

Обучение чтению научно-технической литературы

(для студентов I курса технических специальностей,
изучающих английский язык)

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Учебное пособие «Обучение чтению научно-технической литературы» предназначено для аудиторных занятий со студентами 1 курса технических специальностей, изучающими иностранный язык по программе бакалавриата, а также для самостоятельной работы студентов. Оно является основной частью УМК и используется в учебном процессе вместе с методическими указаниями по грамматике английского языка и методическими указания по обучению основам коммуникации.

Цель пособия – подготовить студентов к работе с оригинальной литературой, обучить необходимым лексико-грамматическим навыкам для извлечения информации из профессионально-ориентированных текстов, сформировать первичные навыки устной и письменной коммуникации.

Тексты каждого урока (А, В, С) позволяют осуществлять работу по обучению различным видам чтения, письму и говорению, закрепить полученные навыки работы с иноязычным текстом, а диалоги и творческие задания – усвоить определенный набор речевых клише, необходимых для коммуникации. Для развития навыков аудирования ряд упражнений и текстов имеет аудиовersion.

При составлении методических указаний использовались толковые словари, Интернет-ресурсы, а также следующая литература:

1. Андрианова Л.Н., Багрова Н.Ю., Ершова Э.В. Книга для чтения по английскому языку для заочных технических вузов.- М.: Высшая школа, 1980.
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4. УМК Macmillan Guide to Science. - Macmillan, 2009.
5. Esteras S.R. Infotech. English for computer users. - Cambridge, 1996.
6. M. Ibbotson. Cambridge English for Engineering. Cambridge University Press, 2008.
7. Hartley B., Viney P. StreamLine English. - Oxford, 1988.

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2011

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PART II

UNIT 1

GRAMMAR: Passive Voice and Modal Verbs (revision).

TEXTS: 20th Century. Television is Developed. A.Einstein.

TEXT A.

20TH CENTURY

1) Read and analyze the text, find Passive Voice forms, Modal Verbs:



Technology has made modern society possible. It has added to leisure time and reduced the long hours of work. Technology can allow the world to feed itself. It has reduced the effects of natural catastrophes. The world is now a smaller place where people can communicate with each other and travel rapidly everywhere.

The establishment of the assembly line by Henry Ford in 1913 made automobiles inexpensive enough. Technology has raised the standard of living. The 20th century has become the century of many inventions. New materials (e.g. synthetic rubber, artificial fabrics and plastics) have affected the ways of life and fashion.

Electronics was ushered in when Marconi sent the first transatlantic radio message in 1901. Radio and television changed communications and entertainment habits. In 1948 the transistor was invented, and the era of modern computers was started.

In 1957 the Space Age began, when the first Earth-orbiting satellite – *Sputnik* was launched by the Soviet Union.

Medical technology was expanded by the use of new medicines and new equipment. New technologies in biology led to genetic engineering, in which living cells can be altered. In 1996 a lamb called Dolly has become the first large animal which was cloned from the genetic material extracted from the adult cell.

Technology keeps advancing at a rapid rate. It can only be guessed what the “information revolution” of the XXI century will bring about.



NOTES:

| | |
|--|-------------------------------|
| Leisure time – | досуг |
| To feed (fed, fed) – | питать(ся) |
| Entertainment habits – | виды развлечений |
| To alter – | менять |
| Adult cell – | клетка взрослого организма |
| Keeps advancing at a rapid rate – | продолжает быстро развиваться |
| To guess – | догадываться |

REMEMBER:

Reduce , v 1) Уменьшать, снижать, сокращать (вес, число, скорость, степень, затраты и т.д.).

2) *хим.* Восстанавливать

reduction , n 1) уменьшение, сокращение

2) восстановление

Exersize 1. Find in the text all international words

Exersize 2. Find English equivalents:

Уровень жизни, искусственные ткани, новые лекарства, информационная революция, новое оборудование, первый спутник вокруг земной орбиты, каучук, радиосигнал, образ жизни, запускать на орбиту, сборочная линия, офисная оргтехника, генная инженерия.



Exersize 3. Answer the questions:

- 1) What are the positive effects of technology?
- 2) What are the negative effects of technology?
- 3) What new technologies in biology can do?
- 4) What new materials were invented in the XXth century?
- 5) When was the new area of modern computers and office machines started?
- 6) Why is the first Earth-orbital satellite called all over the world as Sputnik?

a) Discuss the information below:

Pattern: *In 1938 nylon was invented by a group of American organic chemists.*

Use the verbs: *to discover, to open, to invent, to establish, to launch, to introduce.*

- 1) An employee in the patent office of a New York firm, Chester Floyd Carlon, first dry copy, by attracting dry carbon powder to paper by static process, 1938.
- 2) 1960, Xerox Corporation, first automatic copier.

- 3) 1927, the first clothes washers.
- 4) 1945, the first sale of ballpoints at \$12.50 each.
- 5) In the late 1940's, remote controls for garage doors. In 1950, by Zenith Electronics, TV remote control.
- 6) 1971, Texas Instruments, the first electronic calculator.
- 7) In the late 1930's, the first tape recorder and wire recorder, Marvin Camras from the Illinois Institute of Technology.
- 8) In 1968, an American inventor D. Engelbart, computer mouse.
- 9) In 1990, worldwide web (WWW) by CERN (The European Laboratory for Particle Physics).
- 10) In 1925, Commercial fax service.

b) Write down 6 sentences with the expressions above.

Exersize 4.

a) Make up the sentences and tell

 **WHO made WHAT.**

Pattern: *I. Newton opened the laws of motion.*

| | | |
|-------------------|-------|----------------------------------|
| Alexander Fleming | _____ | special theory of relativity. |
| Max Plank | _____ | the atom. |
| Albert Einstein | _____ | quantum theory of light. |
| Ernest Rutherford | _____ | penicillin. |
| Ivan Pavlov | _____ | first motorized plane. |
| Wright brother | _____ | conditioned reflex |
| Antoine Lavoisier | _____ | the Law of Periodicity |
| M. Lomonosov | _____ | the idea of conservation of mass |
| L.Mendeleev | _____ | the Law of Conservation of Mass |

Use the verbs: *to discover, to open, to invent, to establish, to launch, to introduce, split (расщеплять), to formulate.*

b) Rewrite the sentences in the Passive Voice.

Pattern: *Special theory of relativity was formulated by A. Einstein.*

🔊 Exercise 5. NUMBERS. Listen and remember.

| | |
|-----------|-------------------------|
| 100 | a hundred |
| 1,000 | a thousand |
| 1,000,000 | a million |
| 101 | a hundred and one |
| 350 | three hundred and fifty |

| | |
|---------|---|
| 529 | five hundred and twenty nine |
| 2,491 | two thousand, one hundred and ninety one |
| 7,512 | seven thousand, five hundred and twelve |
| 27, 403 | twenty seven thousand, four hundred and three |

Years

| | | |
|------|-------|------------------------|
| 1764 | 17/64 | seventeen sixty-four |
| 1890 | 18/90 | eighteen ninety |
| 1900 | 1900 | nineteen hundred |
| 1907 | 19/07 | nineteen oh seven |
| 2000 | | two thousand |
| 2007 | | two thousand and seven |

☎ Telephone numbers

| | |
|----------------|---|
| 01425 365 7098 | oh one four two five three six five seven oh nine eight |
| 0609 655 400 | oh six oh nine six double five, four double oh |

🌡 Temperatures

| | |
|------------------|-----------------------------------|
| 14 ⁰ | fourteen degrees |
| 0 ⁰ | zero |
| -12 ⁰ | minus twelve (degrees) below zero |

Ordinal numbers

| | | | |
|------|------------|------|---------------|
| 1st | first | 20th | twentieth |
| 2nd | second | 21st | twenty-first |
| 3rd | third | 22nd | twenty-second |
| 4th | fourth | 23rd | twenty-third |
| 5th | fifth | 24th | twenty-fourth |
| 13th | thirteenth | 31st | thirty-first |
| 15th | fifteenth | 52nd | fifty-second |

Dates

| | |
|------------|---|
| 22 May | May the twenty-second the twenty second of May May twenty second (American English) |
| 13 January | January the thirteenth the thirteenth of January |

| | |
|------------|---------------------------------------|
| 30 January | thirteenth January (American English) |
| | January the thirtieth |
| | the thirtieth of January |
| | January thirtieth (American English) |

Fractions

| | | |
|-----|----------------|----------------------------------|
| 1/2 | a half | |
| 1/4 | a quarter | a fourth (American English) |
| 3/4 | three quarters | three fourths (American English) |
| 1/3 | a third | |
| 2/3 | two thirds | |
| 1/8 | one eighth | |
| 5/8 | five eighths | |

Decimals

| | |
|--------------------------|------------------------------|
| 1.6 | one point six |
| 23.95 | twenty-three point nine five |
| 0.762 | nought point seven six two |
| zero point seven six two | (American English) |

Percentages

| | |
|-------|----------------------------------|
| 1% | one per cent |
| 50% | fifty per cent |
| 67.3% | sixty-seven point three per cent |

Exercise 6.

a) Make up the sentences and name the main inventions of the 20th century.

