff and frequency reuse, permitted spread spectrum, reallocate

Exercise 4. Find the English equivalents of the following words and word-combinations in the text.

передавать и принимать электрические волны, машины переменного тока, регенеративная цепь, надежный, перераспределять, передатчик непрерывной волны, мобильный телефон, почтовый голубь, беспроводной телеграф, был прямым конкурентом, радиослушатель мог услышать, электронная лампа, основа для сотовых телефонов, запатентовал, радиоприемник, первый генератор переменного тока, проводил эксперименты, конкурент, имущество

Exercise 5. Put 8 questions to the text.

Exercise 6. Read in English the following years:

1885, 1891, 1893, 1903, 1906, 1912, 1999, 1970, 1925, 1936, 2000, 2006, 2018, 2012, 1884

Exercise 7. Translate the 2nd and 3rd paragraphs of the text.

Exercise 8. Define whether the following statements are true or false and correct the false ones.

1. Ernst Alexanderson—born in Norway, this remarkable inventor improved the first alternator to make receiving of speech (as opposed to the dots and dashes of telegraphs) possible.
2. It is said that this holder of 344 patents “virtually invented everything General Electric did in the field of AM, FM, and TV.”
3. Reginald Fessenden spent much of his working life in England where he developed a way to combine sound and radio carrier waves.
4. His first effort to transmit this mixed signal— to a receiver where the carrier wave would be removed and the listener could hear the original sound— was successful.
5. DeForest was a direct competitor to A.S. Popov.

Exercise 9. Match the names of inventors with their inventions:

1. Henirich Hertz	a. introduced many of the first uses of wireless telegraphy to European navies.
2. Nikola Tesla	b. is considered to be the inventor of the “Audion” vacuum tube.
3. Nikola Tesla	c. developed the first alternator to make transmission of speech (as opposed to the dots and dashes of telegraphs) possible.
4. Ernst Alexanderson	d. was the first to prove that you could transmit and receive electric waves wirelessly.
5. Edwin Armstrong	e. was the first to demonstrate a radio receiver on May 7th and a wireless telegraphy by sending a radiogram on March 24th 1896.
6. Guglielmo Marconi	f. invented, among other things, an induction coil widely used in radio. (reduction, simulation, provocation)
7. Lee DeForest	g. is a creator of FM radio and his inventions are considered to provide the foundation for cellular phones.
8. Alexander Popov	h. discovered the basis for most alternating-current machinery.

Exercise 10. Write a summary of the text.

Text B. Radio at Work

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

aerial - антенна

broadcasting – радиовещание, трансляция

communication – связь

efficient [ɪ'fɪʃ(ə)nt] - действенный,

результативный, эффективный

effective [ɪ'fektɪv] - действенный,

результативный, эффективный

innovative – нетрадиционный,

нестандартный, прогрессивный

interoperability – совместимость

maritime, aviation, and land-based mobile

radio systems – морские, авиационные и

наземные мобильные радиосистемы

nonbroadcast – нешироковещательный

ocean-going ships - океанский лайнер

official – представитель, официальный

представитель

on behalf of от чьего-л. имени (лица), по

чьему-л. поручению

package delivery services – служба доставки

public safety – общественная безопасность

radar – радар, РЛС

radio beacons – радиомаяк

radio equipped vehicles -

радиофицированный автомобиль

radio spectrum - радиочастотный спектр,

tow truck – эвакуатор

underpin- поддерживать

Exercise 2. Study the text and try to understand it

There are hundreds, if not thousands, of uses of **radio spectrum** and technology. Everything from baby monitors and **broadcasting** to **radar** and **radio beacons** are

applications of radio. This text focuses on the first historical use of radio—mobile radio.

Technologies that **underpin** mobile radio were first put to work in the 1890s **on behalf of oceangoing ships**, which had previously relied on carrier pigeons and flags for their **communications**.

In 1910, Frederick Baldwin and John McCurdy were the first **to trail an antenna** behind their biplane [ˈbaɪplæn] to demonstrate radio's uses for aviation.

In 1921, Detroit police commissioner *комиссар полиции* William Rutledge was the first public safety official to use **radio equipped vehicles**.

Today, **maritime, aviation, and land-based mobile radio systems** remain among the most important **nonbroadcast** uses of the radio spectrum.

But mobile radio isn't just for safety purposes today. Taxi drivers, **tow truck** dispatchers, and **package delivery services** are just a few of the businesses that make **innovative** use of mobile radio.

In fact, mobile radio has become such a key tool in all business communications that one of the FCC's major challenges is ensuring **efficient** and **effective** use of the radio spectrum by business, while guaranteeing the reliability and **interoperability** of all public safety radio uses.

In finding a way to make this all work, the FCC helps make America a safer and better place to live.

Post-text exercises

Exercise 3. Give Russian equivalents of the following words and word-combinations.

applications of radio, uses of radio spectrum, put to work, previously, aerial, underpin, to trail an aerial, rely on carrier pigeons, official, radio equipped vehicles, maritime, nonbroadcast, safety purposes, tow truck dispatchers, package delivery services, businesses, major challenges, efficient and effective use, reliability, interoperability, broadcasting, radio beacons, focus on.

Exercise 4. Find the English equivalents of the following words and word-combinations in the text.

использование радиочастотного спектра, от детских мониторов и вещания до радаров и радиомаяков, применения радио, сосредоточиться на, полагался на

почтовых голубей, для их связи, продемонстрировать использование радио для авиации, поддерживать, оснащенные радиоаппаратурой, таксисты, диспетчеры эвакуаторов и службы доставки, важные проблемы, надежность

Exercise 5. Put 5 questions to the text.

Exercise 6. Repeat and translate into Russian the following words.

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.

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.

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.

Exercise 7. Translate the 2nd and 3rd paragraphs of the text.

Exercise 8. Speak on the following topic: “Mobile radio has become a key tool in all business communications”.

Exercise 9. Define whether the following statements are true or false and correct the false ones.

1. Today maritime, aviation, and land-based mobile radio systems remain among the most important broadcast uses of the radio spectrum.
2. But mobile radio is only for safety purposes today.
3. Taxi drivers, tow truck dispatchers, and package delivery services are just a few of the businesses that don't make innovative use of mobile radio.
4. Not finding a way to make this all work, the FCC helps make America a safer and better place to live.
5. There are a few uses of radio spectrum and technology.

Exercise 10. Write a summary of the text.

UNIT 2 RADIO AND ITS APPLICATION

Text A. Invention of Radio is Contribution of Many Sciences

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

arouse – вызывать

crest – гребень (волны)

disturbance – возмущение

divide – делить

electromagnetic wave – электромагнитная волна

frequency – частота

means of propagating – способ распространения

oscillate – колебаться, выбрировать

perceive – воспринимать, ощущать

related – взаимосвязанные

straight – прямой

transmitter – радиопередатчик

unobservable – невидимый

velocity – скорость

wavelength – длина волны

Exercise 2. Study the text and try to understand all details.

Invention of Radio is Contribution of Many Sciences

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. In 1864 James Clerk Maxwell, professor of experimental physics at Cambridge 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 wave 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 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 a vacuum. Like light waves radio waves travel in straight lines at a velocity of about 300,000 kilometers (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.

Post-text exercises

Exercise 3. Give Russian equivalents of the following words and word-combinations.

Electrical disturbance, considerable distance, source, speed, outward, detect, transmitter, electromagnetic wave, velocity, oscillate, frequency, wavelength, research, radio messages and signals travel across space, a local magnetic field, proved mathematically, wave moving at the speed of light, was tested, radio made phenomenal progress, radio waves travel in straight lines, at a velocity, received the first transatlantic radio signal, a frequency of one cycle per second is called one hertz, is known as the wavelength.

Exercise 4. Find the English equivalents of the following words and word-combinations in the text.

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

Exercise 5. 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 force. (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)

Exercise 6. Translate the 4th paragraph of the text.

Exercise 7. Read the text and answer the questions.

1. What demonstrations did Michael Faraday make at the beginning of the 19th century?
2. What is the essence of Maxwell's prediction?
3. Why couldn't his theory be proved in those days?
4. When did the 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?

Exercise 8. 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 H. 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.

Exercise 9. Complete the following sentences choosing the most suitable variant.

1. Guglielmo Marconi, the Italian physicist, --- the first transatlantic radio signals in St. John's Newfoundland. (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 H. 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 prediction 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)

Exercise 10. Develop the following ideas. Use the words and word-combinations provided in brackets.

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, to instrument for transmission or perception..., make an impression at a large distance, to compare them to light waves, Maxwell's ideas were checked...)

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)

Text B

Exercise 1. Read the following words and try to remember them.

accident - авария, несчастный случай
 application – использование, применение

cordless telephone - беспроводный телефон
 dim - тусклый, неясный

entertainment – развлечение
equipment – оборудование
essential - существенный, важный
exchange messages - обмениваться
сообщениями
radio-operated toy airplanes and cars - радио-
управляемые игрушечные самолеты и
автомобили

space exploration- исследование космоса
traffic jam - дорожная пробка, пробка на
дороге
traffic violations - нарушения правил
дорожного движения
truck - грузовой автомобиль
vehicle - транспортное средство

Exercise 2. Read and entitle the text.

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 the 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 device used to page the person who carries out.

In radio telephones such as cellular mobile phones, 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.

Post-text exercises

Exercise 3. Give Russian equivalents of the following words and word-combinations.

cordless telephone, discover, solar system, determine, traffic violations, space exploration, receive messages, transmit, comparatively, manufacturing and industrial methods, message, voice signals, for communication, moving vehicles, cordless telephone, toy airplanes and cars, universe.

Exercise 4. Answer the following questions.

1. What applications of the radio can you find in your home?
2. What other applications of the radio apart from those mentioned in the text can you remember?

Exercise 5. Define whether the following statements are true or false and correct the false ones.

1. Television is one of the least popular forms of the entertainment in the home.
2. It uses special equipment for sending and receiving pictures in the form of radio signals.
3. Other home devices that don't use radio technology are telephones and radio-operated toy airplanes and cars.
4. Radio technology has no uses outside the home.
5. Observers in airplanes can report traffic violations, accidents and traffic jams by radio to police officers on the ground.
6. In radio telephones such as cellular mobile phones, voice signals are sent by high-frequency radio signals called microwaves.
7. Land based microwave relay stations and communication satellites orbiting the Earth don't receive and transmit the microwave signals.

Exercise 6. Give English equivalents of the following words and word-combinations.

Практическое применение, было использовано, все еще используется для этой цели, нарушения правил дорожного движения, авария, несчастный случай, дорожная пробка, тусклый, существенный, исследование космоса, обмениваться сообщениями, развлечение, оборудование, солнечная система, беспроводный телефон.

Exercise 7. Match the words with their definitions:

Word	Definition
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. place from which something comes or is got
3. technology	c. send out rays of light or heat
4. research	d. transmit, extend the operation
5. frequency	e. comparatively small body moving in orbit round a planet
6. radiate	f. study, mastery and utilization of manufacturing and industrial methods
7. propagate	g. number of repetitions in a given time
8. source	h. investigation undertaken in order to discover new facts
9. relay	i. part of a telegraph or radio apparatus for sending out signals, messages, music, etc.

Exercise 8. Arrange the words of the two groups in pairs:

a) with a similar meaning

1. happen	a. alike;
2. speed	b. vibrate;
3. receive	c. notice;
4. devise	d. propagate;
5. considerable	e. wireless;
6. unobservable	f. piece together;
7. spread	g. demonstrate;
8. similar	h. velocity;
9. show	i. profession;
10. detect	j. occur;
11. occupation	k. obtain;
12. oscillate	l. important;
13. cordless	m. perceive;
14. join	n. invent;
15. observe	o. imperceptible

b) with contrary meaning

1. different	a. clear;
2. transmitter	b. return;
3. earliest	c. unobservable;
4. inward	d. slowly;
5. easy	e. primarily;

6. absence	f. essential;
7. standing	g. distant;
8. finally	h. difficult;
9. leave	i. presence;
10. low	j. similar;
11. near	k. receiver;
12. rapidly	l. high;
13. dim	m. latest;
14. visible	n. moving;
15. detailed	o. outward

Exercise 9. Give a summary of the text.

Exercise 10. Speak about the story of radio and its basic physical properties.

UNIT 3. RADIO COMMUNICATION

Text A. Radio-Transmission

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

achievement - достижение

application - применение

broadcasting - радиовещание

communication - передача, сообщение;
связь

component - компонент; элемент

current - (электрический) ток

direction - направление

engineering - техника; инженерное
искусство

frequency - частота

ground - заземление

oscillator ['ɒsɪleɪtə] - генератор

receiver - приемник

similar - сходный; подобный

to amplify - усиливать

to convert - превращать,
преобразовывать

to develop - развивать; разрабатывать

to employ - употреблять, использовать

to produce - производить; вырабатывать

to radiate - излучать

to reach - достигать; доезжать

to set up - восстанавливать

to transmit - передавать

transfer - перенос; передача

transmitter - передатчик

wave - волна

Exercise 2. Study the text and try to understand all details.

Radio-Transmission

Radio is one of the greatest achievements of modern engineering. Radio employs electrical energy to transmit signals. The most developed application of radio

is in communication and broadcasting. Radio communication is the transfer of high-frequency energy from the transmitter to the receiver. The necessary components of radio communication are a transmitter and a receiver. The main parts of a transmitter are a high-frequency oscillator, a ground and an antenna. When electric oscillations are produced in the antenna, it starts radiating radio waves. These waves travel in all directions. When radio waves reach the antenna of a receiver, they set up currents in it of a similar form to those in the transmitting antenna. These currents are directed from the antenna to a radio-receiver where they are first amplified and then converted into audio frequency signals.

Post-text exercises

Exercise 3. Read the text and answer the questions.

1. What is the most developed application of radio? 2. What is radio-communication? 3. What does radio employ to transmit signals? 4. What are the necessary components of radio-communication? 5. Under what condition does the transmitting antenna radiate radio waves? 6. In what direction do these waves travel? 7. What happens when radio waves reach the antenna of a receiver?

Exercise 4. Form with the help of suffixes *-er* or *-or* nouns from the following verbs:

to transmit, to receive, to radiate, to amplify, to convert, to oscillate, to produce, to travel, to direct.

Exercise 5. Find the Russian equivalents for English words and phrases.

1. application	a. звуковая частота
2. audio-frequency	b. радиопередающие и радиоприемные устройства
3. amplifier	c. радиотехника
4. achievement	d. приемник
5. radio-engineering	e. применение
6. radio transmitting and radio receiving devices	f. использовать электромагнитные волны
7. to employ electromagnetic waves	g. высокочастотный генератор
8. receiver	h. передатчик
9. transmitter	i. достижение
10. high-frequency oscillator	j. усилитель

11. transmitting station	к. приемная станция
12. receiving station	л. передающая станция

Exercise 6. Group pairs of words with opposite meanings.