What of them do you enjoy?
 What was invented at the year of your birth?

b) Write down 6-10 sentences and discuss the information. Find the necessary information in the Internet.

1901 –electric typewriter
 1902 –airconditioner, speedometer, crayon.
 1903 –skyscraper.
 1904 –novocaine.
 1905 –animated cartoon.



1906 –vacuum cleaner, plastic.
1907 –cellophane, electric razor, paper cup.
1908 –cigarette lighter.

1911 –superconductivity.
1913 –artificial kidney, crossword puzzle, assembly line.
1914 –traffic light, zipper.
1915 –radiotelephone
1918 –electric food mixer.
1919 –short wave radio.

1920 –tea bag, submachine gun.
1921 –lie detector.
1922 –self-winding watch.
1923 –TB vaccine.
1924 –frozen food, spiral-bound notepad.
1926 –talking movies, liquid-fuel rocket.
1927 –tape recorder.
1928 –black and white television



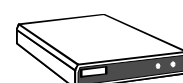
1930 –cyclotron, scotch tape, supermarket
1931 –electric guitar, FM radio, freon
1932 –color cartoon film
1933 –electron microscope
1934 –radar
1935 –beer can, Kodachrome film
1937 –xerography, radiotelescope
1938 –fluorescent lighting
1939 –DDT, helicopter



1940 –colour television
1941 –aerosol can
1942 –nuclear reactor
1943 –all electronic calculating device
1945 –atomic bomb, microwave oven
1946 –mobile phone
1947 –transistor
1948 –cable television
1949 –super music amplifier

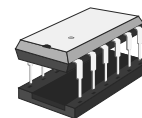


1950 –credit card
1951 –super glue
1952 –sex-change operation, answering machine
1953 –DNA
1954 –vertical – take off plane
1955 –lego, optic fiber, synthetic diamond



1956 –computer hard disk
1957 –IBM, sputnik, high speed dental drill
1958 –modem, ultrasound
1959 –electrocardiograph.

1960 –breast implant, fiber-tip pen, halogen lamp, laser.
1962 –audiocassette, laser eye surgery.
1963 –instant color film, videodisc.
1964 –acrylic paint, touch-tone phone, liquid crystal display.
1965 –potable video recorder, hologram, soft contact lenses.
1966 –fuel injection for autos.
1967 –heart transplant.
1968 –computer with integrated circuits
1969 –lunar landing.



1970 –floppy disk.
1971 –dot-matrix printer, space station, liquid crystal display.
1972 –word processor, compact disk.
1975 –laser printer, personal computer.
1976 –ink-jet printer, VHS system for video recording.
1977 –Apple II, fiber-optic communication
1978 –test-tube baby.
1979 –Rubik's cube.



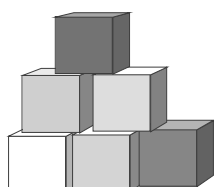
1980 –hepatitis –B
1981 –MS-DOS, space shuttle.
1983 –cellular-phone, network, computer virus.
1984 –Macintosh computer, Random Access Memory
1985 –genetic fingerprinting.
1986 –digital audiotape.
1987 –3-d videotape.
1988 –contact lenses.
1989 –high definition television.



1993 –Pentium processor
1994 –microwave
1996 –web TV
1997 –cloning



Exercise 7. Translate the text in a written form using a dictionary:



HOLOGRAPHY

Holography is a technique by which the image of a three dimensional object is recorded on film so that when the film is

illuminated under the proper conditions, a three dimensional image of the object is created.

Holography was invented by Dennis Gabor, a Hungarian-born physicist. He was awarded the Nobel prize for physics in 1971. The development of the laser in the 1960s greatly improved the holograms.

Exercise 8. Listen to the tasks and write down the numbers.

TEXT B

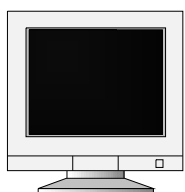
1926 – TELEVISION IS DEVELOPED

Read the text below and find the answers:

- 1) *Who and when applied for patent for a mechanical television?*
- 2) *With what corporation did the scientist work?*
- 3) *Who and when demonstrated a television receiver?*
- 4) *Who developed electronic television in Asia?*
- 5) *When was the first television station built?*

Television is the greatest invention of the XX century. Today many of us cannot imagine our life without TV/

John Logie Baird (1888-1946) applied for a patent for a mechanical television in 1923. He made successful experiments in transmitting images in 1926, and in 1930 he worked with the British Broadcasting Corporation (BBC) to begin mechanical television broadcasting. He also tried, rather unsuccessfully, to mass-market his television transmitter.



In 1923 Vladimir Zworykin (1889-1982), Russian born engineer, also applied for a patent. His was for a television camera that converted optical images into electric pulses. On November 18, 1929, at a convention of radio engineers, Zworykin demonstrated a television receiver containing his “kinescope”, a cathode-ray tube. That same year Zworykin joined the Radio Corporation of America (RCA) in Camden, New Jersey. As the director of their Electronic Research laboratory, he was able to concentrate on his system and to improve it. Zworykin’s “storage principle” is the basis of modern TV.

Meanwhile, in Japan, Kenjiro Takayanagi was developing electronic television, too. He was ahead of Zworykin, but better publicity gave Zworykin the nickname “father of television”. Takayanagi transmitted an image electronically in 1926, with a 40-line resolution and film running at 14 frames per second.

In 1932 the BBC launched the first regularly broadcast programs using Baird’s mechanical equipment. The first special-purpose television was built in Germany in 1935 in preparation for the Berlin Olympic Games the following year. That Olympic year, NBC experimented with electronic broadcast from the top of

the Empire State Building. In 1937 BBC began the first regular, high quality broadcasting service using an electronic system.



Exercise 1. False or true?

- 1) J.L. Baird is the father of television.
- 2) Vladimir Zworykin was the famous Russian scientist.
- 3) Zworykin's kinescope was a cathode-ray tube.
- 4) J.L. Baird worked with several American broadcasting corporations.
- 5) The first special-purpose television station was built in America.
- 6) The first regular, high quality broadcasting service using an electronic system was started by NBC.

Use the expressions: *quite right, you are wrong, I can't agree with you.*

TEXT C

SOME INTERESTING FACTS ON ALBERT EINSTEIN.

🔊 Listen to the dialogue with a historian talking about Einstein. Then complete each sentence with a word or short phrase.

a) Interviewer: Hello once again to all our listeners! My name is Bary Duke and our guest tonight on the Lives of Famous Scientists programme is Dr Emma Steed, the world famous expert on Albert Einstein. She's going to share some little-known facts about great physicist with us. Welcome, Dr Steed. It's a pleasure to have you on our show.

Dr Steed: Thank you, Mr Duke. It's a pleasure to be here.

I.: So, Doctor, what interesting things are you going to tell us about tonight?

Dr.S.: Well, I thought I'd start with Einstein's childhood. Did you know that Einstein started making discoveries when he was five?

I.: Five? No. I didn't. What did he discover?

Dr S. Well, his father had given him a magnetic compass – you know, the kind we use to show us direction. Well, Einstein realized that something was causing the needle on the compass to move in a certain way, and he began to take an interest in the physical world.

I.: That's amazing!

Dr S.: Yes, but that's not all. The Einstein hobby was building models and mechanical devices, much to the amazement to his parents and elders. And if it wasn't enough, when he was twelve years old, he was given a book of Euclidean geometry. He quickly became fascinated by it and taught it to himself. Once he'd learned it, he started to teach him calculus.

I.: Wow! All of us who have struggled to learn those subjects are really impressed by that!

Dr S.: Well, that wasn't all. When he was sixteen, he did a thought experiment called "Albert Einstein's Mirror". While he was looking into a mirror, he tried to imagine what would happen to his image if he were moving at the speed of light – he actually drew some important conclusions about that which would later be an important element of his theory of special relativity.

I.: Tell me, Doctor, is it true that Einstein had some kind of learning difficulty which caused him problems at school?

Dr S.: I know it's a common tale, but recent research has shown that there is no truth to it.

b) Complete the sentences:

- 1) Einstein made his first scientific discovery when he was.....years old.
- 2) He realized that something was causing the needle of the compass.....in a certain way.
- 3) He taught himself at the age of twelve.
- 4) Einstein tried to get information about the speed of.....by looking into a
- 5) Recent research shows that there is no.....in the belief that Einstein had a learning difficulty.

UNIT 2

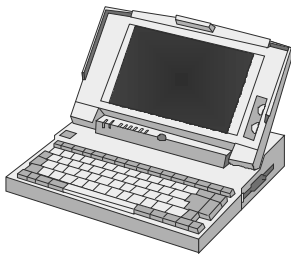
GRAMMAR: Passive Voice and Modal Verbs (revision), Participles.

TEXTS: Computer system. IWB. Norbert Wiener

TEXT A

COMPUTER SYSTEM

Read and analyse the text, find Passive Voice forms, Modal Verbs and Participles. Retell the text using a scheme (exc.5):



A computer system consists of two parts: the software and the hardware. The software includes information in the form of data and program instructions. The hardware components are the electronic and mechanical parts of the system. The basic structure of a computer system is made up of three main hardware sections: the Central Processing Unit (CPU), the main memory, and the peripherals.

The CPU is the “brain” of the computer serving also as the nerve centre of the entire computer. Its key components are: a Control Unit, an Arithmetic Logic Unit, performing mathematical calculation and logical operations, a clock and some memory registers.

The CPU is contained of a single microprocessor chip executing program instructions and coordinating the activities of all the other components. In order to increase the speed of the central processor, a co-processor chip can be installed inside the computer. This chip performs mathematical calculations very rapidly.

The main memory holds the instructions and data which are currently being processed by the CP. The internal memory is usually composed of two sections: RAM (random access memory) and ROM (read only memory). RAM is a temporary type of memory that stores data and instructions that the CPU is working with at that moment. RAM contents are lost when you turn off the computer. However, ROM is a stable, permanent type of memory storing the information necessary to start up and operate the computer.

The peripherals are the physical units attached to the computer. They include input and output devices as well as storage devices. Input devices enable users to give information to the computer; for example, the keyboard and the mouse. Output devices allow users to get results from the computer: e.g. we can see the output on the monitor or in printed form. Secondary memory devices such as floppies, hard disk, optical disks, flash cards, etc. are used to provide permanent storage of information.

Exercise 1. Find English equivalents from the text A:

Программное обеспечение, устройство вывода, долговременная память, аппаратные средства, мозг, выключать, в напечатанном виде, жесткий диск, данные, центральный процессор, выполнять программу, микросхема, постоянное хранение информации, запускать, увеличивать скорость, оперативная память.

Exercise 2. Make up the sentences:

- 1) The, is, the, “brain”, CPU, of, computer, the.
- 2) The, components, hardware, electronic, are, the, parts, and, of, mechanical, system, the.
- 3) The, software, in, includes, the, form, of, information, data , program, and, instructions.
- 4) The, are, the, peripherals, units, physical, to, attached, the, computer.
- 5) Input, devices, the, the, are, and, keyboard, mouse, the.
- 6) The, are, the, elements, software, written, programs, the, system, for.
- 7) Computer, used, system, in, laboratory, a, have, may, display, graphics, hardware.
- 8) To, process, together, data, working, of, components, is, a, computer, system, a, collection.



Exercise 3. Fill in the words, use HELP below:

1. The _____ is the information in the form of data and _____ instructions.
2. The _____ components are _____ and mechanical parts of the system.
3. The _____ performs calculations very _____ .
4. The CPU is a microprocessor _____ .
5. The _____ memory keeps the instructions and the data which are currently being processed by the CPU.
6. RAM and ROM usually compose the _____ memory of a microcomputer.
7. The physical units attached to the computer are called the _____.
8. The keyboard and the mouse are the _____ devices.
9. _____ and _____ disks are secondary memory devices.
10. We can see the output on the _____ or in printed form.

HELP: co-processor, rapidly, main, peripherals, hardware, software, electronic, chip, entire, input devices, output devices, hard, flash cards.

Exercise 4. Decode the abbreviations:

PC, ROM, CPU, RAM, CD-ROM, RW disc, BASIC.



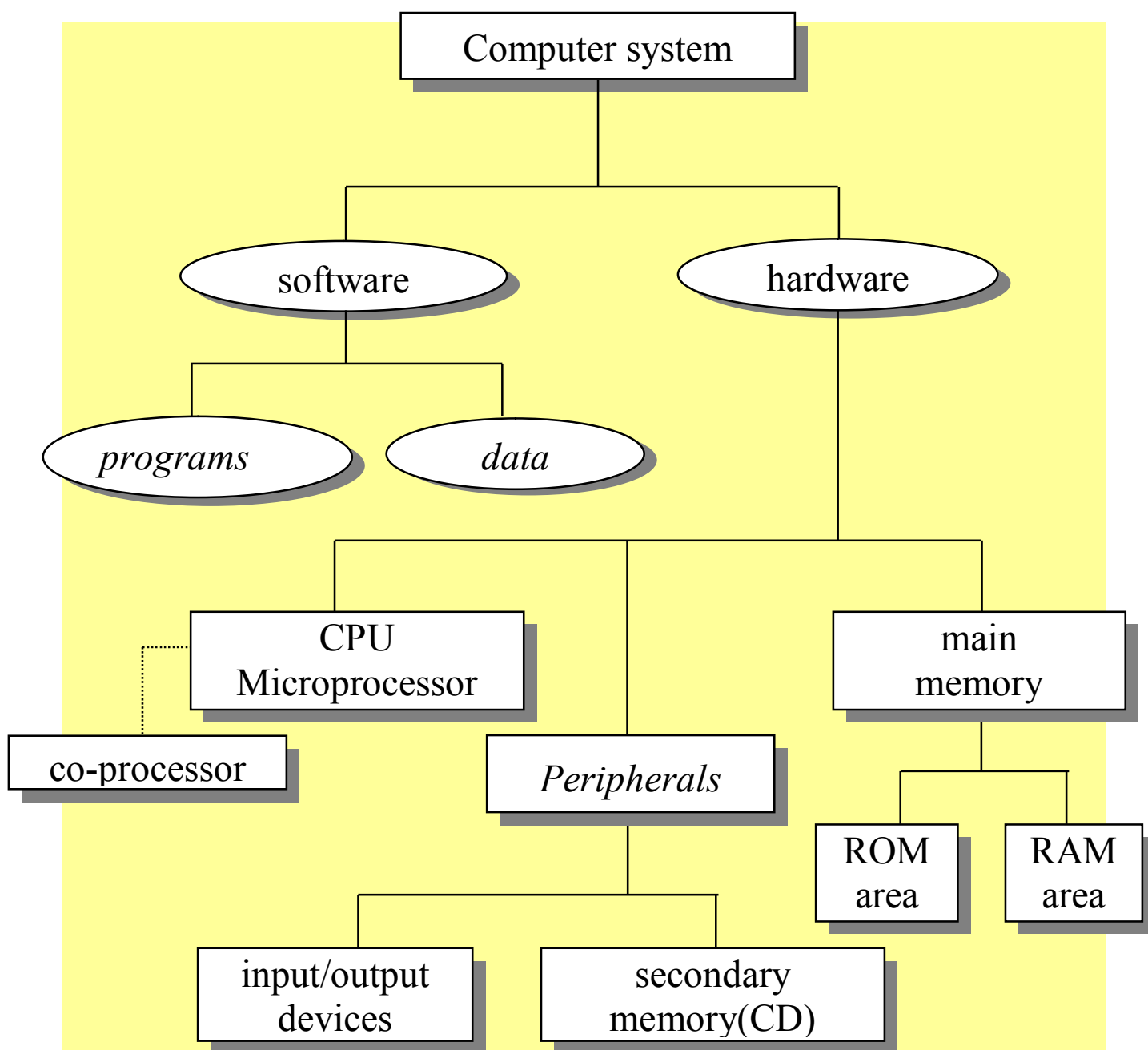
MEMORIZE (запомните):

| | |
|---------------------------|--|
| Process /'əʊ/, n | технологический процесс, прием, способ; обработка информации |
| Process /'əʊ/, v | обрабатывать, подвергать процессу обработки (с изменением качества). |
| Processor /'əʊ/, n | обрабатывающее устройство, процессор |

Exercise 5. Discuss the computer architecture using a scheme:

A computer system consists of ...

Exercise 6. Study the Grammar Box section and learn the grammar rules concerning the Participle.



GRAMMAR BOX: PARTICIPLES

1.

N + Participle I (-ing) – функция определения

the languages **operating** (КАКИЕ ? – действующие)

the word **meaning** ... (означать)

the device **reading** ... (читать)

the device **printing** ... (печатать)

the screen **showing** ... (показывать)

the tools **changing** ... (изменять)

2.

N + Participle II (-ed, 3 ф.) (функция определения)

the system **developed** (КАКАЯ ? – разработанная)

the information **accepted**... (принимать)

the instruction **called** a program... (называть)

the cards **punched**... (перфорировать)

the data output... (выводить)

the process performed... (выполнять)

the devices **used**... (применять)

the text **printed**... (печатать)

the text **translated**... (переводить)

the instruction **read**... (читать)

the application **installed**... (устанавливать)

3.