1. low a) small
2. to start b) old
3. to transmit c) different
4. modern d) to receive
5. similar e) high
6. great f) last
7. first g) to stop

Exercise 7. Complete the following sentences choosing the most suitable variant.

1. Radio occupies one of the leading places among the greatest achievements of modern _____.
a) currents; b) receiver; c) engineering.
2. The energy is radiated into space from the _____ by the antenna.
a) receiver; b) transmitter; c) amplifier.
3. To _____ means to make bigger or enlarge.
a) amplify; b) transmit; c) radiate.
4. A transmitting antenna _____ radio waves.
a) receives; b) reaches; c) radiates.
5. Our scientists have great _____ in the field of radio and television.
a) achievements; b) applications c) oscillations

Exercise 8. Use the verbs in brackets in the appropriate form

1. Future radio-engineers (to study) at the radio-engineering faculty.
2. Electronics (to be) a young science.
3. Electronic devices (to play) a great role in radio equipment.
4. A receiving station (to receive) radio waves.
5. Transmitting stations (to radiate) radio waves.
6. A transmitting station (to have) a radio transmitter and an antenna.
7. A radio transmitter (to be) a device for radiating electromagnetic waves.
8. The main parts of a transmitter (to be) a high-frequency oscillator, a ground and an antenna.

Exercise 9. Put the general and special questions

1. He studies at the radio-engineering faculty.

2. He is a first-year student.
3. He goes to a radio-club once a week.
4. There is a radio-set in the room.
5. Radio employs electrical energy to transmit radio signals.
6. We use an amplifier when we want to make signals bigger.
7. A transmitter sends out radio signals at a high frequency.
8. The necessary components of radio communication are transmitter and a receiver.

Exercise 10. Translate into English

1. Радио является одним из величайших достижений современной техники.
2. В мире существует много передающих и приемных радиостанций.
3. Передающая станция имеет передатчик и антенну.
4. Радиопередатчик – это устройство для излучения электромагнитных волн.
5. Высокочастотный генератор, заземление и антенна являются основными компонентами передатчика.
6. Этот знаменитый ученый работает в области радиотехники.
7. Существует много радиопередающих и радиоприемных устройств.
8. Они находят широкое применение во многих сферах.

Text B. Radio Waves and Radio Communication

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

number - число

plane - плоскость

polarization - поляризация

property - свойство

role - роль

to connect - связывать

to vibrate - вибрировать

velocity - скорость

Exercise 2. Study the text and try to understand all details

Radio Waves and Radio Communication

Radio communication plays a great role in our life. Russia has a radio communication which connects our country with the capitals of many countries in Europe, Asia, Africa and Latin America. Radio communication connects different cities and towns of our country. What is radio communication? It is the transmission of information over great distances with the help of high-frequency electromagnetic waves. There are radio-waves. Radio waves travel in all directions at a velocity of 300,000 kilometers per second (km/sec). They can go from here to the Moon and back

in 3 seconds. There are many kinds of radio waves. Some of them vibrate 700,000 times per second; others vibrate a million times per second. The number of vibrations per second is the frequency of a radio wave. Other important properties of a radio wave are intensity, direction of travel and plane of polarization.

Post-text exercises

Exercise 3. Read the text and answer the questions.

1. What role does radio communication play in our life? 2. What is radio communication? 3. At what velocity do radio waves travel in all directions? 4. Are there many kinds of radio waves? 5. What are the important properties of a radio wave?

Exercise 4. Find the English equivalents of the following words and word-combinations in the text.

Radio communication, to play a great role, which connects our country with the capitals of many countries, the transmission of information over great distances, high-frequency electromagnetic waves, radio-waves, travel in all directions, at a velocity, to the Moon and back in 3 seconds, many kinds of radio waves, vibrate a million times per second, the frequency of a radio wave, polarization.

Exercise 5. Define whether the following statements are true or false and correct the false ones.

1. Radio communication plays a great role in our life.
2. Russia has a radio communication which connects our country with the capitals of many countries in Europe, Asia, Africa and Latin America.
3. Radio communication doesn't connect cities and towns of our country.
4. Radio communication is the transmission of information over great distances with the help of low-frequency electromagnetic waves.
5. Radio waves travel in all directions at a velocity of 200,000 kilometers per second (km/sec).
6. They can't go from here to the Moon and back in 3 seconds.
7. There are few kinds of radio waves.

Exercise 6. Give three forms of the following verbs:

to develop, to invent, to discover, to convert, to make, to lead, to think, to come, to give, to know, to find, to have, to be, to go.

Exercise 7. Use Past Indefinite instead of Present Indefinite

1. Russian scientists develop and improve the theory of radio transmitting and radio-receiving devices. 2. Radio broadcasting is a part of our life. 3. A wide application of radio devices leads to the further development of science. 4. "Radio" comes from the well-known Latin word "radius". 5. They have many books on electricity and magnetism. 6. This scientist gives much time to experiments in physics. 7. He doesn't take part in this research.

Exercise 8. Read in English the following numbers:

a) 11; 12; 13; 15; 20; 30; 50; 100; 134; 245; 827; 1,243; 3,854; 54,791.

b) $1/3$; $1/2$; $1/4$; $1/6$; $3/8$; $2/6$; 0.5; 0.35; 0.24; 2.35.

Exercise 9. Read in English the following dates:

1.08.1927, 2.09.1836, 3.10.1934, 12.03.1905, 7.01.1971, 9.02.1976,

11.02.1900, 13.07.1977, 4.03.1933, 20.08.1939, 12.03.1940, 11.02.2000

11.02.2005, 14.11.2015, 7.04.2016

Exercise 10. Put 6 questions to the text.

UNIT 4 MARCONI

Text A. Marconi and His Invention

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

adjust – настраивать, регулировать
communication – связь, системная связь
distinctness – ясность, отчётливость
hitch – помеха, препятствие
preliminary – предварительный,
подготовительный

receiver – приёмник
reception – приём
sensitive – чувствительный
transmission – передача
transoceanic – трансокеанский
wireless message – радиосигнал,
радиосообщение

Exercise 2. Study the text and try to understand all details.

Marconi and His Invention

Italian electrical engineer Guglielmo Marconi was the first to create a practical system communicating over long distances using radio signals. New reports in issues

of *Scientific American* from 1902 to 1903 recorded Marconi's first successful transmissions and receptions of radio signals across the Atlantic Ocean.

Here are some abstracts from news reports published in "Scientific American".

The Marconi Transoceanic Experiments

January 4, 1902

The *Scientific American* is enabled to present to its readers the first photographs that have been taken of Marconi's station at Signal Hill, Newfoundland – a station which will hereafter be memorable as the first place where a transoceanic wireless message was received.

That the signals were received can hardly be doubted. Marconi himself has publicly stated that the signals were heard with certainty and distinctness. At the Signal Hill station a receiving wire was employed about 400 feet high, which was supported by a kite. At Cornwall, the transmitting station was provided with an apparatus which was much more powerful than that previously used for communicating at distances of 200 miles. Even with a transmitter of increased power, the signals were heard only with the aid of a most sensitive telephone receiver.

The announcement of his success has earned for Marconi a popularity which is not the fortune of all inventors. The Canadian government has determined to stand by him in his fight against the Anglo-American Cable Company. Officials have honored him everywhere.

Marconi Sends Messages Across the Atlantic

January 3, 1903

It is now authoritatively announced by Marconi himself that wireless messages have been transmitted between the Old and the New World. Messages were sent from Lord Minto, Governor-General of Canada, and from Marconi, to King Edward. Messages were likewise sent to the King of Italy, by Marconi and by Commander Martino of the Italian cruiser "Carlo Alberto"; other messages were from Dr. Parkin to the *London Times* and from Richard Cartwright of Canada to the *Times*.

Marconi states that it was about a month ago that he succeeded in transmitting messages from Table Head to Cornwall. First, the messages were all in code and were simple queries, such as "How is this?"

In many respects this achievement of Marconi is fully equal to that of Cyrus Field in opening communication between America and England by means of the submarine cable. But the distance covered by Marconi is greater than that over which the first submarine cable extended, by about 300 miles. So far as practical results are

concerned, the Anglo-Italian inventor may well be regarded as the pioneer of commercial wireless telegraphy. Where others have failed he has succeeded.

The First Wireless Message from the United States to England
January 31, 1903

On the night of January 18, Marconi succeeded in outdoing himself when he transmitted a message of greeting from President Roosevelt to King Edward VII directly from the Cape Cod station to Poldhu, England. The distance covered is greater by 600 miles than that over which messages have previously been sent.

The performance is all the more remarkable when it is considered that the message was sent without any previous attempt to establish communication by preliminary signals.

Marconi's success came unexpectedly. After having busied himself all day in preparing his sending apparatus, he began to practice sending President Roosevelt's message without calling either the Poldhu or the Glace Bay station, contrary to the arrangements which he had made. Thinking that he might not be able to get the English station for a day or two, he decided to send the President's message by way of the Glace Bay station. Calling up the operator there he gave him the message with instructions to forward it to England. To Marconi's astonishment he received a reply from Glace Bay that the operator had been informed by the station at Poldhu that the message had been received directly from Cape Cod. There was not the slightest hitch in the process of sending. About four minutes were required to transmit the entire message.

King Edward replied to the message which he received from the President by cable.

The King sent his message by cable for the reason that Marconi was adjusting his instrument for sending tests to England and did not wish to upset his plans by making any attempt at receiving from the other side of the ocean.

Post-text exercises

Exercise 3. Give Russian equivalents of the following words and word-combinations.

Communication, successful transmission, transoceanic wireless message, with certainty and distinctness, a receiving wire, announcement, commercially, enormous cheapening, submarine cable, establish, take advantage of, unexpectedly, reception, sending apparatus, without calling, the arrangements, to give the message.

Exercise 4. Find the English equivalents of the following words and word-combinations in the text.

Передающая станция, практическая система связи, не подлежит сомнению, воздушный змей, решиться, беспроводной телеграф, закодированы, подводный кабель, превзойти самого себя, усовершенствовать, нарушать планы, потерпеть неудачу, настраивать (регулировать), чувствительный, приёмник, связь, предварительный (подготовительный), настраивать, регулировать, помеха (препятствие).

Exercise 5. Match the words with their definitions:

Word	Definition
a. radar	a) a machine or system that has been invented by someone.
b. invention	b) a system of sending sound over a distance using electrical signals.
c. system	c) a piece of wire that receives television or radio signals.
d. receiver	d) a piece of equipment used for sending radio signals or for broadcasting programmes
e. signal	e) a system of sending pictures and sounds by electrical signals over a distance so that people can receive them on a television set.
f. telegraph	f) is used to refer to a set of equipment, parts, or devices, for example a hi-fi or computer.
g. transmitter	g) a way of discovering the position or speed of things that cannot be seen, using radio signals.
h. aerial	h) a series of sound or light waves which carry information.
i. radio	i) a system of sending messages over long distances by means of electrical or radio signals.
j. television	j) a part of a telephone that you hold near to your ear and speak into; or a radio, or a television set

Exercise 6. Complete the following sentences and translate them into Russian.

... a receiving wire was employed about 400 feet height ...

... the signals were heard only with the aid of ...

... the messages were all in code and ...

But the distance ... by about 300 miles.

... without any previous attempt to establish communication ...

... he gave him the message with instructions ...

... in the process of sending.

Exercise 7. Translate the 3 and 4th paragraphs of the text.

Exercise 8. Put as many questions as possible to the first sentence of the text.

Exercise 9. Define whether the following statements are true or false and correct the false ones.

1. News reports in issues of “American Science”, from 1902 to 1903 recorded Marconi’s first successful transmission of radio signals across the Atlantic Ocean.
2. At Cornwall, the receiving station was provided with an apparatus which was much more powerful than the previously used one.
3. The Canadian government has determined to stand by him in his fight against the Anglo-American Cable Company.
4. The distance covered by Marconi is greater than that over which the first submarine cable extended.
5. Marconi transmitted a message of greeting from President Roosevelt to King Edward VI.
6. About forty minutes were required to transmit the entire message.
7. The King sent his message by cable because he didn’t want to upset Marconi’s plans who was adjusting his instrument for sending tests to England.

Exercise 10. Write a summary of the text.

Text B.

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

aerial ['æəriəl] - антенна

astonish the world - удивить мир

government – правительство

kite - воздушный змей

multi-millionaire - мульти-миллионер

Newfoundland - Ньюфаундленд (остров, провинция)

Poldhu in Cornwall - бухта Полду на п-острове Корнуолл

the English Channel – Ла- Манш

to send messages – отправлять, передавать сообщения

transmit radio signals - передавать радиосигналы

wireless telegraph – беспроводной (беспроволочный) телеграф

Exercise 2. Read and entitle the text.

Today we don't think twice when we turn on the radio, but when a 21 -year-old Italian invented it over 100 years ago no one could believe their ears.

One day in 1895 in Bologna, Italy, an Italian engineer sent the world's first radio signal. Using a simple radio transmitter and a receiver, he sent a signal from his attic room to his brother who was hidden in a field a kilometer away. When his brother received the signal he fired a gun. The Italian government showed no interest in young Marconi's invention, but his mother believed he had a good idea. So in February of the following year, she sent him to England to meet her cousin who was an important engineer. It was a journey that would change the world.

In England, this engineer and his cousin were joined by two other inventors. In 1897 he formed the Wireless Telegraph Company in London and started to transmit simple radio signals over long distances. In 1899 he sent the first wireless telegraph across the English Channel to France. They were transmitted from Poldhu in Cornwall, and were received 3,520 kilometers away in St John's, Newfoundland, using an aerial flown in the air by a kite.

He had always believed that radio waves could travel round the curve of the earth. By 1901 he had improved his radio system so much that on 12th December he astonished the world by sending the first radio signals across the Atlantic Ocean.

This meant that ships were now able to send messages from ship to shore if they were in distress. His system was soon adopted by the British and Italian navies. From now on, his company had the monopoly of wireless communication and he became a multi-millionaire.

This engineer is one of the key figures of the twentieth century. He even recognized the military importance of radar and thought of the idea of sending radio signals out into space. When he died in 1937, wireless stations all over the world closed down for two minutes as a mark of respect. He made only one big mistake. He thought that television would never become popular.

Post-text exercises

Exercise 3. Choose the best answer to these questions according to the text.

1. What important event happened in Bologna in 1895?
2. Why did Marconi's mother send him to England?
3. Where did Marconi send his first telegraph?
4. What astonished the world in 1901?
5. What mistake did Marconi make?

Exercise 4. Find the English equivalents of the following words and word-combinations in the text.