N + Participle I (-ing) Passive – функция определения

Devices being used (КАКИЕ ? – применяемые)

the operation being performed

the applications being installed

the instructions being given

the text being printed

flash cards being inserted

DISCUSSION:

WHAT COMPUTERS CAN DO IN PARTICULAR AREAS?

Here are some ideas:

In factories, computers are used to control machinery, robots, production lines, lists of products, etc.

In Formula 1, computers are used to design and construct racing cars. Computers help engineers to design the car body and the mechanical parts. During the races a lot of microprocessors control the electronic components of the car and monitor the engine speed, temperature and other actual information.

In entertainment...

In libraries...

WHAT ARE THE SPEAKERS' JOBS?

1) I use my computer to do the usual office things like write memos, letters, faxes and so on, but the thing I find really useful is electronic mail. We are an international company and we have offices all over the world. We're linked up to all of them by e-mail. With e-mail I can communicate with the offices around the world very efficiently. It's really changed my life.



2) Well, I use computers for almost every aspect of my job. I use them to design electrical installations and lighting systems: for example the program will tell you how much lighting you need for a particular room, or how much cable you need, and it will show where the cable should go. I also use the computer to make drawings and to keep records. We have to test our installations every five years and the information is stored on computer.



Check, if you know the following verbs:

To consist, to include, to make up, to contain, to execute, to increase, to install, to perform, to compose of, to turn on, to turn off, to store, to hold, to keep to start up, to operate, to attach, to enable, to allow, to print, to provide.

TEXT B

IWB

a) Translate the text in a written form using a dictionary:

IWB – interactive whiteboards – are innovative tools providing efficient training in a classroom. IWB is made “interactive” by being linked to a computer which uses special IWB software. Three essential components needed to use in IWB are the **whiteboard** itself, a **computer** which has IWB software installed and a **data projector** (or beamer) which projects the image from the computer screen onto the whiteboard. What makes the IWB different from a normal whiteboard is that the teacher uses the special pen to manipulate content on the whiteboard itself rather than (a he using the mouse to manipulate images on the computer screen).

The latest IWB can also be used with a wireless tablet PC (a smaller hand-held computer) instead of a large desktop or laptop computer.

The interactive whiteboard itself comes in different sizes, measured diagonally across. The most common size is 190 cms (75 inches) across, and the teachers tend to agree that the bigger the board, the more effective it is, as images are more clearly displayed on a larger board.

The main advantage of an IWB used with a computer and data projector over a computer and data projector used on their own is that you can write on the IWB with your pen or finger and interact with what on the screen from the front of the class rather than having to look down to your computer and using the mouse to control the screen.

b) Retell the text, using the following keywords:

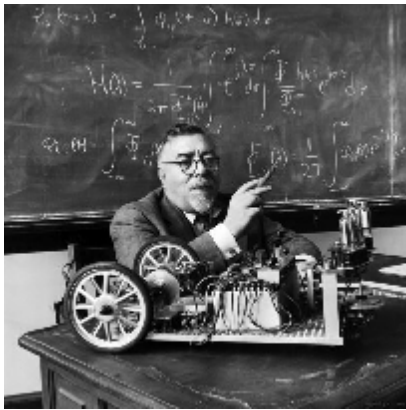
innovative tools, special software, three main components, data projector, to project the image, a wireless tablet PC, different sizes.

TEXT C

NORBERT WIENER (1894 – 1964)

Read the text below and find the answers. Write them down in a chart.

- 1) *What disciplines did N. Wiener study?*
- 2) *In what countries did he study ?*
- 3) *What project played an important part in his development of the science of cybernetics?*
- 4) *What is cybernetics ?*
- 5) *In what branches of science did N. Wiener work?*
- 6) *What modern sciences use today the ideas of Norbert Wiener ?*



Norbert Wiener, the famous applied mathematician, was born in 1894 in the USA and died in Stockholm, Sweden, in 1964. His father was a professor of Slavonic languages at Harvard. Norbert was a very intelligent child and his father was determined to make him a famous scholar. This is indeed what he became, being awarded a PhD by Harvard at the age of 18. He also studied Philosophy, Logic and Mathematics at Cambridge and Göttingen.

His first important position was that of Instructor of mathematics at MIT (Massachusetts Institute of Technology) in 1919, followed by that of Assistant Professor in 1929 and of Professor in 1931. Two years later, in 1922, he was elected to the National Academy of Sciences (USA), from which he resigned in 1941. In 1940 he started to work on a research project at MIT on anti-aircraft devices, a project that played an important part in his development of the science of cybernetics.

The idea of cybernetics came to Wiener when he began to consider the ways in which machines and human minds work. This led to the idea of cybernetics, which is the study of the ways humans and machines process information, in order to understand their differences. It often refers to the machines that imitate human behaviour. The term was coined from the Greek *kubernetike* which means *the art of the steersman* (the skill of the captain when controlling the ship). This idea made it possible to turn early computers into machines that imitate human ways of thinking, particularly in terms of control (via negative feedback) and communication (via transmission of information).

Norbert Wiener was also deeply attracted to mathematical physics. This interest originated in the collaborative work that he did with Max Born in 1926 on quantum mechanics. But Wiener's interests were not limited to logic, mathematics, cybernetics or mathematical physics alone, as he was also familiar with every aspect of philosophy. In fact, he was awarded his doctorate for a study on mathematical logic that was based on his studies of philosophy. In addition to that, in a very different field, he wrote two short stories and a novel. Wiener also published an autobiography in two parts: *Ex-Prodigy: My Childhood and Youth* and *I am a Mathematician*.

Due to his involvement in many different disciplines, Wiener was able to draw on many resources in his varied research, thus making him an incredibly successful *applied* scientist. Wiener was one of the most original and significant contemporary scientists and his reputation was securely established in the new sciences such as cybernetics, theory of information and biophysics.

NOTES:

Awarded a PhD by Harvard – получил степень доктора философии (высшая научная степень, третья после степеней бакалавра и магистра) в Гарвардском университете – одном из самых престижных и старинных университетов США.

Cambridge – один из самых старинных и престижных университетов Великобритании.

Göttingen – знаменитый университет в Германии, знаменитый своей школой естественных наук и богатейшей библиотекой.

MIT – Массачусетский технологический институт – один из первых и самых престижных политехнических вузов США.

To resign – уйти с должности

Steersman – рулевой

in terms of, via – посредством, через

collaborative work – сотрудничество

due to his involvement in many different disciplines – благодаря увлеченности различными дисциплинами

applied scientist - ученый, занимающийся прикладными проблемами (ср. applied mathematician)

securely established - надежно подтверждена

Exercise 1. The chart for your written answers:

| | | |
|---|---|--|
| 1 | N.W. studied the following disciplines: | |
| 2 | N.W. studied at such countries as : | |
| 3 | The important project was | |
| 4 | Cybernetics is | |
| 5 | N.W. worked in the different branches: | |
| 6 | His ideas are used today in | |

🔊 Exercise 2. Listen to the text and add information to the chart:

| | |
|---------|--|
| In 1894 | |
| In 1964 | |
| In 1912 | |
| In 1919 | |
| In 1926 | |
| In 1929 | |
| In 1931 | |
| In 1940 | |
| In 1941 | |

HELP: In eighteen ninety four ..., In nineteen sixty four...

Exercise 3. Choose the correct answer:

1. *Norbert Wiener died*

- a) in the USA
- b) in Germany
- c) in Sweden

2. *Norbert Wiener began to think seriously about cybernetics*

- a) when he was at MIT
- b) when he was a science instructor
- c) after he resigned

3. *An example of cybernetics in action is*

- a) a television
- b) a computer
- c) an airplane

4. *Wiener wrote a book about*

- a) himself
- b) mathematics
- c) philosophy

Exercise 4. Discuss with your partner the biography of Norbert Wiener.

Use the expressions: to my mind; I think: as far as I know; It seems to me;
I'd like to note that



WORDS TO BE REMEMBERED IN UNIT 2:

Software, hardware, chip, main memory, CPU, to contain, to consist of, to compose, cybernetics, to include, to exclude, to install, to perform, to operate, to process, to store information, to input, to output, to print, keyboard, device, to provide, access, accessible, www, web, digital.

UNIT 3

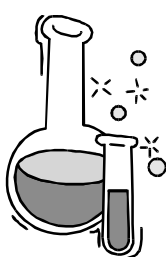
GRAMMAR: Participle, Absolute Participial Construction.

TEXTS: Water. Papermaking. The Beginning of Chemistry.

TEXT A

WATER

Water is a chemical compound of oxygen and hydrogen, the latter gas forming two thirds of its volume. It is the most abundant of all chemical compounds, five seventh of the earth's surface being covered with water. As we know, water does not burn, on the contrary, it is often used for putting out the fire.



So, the two gases which it is composed of act in the opposite way: one of them – hydrogen – burns, the second – oxygen – making things burn faster than does air. Hydrogen is the lightest gas known, oxygen being slightly heavier than air.

Water is one of the most incompressible substances, the properties of a compound being incompressible unlike the elements of which it is made. By means of hydraulic accumulators water can be subjected to a tremendous pressure without appreciably reducing its volume.

Water like air is never found quite pure in nature but contains various salts and minerals in solution. Salt water being heavier, some things will float in it; hence, it's easier to swim in salt water. When sea water freezes, the salts separates from it, ice being quite pure.

Water applications are almost endless. Water is necessary for the existence of man, animals and plants, every living thing containing large amounts of water. Being a solvent of most substances, it is indispensable in chemistry and medicine. When used in engineering, its great resistance to compression enables it to transmit enormous power. When heated, water changes into an invisible gas; freezing it we get a solid block of crystals. When evaporated, it forms clouds and falls from them on the earth as rain and snow, the soil absorbing the water which appears on the surface again to begin a new cycle of evaporation. It goes round and round, the total amount of water on the earth never changing.



Exercise 1. Check if you know these verbs:

To cover, to burn, to make, to compress, to subject, to reduce, to contain, to float, to freeze, to separate, to transmit, to change, to evaporate, to fall, to absorb, to appear.



Exercise 2. Analyse the structure of the words:

Slightly, heavier, incompressible, unlike, various, compression, indispensable, evaporation, seventh, lightest, invisible smaller, hydraulic, tremendous, impure.

Exercise 3. Find English equivalents and write them down:

Последний из упомянутых, огромная сила, поверхность земли, как известно, наоборот, в отличие от, при помощи, общее количество. без заметного уменьшения, существование человека, незаменима в медицине, техника, напротив, невидимый газ.

Exercise 4. Analyse and translate:

1. fast – faster – the fastest; light – lighter – the lightest;
heavy – heavier – the heaviest;
a. great – _____ – the _____, small – _____ – the _____,
b. easy – _____ – the _____, strong – _____ – the _____,
c. big – _____ – the _____, hot – _____ – the _____.
2. Smaller space, lighter weight, heavier than air, faster than sound, the lightest gas, the largest amount, lower pressure, the highest temperature, the easiest process, the strongest alloy.



Exercise 5. Answer the questions:

- 1) What is water composed of?
- 2) What gases does it contain?
- 3) What are the properties of oxygen and hydrogen?
- 4) What is generally used for putting out the fire?
- 5) What gas makes things burn?
- 6) At what temperature does water become solid?
- 7) What is the freezing point of water?
- 8) How do we make ice liquid?
- 9) What can be compressed easier: a gas or a liquid?
- 10) What can reduce the volume of a gas?
- 11) Why must water be purified?
- 12) Why is the total amount of the water on the earth never changing?



Exercise 6. Fill in the words and translate:

1. Water is a _____ oxide, a compound of _____ and _____. 2. Many mineral substances _____ water of crystallization and in the atmosphere there are millions of tons of water _____. 3. Ordinary water is _____, it usually containing dissolved salts and _____. 4. Water is one of the _____ substances known. 5. The _____ point of water is taken as 0°C and the point of water at 1 atm. is taken as 100°. 6. Water being the most important _____, it is indispensable in chemistry, industry, medicine.

HELP: vapour, hydrogen (2), gases, solvent, impure, freezing, contain, incompressible, oxygen, boiling.



Exercise 7. Make up the sentences:

- 1) A, water, is, chemical, of, oxygen, compound, hydrogen, and.
- 2) Is, it, the, abundant, of, most, all, compounds, chemical.
- 3) Water, not, burn, does, is, and, used, putting, for, out, fire, the.
- 4) Hydrogen, the, is, gas, lightest, known.
- 5) Water, air, is, like, never, quite, pure, found, nature, in.

1. Two gases _____ changes _____ act in the opposite way. 2. They _____ can be compressed _____ into a much smaller space. 3. Water _____ can act _____ as a solvent _____. 4. Hydrogen _____ is never found _____ into invisible gas _____ is often used _____ quite pure _____ forms _____ in chemistry and medicine. 5. It _____ is indispensable _____ two thirds of its volume.

Exercise 8. Translate according to the models:

| | |
|---|---|
| A | <p>1. Water is a chemical compound of oxygen and hydrogen, the latter gas <u>forming</u> two thirds of its volume. Вода представляет собой химическое соединение кислорода и водорода, причем водород образует две трети ее объема.</p> <p>2. Rain <u>falling</u> on the ground, the soil absorbs the water. Когда дождь падает на землю, почва поглощает воду.</p> |
|---|---|

1. The salt separates from freezing water, the ice being quite pure.
2. Water is never absolutely pure in nature, the amount of impurities depending on the locality.
3. When we drink water, it washes our system, the body being purified of poison.
4. The experiments with water containing substances being very interesting, we worked readily.
5. The range of water application being very wide, the scientists are interested in them.
6. Rain water being examined with a magnifying glass, they saw many impurities.
7. The experiment being very difficult, he has to spend much time in the laboratory.
8. A gas can be dissolved in liquid, the latter changing its boiling point.

| | |
|---|---|
| B | <p>Water can be produced in the laboratory if the chemist mixes oxygen and hydrogen.</p> <p>Water can be produced in the laboratory, the chemist <u>mixing</u> oxygen and hydrogen.</p> |
|---|---|

1. Aluminium is a light metal, but copper is much heavier.
2. Metals are seldom used in their pure form as alloys (сплавы) have better

properties for industrial application.

3. As steel is one of the strongest metals, we use it for products where great strength is required.
4. As water is necessary for the existence of man, we drink water and receive it with many products.
5. While water like air is never found pure in nature, we usually purify it by various means.
6. Hydrogen doesn't burn, whereas oxygen supports burning.



Exercise 9. Analyse and translate:

- 1) There are several different types of mixtures, some being homogeneous and others heterogeneous.
- 2) Salt can be obtained from salt mines, sea water.
- 3) The hydrogen atom, having its valence electrons in the first level, is small in the diameter than is the sodium atom.
- 4) The temperature remaining constant, the volume of a given mass is inversely (обратно) proportional to the pressure to which it is subjected.
- 5) The steam expanding, its volume increases.
- 6) Other conditions being equal, iron heats up faster than aluminium.
- 7) The experiments having been carried out, we started new investigations (исследования).
- 8) Oxygen combines with many elements, the product formed being called an oxide.
- 9) The gas being invisible, we didn't notice its formation.
- 10) Hydrogen being the lightest of elements, its density is the smallest of all substances.

TEXT B

PAPERMAKING

Translate in a written form:



The place paper occupies in modern life makes it as necessary as food and water. The art of papermaking was readily known some thousand years ago, bamboo fibres and rags being the principal material paper pulp was made of.

Water is one of the most important materials used in papermaking. The quality of the paper is determined to a great extent by the quality of the water and, in particular, the colour of the paper is seriously affected by the coloured impurities in the water the fibres are washed in during the pulping process. The presence of bacteria most process waters contain may lead to the formation of slime with consequent slime spots in the paper which chemicals and water successfully remove. Mechanical pulp or

groundwood is made by grinding blocks of wood against the revolving abrasive stone in the presence of water. The process is relatively simple as it merely involves the wet grinding of the wood.

The wet pulp is fed on to an endless wire screen as a thin layer to remove as much of the water as possible. It is then passed between heated roll, a dry thin sheet of porous paper producing, such as filter paper, which is fairly pure cellulose (to be continued).



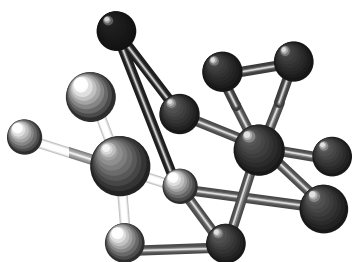
NOTES:

| | |
|--------------------------|-----------------------|
| Abrasive – | наждачный, абразивный |
| Feed (fed, fed) – | питать, подавать |
| Fibre – | фибра, волокно |
| Groundwood – | древесная масса |
| Pulp – | бумажная масса |
| Rag – | Тряпье |
| Slime | Загрязнение |

TEXT C

BEGINNING OF CHEMISTRY

Although chemistry as we know it today is a young science, its history began several thousand years ago, when a great number of facts which are useful in modern chemistry were discovered.



Greece, Rome and especially Egypt, were the countries where a lot of knowledge about the world of nature was accumulated. But this knowledge was purely practical.

People of this countries manufactured gold, silver, copper and iron but they did not know how these metals could be purified. They observed the changes of wine into vinegar but understood little why the process of fermentation took place. Their doctors prepared medicines from plant material but could not tell what elements they consisted of.