Передавать радиосигналы; отправлять, передавать сообщения; антенна; воздушный змей; включать радио; никто не мог поверить; используя простой радиопередатчик и приемник; чердачная комната; в поле; стрелять из ружья; не проявлять интереса; удивить мир; два других изобретателя; беспроводная связь; является одной из ключевых фигур, военное значение радиолокатора.

Exercise 5. Give Russian equivalents of the following words and word-combinations.

Radio transmitter and a receiver, to send a signal, to receive a signal, to fire a gun, government, invention, to transmit simple radio signals over long distances, to send the first wireless telegraph, the English Channel, from Poldhu in Cornwall, by a kite, travel round the curve of the earth, to improve, to astonish the world, across the Atlantic Ocean, from ship to shore, to be in distress, wireless communication.

Exercise 6. Study the following words and choose:

nouns:

- | | | | |
|----------------|------------------|-----------------|-------------------|
| a) oscillator; | b) oscillatory; | c) oscillate; | d) oscillation; |
| a) transmit; | b) transmission; | c) transmitter; | d) transmissible; |
| a) operation; | b) operating; | c) operator; | d) operative; |
| a) apply; | b) applied; | c) applicant; | d) appliance; |

adjectives:

- | | | | |
|---------------|-------------------|------------------|-----------------|
| a) frequency; | b) frequentative; | c) frequent; | d) frequency; |
| a) cycle; | b) cyclist; | c) cyclical; | d) cyclically; |
| a) voice; | b) voiced; | c) voiceless; | d) voicelessly; |
| a) observe; | b) observer; | c) unobservable; | d) observation. |

Exercise 7. Speak on the topic: “Marconi’s successful experiments in transmitting messages”.

Exercise 8. Translate the 3^d and 4th paragraphs of the text.

Exercise 9. Define whether the following statements are true or false and correct the false ones.

1. One day in 1895 in Bologna [bə'lonjə], Italy, an English engineer sent the world's first audio signal.

2. Using a simple radio transmitter and a receiver, he sent a signal from his attic room to his sister who was hidden in a wood a kilometer away.
3. When his brother received the signal he fired a gun.
4. The Italian government showed interest in young Marconi's invention, but his mother didn't believe he had a good idea.
5. So in March of the following year, she sent him to England to meet her cousin who was an important engineer.
6. It was a journey that would change the world.
7. He thought that television would become popular.

Exercise 10. Give a summary of the text.

UNIT 5 A. POPOV AND HIS INVENTION

Text A. A. Popov

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

audible – звуковой, слышимый

device – прибор, устройство

generate – генерировать, производить

inventor – изобретатель

lightning discharge – грозовой разряд,
молния

oscillation – колебание, вибрация

range – диапазон, дальность действия

record – записывать, регистрировать

transmit – передавать

wire – провод, проводник

wireless – беспроводной, радио

Exercise 2. Study the text and try to understand all details

Text A. A. Popov

A.S. Popov, the great Russian inventor, was born in 1859. By the time he graduated from Petersburg University (1882) he had already possessed a broad knowledge of electrical theory as well as a wide experience in that field.

Working both as scientist and teacher, he always carried on some practical work, solving many practical problems such as the introduction of electricity into the Navy and others. Popov was one of the first to pay attention to the works of Hertz who proved by experiments the existence of electromagnetic waves. After many experiments carried out together with his assistant Ribkin the device Popov constructed began receiving electromagnetic waves at a long distance. By means of his receiver Popov could detect the waves at a distance of some meter and then

kilometers. The receiver recorded waves generated by lightning discharges. While experimenting the scientist found out that a free wire being connected to the receiver, the range of the latter increased. Thus he connected his first receiver to the first antenna.

On April 25, 1895, Alexander Popov demonstrated his device at the Russian Physico-Chemical Society. Having summarized the results of his experiments, Popov expressed his hope that the device, after being perfected, would make possible transmitting signals at a distance by means of rapid electrical oscillations. In summer 1895, Popov's invention was successfully tested and in the same year he attached to the device an apparatus previously used for recording telegrams over the wire telegraph. In the following year this receiver was used at the electric power station in Nizhny Novgorod for warning about approaching thunderstorm.

The great Russian inventor didn't make any secret of his discovery, describing it in the press and making reports about it at the meetings of scientific societies. In the same year he demonstrated the transmissions of words over a wireless telegraph. This new demonstration proved to be of great importance.

In summer 1897, Popov successfully carried out his experiments at sea, having succeeded in effecting radio communication between the shore and the sea at a distance of 3 klm.

In this way the future wireless communication between the continents was being prepared. The year 1898 witnessed a new important invention made by Popov together with his assistants Ribkin and Troitsky, namely the reception of audible signals by means of a receiver. All these successful experiments having been completed, serious practical testing began. Popov's radio telegraph helped to save the battleship "General Admiral Apraksin".

Popov's work drew attention in many countries. The wireless telegraphy is the result of Popov's experiments, this fact having been acknowledged by different representatives of foreign science, engineering and industry. Popov was offered immense profits from commercial use of his invention in case he leaves Russia. But the Russian patriot refused the wealth offered to him, preferring to remain a true son of his fatherland "I am a Russian and I must give all my knowledge, all my work and all my achievements to my native land" were his words.

Post-text exercises

Exercise 3. Give Russian equivalents of the following words and word-combinations.

Discharge, carry on, long distance, receiver, record, increase, oscillation, previously, thunderstorm, wireless telegraph, discovery, by means of his receiver, successful experiments, to solve practical problems, the introduction of electricity into the Navy, to pay attention to the works, to prove by experiments, the existence, to receive electromagnetic waves, by means, detect the waves at a distance of some meter, lightning discharges, to express the hope, rapid electrical oscillations.

Exercise 4. Find English equivalents of the following words and word-combinations in the text.

Решать, диапазон, прибор, усовершенствовать, звуковой сигнал, предлагать, передача, успешно испытать, важность, проводить эксперимент, привлечь внимание, признавать, огромный, все мои достижения, успешный эксперимент, военно-морской флот, обращать внимание на работы, доказывать экспериментами, существование, получать электромагнитные волны, посредством, обнаруживать волны на расстоянии, разряды молний, выражать надежду, электрические колебания.

Exercise 5. Match the words with their definitions.

Word	Definition
1. invent	a. test or trial carried out carefully in order to study what happens
2. experience	and gain new knowledge
3. experiment	b. produce
4. generate	c. metal in the form of a thread
5. receiver	d. complete something
6. wire	e. create or design something not existing before
7. carry out	f. apparatus for receiving signals
	g. process of gaining knowledge or skill by doing and seeing things

Exercise 6. Complete the following sentences and translate them into Russian.

- ... Popov could detect the waves ...
- ... invention was successfully tested.
- ... this receiver was used ...
- ... over a wireless telegraph.
- The year 1898 witnessed ...
- ... from commercial use of his invention ...
- ... I must give all my knowledge, all my work ...

Exercise 7. Put the words in the correct order.

1. Receiver, electromagnetic waves, at, distance, his, could, long, a, his device.
2. Discharges, waves, the receiver, generated, recorded, by, lightning.
3. Was, in, 1895, tested, his, summer, invention, successfully.
4. Scientific societies, Popov, discovery, made, his, at, meeting, the, reports, about, of.
5. Countries, drew attention, many, in, work, his.

Exercise 8. Find in the text the sentences with Participles in the function of an adverbial modifier. Translate the sentences into Russian.

Exercise 9. Translate the following sentences with Absolute Participial Construction into Russian.

1. The experiment being over, the reporters attacked the young scientists with questions.
2. The question being difficult, I had to think for a moment.
3. This scientist worked much to perfect his invention, his scientific achievements being highly appreciated all over the world.
4. The device having been carefully tested, we put it into operation.
5. The direction of the current being reversed in the conductor, the direction of the needle is similarly reversed from its former position.
6. A series of experiments having been completed, I. Kurchatov launched Europe's first cyclotron at the Radio Institute.
7. Many chemical and organic compounds are semiconductors, their conductivity increasing with heating and falling with cooling.

Exercise 10. Define whether the following statements are true or false and correct the false statements.

1. When A. Popov graduated from Petersburg University he was quite experienced in electrical theory.
2. Popov solved many theoretical problems such as the introduction of electricity into the Navy.
3. By means of his receiver Popov could detect the waves at a distance of some kilometers.
4. Popov was the first to connect the receiver to the antenna.
5. Popov kept his discovery in secret.
6. In 1899 the reception of audible signals was fulfilled by means of a receiver.

7. The invention of the wireless telegraphy by Popov is acknowledged all over the world.

Exercise 11. Match the following words with their translation.

- I. 1) invent; 2) inventor; 3) invention; 4) inventive;
a) изобретение; b) изобретательный; c) изобретать;
d) изобретатель;
- II. 1) light; 2) lighten; 3) lighter; 4) lighting; 5) lightning;
a) зажигалка; b) освещать; c) молния; d) освещение; e) свет;
- III. 1) receive; 2) receivable; 3) receiver; 4) received;
a) радиоприёмник; b) принимать; c) общепринятый; d) годный к
принятию;
1) prefer; 2) preferable; 3) preferably;
4) preference; 5) preferential;
a) предпочтение; b) предпочитать; c) предпочтительный;
d) предпочтительно; e) пользующийся предпочтением;
- IV. 1) produce; 2) producer; 3) producible;
4) production; 5) productive;
a) производство; b) производящий; c) производить;
d) производимый; e) производитель;
- V. 1) transmit; 2) transmitter; 3) transmission; 4) transmissible;
a) радиопередатчик; b) передавать; c) передающийся;
d) передача;

Text B.

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

a post-graduate – аспирант

achievement - достижение

anniversary - годовщина

authority [ɔ:'θɔ:riti] - авторитет

electrical engineering - электротехника

lay the foundation - заложить фундамент,
заложить основу

make a priceless contribution – внести

(сделать) бесценный вклад

modern engineering - современная
техника

occupy ['ɔ:kjəpaɪ] - занимать, занять

radio engineering – радиотехника

radio-receiving set - радиоприемное
устройство, радиоприемник

Exercise 2. Read and entitle the text.

Radio occupies one of the leading places among the greatest achievements of modern engineering. It was invented by Professor A.S. Popov, who demonstrated the

first radio-receiving set in the world on May 7, 1895. And it is on this day that we mark the anniversary of the birth of the radio.

By his invention Popov made a priceless contribution to the development of world science.

A.S. Popov was born in the Urals, on March 16, 1859. For some years he had been studying at the seminary in Perm and then went to the University of St. Petersburg. In his student days he worked as a mechanic at one of the first electric power-plants in St. Petersburg which was producing electric lights for Nevsky prospect.

After graduating from the University in 1882, A.S. Popov remained there as a post-graduate at the Physics Department. A year later he became a lecturer in Physics and Electrical Engineering in Kronstadt. By this time he had already won recognition among specialists as an authority in this field.

After Hertz had published his experiments proving the existence of electromagnetic waves, A.S. Popov thought of a possibility of using Hertz waves for transmitting signals over a distance. Thus the first wireless (radio) receiving set was created. Then Popov developed his device and on March 24, 1896 he demonstrated the transmission and reception of a radiogram consisting of two words: Heinrich Hertz. On that day the radio-telegraphy was converted from an abstract theoretical problem into a real fact.

Popov's invention laid the foundation for further inventions and improvements in the field of radio engineering. Since that time scientists all over the world have been developing the modern systems of radio-telegraphy, broadcasting, television, radiolocation, radio navigation and other branches of radio electronics.

Radio will find still greater applications in many fields of science and technology.

Post-text exercises

Exercise3. Answer the following questions:

1. When did A.S. Popov demonstrate his first radio-receiving set? 2. Where and when was A.S. Popov born? 3. Where did he work in his student days? 4. When did A.S. Popov think of a possibility of using Hertz waves for transmitting signals over a distance? 5. What was the content of the first radiogram? 6. How did Popov's invention contribute to further development of radio communication?

Exercise 4. Find English equivalents of the following words and word-combinations in the text.

Среди величайших достижений, было изобретено, внес бесценный вклад, аспирант, стал преподавателем физики и электротехники, уже завоевал признание, доказывающие существования электромагнитных волн, для передачи сигналов на расстояние, был создан, продемонстрировал передачу и прием, состоящей из двух слов, был превращен из абстрактной теоретической задачи в реальный факт, заложить фундамент, в области радиотехники.

Exercise 5. Retell the text.

Exercise 6. Speak on the following topic: “A. Popov’s role in the development of radio engineering”.

Exercise 7. Find Russian equivalents of the following words and word-combinations.

Invention, to make a priceless contribution, the development of world science, electric power-plant, electric lights, a post-graduate, to become a lecturer, by this time, to win recognition, an authority in this field, the existence of electromagnetic waves, for transmitting signals over a distance, to lay the foundation, in the field of radio engineering, broadcasting, television, radiolocation, radio navigation, branches of radio electronics, applications, in many fields of science and technology.

Exercise 8. Translate the second and the third paragraphs of the text.

Exercise 9. Match the following words with their translation.

- I. 1) *direct*; 2) *direction*; 3) *directional*; 4) *directly*; 5) *directory*;
а) направленный; б) справочник; с) прямой;
д) направление; е) прямо;
- II. 1) *energy*; 2) *energetic*; 3) *energetics*; 4) *energize*
а) энергичный; б) питать энергией; с) сила, мощность;
д) энергетика;
- III. 1) *divide*; 2) *divided*; 3) *dividing*; 4) *divider*; 5) *division*
а) разделяющий; б) делить; с) раздельный;
д) деление; е) делитель;
- IV. 1) *measure*; 2) *measurable*; 3) *measureless*;
4) *measurer*; 5) *measurement*
а) измерение; б) измерительный прибор; с) измерять;
д) безмерный; е) измеримый;
- V. 1) *locate*; 2) *location*; 3) *locality*; 4) *local*; 5) *locator*

- a) местность; b) искатель; c) определение местонахождения;
 d) местный; e) определять местонахождение;

VI. 1) *pole*; 2) *polar*; 3) *polarity*; 4) *polarize*; 5) *polarization*

- a) полярный; b) поляризовать; c) поляризация;
 d) полюс; e) полярность;

Exercise 10. Find in the text the sentences with the Passive Voice and translate them into Russian.