The credit for the foundation of our ideas about the structure of matter must be given to the ancient Greeks. Some philosophers thought that all kinds of matter could be made from air and fire, others believed there were four primary elements – fire, water, air and earth. Democritus who lived in the fifth century B.C. thought that all matter could be made by fusing small, indivisible particles together. Here we have the beginnings of the atomic theory of our day.



Exercise 1. False or true?

1. Chemistry is an old science.
2. Ancient Greeks and Romans knew nothing about the world of nature.
3. People of Egypt, Greece and Rome could manufacture gold, silver and iron.
4. They knew even how to purify these metals.
5. Their doctors prepared various medicines from plant materials.
6. The foundation of the ideas about the structure of matter was made by Romes.
7. The philosophers thought that all kinds of matter consisted of four main elements.
8. Democritus lived in the 4th century A.D.

Use the expressions: to my mind, it's quite right, far from it, I'm afraid, you are mistaken, nothing of the kind, you are wrong, on the contrary.

DISCUSSION:

- 1) When were the most important facts in modern chemistry discovered?
- 2) In what countries was a lot of knowledge about the natural world accumulated?
- 3) What metals could the people of those countries manufacture?
- 4) Did they understand the process of fermentation ?
- 5) The doctors could not tell the elements of which the plants consisted of, could they ?
- 6) Who founded ideas on the structure of matter?
- 7) What four primary elements were determined?

🔊 Exercise 2. Listen to the text and write down its main ideas.

UNIT 4

GRAMMAR: Participle and Gerund.

TEXTS: Machine-building Materials. Papermaking. Computer Dating.



TEXT A.

MACHINE-BUILDING MATERIALS

Different metals are widely used in the machine-building industry. Metals applied for industrial purposes are called “engineering metals”. There are two groups of metals: ferrous metals and non-ferrous metals.

Non-ferrous metals are more expensive than ferrous metals. The metals most frequently used to make non-ferrous metal castings are copper, tin, zinc, lead, nickel, gold, and aluminium.

Ferrous metals consist of iron combined with carbon, silicon, phosphorus and other elements. Carbon is the most important of all elements present in ferrous alloys. Ferrous metals are used in industry in two general forms: steel and cast iron, which differ in the quantity of carbon content. These two ferrous alloys are derived from pig iron which is produced in a blast furnace in the form of pigs. Metals are usually melted and poured into a form which is called a “mould”. This process is known as casting. The work of casting metals is performed in foundries.

Production of castings made from different metals requires different types of melting furnaces. The cupola furnace is usually used for melting grey iron. The air cupola, and electric furnaces are used to melt the metal for making malleable iron castings. For melting steel the open-hearth, crucible or electric furnaces are used. In melting non-ferrous metals generally crucibles or electric furnaces are used. The fuels mostly employed for melting metals are coke, coal, oil and gas.

Besides the different types of furnaces, different kinds of moulding sand are also required for making the moulds for different metals.

GRAMMAR BOX: GERUND

Melt + ing, experiment + ing, smoke + ing

Melting the metals. For melting the metals.

In melting the metals. The method of experimenting.

By melting the metals. No smoking.

Translate:

by processing – при обработке, путем обработки

By + GERUND:

| | |
|----------------|---------------|
| by boiling | (кипятить) |
| by performing | (выполнять) |
| by mixing | (смешивать) |
| by producing | (производить) |
| by obtaining | (получать) |
| by discovering | (открывать) |
| by alloying | (сплавлять) |
| by rubbing | (тереть) |

Translate:

For + GERUND:

for processing – для обработки

| | |
|----------------|----------------|
| for changing | (изменять) |
| for altering | (менять) |
| for operating | (действовать) |
| for combining | (соединять) |
| for employing | (применять) |
| for printing | (печатать) |
| for showing | (показывать) |
| for treating | (обрабатывать) |
| for separating | (отделять) |

Find Gerunds in text A. Compare Participles and Gerunds:

| | |
|------------------|---------------------|
| Freezing water | a freezing point |
| замерзающая вода | точка замерзания |
| A smoking man | a smoking room |
| курящий мужчина | курительная комната |
| A reading girl | a reading room |
| читающая девушка | читальный зал |



Exercise 1. Analyse functions of the Gerund and its translation:

Подлежащее:

Solving practical problems is a difficult job (*решение, решать*)

Сказуемое:

Our aim is solving (*решение, решить*).

Дополнение:

He likes solving difficult problems (*решать, решение*).

I know of the problem having been solved (... , что задача была решена)

Определение:

The way of solving the problem is not easy (*Решить...*)

Обстоятельство:

In solving the problem we made some mistakes (*Решая ...*)

On solving the problem he proceeded to make experiments (*Решив...*)

By solving the problem he got the required results (*Решая, решив...*)

You cannot do without solving the problem (*...без решения...*).

Exercise 2. Analyse and translate sentences with Gerund:

- 1) Copper is made for making electrical contacts.
- 2) Aluminium is extensively used in casting (отливать).
- 3) The work of casting metals is performed in special shops.
- 4) For separating iron from impurities the iron ore must be melted at a very high temperature.
- 5) For melting steel various types of furnaces are employed.
- 6) By combining several metals we obtain alloys.
- 7) Magnets made by rubbing pieces of iron against natural magnets are called artificial magnets.
- 8) Scientists succeeded in developing means of obtaining a synthetic rubber.
- 9) The hardening process consists in heating steel and cooling it in water.
- 10) Analysing the facts is the first stage in the work of a scientist.

**Exercise 3. Check if you know these verbs:**

To use, to apply, to call, to differ, to combine, to derive, to produce, to melt, to pour, to cast, to perform, to require, to employ

**Exercise 4. Make nouns and Gerunds from the following verbs, translate them.**

To use _____

To apply _____

To produce _____

To combine _____

To perform _____

To employ _____

To require _____

Exercise 5. Find English equivalents in TEXT A:

Широкое применение, машиностроение, доменная печь, различные металлы, тигель, тигельная печь, вагранка, мартеновская печь, для промышленных целей, ковкий, технические металлы, черные металлы, цветные металлы, ковкие металлы, содержание углерода, топливо, литейная форма, отливка, литейная, чугун, специальный легированный чугун, серый чугун, ковкий чугун, чугун в чушках, плавить, плавильная печь, железо, кремний, фосфор, лить (отливать), формовочная смесь.



Exercise 6. Write out from the text:

Types of furnaces:

Types of fuel:

Types of metals:



Exercise 7. Fill in the words and translate:

- 1) _____ metals are widely _____ in the machine-building industry.
- 2) Metals _____ for industrial purposes _____ called “engineering metals”.
- 3) There are two groups of metals: _____ metals and _____ metals.
- 4) _____ metals consist of iron combined with carbon, silicon, phosphorus and other elements.
- 5) _____ is the most important of all elements present in ferrous _____.
- 6) _____ metals are used in industry in two general forms: steel and _____ iron.
- 7) Two ferrous alloys are derived from _____ iron which is produced in a blast furnace in the form of pigs.
- 8) Metals are usually _____ and poured into a form which is called a “mould”.
- 9) This process is known as _____.
- 10) The work of casting metals is _____ in foundries.
- 11) Производство _____ of castings made from different metals требует _____ different types of melting furnaces.
- 12) Вагранка _____ is usually used for melting grey iron.
- 13) Электроды _____ are used to melt the metal for making maleable iron castings.
- 14) For melting steel мартеновские _____, тигельные _____ or electric furnaces are used.
- 15) In melting цветные _____ metals generally crucibles or electric furnaces are used.
- 16) Топливо _____ mostly employed for melting metals are coke, coal, oil and gas.



Exercise 8. Answer the questions:

1. What are the engineering metals?

2. What are the two groups of metals?
3. What do ferrous metals consist of?
4. When are ferrous metals used?
5. What are the two general forms of ferrous metals?
6. Where is pig iron produced?
7. How are called the forms where two metals are melted and poured?
8. When is the cupola furnace used?
9. What is used for making malleable iron castings?
10. What is used for making steel?
11. What is used in melting non-ferrous metals?
12. What fuels are mostly employed for melting metals?

TEXT B

PAPERMAKING (Continuation)

For making a paper that is suitable for writing and printing the pulp is mixed with a number of inorganic solids, for example clay and chalk, which lend rigidity to the paper.

Most papers are given a smooth coating by treating them with some substance like casein that can be ironed for forming the hard surface necessary for writing and printing.

By careful observation and practice one can judge the quality of good groundwood, when properly made, from its colour. When produced from partially decayed wood the pulp inevitably will be brittle and low in strength. A lighter coloured pulp will result from freshly cut wood.

The process of pulp manufacturing is improved: pulp is processed by automatic machinery.

Exercise 1. Translate the text using a dictionary. Find Gerund.