UNIT 6 RADIO WAVES

Text A. Essential Properties of Radio Waves

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

alternating current – переменный ток

at the right angle – под прямым углом

broadcast station – радиопередающая станция

equation – уравнение

flux – поток

in rural areas - в сельских районах

in urban locations - в городах

intelligible – информационный, разборчивый

interference – помеха

measure – измерять

perpendicular lines - перпендикулярные линии

plane of polarization – плоскость поляризации

relation – соотношение, зависимость

reverse – изменять (направление),

реверсировать

satisfactory service – удовлетворительное обслуживание

strength – сила, напряжённость, интенсивность

wave front – волновой фронт, фронт импульса

wavelength – длина волны

mV от millivolt - МИЛЛИВОЛЬТ

Exercise 2. Study the text and try to understand all details

Text A. Radio Waves

Electrical energy that has escaped into free space exists in the form of electromagnetic waves. These waves, which are commonly referred to as radio waves, travel with the velocity of light and consist of magnetic and electrostatic fields at right angles to each other and also at right angles to the direction of travel. One-half of the electrical energy contained in the wave exists in the form of electrostatic energy, the remaining half being in the form of magnetic energy.

The essential properties of a radio wave are the frequency, intensity, direction of travel, and plane of polarization. The radio waves produced by an alternating current will vary in intensity with the frequency of the current and will therefore be alternately positive and negative. The distance occupied by one complete cycle of such an alternating wave is equal to the velocity of the wave divided by the number of cycles being sent out each second and is called the wavelength.

The strength of a radio wave is measured in terms of the voltage stress produced in space by the electrostatic field of the wave and is usually expressed in microvolts stress per meter.

The minimum field strength required to give satisfactory reception of the radio wave varies with the amount of interference that is present. Under the most favourable conditions it is possible to obtain intelligible signals from waves having a strength as low as 0.1 mv per meter, but ordinarily interfering waves generated by both man-made and natural sources draw out such weak radio signals and make much greater field strengths necessary.

Thus experience has shown that in rural areas a field strength in the order of 100 mv per meter is required to give what the listener considers satisfactory service from a broadcast station, while in urban locations, where the man-made interference is much greater, a field strength of 5000 to 30,000 mv per meter is needed to insure good reception at all times.

A plane parallel to the mutually perpendicular lines of electrostatic and electromagnetic flux is known as the wave front. A wave always travels in a direction at right angles to the wave front, but whether it goes forward or backward depends upon the relative direction of the lines of electromagnetic and electrostatic flux. If the direction of either the magnetic or electrostatic flux were reversed, the direction of travel would be reversed, but reversing both sets of flux has no effect.

The direction of the electrostatic lines of flux is called the direction of polarization of the wave. If the electrostatic flux lines are vertical, the wave is vertically polarized; when the electrostatic flux lines are horizontal and the electromagnetic flux lines are vertical, the wave is horizontally polarized.

Post-text exercises

Exercise 3. Give Russian equivalents of the following words and word-combinations.

Refer, consist of, travel, essential, vary, relation, abbreviated, wavelength, intelligible signals, forward, backward, reversed, voltage stress, in rural areas, a field strength, satisfactory service, a broadcast station, in urban locations, a field strength,

perpendicular lines, electrostatic and electromagnetic flux, to travel, at right angle, to depend upon, the direction of polarization of the wave.

Exercise 4. Find English equivalents of the following words and word-combinations in the text.

Угол, свойство, приём, искусственный, слабые радиосигналы, содержать, измерять, напряжённость поля, электромагнитный поток, радиопередающая станция, частота, соотношение, зависимость, уравнение, сила (напряжённость), интенсивность измерять, помеха, радиопередающая станция, волновой фронт, фронт импульса, поток, изменять (направление), в сельских районах, в городах, удовлетворительное обслуживание, перпендикулярные линии.

Exercise 5. Match the words with their definitions.

Word	Definition
1. angle	a. amount, total or number
2. velocity	b. find the size, extent, volume, degree, etc.
3. quantity	c. cause to go in the opposite direction
4. equal	d. flow
5. measure	e. speed
6. broadcast	f. space between 2 lines or surfaces that meet
7. flux	g. send out (speech, music, etc.) in all directions, especially by radio or TV
8. reverse	h. the same in size, amount, value, etc.

Exercise 6. Complete the following sentences and translate them into Russian.

- ... are the frequency, intensity, direction of travel ...
- ... from the above equation to have a long wavelength ...
- ... varies with the amount of interference that is present.
- One-half of the electrical energy ...
- ... were reversed, the direction of travel ...
- ... is known as the wave front.
- ... abbreviated kHz, or in megahertz ...

Exercise 7. Put the words in the correct order.

1. Free space, exists, electrical energy, in the form of, that, electromagnetic waves, has escaped, into.
2. Travel, the velocity, radio waves, of, light, with.

3. An alternating current, vary, with the frequency, the radio waves, of the current, produced by, in intensity.
4. Corresponds, wave, to, a short wavelength, high, frequency, a.
5. The direction, of the wave, lines of flux, polarisation, is called, the direction, the electrostatic lines, of.

Exercise 8. Put as many questions as possible to the last sentence of the second paragraph.

Exercise 9. Define whether the following statements are true or false and correct the false ones.

1. Electrical energy that has escaped into free space exists in the form of electromagnetic waves.
2. Radio waves don't travel with the velocity of light.
3. One-half of the electrical energy contained in the wave exists in the form of electrostatic energy, the remaining half being in the form of magnetic energy.
4. The unessential properties of a radio wave are the frequency, intensity, direction of travel, and plane of polarization.
5. The radio waves produced by direct current will vary in intensity with the frequency of the current.
6. The minimum field strength required to give satisfactory reception of the radio wave varies with the amount of interference that is present.
7. Under the most favourable conditions it is possible to obtain intelligible signals from waves having strength as low as 0.001 mv per meter.

Exercise 10. Translate the following sentences into Russian. Pay attention to the functions of the Participles.

1. Frequencies ranging from 300 to 3000 kHz are referred to as medium radio frequencies.
2. The velocity of light has a special significance in the Universe, its value being 300 mln metres per second in a vacuum.
3. Having been tested under unfavourable conditions, the machine was successfully put into operation.
4. The device demonstrated is the simplest type.
5. The current induced in the coil of the electromagnet will also oscillate at the frequency of the original sound.
6. Having finished the research, the scientists made a thorough analysis of the data obtained.

7. Electromagnetic waves of frequencies called radar frequencies provide a method of seeing in the dark or in fog.
8. The laboratory just referred to was provided with the most modern measuring devices.
9. An aircraft travelling at less than the speed of sound creates pressure waves ahead of itself.

Exercise 11. Define whether the following statements are true or false and correct the false statements.

1. The radio waves produced by a direct current will vary in intensity with the frequency of the current.
2. The frequency is expressed in kilohertz or megahertz.
3. Under the most favourable conditions it is possible to obtain intelligible signals from waves having a strength as low as 0.1 mv per cm.
4. In rural locations a field strength of 5000 to 30,000 mv per meter is needed to insure good reception at all times.
5. A wave always travels in a direction at right angles to the wave front.
6. The wave is vertically polarized when the electrostatic flux lines are vertical.
7. The strength of a radio wave is expressed in microvolts stress per meter.

UNIT 7 MAJOR STEPS OF ELECTRONICS HISTORY

Text A. Electronics

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

array – целый ряд, большое количество,
масса, множество

attenuate – истощать, ослаблять

cellular telephone – сотовый телефон

consumer – широкого потребления (о
товарах)

device – прибор, устройство, схема

digital – цифровой, дискретный

encompass – содержать, заключать (в
себе)

impact – воздействие, влияние

integrated circuit – интегральная схема,
микросхема

intermingle – смешивать, перемешивать

intricate – сложный, запутанный

optical fibre – оптическое волокно,
световод

pervasive – распространяющийся,
проникающий

regenerate – восстанавливать

sophisticated – сложный

Exercise 2. Study the text and try to understand all details

Text A. 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.

Post-text exercises

Exercise 3. 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, integrate, 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

Exercise 4. Study the following words and choose

a) nouns

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

b) adjectives

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

Exercise 5. Give Russian equivalents of the following words.

Circuit, fibre, impact, deal, utilize, range, cellular, volume, performance, convert, facilitate, attenuate, pervasive, apparent, manufacture, research in these fields, to lead to the development, key devices, integrated circuits, lasers, optical fibres, military products, from cellular radiotelephone systems and videocassette recorders to high-performance supercomputers, weapons systems, the electronics industry, developing countries, significant advances, the impact of electronics on modern life, at least.

Exercise 6. Find English equivalents of the following words in the text.

Электронная лампа, широкая область, первоначально, поведение электрона, интегральная схема, оптическое волокно, 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, содержать, прибор, интегральная схема, оптическое волокно, световод, целый ряд, большое количество.

Exercise 7. Match the words with their definitions.

Word	Definition
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

Exercise 8. Arrange the words of the two groups in pairs with

similar meaning.

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

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

Exercise 9. 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.

3. 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.

Exercise 10. Define 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.

Text B.

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

blacken –загораться

bulb - лампочка, электрическая

лампочка, электрическая лампа

conventional electron tubes - обычные

электронные трубки

discharge – разряд

filament - нить накаливания, нить накала

give off material – выделять, испускать,

излучать вещество

incandescent [ˌɪnkæ'nɪdes(ə)nt] lamp -

лампа накаливания

negative charge - отрицательный заряд

photoelectric cell - фотоэлемент,

фотоэлектрический элемент

trace - проследить, прослеживать

vacuum tube - электронная лампа

working principles - принцип работы

Exercise 2. Read and translate 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

Post-text exercises

Exercise 3. Annotate the text.

Exercise 4. 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?

Exercise 5. 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.

Exercise 6. Speak on the topic: “Major steps of electronic history”.

Exercise 7. Give Russian equivalents of the following words.

Edison effect, to lead to the development, radio tube, thermionic emission, the filament, discharge of electrons, is widely used, conventional electron tubes, to prove the existence of radio waves, to discover the photoelectric effect, a negative charge, ultraviolet radiation, cesium, selenium, to be sensitive to visible light, the development of the radio tube, Fleming valve, surrounding space, a negative space charge, strength of the current, the voltage from the battery, a radio detector, to produce corresponding changes, to reproduce the signal in the receiving apparatus.

Exercise 8. Find English equivalents of the following words in the text.

Электронная лампа, нить накала, проследить, лампочка, разряд, обычные электронные трубки, отрицательный заряд, фотоэлемент, фотоэлектрический элемент, выделять, (излучать) вещество, загораться, принцип работы, внутри лампы, для преодоления силы притяжения, в структуре металла, разряд электронов, в качестве источника, в обычных электронных лампах, в телевизионных трубках, существование радиоволн, полированный металл, цезий, селен, фотоэлектрические ячейки.

Exercise 9. Define whether the following statements are true or false.

1. The working principles of electronics can be demonstrated by tracing the history of radio tubes and photoelectric cells.
2. This was called the Edison effect, and it led to the development of the modern devices.
3. This discharge of electrons is not used as a source of electrons in conventional electron tubes.
4. In 1887 Heinrich Hertz discovered the photoelectric effect.
5. If polished metal is given a negative charge and then is flooded with ultraviolet radiation, it steadily becomes the charge.
6. Some chemical elements such as cesium and selenium are not sensitive to visible light.
7. This discovery led to photoelectric cells.

Exercise 10. Study the following words and choose:

a) nouns

- a) actual; b) act; c) actuality; d) actualize
- a) amplify; b) amplification; c) amplifier; d) amplified
- a) carry; b) carrier; c) carriage; d) carried
- a) guide; b) guidance; c) guided; d) guiding
- a) vast; b) vastness; c) vastly; d) vastitude
- a) vital; b) vitalize; c) vitality; d) vitalization
- a) volume; b) voluminous; c) volumetric; d) voluminosity

b) adjectives

- a) axe; b) axial; c) axle; d) axled
- a) pendulum; b) pendant; c) pendulous; d) pendulate
- a) control; b) controller; c) controllable; d) controllability
- a) determine; b) determinate; c) determinable; d) determination.
- a) magnify; b) magnificence; c) magnificent; d) magnification.
- a) prevent; b) preventive; c) prevention; d) preventor

- a) transmitter; b) transmit; c) transmissible; d) transmitting
a) tune; b) tuneful; c) tuned d) tuner

UNIT 8 INTEGRATED CIRCUITS

Text A. Functions of ICs

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

amplification – усиление

appliances – приборы, бытовые

электроприборы

array – множество

beat – бой, биение

circuitry – схема

external – внешний

fiber – волокно, нить

fidelity – точность воспроизведения,
(качество воспроизведения)

integrated circuit – интегральная схема

magnify – увеличивать

measurement – измерение

network – сеть

oscillation – колебание, качание,
вибрация

oscillator – излучатель, осциллятор,
генератор

pendulum – маятник

supplement – дополнять, пополнять

switch – переключать, коммутировать

test pattern – испытываемый образец

versatile – разносторонний,
многосторонний, универсальный

virtually – фактически, в сущности

Exercise 2. Read and try to understand this text.

Text A. Functions of ICs

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.

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.

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.

Post-text exercises

Exercise 3. Repeat and translate into Russian the following words:

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

beat, circuit, fiber, gripper, pendulum, wave, actual, vital, carry, range, tie, tune;

b) with the stress on the second syllable:

response, internal, invaluable, control, convert, determine, manufacture, prevent, transmit, efficiently, exactly;

c) with two or more stresses:

interference, oscillator, sophisticated, versatile, voluminous, amplify, magnify.

Exercise 4. Give Russian equivalents of the following words and word-combinations.

Ultrafast, electronic circuitry, primary function, weak signals, similar, pendulum, amplitude of oscillation, tune out, interference, manufacture, actual results, amplify, fidelity, in many cases, with the help of oscillator circuits, to have a natural period or cycle of electrical current, external signals, from a particular radio channel, the oscillator circuit, to increase, the amplitude of oscillation, to reduce, interference among channels in a receiver, electronic devices, high-fidelity stereo systems, tape recorders, calculators, integrated circuits.

Exercise 5. Give 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, интегральная схема, универсальный, схема, усиление, увеличивать, излучатель (осциллятор, генератор), маятник, внешний, колебание, точность воспроизведения (качество воспроизведения), измерение, испытываемый образец, фактически, переключать, сеть, дополнять, волокно.

Exercise 6. 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

Exercise 7. Develop the following ideas. Use the words provided in the brackets.

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).

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).

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).

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

Exercise 9. Answer the following 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. How are electronic circuits used in modern communications?

Exercise 10. Define 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. Electronic circuits switch telephone calls both on Earth and in communications satellites.

Text B

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

circular wafer of silicon - круглая

пластина из кремния

despite - несмотря на

drawing – чертеж

etch away – вытравливать

exposed to light - подверженные

воздействию света

integrated circuit (IC) - интегральная
схема (ИС)

leaving the other parts intact - оставляя
другие части неповрежденными

rectangular chips - прямоугольные
чипы

semiconductor-based circuits -
полупроводниковые схемы

solvent ['sɒlvənt] - растворитель,
раствор

technique – метод, способ

Exercise 2. Read and entitle the text.

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.

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.

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.

Post-text exercises

Exercise 3. Put 5 questions to the text.

Exercise 4. Annotate the text.

Exercise 5. Speak on the following topic: “Wide use of integrated circuits in our life”.

Exercise 6. Match the words with their definitions.

Words	Definition
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	c. clothed path for an electrical current;
4. fidelity	d. device for producing electric oscillations;
5. oscillator	e. accuracy, exactness;
6. pendulum	f. answer, reaction;
7. response	g. difficult to understand or explain;
8. complex	h. weighted rod hung from a fixed point so that it swings freely, especially one to regulate the movement of a clock;
9. internal	i. great in quantity; occupying much space;
10. voluminous	j. of or in the inside

Exercise 7. Arrange the words of the two groups in pairs

with similar meaning

1. response	a) to draw attention to;
2. voluminous	b) sophisticated;
3. to supplement	c) to strengthen;
4. to amplify	d) to direct;
5. to control	e) to define;
6. fast	f) to increase;
7. to magnify	g) answer;
8. complex	h) to produce;
9. to manufacture	i) to add;
10. to determine	j) rapid;
11. vast	k) extensive;
12. versatile	l) many-sided;
13. to highlight	m) huge;

with contrary meaning

1. fast	a) to weaken;
2. internal	b) simple;
3. invaluable	c) slow;
4. sophisticated	d) to take to pieces;
5. vital	e) to reduce;
6. voluminous	f) to unpack;
7. to amplify	g) to promote;
8. to assemble	h) to untie;
9. to magnify	i) approximately;
10. to pack	j) external;
11. to prevent	k) valuable;
12. to tie	l) small;
13. exactly	m) unimportant;
14. efficient	n) inefficient;

Exercise 8. Give Russian equivalents of the following words and word-combinations.

Despite the importance, electronic devices, separated components, instead, are embedded in a single complex piece of silicon, integrated circuit (IC), manufacture of integrated circuits, circular wafer of silicon, have produced drawings, with the help of computers, are then reduced in size many times, are first coated with a material called a photoresist, etch away .

Exercise 9. Find English equivalents of the following words and word-combinations in text.

несмотря на, полупроводниковые схемы, интегральная схема (ИС), пластина из кремния, чертеж, растворитель, вытравливать, подверженные воздействию света, оставляя другие части неповрежденными, прямоугольные чипы, метод, конструкторы, самая передовая технология, инженер-электрик.

Exercise 10. Find in text the sentences with Past Simple and translate them.

UNIT 9 LASER

Text A. What is Laser?

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

amplification – усиление

beam – луч

capacity – мощность

disintegrate – распадаться на составные части

encode – кодировать

fuel – топливо

heat-resistant – теплостойкий

installation – установка, сборка

invade – вторгаться

lead – свинец

solar – солнечный

stimulate – возбуждать, индуцировать

sword of heat – огненный меч

unamenable – неподдающийся

varorize – испарять(ся)

weapon – оружие

Exercise 2. Study the following words and choose

a) *nouns*

reality, real, realistic, realize.

intense, intensity, intensive, intensification

resistant, resist, resistance, resistive

developing, development, developed, develop

provide, providing, provision, provided

b) *English equivalents*

устанавливать - installment, installation, install

различие, разница - differ, difference, different

распадаться - disintegrator, disintegration, disintegrate

применимый - application, applicable, apply

укреплять - strong, strength, strengthen

эффективно - efficient, efficiency, efficiently

усилитель - amplification, amplifier, amplify

связь - communicate, communicative, communication

передавать - transmission, transmitter, transmit

Exercise 2. Read and try to understand the text.

Text A. 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 provide 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 unamenable 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 magic¹. 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 route².

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 effect³, because of the great technological difficulties to be overcome and therefore the great cost involved. But there is no doubt that in time these projects will be realized and the laser beam will begin operating in other space as well.

Notes

as to suggest magic - можно принять за чудо

on route - на пути

put into effect – осуществлять

Post-text exercises

Exercise 3. Give Russian equivalents of the following words.

Before the turn of the century, mysterious, sophisticated invention, pure single colour, light beam, thermonuclear reaction, limitless source, conduct physical experiments, solve the problem, disintegrate, duration, approximately, encounter, complex signals, simultaneously, transmit, satellite, solar radiation, overcome.

Exercise 4. Read the text and find English equivalents of the following words and word combinations in text.

Средство, усиление, свет, эмиссия, нагрев, топливо, распад, проводить, теплостойкий, обработка, установка, возбуждать (индуцировать), выполнение, инструмент, продолжительность, менять, оружие, передавать, свинец, установка, сборка, топливо, распадаться на составные части, мощность, кодировать, солнечный.

Exercise 5. 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)

Exercise 6. Translate the third and the fifth paragraphs of the text.

Exercise 7. 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.

Exercise 8. 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

Exercise 9. Answer the following 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?

Exercise 10. Speak on the following subjects using the given words.

Laser is a very important invention of man (intensive, produce, beam, pure, single, beam, colour).

Laser is widely used in science and industry (scientists, problem, works, combine, technological, two, big, discovery).

Laser may be used in communications (intensity, change, laser, complex, encode, signal).

Lasers will be used for transmission of energy to space stations (long distance communication, the Moon, solar system, surface).

Text B

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

at a rapid rate - быстрыми темпами

fabrication – изготовление, производство

global telecommunication network - глобальная телекоммуникационная сеть

improve - улучшать, совершенствовать

of incredible transparency - невероятной прозрачности

optical communication - оптическая связь

optical fiber - оптическое волокно

optical transmission systems - оптические системы передачи

reliability – надежность

Exercise 2. Read and translate the text. 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.

Post-text exercises

Exercise 3. Put 5 questions to the text.

Exercise 4. Retell the text.

Exercise 5. Speak on the following topic: “Lasers and their use”.

Exercise 6. Match the words with their definitions.

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

Exercise 7. Arrange the words of the two groups in pairs.

with similar meaning

1. rapidly	a) requirement;
2. sophisticated	b) almost;
3. conduct	c) carry out;
4. demand	d) quickly;
5. approximately	e) complex;
6. fulfil	f) possibility;
7. opportunity	g) realize;
8. application	h) as well;
9. also	i) use;

with contrary meaning

1. further	a) incapable;
2. integrate	b) powerful;
3. cooling	c) limitless;
4. outside	d) inside;
5. powerless	e) uncontrolled;
6. controlled	f) heating;
7. limited	g) disintegrate;
8. capable	h) nearer;
9. single	i) numerous;

Exercise 8. Give Russian equivalents of the following words.

Greatly improved, optical communication, a considerable increase in capacity, quality, performance and reliability, new technologies, optical fibers, the speed of telecommunication, specialized information service, computer data, video images, will be integrated into a single digital communication network, to process and transmit any kind of information, combining two technologies, silicon fibres, transmit pulses of light, high-capacity optical transmission systems.

Exercise 9. Read the text and find English equivalents of the following words and word combinations.

Оптическая связь, оптическое волокно, улучшать, надежность, глобальная телекоммуникационная сеть, производство, оптические системы передачи, быстрыми темпами, прозрачность, компакт-диски для музыки, позволяет пользователям компьютера записывать, инструмент, оружие, изощенный, луч, сообщение, спутник, лазер.

Exercise 10. Find in text the sentences with Present Simple and translate them.

UNIT 10 TELECOMMUNICATION SYSTEM

Text A. Telecommunication

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

coaxial – коаксиальный

convert – превращать

encode – кодировать, шифровать

enormously – чрезвычайно

existence – обмен

filament – нить накала

increasingly – всё больше и больше, всё в большей и большей степени

instantaneously – моментально

instantly – немедленно

optical fiber – оптическое волокно

repeater station – ретрансляционная станция

satellite – спутник

spread – распространение

supplement – дополнять

tie – связывать

wire transmission – проводная передача

Exercise 2. Study the text and try to understand all 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 over** 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 (многopарный), 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 into light signals by a **laser-driven transmitter** (лазерный передатчик) carry both speech and data over **bundles** of thin glass or plastic filaments.(нить накаливания)

Radio communications systems transmit electronic signals in **relatively** narrow **frequency bands** (диапазон частот) 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** (далеко отстоящих друг от друга местах) **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 *промежуточное реле* or repeater stations *ретрансляционная станция*, 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 *кодированные данные* ranging from the business accounts of a multinational corporation to medical data relayed for analysis by physicians thousands of miles from a patient.

Post-text exercises

Exercise 3. Give Russian equivalents of the following words and word-combinations.

Computer data, wire lines, multi pair cable, coaxial cable, computer-processed data, commercial broadcasting, satellite communication, ground-based microwave system, additionally, to consist of, point-to-point communications, telephone, telegraph, data transmission, postal service, the electronic media, telecommunications, the invention of the telephone, fundamentally transformed telecommunications, during the middle decades of the 20th century, to carry information, by huge masses of computer data, global network.

Exercise 4. Find the equivalents of the following words and word-combinations in text.

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.

Exercise 5. Match the words with their definitions:

Word	Definition
1. filament	1. any manmade object launched from and revolving around the earth
2. encode	

3. dial	2. a fine wire with a high resistance; it is heated by the passage of an electric current, it is used in electric-light bulbs
4. supplement	3. very great in size, quantity, extent...
5. tie	4. call by means of a telephone
6. progress	5. at once
7. instantly	6. a conductor for a high electric current; it consists of several wire twisted together and covered with insulating material such as rubber, plastic, cloth
8. huge	7. to carry out a progress on data for a particular purpose, may be carried by a person, or by a computer.
9. satellite	8. to convert (a message, document...) from plain text into code
10. cable	9. make an addition or additions to
	10. to make a connection

Exercise 6. Arrange the words of the two groups in pairs

a) with a similar meaning

1. huge	a. with the help of;
2. various	b. alter;
3. require	c. send;
4. supplement	d. enormous;
5. tie	e. information;
6. existence	f. different;
7. carry	g. connect;
8. convert	h. apply;
9. data instantaneously	i. compose;
10. transmit	j. conduct;
11. change	k. immediately;
12. consist	l. being;
13. use	m. addition;
14. by means of	n. demand;
	o. transform

b) with contrary meaning

a. transmit	a. separate;
b. various	b. exclude;
c. tie	c. receive;
d. wide	d. slowly;

e. thin	e. decode;
f. include	f. similar;
g. allow	g. forbid;
h. encode	h. narrow;
i. rapidly	i. thick

Exercise 7. Translate the 6th and 7th paragraphs of the text.

Exercise 8. Read the text and answer the questions.

1. What is 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?

Exercise 9. 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.

Exercise 10. 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

Text B.

Pre-text exercises.

Exercise 1. Read the following words and try to remember them.

access – доступ

by means of – посредством

contact one another - связаться друг с другом

convert - преобразовать

in a variety of ways - различными способами

involve a sender of information -

включать отправителя информации

on a computer screen - на экране

компьютера

point-to-point transmission – передача из одной точки в другую

reach - достичь, достигать

recipient – получатель

telecommunication - телесвязь

telephone wire - телефонный провод,

телефонный кабель

transmit electronic signals – передавать
электронные сигналы

wide range - широкий диапазон

Exercise 2. Read and entitle the text.

Telecommunications embraces all devices and systems that transmit electronic signals across long distances. Telecommunications allows people around the world to contact one another, to access information instantly, and to communicate from remote areas. Telecommunications usually involves a sender of information and one or more recipients linked by a technology, such as a telephone system, that transmits information from one place to another. Telecommunications devices convert different types of information, such as sound and video, into electronic signals. The signals can then be transmitted by means of media such as telephone wires or radio waves. When a signal reaches its destination, the device on the receiving end converts the electronic signal back into an understandable message, such as sound over a telephone, moving images on a television, or words and pictures on a computer screen. Telecommunications enables people to send and receive personal messages across town, between countries, and to and from outer space. It also provides the key medium for news, data, information and entertainment.

Telecommunications messages can be sent in a variety of ways and by a wide range of devices. The messages can be sent from one sender to a single receiver (point-to-point) or from one sender to many receivers (point-to-multipoint). Personal communications, such as a telephone conversation between two people or a facsimile (fax) message (*see Facsimile Transmission*), usually involve point-to-point transmission. Point-to-multipoint telecommunications, often called broadcasts, provide the basis for commercial radio and television programming.

Post-text exercises

Exercise 3. Find Russian equivalents of the following words and word-combinations in the text.

Electronic signals, long distances, allows people to contact one another, to access information instantly, to communicate from remote areas, telecommunications usually involves a sender of information, recipients, convert different types of information, the signals can then be transmitted, by means of, reaches its destination, moving images on a television, words and pictures on a computer screen, to send and receive personal messages, entertainment.

Exercise 4. Give English equivalents of the following words and word-combinations.

Телесвязь, передавать электронные сигналы, доступ, связаться друг с другом, включать отправителя информации, получатель, преобразовать, посредством, телефонный кабель, на экране компьютера, достигать, различными способами, широкий диапазон, факсимильная передача, передача из одной точки в другую, трансляция.

Exercise 5. Speak on the following topic “What does the term ‘telecommunications’ mean?”

Exercise 6. Repeat and translate into Russian the following words.

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.

with the stress on the second syllable:

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

with two or more stresses:

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

Exercise 7. Make an outline of the text.

Exercise 8. True or false:

1. The signals can be transmitted by means of media such as telephone wires or radio waves.
2. When a signal reaches its destination, the device on the receiving end converts the electronic signal back into an understandable message.
3. Telecommunications unenables people to send and receive personal messages across town, between countries, and to and from outer space.
4. It doesn't provide the key medium for news, data, information and entertainment.
5. Telecommunications messages can be sent in by a few ranges of devices.
6. The messages can be sent from one sender to a single receiver (point-to-point) or from one sender to many receivers (point-to-multipoint).
7. Personal communications, such as a telephone conversation between two people or a facsimile (fax) message usually involve point-to- multipoint transmission.

Exercise 9. Put 6 questions to the text.

Exercise 10. Retell the text.

UNIT 11 WIRELESS COMMUNICATIONS: WHAT IS IT?

Text A. Wireless Communication

Pre-text exercises

Exercise 1. Read the following words and try to remember them.

band – диапазон

broadcast – радиовещание, вещание

cellular – сотовый (относящийся к радиотелефонной системе)

convert – преобразовывать, превращать

decode – расшифровать

device – устройство, прибор

disturb – создать помехи

drawback – изъян, недостаток

message – сообщение

oscillator – генератор (высоких частот)

radio frequency – радио частота

transceiver – приемопередатчик, радиопередатчик

transfer – передача

transmission – трансляция, передача

transmitter – передатчик

wire – электрический провод

Exercise 2. Study the text and try to understand all details.