TEXT C

COMPUTER DATING

Listen to the text and reproduce it. Discuss in pairs your likes and dislikes:

Interviewer: Come in.

Mr. Bull: Ah, good afternoon. My name's Bull... John Bull. I'm looking for a girlfriend.

Int.: Please, sit down, Mr. Bull. May I ask you some questions?

Mr. B.: Oh, yes... What about?

Int.: Music, for example... Do you like music?

Mr. B.: Yes, I do. I like classical music.

Int.: Do you like pop-music?

Mr. B.: No, I don't... and I don't like jazz.

Int.: How old are you Mr. Bull?

Mr. B.: What? I don't like personal questions!

Int.: Oh, well. Can you complete this form later and send it by post?

MEMORIZE!

GERUND:

I like dancing.

He likes fishing.

She likes swimming.

I like singing.

Do you like cooking?

Does he like driving?

Did your parents like swimming?

No smoking!

I like playing chess (football, hockey, tennis).

He dislikes drinking beer (milk, vodka).

She hates writing letters.

Match the sentences in English and in Russian.

We'll be able to go swimming tomorrow.

We'll be able to go skiing next week.

We'll be able to go skating next Sunday.

It is pleasant to go mushrooming in such weather.

Thank you for inviting me to dinner.

Thank you for coming.

It's high time to go shopping.

В следующие выходные мы сможем пойти на лыжах.

Завтра мы сможем поплавать.

Спасибо за приглашение на обед.

В следующее воскресенье мы сможем покататься на коньках.

В такую погоду приятно ходить за грибами.

Давно пора идти за покупками.

Спасибо, что пришли.

Make up your own phrases . Pattern:

It is pleasant to go skiing in such weather.

Memorize the proverbs with Gerund and Participle.

Seeing is believing. Лучше раз увидеть, чем сто раз услышать.

It goes without saying. Само собой разумеется.

Barking dogs seldom bite. Лающие собаки редко кусают.

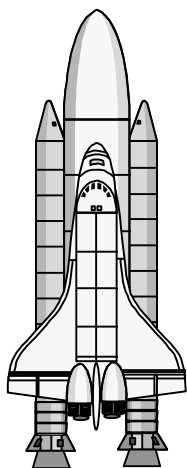


WORDS TO BE REMEMBERED AFTER UNIT 4

Metals: ferrous metals, non-ferrous metals, engineering, copper, tin, zinc, lead, gold, nickel, aluminium, iron, steel, cast iron, grey cast iron; cast, casting, alloy, alloying, melt, melting, mould, carbon content; **furnaces:** cupola, electric, open-hearth; **fuel:** gas, coke, coal

UNIT 5
REVISION AND CONSOLIDATION

TEXT A
ALUMINIUM AND ITS ALLOYS



Aluminium is a very important element used in many industries. Aluminium is a soft, silvery-white metal. It is light in weight, has high corrosion-resistant qualities and is used for automobile and airplanes parts as well as for making different light-weight objects used in everyday life. It is resistant to all inorganic acids except hydrochloric.

Aluminium is used extensively for castings. Aluminium is too soft for making castings, some other metals being mixed with it. The metals that alloy freely with aluminium are copper, zinc, and iron. Engineers often use combined metals in industry.

Exercise 1. Discuss the properties of aluminium and answer the questions.

- 1) How does aluminium look like?
- 2) What are the physical properties of aluminium?
- 3) Where is this metal applied?
- 4) What are the chemical properties of aluminium?
- 5) What metals is aluminium alloyed with?

Exercise 2. Listen to the talk of two engineers whose task is to compare steel and aluminium car bodywork from an ecological perspective.

Sophia: OK, so steel bodywork versus aluminium bodywork.

Pete: What about pre-use, then?

S: Well, I think it takes a lot of energy to produce aluminium, compared with steel, because aluminium's made by electrolysis.

P: Yeah. So, steel is better, presumably.

S: I think so, yeah. But, hang on a minute, with aluminium it depends how much is derived from ore, and how much is recovered from recycled material. As far as I know, recycling aluminium takes less energy. So, I'm not really sure.

P: Presumably, it'll be mixed, won't it? For a given batch, there will be so much new material, and so much recycled material.

S: Probably, yeah. So, it needs to be researched then.

P: Is car bodywork galvanised when it's made from steel?

S: Um...good question. I'm not sure.

P: If it is, if it has to be coated with zinc, then that would take extra material and extra energy. So that's an important consideration.

S: Mm..., true. So, that's another question to note.

P: Then, there's the energy consumed when they're transporting bulk metal to the car plant.

S: Presumably, aluminum takes less energy to transport, being lighter.

P: I'd say so, yeah.

S: OK, What about manufacturing?

P: Well, aluminium would be lighter to handle, wouldn't it ? It probably takes less energy to cut, as well.

S: Yeah. Not sure whether it takes less energy to weld, compared with steel.

P: Good question. Another thing to check out.

S: Mm. what about in-use, then? I assume, aluminium's better, because it's lighter, so you consume less fuel.

P: Yeah, and it should last longer, as well.

S: Mm, it that an environmental consideration, though?

P: Well, yeah, because if things last longer, they need to be manufactured less often. So you use less energy.

S: True. But then, is the lifespan of a car determined by the life of its bodywork?

P: Ah, good point.

S: It's usually determined by the chassis, or the engine, isn't it?

P: Is it ?

S: Another one to be researched.

P: OK, what about post-use, then?

Exercise 3. Find in a dictionary the meaning of the words bulk, batch, consume, fuel, to weld, lifespan, to manufacture, to handle, to coat.

Exercise 4. Read the dialogue with a partner. Write down and then discuss advantages and disadvantages of steel and aluminium.

ENVIRONMENTAL AUDIT PRODUCT PHASES:

✂Pre-use

✂In use

✂Post use

Exercise 5. Work in pairs. Ask and answer question about different materials using the following phrases:

Can ...be recycled? What's ...made of ? Is it light (heavy, soft, tough, fragile...)?

HELP: gold, plastic, steel, iron, tin, aluminium, etc.

TEXT B

ALLOYS

The most useful metals are iron, copper and aluminium. However, only small quantities of these metals are employed in their pure form. Most of useful metallic materials are formed from combinations of the above metals, known as alloys.

An alloy is a mixture of two or more metals melted together. For making alloys metals are usually mixed in their liquid state. A steel containing some metallic element other than iron and carbon is generally known as “special steel”. These various metals when added to steel in certain percentages, increase the hardness and the toughness of the steel.

Exercise 1. Read and analyse the text. Give definitions of: an alloy, special steel, the most useful metals.

Exercise 2. Retell the text in English.

Exercise 3. Match the materials and the definitions.

| | |
|--------------------|--|
| 1. stainless steel | a metal used to make brass, and in galvanised coatings on steel |
| 2. zinc | the predominant metal in steel |
| 3. iron | a type of steel not needing a protective coating, as it doesn't rust |
| 4. bronze | a dense, poisonous metal |
| 5. lead | rocks from which metals can be extracted |
| 6. hardwood | an alloy made from copper and tin |
| 7. ore | timber from pine trees |
| 8. softwood | timber from deciduous trees |

Exercise 4. Complete the following sentences using prepositions from, with, of.

- 1) Bronze contains significant amounts of copper.
- 2) Galvanised steel is steel coated _____ zinc.
- 3) Steel is an alloy derived _____ iron.
- 4) Pure metals can usually be recovered _____ alloys.
- 5) To produce stainless steel, iron is mixed _____ other metals.
- 6) Stainless steel contains quantities _____ chromium and nickel.
- 7) Glass tableware contains traces _____ metals, such as lead.
- 8) When new metal is extracted _____ ore, the costs can be high.

Exercise 5. Match the materials and their properties.

Materials
Steel glass aluminium

Properties
water-resistant abrasion-resistant

| | | | | | |
|----------|--------|---------|--------------------|-------------|------------------|
| titanium | gold | plastic | corrosion-resistan | brittle | tough |
| copper | rubber | silver | shock-resistant | elastic | durable |
| | | | heavy | lightweight | thermally stable |

TEXT C

PROCEDURES AND PRECAUTIONS



Exercise 1. Study the warning notices above. Read the instruction manuals and answer the questions.

- a) In the event of fire water extinguishers should not be used on this machine as it contains electrical circuits, and can therefore cause electrocution. Only a carbon dioxide extinguisher should be used.
- b) When lifting this machine, it is essential that only the two lifting eyes marked in red should be used. No other parts of the frame are load-bearing and must not, therefore, be used as anchor points.
- c) Care should be, taken when cleaning below the guillotine blade, as there is a danger that the blade may descend. Before cleaning, the control lever should always be set in the Blade Locked position. Protective gloves should be worn during cleaning as the sump below the blade may contain sharp metal off-cuts.
 - 1) Why is unsafe to put water on the machine?
 - 2) What type of fire extinguisher is recommended?
 - 3) What is the purpose of the items marked in red on the machine?
 - 4) What could happen if the machine was lifted by other parts of the frame?
 - 5) Why is it important to lock the guillotine blade?
 - 6) What other danger is there, and what precaution should be taken as a result?