Wireless Communication

Wireless communications are various telecommunications systems that use radio waves to carry signals and messages across distances. Wireless communications systems use devices called transmitters to generate radio waves. A microphone or other mechanism converts messages, like sounds or other data, into electronic impulses. The transmitters change, or modulate, the radio waves so they can carry the impulses, and then transmit the modulated radio signals across distances. Radio receivers pick up these signals and decode them back into original messages. Commercial radio and television are also wireless telecommunications system, but radio and television are mainly public broadcast services rather than personal communications systems.

Wireless communications allow people greater flexibility while communicating, because they do not need to remain at a fixed location, such as a home or office. Wireless technologies make communications services more readily available than traditional wire-based services (such as ordinary telephones), which require the installation of wires. This is useful in places where only temporary communications services are needed, such as at outdoor festivals or large sporting events. These technologies are also useful for communicating in remote locations, such as mountains, jungles, or deserts, where telephone service might not exist. Wireless

services allow people to communicate while in a car, airplane, or other moving vehicle. Police, fire, and other emergency departments use two-way radio to communicate information between vehicles that are already responding to emergency calls, which saves valuable time. Construction and utility workers frequently use hand-held radios for short-range communication and coordination. Many businesspeople use wireless communications, particularly cellular radio telephones, to stay in contact with colleagues and clients while traveling.

All wireless communications devices use radio waves to transmit and receive signals. These devices operate on different radio frequencies so that signals from one device will not overlap and interfere with nearby transmissions from other devices.

Principles of Wireless Communications

Wireless communications begin with a message that is converted into an electronic signal by a device called a transmitter. The transmitter uses an oscillator to generate radio waves. The transmitter modulates the radio wave to carry the electronic signal and then sends the modified radio signal out through space, where it is picked up by a receiver. The receiver decodes, or demodulates, the radio wave and plays the decoded message over a speaker. Wireless communications provide more flexibility than wire-based means of communication.

However, there are some drawbacks. Wireless communications are limited by the range of the transmitter (how far a signal can be sent), and since radio waves travel through the atmosphere, they can be disturbed by electrical interferences (such as lightning) that cause static.

Wireless communications systems involve either one-way transmissions, in which a person merely receives notice of a message, or two-way transmissions, such as a telephone conversation between two people. An example of a device that sends one-way transmission is a pager, which is a radio receiver. When a person dials a pager number, the pager company sends a radio signal to the desired pager. The encoded signal triggers the pager circuitry and notifies the customer carrying the pager of the incoming call with a tone or a vibration, and often the telephone number of the caller. Advanced pagers can display short messages from the caller, or provide news updates or sports scores.

Two-way transmissions require both a transmitter and a receiver for sending and receiving signals. A device that functions as both a transmitter and a receiver is called a transceiver. Cellular radio telephones and two-way radios use transceivers, so that back-and-forth communication between two people can be maintained. Early transceivers were very large, but they have decreased in size due to advances in

technology. Fixed-base transceivers, such as those used at police stations, can fit on a desktop, and hand-held transceivers have shrunk in size as well. Several current models of hand-held transceivers weigh less than 0.2 kg (0.5 lb).

Post-text exercises

Exercise 3. Give Russian equivalents of the following words and word-combinations.

Wireless communication, message, transmitter, broadcast, wire, remote location, valuable time, hand-held radio, convert, oscillator, drawbacks, disturb, shrunk, to involve one-way transmissions, to receive a message, two-way transmission, a telephone conversation between two people, to send one-way transmission is a pager, a radio receiver, the desired pager, the incoming call, a vibration, short messages, to update, two-way transmissions, to require both a transmitter and a receiver, a transceiver.

Exercise 4. Give English equivalents of the following words and word-combinations.

Данные, дешифровать, эксплуатационная гибкость, требовать, работники строительной компании, с малым радиусом действия, согласованность, сотовый телефон, частота, устройство, генератор (высоких частот), передача, радио частота, преобразовывать, приемопередатчик, диапазон, создать помехи, трансляция (передача), передатчик, недостаток, устройство, сотовый, сообщение, радиовещание, расшифровать, электрический провод.

Exercise 5. Match the words with their definitions:

Word	Definition
1. broadcast	a. pass on news, information, feelings; exchange information;
2. decode	b. number of repetitions in a given time;
3. frequency	c. piece of news, or a request, sent to something;
4. message	d. part of an apparatus for receiving smth., apparatus for receiving broadcast programmes;
5. communicate	e. send out in all direction, especially in radio;
6. drawback	f. smth which lessens one's satisfaction or makes progress less easy;
7. receiver	g. get the meaning of smth that written in code

Exercise 6. Use the right word from those given below:

cellular, overlap, to decode, flexibility, converts, dials, band, circuitry, to communicate, charged

1. One of the functions of radio receivers is ... signals back into the original messages.
2. Wireless communications provide people with greater ... while communicating.
3. Many businessmen prefer to use ... radio telephones to stay in contact with colleagues and clients.
4. Signals of wireless communications devices mustn't ... and interfere with nearby transmissions from other device.
5. Transmitter ... a message into an electronic signal.
6. A radio signal is sent to the desired pager by the pager company when a person ... a pager number.
7. The pager ... is triggered by the encoded signal.
8. At present civil authorities use small hand-held radio transceivers ... with each other directly.
9. Amateur or ham radio operators use the shortwave radio
10. Ionized or electrically ... particles in the layer of the atmosphere make shortwave radio broadcasts possible.

Exercise 7. Choose the best answer.

1. The word *message* means ...
 - a. a written request;
 - b. a piece of news or a request sent to smb.;
 - c. movement of the hand, head, etc. used with or instead of words;
 - d. a signal.
2. The best explanation of the word *transmitter* might be...
 - a. a part of an apparatus for receiving broadcast signals;
 - b. a person who receives;
 - c. a part of a telegraph or radio apparatus for sending out signals, messages, etc.;
 - d. an instrument for recording oscillations.
3. The word *frequency* implies...
 - a. excitement;
 - b. one swing of an electric charge;
 - c. a vibrating movement;
 - d. rate of occurrence; number of repetitions (at a given time).

4. The word *range* refers to ...
 - a. a variation between limits;
 - b. a line of persons or things;
 - c. a position in a scale;
 - d. a category or class.
5. The word *wire* means...
 - a. a radio set;
 - b. metal drawn out into the form of a thread;
 - c. a rope;
 - d. electric current
6. The best explanation of the word *broadcast* might be...
 - a. to give or pass;
 - b. to send out in all directions, esp. by radio or TV;
 - c. to help with the hand;
 - d. to pass by tradition, inheritance.
7. The verb *oscillate* means...
 - a. to swing backwards and forwards as the pendulum of a clock does;
 - b. to move regularly to and fro;
 - c. to cause smb. to move in a certain direction by waving;
 - d. to distribute

Exercise 8. Are the following statements true or false?

1. The transmitters transmit the modulated radio signals across distances.
2. Commercial radio and television aren't wireless communications systems.
3. A person should remain at a fixed location, such as home or office while using wireless communications.
4. Traditional wire-based services make communications services more readily available than wireless technologies.
5. Wireless communications are useful in remote locations where telephone service might not exist.
6. The number of companies offering wireless communications services has decreased in recent years.
7. The transmitter decodes, or demodulates the radio wave and plays the decoded message over a speaker.
8. The range of the transmitter doesn't limit wireless communications.

Exercise 9. Answer the following questions.

1. What functions do transmitters perform?
2. What functions do receivers perform?
3. What are the advantages of wireless communications?
4. Has the number of companies offering wireless communications services grown steadily in recent years?
5. What are the main principles of wireless communications?
6. How does a pager work?
7. What devices use transceivers?

Exercise 10. Translate the first and last paragraphs of the text.

Text B

Exercise 1. Read the following words and try to remember them.

air traffic controllers – авиадиспетчеры,
диспетчеры УВД

beacon – маяк

determine their positions – определить
свое местоположение

distress channels - каналы бедствия

hand-held radio transceivers - ручные
радиоприемники

in distress - попавший в беду, терпящий
бедствие

monitor - контролировать

radio- радиостанции

shortwave radio band - коротковолновый
радиодиапазон

shrink in size – уменьшаться в размере

skipping of waves - пропускание волн

walkie-talkie - рация

Exercise 2. Read the text and try to entitle it.

Wireless communications systems have grown and changed as technology has improved. Several different systems are used today, all of which operate on different radio frequencies. New technologies are being developed to provide greater service and reliability.

A. Air Transceivers

Radio operators still monitor distress channels, but maritime and aviation telecommunications systems now use high-frequency radios and satellites capable of transmitting speech, rather than wireless telegraphy, to send messages. Aircraft pilots use radios to communicate with air traffic controllers at airports and also to communicate with other pilots. Navigation beacons are equipped with transmitters that send automated signals to help ships and aircraft in distress determine their positions. While high-frequency radio can transmit signals over long distances, the quality of

these signals can be diminished by bad weather or by electrical interference in the atmosphere, which is often caused by radiation from the sun.

B. Hand-Held Radio Transceivers

Police, fire, and other emergency organizations, as well as the military, have used two-way wireless radio communication since the 1930s. Early vehicle-based radios were large, heavy units. After the invention of the transistor in 1948, radios shrank in size to small hand-held radio transceivers, which civil authorities now use to communicate with each other directly. Public two-way radios with several frequency options are widely available as well. Usually limited in range to a few miles, these units are great aids for such mobile professionals as construction workers, film crews, event planners, and security personnel. Simpler two-way radios, called walkie-talkies, have been popular children's toys for years.

C. Shortwave

Long-range broadcast services and frequencies, in what is known as the shortwave radio band (with frequencies of 3 to 30 megahertz), are available for amateur or ham radio operators. Shortwave radio broadcasts can travel long distances because of the concentration of ionized, or electrically charged, particles in the layer of the atmosphere known as the ionosphere. This layer reflects radio signals, sending signals that are transmitted upward back to earth. This skipping of waves against the ionosphere can greatly increase the range of the transmitter. The degree of reflectivity of the ionosphere depends on the time of day.

D. Cellular Radio Telephones

Cellular radio telephones, or cell phones, combine their portable radio capability with the wired, or wireline, telephone network to provide mobile users with access to the rest of the public telephone system used by non-mobile callers. Modern cellular telephones use a network of several short-range antennas that connect to the telephone system. Because the antennas have a shorter range, frequencies can be reused a short distance away without interference.

E. Satellite Communications

Satellite communications services connect users directly to the telephone network from almost anywhere in the world. Special telephones are available to consumers that communicate directly with communications satellites orbiting the earth. The satellites transmit these signals to ground stations that are connected to the telephone system. These satellite services, while more expensive than cellular or other wireless services, give users access to the telephone network in areas of the world where no telephone service exists.

The number of companies offering wireless communications services has grown steadily in recent years. In 1988 about 500 companies offered cellular radio telephone (cell phone) services. By 1995 that number had grown to over 1500 companies serving millions of subscribers. Wireless communication is becoming increasingly popular because of the convenience and mobility it affords, the expanded availability of radio frequencies for transmitting, and improvements in technology.

Post-text exercises

Exercise 3. Put 5 questions to the text.

Exercise 4. Retell the text.

Exercise 5. Be ready to talk about “What are the merits and demerits of the wireless communication”.

Exercise 6. Give Russian equivalents of the following words and word-combinations.

Wireless communications systems, radio frequencies, reliability, high-frequency radio, send messages, maritime and aviation telecommunications systems, air traffic controllers, electrical interference, depends on, cellular radio telephones, several short-range antennas, to have a shorter range, skipping of waves against the ionosphere, convenience, is becoming increasingly popular.

Exercise 7. Find English equivalents of the following words and word-combinations in text.

попавший в беду, определить свое местоположение, ручные радиоприемники, уменьшаться в размере, рация, радиостанция, коротковолновый радиодиапазон, пропускать волны, могут передавать сигналы, доступность, предлагать услуги беспроводной связи, соединять пользователей с телефонной сетью, пропускание волн, может значительно увеличить, беспроводная связь становится очень популярна, благодаря, совершенствование технологий.

Exercise 8. Translate the 2nd and 3rd paragraphs of the text.

Exercise 9. Say whether the following statements are true or false.

1. Radio communications services connect users directly to the telephone network from almost anywhere in the world.
2. Special telephones are not available to consumers that communicate directly with communications satellites orbiting the earth.

3. The satellites transmit these signals to ground stations that are connected to the telephone system.
4. These satellite services, while cheaper than cellular or other wireless services, give users access to the telephone network in areas of the world where no telephone service exists.
5. Modern cellular telephones use a network of several short-range antennas that connect to the telephone system.
6. Special telephones are available to consumers that communicate directly with communications satellites orbiting the earth.
7. The satellites transmit these signals to ground stations that are connected to the radio.

Exercise 10. Give a summary of the text.

UNIT 12 SOME STEPS FROM THE HISTORY OF COMMUNICATION SYSTEMS DEVELOPMENT

Pre-text - exercises

Exercise 1. Read the following words and try to remember them.

a *far* sensitive receiver – зд. *очень*
чувствительный приемник
ancient ['eɪn(t)ʃ(ə)nt] times - в древности
armies - вооруженные силы
award - присуждать, назначать (награду, премию)
broadcasting - радиовещание, трансляция; радиопередача
capable - (of) способный на что-л.
contribute - вносить вклад
deliver - доставлять, разносить, развозить
due to - благодаря; вследствие; в результате; из-за
early – зд. первые
establish - учреждать, устанавливать
feasibility - осуществимость, выполнимость
frequency modulation - частотная модуляция
intelligible messages - четкие, ясные послания, сообщения
introduction - введение, вступление
lay - laid - класть, положить

maritime - морской
microphone ['maɪkrəfəʊn] - микрофон
mirror galvanometer [ˌgælvə'nɒmɪtə] - зеркальный гальванометр
navy - военно-морской флот, военно-морские силы
numerous ['nju:m(ə)rəs] - многочисленный, множественный
papyrus - папирус
postal system - почтовая система
powdered carbon - порошкообразный уголь
prove - доказывать
receiving coil - приемная катушка
runner - посыльный, гонец
sensitive instrument - точный прибор; чувствительный прибор
simultaneously [ˌsɪm(ə)'teɪniəsli] - одновременно
suggest - предлагать, советовать
transmitting coil - передающая катушка

Learn to pronounce:

Charles [tʃɑ:lz] Bourseul [bur'sel] - Шарль Бурсель

Samuel ['sæmjʊəl] Morse [mɔ:s]

Nobel [nəʊ'bel] Prize

Julius ['dʒu:lɪəs] Caesar ['si:zə]

Graham ['grɛɪəm] Bell

Egyptians [ɪ'dʒɪpʃ(ə)n] - египтянин, египтянка

Exersice2. Read this text and try to understand it.

Some Steps from the History of Communication Systems Development

Long ago men found it necessary to communicate at a distance. When the alphabet was invented, they began to use **papyrus** and something like the modern letter appeared. The first to send letter were the **ancient** Egyptians. A **runner delivered** them. However, the Romans organized the best **postal system** of ancient times.

From then on until the 19-th century, there were practically no advances in the means of communication. Even when Queen Victoria began to rule England in 1837, her means of communication with distant parts of her empire were no faster than those of **Julius Caesar**.

The first practical electromagnetic telegraph was invented by the Russian scientist Pavel Shilling in 1828, and in 1832 he **established** telegraph communication between the Winter Palace and the Ministry of Transport in St. Petersburg. Shilling's work was continued in Russia by B. Yakobi, who made several improvements in the electromagnetic telegraph and linked St. Petersburg with Tsarskoye Selo. This 25 kilometer-line was the longest in the world at that time. Yakobi invented the telegraph sending key, adopted by the American **Samuel Morse**. Morse, however, invented the telegraph code of dots and dashes, which is used all over the world to this day.

The first transatlantic telegraph cable from Europe to America was **laid** in 1858 **due to** the great British scientist Professor William Thomson. He also invented the **mirror galvanometer**, the very **sensitive** instrument used at first to receive signals transmitted over very long cables. Three letters could be transmitted per minute over the first transatlantic cable. The present speed of operation of telegraph cables reaches 2,500 letters per minute.

The telephone is a much younger invention than the telegraph. The French mechanic **Charles Boursel** first **suggested** the idea of transmitting speech electrically. The first telephone that found application was invented by the American **Graham Bell** in 1876. Russian inventors made several important improvements in the telephone. In 1879 the Russian engineer Mikhalsky made a **microphone** with **powdered carbon**, a prototype of the present-day microphone. Next year another Russian inventor, Golubitsky made a **far sensitive receiver** than the receiver of Bell. In 1880 the Russian military communication expert G. Ignatyev invented a device that made it possible to use the same wire **simultaneously** for a telephone conversation and for telegraph communication. Today the method of **frequency modulation** makes it possible to transmit several hundred telephone conversations over the same wire simultaneously.

The telegraph and the telephone were soon followed by an even more wonderful invention, which made possible communication without wires. **Numerous** scientists from different countries **contributed** to the appearance of wireless communication. Heinrich Hertz, constructed a primitive radio system **capable** of transmitting and receiving space waves through free space. In 1893, Nikola Tesla, in America, first demonstrated the **feasibility** of wireless communications. He **proved** that **intelligible messages** could be transmitted without wires and established a system which was composed of a **transmitting coil (or conductor)** and a **receiving coil**. At last, in 1895, the Russian scientist A.S. Popov demonstrated his first radio receiver. In March 1897 G. Marconi, an Italian inventor, transmitted wireless telegraphy signals over a distance of two miles and later he established the first transatlantic radio communication between Canada and England. For this achievement, he was **awarded** the Nobel Prize.

Early uses of communication were **maritime** for sending telegraphic messages using Morse code between ships and land. Radio was used to pass on orders and communications between **armies and navies** in World War I. **Broadcasting** became possible in the 1920s with the **introduction** of radio receivers in Europe and the U.S.A. Another use of radio was the development of detecting and locating aircraft and ships by the use of radar.

Today radio takes many forms, including wireless networks and mobile communications of all types, as well as radio broadcasting.

Post-text exercises

Exercise 3. Look through the text. Answer the questions using the information from the text:

1. When and how did the first messages appear? 2. Where were the first letters delivered? 3. Who established the first telegraph and when? 4. Who continued and improved the achievements of P. Shilling? 5. What did B. Yacobi invent? 6. What is S. Morse famous for? 7. Who first suggested the idea of transmitting speech? 8. What Russian engineers perfected the idea of telephone conversation? 9. What scientists contributed to the development of wireless communication? 10. Who was awarded the Nobel Prize and what for?

Exercise 4. Translate the following word combinations:

Postal system; from then on; to establish telegraph communication; communication system development; to make several improvements; the telegraph sending key; the telegraph code of dots and dashes; to lay the cable; due to; to invent the mirror galvanometer; at first; to transmit per minute; to reach the speed of operation; the idea of transmitting speech; to find application; to make several important improvements; powdered carbon; the present – day microphone; a far sensitive receiver; to use the same wire simultaneously; to contribute to the appearance of wireless communication; the feasibility of wireless communications; intelligible messages; a transmitting coil and a receiving coil; at last; a radio receiver; to be awarded the Nobel Prize; to pass on orders; radio broadcasting; to become feasible; detecting and locating aircrafts and ships.

Exercise 5. Remember the meaning of the verbs and translate their derivatives.

to transmit – transmitter, transmission, transmitted, transmissible, transmitting (coil)
to receive – receiver, reception, receptive, receptivity, receiving (coil)
to communicate – communication, communicative, uncommunicative, communicator
to improve – improvement, improver, improved, unimproved, improvable, unimprovable
to appear – disappear, appearance, disappearance
to establish – to disestablish, established, establishment
to follow – follower, following
to contribute – contribution, contributor, contributory
to invent – inventor, invention, invented
to predict – predicted, prediction, predictor

Exercise 6. Find the English equivalents of the following words and word-combinations in the text.

Ancient, armies, award, broadcasting, capable, contribute, deliver, electromagnetic telegraph, establish, telegraph communication, to make improvements, code of dots and dashes, due to, mirror galvanometer, sensitive instrument, over the first transatlantic cable, to suggest, transmitting speech electrically, transmitting coil, frequency modulation, intelligible messages, sensitive receiver, numerous, papyrus, postal system, powdered carbon prove.

Exercise 7. Define whether the following statements are true or false and correct the false ones.

1. The first practical electromagnetic telegraph was invented by the Russian scientist Pavel Shilling in 1868.
2. He established telegraph communication between the Winter Palace and the Ministry of Transport in Moscow.
3. Shilling's work was continued in Russia by B. Yakobi.
4. B. Yakobi made several improvements in the electromagnetic telegraph and linked St. Petersburg with Tsarskoye Selo.
5. This 25 kilometer-line was the shortest in the world at that time.
6. Pavel Shilling invented the telegraph code of dots and dashes, which is used all over the world to this day.
7. The telephone is a much younger invention than the telegraph.
8. The German mechanic Charles Boursel first suggested the idea of transmitting speech electrically.

Exercise 8. Translate the 4th paragraph of the text.

Exercise 9. Read the text and answer the questions.

1. When was the first practical electromagnetic telegraph invented?
2. Who established telegraph communication between the Winter Palace and the Ministry of Transport in St. Petersburg?
3. Who invented the telegraph sending key, adopted by the American Samuel Morse?
4. Who invented the telegraph code of dots and dashes, which is used all over the world to this day?
5. When was the first transatlantic telegraph cable from Europe to America laid?
6. Who invented the mirror galvanometer?

Exercise 10. Match the names of inventors with their inventions:

1. Pavel Shilling	a. invented the telegraph sending key
2. B. Yakobi	b. invented the mirror galvanometer
3. Morse	c. the first practical electromagnetic telegraph
4. William Thomson.	d. first suggested the idea of transmitting speech electrically
5. Charles Boursel	e. invented the telegraph code of dots and dashes,
6. Mikhalsky	f. invented the first telephone
7. Graham Bell	g. made a microphone with powdered carbon, a prototype of the present-day microphone
8. G. Ignatyev	h. invented a device that made it possible to use the same wire simultaneously for a telephone conversation and for telegraph communication.

PART II

ADDITIONAL TEXTS

Text 1. Passive Elements in Radioelectronic Apparatus

Passive elements in electrical circuits are the elements that do not generate energy. They include resistors, capacitors, inductance coils, transformers, oscillatory circuits.

Units in which resistance is deliberately created are known as resistors. They are used either to reduce the current to a desired value or to produce a specific voltage drop external to the voltage source. Resistors are available in a wide range of values, from a fraction of an ohm to many megohms.

Inductance coil is a coil of wire with an air or iron core through which an alternating current is passed. The inductance of coil depends on the number of turns, the cross-sectional area and the material inside the coil. The unit of inductance is the henry.

A transformer is a static electromagnetic apparatus operated on the basis of induction. It consists of two coils (primary and secondary) which have mutual inductance between them. These two coils are coupled by means of mutual inductance. With the help of transformer we can transfer the energy from one circuit to another and also change it from one voltage level to another. There exist step-up and step-down transformers.

The device known as a condenser (capacitor) consists of two conducting plates, separated by an insulating material called a dielectric. A condenser is capable of storing electrical energy.

The property of two electrical conductors, separated by a dielectric, to receive and retain electrical charges is known as capacity. It depends upon the area of the plates, the distance between them and upon the nature of dielectric. The unit of capacitance is the farad.

An oscillatory circuit includes a capacitor connected to a self-inductance coil. The electric properties of such a circuit are determined by the capacitance the capacitor, the inductance of the coil and the resistance of the entire circuit.

Text 2. Vacuum Tubes

Though ousted in many spheres of application, electron valves present some interest as they are still in use.

An electron tube has a glass or metal envelope enclosing metal electrodes in a vacuum. The electrodes enable the electrons to flow through the evacuated space

inside the tube. The electrode which emits electrons is the cathode. Generally, the cathode is heated by a wire filament, which results in thermionic emission of electrons.

The electrode that collects the emitted electrons is the anode, or plate. The plate has a positive potential applied with respect to the cathode, so that the emitted electrons are attracted to provide plate current. Between the cathode and the anode the tube can also have the third electrode - a wire serving as a control grid to increase or decrease electron flow to the plate.

There are two advantages in using a vacuum tube to provide current. First, the emitted electrons can flow in only one direction from the cathode to the plate inside the tube. Thus, the tube serves as a rectifier, changing alternating current into direct current.

Second, the amount of plate current can be controlled by the grid, so that in practice, a small potential on the grid can control a much larger potential on the plate. Therefore, the tube can be used as an amplifier for electrical variations.

The diode is used as a half-wave rectifier. Two diodes can be used in a full-wave rectifier circuit.

In the triode the control grid determines how many electrons from the space charge can be attracted by the positive plate to provide plate current. The more negative the control grid voltage is, the less the plate current.

Text 3. Transistors

A transistor is an entirely new type of electron device consisting of two p-n junctions. Transistors are far smaller than tubes, have no filament and hence need no heating power. They are mechanically rugged, have practically unlimited life and can do some jobs better than electron tubes.

A p-n-p junction is known to be made up of a sandwich of two p-n germanium junction diodes, placed back to back. The centre of the n-type portion of the sandwich is extremely thin in comparison with the p-regions. If a potential difference is applied to the junction transistor so that the p-regions are negative with respect to the central n-region, the mobile electrons in the n-region, therefore, move away from both the junctions in the direction of the positive connecting terminal. The holes in each of the p-region also move away from the junctions and are attracted toward the negative terminals. Under this condition the current flow stops. The n-p-n transistor is similar to the p-n-p transistor except that polarities are reversed. Transistors are widely used in various amplifiers, receivers, oscillators and many other electronic devices.

In recent years the transistor - an entirely new type of electron device has replaced the electron tubes in many applications. In contrast to electron tubes the

transistor relies for its operation on the movement of charge carriers through a solid state, a semiconductor.

When transistors are operated as an amplifier three basic circuit connections are possible. These are:

common- base

common - emitter

common - collector

The common - emitter circuit is the most efficient of the three basic connections. The common - collector connection provides a high input resistance, a low output resistance and about the same gain as the common - emitter circuit.

The common - base connection provides a very low input resistance and a high output resistance.

The bipolar transistor

The bipolar junction transistor consists of two junctions formed by a sandwich of doped semiconductor material. These bipolar transistors may be of p-n-p or n-p-n type. In the n-p-n transistor a thin layer or lightly doped p-type material (base) is placed between two thicker layers of n-type material (emitters collector). In the p-n-p transistor the base is made up of n-type material. The base layer may be as thin as one micron. When the circuit is closed the base-emitter junction becomes forward - biased allowing a current to flow in the collector -emitter circuit. This is transistor action. Thus, the transistor is a current -controlled device. The current gain is the ratio of collector current to the base current. In a typical small silicon transistor the current gain is of the order of 100.

Text 4. The basic elements of a telecommunication system

The basic elements of a telecommunication system are:

- a transmitter that takes information and converts it to a signal for transmission;
- a receiver that receives and converts the signal back into usable information.

For example, consider a radio broadcast. In this case, the broadcast tower is the transmitter, the radio is the receiver and the transmission medium is free space. Often telecommunication systems are two-way and devices act as both a transmitter and receiver or transceiver. For example, a mobile phone is a transceiver. Telecommunication over a phone line is called point-to-point communication because it is between one transmitter and one receiver; telecommunication through radio

broadcasts is called broadcast communication because it is between one powerful transmitter and numerous receivers.

Signals can either be analogue or digital. In an analogue signal, the signal is varied continuously with respect to the information. In a digital signal, the information is encoded as a set of discrete values (e.g. 1's and 0's).

A collection of transmitters, receivers or transceivers that communicate with each other is known as a network. Digital networks may consist of one or more routers that route data to the correct user. An analogue network may consist of one or more switches that establish a connection between two or more users. For both types of network, a repeater may be necessary to amplify or recreate the signal when it is being transmitted over long distances. This is to combat noise which can corrupt the information carried by a signal.

A channel is a division in a transmission medium so that it can be used to send multiple independent streams of data. For example, a radio station may broadcast at 96 MHz while another radio station may broadcast at 94.5 MHz. In this case the medium has been divided by frequency and each channel received a separate frequency to broadcast on. Alternatively one could allocate each channel a segment of time over which to broadcast.

The shaping of a signal to convey information is known as modulation. Modulation is a key concept in telecommunications and is frequently used to impose the information of one signal on another. Modulation is used to represent a digital message as an analogue waveform. This is known as keying and several keying techniques exist —these include phase-shift keying, amplitude-shift keying and minimum-shift keying. Bluetooth, for example, uses phase-shift keying for exchanges between devices.

However, more relevant to earlier discussion, modulation is also used to boost the frequency of analogue signals. This is because a raw signal is often not suitable for transmission over free space due to its low frequencies. Hence its information must be superimposed on a higher frequency signal (known as a carrier wave) before transmission. There are several different modulation schemes available to achieve this — some of the most basic being amplitude modulation and frequency modulation. An example of this process is a DJ's voice being superimposed on a 96 MHz carrier wave using frequency modulation (the voice would then be received on a radio as the channel "96 FM").

Text 5. Radio. AM and FM

Originally, radio technology was called 'wireless telegraphy', which was shortened to 'wireless'. The prefix radio- in the sense of wireless transmission was first recorded in the word radioconductor, coined by the French physicist Edouard Branly in 1897 and based on the verb to radiate. 'Radio' as a noun is said to have been coined by advertising expert Waldo Warren (White 1944). The word appears in a 1907 article by Lee de Forest, was adopted by the United States Navy in 1912 and became common by the time of the first commercial broadcasts in the United States in the 1920s. (The noun 'broadcasting' itself came from an agricultural term meaning 'scattering seeds'.) The American term was then adopted by other languages in Europe and Asia, although Britain retained the term 'wireless' until the mid-20th century.

In Chinese, the term 'wireless' is the basis for the term 'radio wave' although the term for the device that listens to radio waves is literally 'device for receiving sounds'.

AM broadcast radio sends music and voice in the Medium Frequency (MF—0.300 MHz to 3 MHz) radio spectrum. AM radio uses amplitude modulation, in which louder sounds at the microphone causes wider fluctuations in the transmitter power while the transmitter frequency remains unchanged. Transmissions are affected by static because lightning and other sources of radio add their radio waves to the ones from the transmitter.

FM broadcast radio sends music and voice, with higher fidelity than AM radio. In frequency modulation, louder sounds at the microphone cause the transmitter frequency to fluctuate farther, the transmitter power stays constant. FM is transmitted in the Very High Frequency (VHF—30 MHz to 300 MHz) radio spectrum. FM requires more radio frequency space than AM and there are more frequencies available at higher frequencies, so there can be more stations, each sending more information. Another effect is that shorter VHF radio waves act more like light, travelling in straight lines, hence the reception range is generally limited to about 50-100 miles. During unusual upper atmospheric conditions, FM signals are occasionally reflected back towards the Earth by the ionosphere, resulting in Long distance FM reception. FM receivers are subject to the capture effect, which causes the radio to only receive the strongest signal when multiple signals appear on the same frequency. FM receivers are relatively immune to lightning and spark interference.

FM Subcarrier services are secondary signals transmitted “piggyback” along with the main program. Special receivers are required to utilize these services.

Analog channels may contain alternative programming, such as reading services for the blind, background music or stereo sound signals. In some extremely crowded metropolitan areas, the subchannel program might be an alternate foreign language

radio program for various ethnic groups. Subcarriers can also transmit digital data, such as station identification, the current song's name, web addresses, or stock quotes. In some countries, FM radios automatically retune themselves to the same channel in a different district by using sub-bands.

Aviation voice radios use VHF AM. AM is used so that multiple stations on the same channel can be received. (Use of FM would result in stronger stations blocking out reception of weaker stations due to FM's capture effect). Aircraft fly high enough that their transmitters can be received hundreds of miles (kilometres) away, even though they are using VHF.

Marine voice radios can use AM in the shortwave High Frequency (HF—3 MHz to 30 MHz) radio spectrum for very long ranges or narrowband FM in the VHF spectrum for much shorter ranges.

Government, police, fire and commercial voice services use narrowband FM on special frequencies. Fidelity is sacrificed to use a smaller range of radio frequencies, usually five kHz of deviation, rather than the 75 kHz used by FM broadcasts and 25 kHz used by TV sound.

Civil and military HF (high frequency) voice services use shortwave radio to contact ships at sea, aircraft and isolated settlements. Most use single sideband voice (SSB), which uses less bandwidth than AM. On an AM radio SSB sounds like ducks quacking. Viewed as a graph of frequency versus power, an AM signal shows power where the frequencies of the voice add and subtract with the main radio frequency. SSB cuts the bandwidth in half by suppressing the carrier and (usually) lower sideband. This also makes the transmitter about three times more powerful, because it doesn't need to transmit the unused carrier and sideband.

TETRA, Terrestrial Trunked Radio is a digital cell phone system for military, police and ambulances.

Commercial services such as XM, WorldSpace and Sirius offer encrypted digital Satellite radio.

Text 6. Electric shock and safety electric system

The strength of current depends on both the voltage and the resistance in a circuit. A current of 50 mA (*milliampere*) *миллиампер* is dangerous for a man; it may result in an electric shock. One gets an electric shock in case one touches live conductors when the power is on. And a current of 100 mA and higher is lethal. Thus, before working on a circuit, deenergize it and work on it with the power off.

Earthing system serves to protect attending personnel from electric shocks when voltage appears on parts that are normally dead. The risk of an electric shock decreases

with decreasing voltage. In wet and hot atmosphere the risk of electric shock increases. Safe voltage for circuits used in dry atmosphere is under 36 V. When the power is on contacts with live conductors are dangerous for life. When a live conductor is touched with both hands the resistance of the conductor is from 10.000 to 50.000 ohms. When a live conductor is touched with one hand the resistance is much higher. The higher is the body resistance, the smaller is the current that flows through the body. Take it into consideration and work with one hand if the power is on! Or work on the circuit with the power off!

Thus measures are taken to protect attending personnel from contacts with live parts of installations under voltage.

The danger of electric shock disappears provided the metal parts of installations under voltage are connected with ground by means of safety earthing. Connecting to ground is made by means of measuring devices. The faulty parts should be detected, eliminated, and replaced by new ones.

Text 7. Electricity and magnetism

It has been known for centuries that certain black heavy stones have the property of attracting iron, this property is called magnetism. A body that exhibits magnetism is called a magnet. The two parts of a magnet that show the strongest magnetism are called the north-pole and south-pole.

Magnets not only affect ordinary iron, but they affect one another. When a pole of one magnet is brought toward a pole of the second magnet, they will repel if both are north-poles or both south-poles, but they will attract if one is the north-pole and the other is the south-pole.

The region in which magnetic forces act is called a magnetic field.

When placed in a strong magnetic field, iron becomes magnetized.

Electricity and magnetism are closely connected. Almost all metals are good conductors of electricity, with copper being one of the best conductors of all. Glass, paper, rubber are the most common non-conductors or insulators.

Many practical applications have resulted from the utilization of the magnetic effect of electricity current.

These effects are used in motors, in most electric meters (amperometers, voltmeters, galvanometers), in electromagnets and practically in all electromechanical apparatus.

Text 8. Uses of Radio Waves

The prime purpose of radio is to convey information from one place to another through the intervening media (i.e., air, space, nonconducting materials) without wires. Besides being used for transmitting sound and television signals, radio is used for the transmission of data in coded form. In the form of radar it is used also for sending out signals and picking up their reflections from objects in their path. Long-range radio signals enable astronauts to communicate with the earth from the moon and carry information from space probes as they travel to distant planets (see space exploration). For navigation of ships and aircraft the radio range, radio compass (or direction finder), and radio time signals are widely used. Radio signals sent from global positioning satellites can also be used by special receivers for a precise indication of position (see navigation satellite).

Digital radio, both satellite and terrestrial, provides improved audio clarity and volume. Various remote-control devices, including rocket and artificial satellite operations systems and automatic valves in pipelines, are activated by radio signals. The development of the transistor and other microelectronic devices (see microelectronics) led to the development of portable transmitters and receivers. Cellular and cordless telephones are actually radio transceivers. Many telephone calls routinely are relayed by radio rather than by wires; some are sent via radio to relay satellites. Some celestial bodies and interstellar gases emit relatively strong radio waves that are observed with radio telescopes composed of very sensitive receivers and large directional antennas (see radio astronomy).

Text 9. Transmission and Reception of Radio Waves

For the propagation and interception of radio waves, a transmitter and receiver are employed. A radio wave acts as a carrier of information-bearing signals; the information may be encoded directly on the wave by periodically interrupting its transmission (as in dot-and-dash telegraphy) or impressed on it by a process called modulation. The actual information in a modulated signal is contained in its sidebands, or frequencies added to the carrier wave, rather than in the carrier wave itself. The two most common types of modulation used in radio are amplitude modulation (AM) and frequency modulation (FM). Frequency modulation minimizes noise and provides greater fidelity than amplitude modulation, which is the older method of broadcasting. Both AM and FM are analog transmission systems, that is, they process sounds into continuously varying patterns of electrical signals which resemble sound waves. Digital radio uses a transmission system in which the signals propagate as discrete

voltage pulses, that is, as patterns of numbers; before transmission, an analog audio signal is converted into a digital signal, which may be transmitted in the AM or FM frequency range. A digital radio broadcast offers compact-disc-quality reception and reproduction on the FM band and FM-quality reception and reproduction on the AM band.

In its most common form, radio is used for the transmission of sounds (voice and music) and pictures (television). The sounds and images are converted into electrical signals by a microphone (sounds) or video camera (images), amplified, and used to modulate a carrier wave that has been generated by an oscillator circuit in a transmitter. The modulated carrier is also amplified, and then applied to an antenna that converts the electrical signals to electromagnetic waves for radiation into space. Such waves radiate at the speed of light and are transmitted not only by line of sight but also by deflection from the ionosphere.

Receiving antennas intercept part of this radiation, change it back to the form of electrical signals, and feed it to a receiver. The most efficient and most common circuit for radio-frequency selection and amplification used in radio receivers is the superheterodyne. In that system, incoming signals are mixed with a signal from a local oscillator to produce intermediate frequencies (IF) that are equal to the arithmetical sum and difference of the incoming and local frequencies. One of those frequencies is applied to an amplifier. Because the IF amplifier operates at a single frequency, namely the intermediate frequency, it can be built for optimum selectivity and gain. The tuning control on a radio receiver adjusts the local oscillator frequency. If the incoming signals are above the threshold of sensitivity of the receiver and if the receiver is tuned to the frequency of the signal, it will amplify the signal and feed it to circuits that demodulate it, i.e., separate the signal wave itself from the carrier wave.

Text 10. Differences between AM and FM receivers

There are certain differences between AM and FM receivers. In an AM transmission the carrier wave is constant in frequency and varies in amplitude (strength) according to the sounds present at the microphone; in FM the carrier is constant in amplitude and varies in frequency. Because the noise that affects radio signals is partly, but not completely, manifested in amplitude variations, wideband FM receivers are inherently less sensitive to noise. In an FM receiver, the limiter and discriminator stages are circuits that respond solely to changes in frequency. The other stages of the FM receiver are similar to those of the AM receiver but require more care in design and assembly to make full use of FM's advantages. FM is also used in television sound systems. In both radio and television receivers, once the basic signals

have been separated from the carrier wave they are fed to a loudspeaker or a display device (usually a cathode-ray tube), where they are converted into sound and visual images, respectively.

Text 11. Development of Radio Technology

Radio is based on the studies of James Clerk Maxwell, who developed the mathematical theory of electromagnetic waves, and Heinrich Hertz, who devised an apparatus for generating and detecting them. Guglielmo Marconi, recognizing the possibility of using these waves for a wireless communication system, gave a demonstration (1895) of the wireless telegraph, using Hertz's spark coil as a transmitter and Edouard Branly's coherer (a radio detector in which the conductance between two conductors is improved by the passage of a high-frequency current) as the first radio receiver. The effective operating distance of this system increased as the equipment was improved, and in 1901, Marconi succeeded in sending the letter S across the Atlantic Ocean using Morse code. In 1904, Sir John A. Fleming developed the first vacuum electron tube, which was able to detect radio waves electronically. Two years later, Lee de Forest invented the audion, a type of triode, or three-element tube, which not only detected radio waves but also amplified them.

Text 12. The major developments in radio in the 20th century

Radio telephony—the transmission of music and speech—began in 1906 with the work of Reginald Fessenden and Ernst F. W. Alexanderson, but it was not until Edwin H. Armstrong patented (1913) the circuit for the regenerative receiver that long-range radio reception became practicable. The major developments in radio initially were for ship-to-shore communications. Following the establishment (1920) of station KDKA at Pittsburgh, Pa., the first commercial broadcasting station in the United States, technical improvements in the industry increased, as did radio's popularity. In 1926 the first broadcasting network was formed, ushering in the golden age of radio. Generally credited with creating the first modern broadband FM system, Armstrong built and operated the first FM radio station, KE2XCC, in 1938 at Alpine, N.J. The least expensive form of entertainment during the Great Depression, the radio receiver became a standard household fixture, particularly in the United States. Subsequent research gave rise to countless technical improvements and to such applications as radio facsimile, radar, and television. The latter changed radio programming drastically, and the 1940s and 50s witnessed the migration of the most popular comedy and drama shows from radio to television. Radio programming became mostly music and news and, to a lesser extent, talk shows. The turn of the

century saw a potential rebirth for radio as mobile digital radio entered the market with a satellite-based subscription service in Europe (1998) and in the United States (2000). Two years later, a land-based digital radio subscription service was inaugurated in the United States.

Radios that combine transmitters and receivers are now widely used for communications. Police and military forces and various businesses commonly use such radios to maintain contact with dispersed individuals or groups. Citizens band (CB) radios, two-way radios operating at frequencies near 27 megahertz, most typically used in vehicles for communication while traveling, became popular in the 1970s. Cellular telephones, despite the name, are another popular form of radio used for communication.

Text 13. British achievements in science and technology in the 20th century

Britain has a long tradition of research and innovation in science, technology and engineering in universities, research institutes and industry. Its record of achievement in the 20th century is in many ways unsurpassed. For example, fundamental contributions to modern genetics were made through the discovery of the three-dimensional molecular structure of DNA (deoxyribonucleic acid) and of cholesterol, vitamin D, penicillin and insulin.

Notable contributions in other areas over the past 25 years have been made in improving the understanding of the nature and origin of the universe; in superconductivity (abnormally high electrical conductivity at low temperatures); in radio astrophysics; and in computer assisted tomography (a form of radiography) for medical diagnosis.

Much pioneering work was done during the 1980s. For example, in 1985 British scientists discovered the hole in the ozone layer over the Antarctic. In the same year was invented DNA fingerprinting, a forensic technique which can identify an individual from a small tissue sample. More recently there have been several British breakthroughs in genetics research, including the identification of the gene in the Y-chromosome responsible for determining sex, and the identification of the other genes linked to diseases, including inherited heart disease. A vaccine has been developed to protect against cancer. The world's first pig to have a genetically modified heart has been bred by scientists at Cambridge University, an important milestone in breeding animals as organ donors for people.

Abbreviation

a. c. - alternating current

a. f. - audio frequency

cm(s) - centimeter (s)

c. p. s. (c/s) - cycles per second

d. c. - direct current

e. g. - for example

e. m. f., emf - electromotive force

etc. - and so on

e. v. - electron-volt

hr(s) - hour(s)

i. e. - that is

i. f. - intermediate frequency

kc - kilocycle

km (s) - kilometer(s)

mc - megacycle

mm(s) - millimeter(s)

n-p-n - negative-positive-negative

p. h. - per hour

p. m. - per minute

p-n-p - positive-negative-positive

p. s. - per second

r. f. - radio frequency

t. r. f. - tuned radio frequency

v. s. - versus

viz. - Namely

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