GLOSSARY. WORDS REVISION

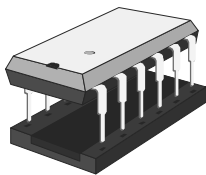
Match the definition and a word

| definition | word |
|--|-----------------------------|
| 1. common name for iron-oxide produced when iron corrodes as a result of exposure to air and water | a. inertia |
| 2. energy in the form of movement, e.g. a spinning wheel | b. blade |
| 3. coated with zinc – used to protect steel from corrosion | c. component |
| 4. cutting device, often metal with a sharp or toothed edge. | d. Computer Assisted Design |
| 5. the resistance of an object to acceleration or deceleration due to its mass | e. kinetic energy |
| 6. individual part of an assembly/mechanism | f. galvanised |
| 7. system used to control a device or vehicle from a distance, usually via a wireless connection | g. centre of gravity |
| 8. automatic control of a system, device or process | h. remote control |
| 9. waste pieces left over after cutting | i. mould |
| 10. theoretical point on the cross-section of an object from which the object's mass is transmitted vertically | j. off-cuts |
| 11. A metal used to make brass, and in galvanised coatings on steel | k. radiator |
| 12. related to movement (e.g. a load generated by a moving object | l. automation |
| 13. heat- exchange device that dissipates heat into the air, usually from a hot liquid that is pumped through it. | m. pulp |
| 14. computer software for producing engineering drawings | o. fan |
| 15. volume containing no gas, e.g. space | p. brass |
| 16. an alloy made from copper and zinc | q. earth |
| 17. spinning device with blades used to generate a flow of air | r. ore |
| 18. soft mass of wood fiber used for making paper | s. mould |
| 19. Rock, earth, mineral, etc. from which metal can be extracted | t. vacuum |
| 20. Hollow shape or form into which molten metal or glass, plaster, gelatine, etc. is poured so it will take a desired shape | u. tin |

TEXTS FOR READING AND TRANSLATION

TEXT 1

ELECTRONIC COMPUTERS



In the early 1940s the electronic computer was made with the mechanical relays replaced by vacuum tubes. These were, however, single-purpose computers designed to aid in the war effort*.

The first general-purpose electronic computer was ENIAC (Electronic Numeric Integrator and Calculator) that was put into operation at the University of Pennsylvania in 1946 – ,000 vacuum tubes and performed 100,000 operation per second (1000 kilohertz, or kHz), 1000 slower than today's megahertz (or MHz) chips.

With the invention of transistors in 1948, vacuum tubes that generated a great amount of heat were replaced by small transistors that functioned perfectly as switches** and generated little heat.

By 1953 there were only about 100 computers in the entire world. They were huge** expensive machines. It was hard to imagine that one day machines that were hundreds of times smaller and thousands of times powerful would occupy most homes and offices.

* – для помощи в военных действиях;

** – переключатели;

*** – огромный.

TEXT 2

PERSONAL COMPUTERS

The first integrated circuit for computers was developed in 1958. Only in 1971 was the microprocessor that contains all the basic elements of a computer on a single chip introduced, followed by desk-top computers in the mid-1970s.



Early computers were built as single-purpose machines, that is, they were built for performing a specific task. The first general-purpose ENIAC built in 1946 was programmable, but changing a program required rewiring* the machine!

The micromini computers of the 1970's and most in the 1980's followed the same pattern** and required extensive knowledge of common codes and function keys.

Apple Computer's Macintosh revolutionized the personal computer industry with a new machine. The user no longer has to memorize an operating system command for loading a program or file. Programs, functions, and files are represented by icons or small graphic images that can be selected with a mouse or other pointing device.

* – перепрошивать;

** – следовали тому же образцу.

TEXT 3

ENGINEERING METALS

Different metals are widely used in the machine-building industry. Metals applied for industrial purposes are called “engineering metals”. There are two types of metals: ferrous metals and non-ferrous metals. Non-ferrous metals are more expensive than ferrous metals. Their main characteristics are: high electrical and thermal conductivity, high corrosion resistance, non-magnetic qualities, light weight, etc. Some of the basic non-ferrous metals are: copper, tin, zinc, lead, nickel, gold and aluminium. Some metals are light, some are hard and others are soft.

TEXT 4

LASER

A laser is a short form of “light amplification by stimulated emission of radiation”. It is a device that stimulates the electrons of a light-producing material to vibrate “in step” (simultaneously), giving off the light with tremendous energy. If we turn an infra-red laser light on granite or marble (мрамор), some seconds later they are as soft as sandstone. Laser light is widely applied in modern tunnel construction.

TEXT 5

SILENT METALS

Research into the methods which can minimize vibration in structures is of considerable importance. One of the ways of reducing vibration in an engineering design is to introduce damping into the structure, that is, to introduce some mechanism for absorbing energy within the system.

To apply damping coating is standard practice today. The damping coatings are usually made of plastics and are applied to sheet-metal shells (наружные части, сделанные из листового металла) such as car bodies. This method is often cheap and has the advantage that the coating can be applied precisely where damping is required.

Metallurgists know that the metals for damping should be strong and tough enough and possess high inherent damping capacity. The scientists want to combine some of the properties that characterize steel with high damping capacity of lead and to produce a material that could be used to minimize noise and vibration. For instance, alloys of manganese and copper can be stronger than ordinary steel, with similar toughness and hardness, yet they have a damping capacity nearly 50 times greater than that of steel.

TEXT 6*

WATERJETS

What makes waterjets such a popular cutting option? Waterjets require few secondary operations , produce net-shaped parts with no heat-affected zone, heat distortion or mechanical stresses caused by other cutting methods , can cut with a narrow kerf, and can provide better usage of raw material since parts can be tightly nested. As a result of the FlowMaster[™] PC control system and intuitive operation, waterjets are extremely easy to use. Typically, operators can be trained in hours and are producing high-quality parts in hours. Additionally, waterjets can cut virtually any material, leaving a satin-smooth edge.

TEXT 7*

UNIQUE FLAT BELT

OTIS Ltd has patented a unique flat belt for elevator systems. It is just 3 mm thick. Yet it is stronger than conventional steel cables. It lasts up to three times longer. And it has enabled OTIS to completely re-invent the elevator. The flat, coated-steel belt totally eliminates the metal-to-metal effect of conventional systems. Coupled with a smooth surface crowned machine sheave, the result is exceptionally quiet operation and superior ride comfort. Furthermore, the flexible flat belt enables a more compact, energy-efficient machine, which can be contained in the hoistway. This enhanced technology reduces building and system operating costs, and frees up valuable space.

TEXT 8 *

GREEN BRAKES

Formula 1 is aiming to lead automotive research in finding hi-tech efficiency gains. One of the keys to this ecological drive is regenerative braking (also known as kinetic energy recovery), which recovers energy generated during deceleration, and stores it as a source of power for a subsequent acceleration.

Regenerative brakes limit the energy loss inherent in traditional braking systems. In most vehicles, conventional brakes comprise pads previously made from asbestos-based composites, but now consisting of compounds of exotic materials, and discs made of ferrous metal. The resulting friction generates heat, which is wasted. Due to the high temperatures generated, brake discs are often made out of ceramics.

The potential for recovering energy also extends to the heat generated by engines and exhaust systems. Heat recovery might offer the added benefit of reducing heat soak (thermal absorption by the chassis) as delicate alloy parts and sensitive non-metallic materials, such as polymers, are susceptible to heat damage.

TEXT 9

AUTOMATED SYSTEM

An automated system can function autonomously, without human control. A manual system requires human control. A Building Management System is a centralized computer system that monitors and controls a wide range of functions in a large building, such as the lights, heating, air-conditioning, smoke detectors, fire-alarms, lifts and security systems.

TEXT 10

APPLICATION OF THERMOSTATS

A thermostat measures and controls the water temperature in a boiler, and there is also sometimes a pressure sensor for safety. A thermostat measures and controls room temperature in a heating system. A refrigerator also has a thermostat to monitor and control the temperature and a light that is activated by the door opening. Washing machines have thermostats to control the temperature of the water inside the machine. The time of the wash cycle is also controlled. The action of the drum is linked to a safety device that prevents the door from being opened while the drum is spinning.



TEST SENTENCES FOR TRANSLATION

- 1) The engineer succeeded in developing several projects every year.
- 2) Mendeleev having arranged the elements in a table, the existence of yet unknown elements could be predicted.
- 3) Let us begin by examining what is done by each student.
- 4) With the temperature falling rapidly, we could not proceed with our experiments out of doors.
- 5) Much of the data collected will be fed into computers during the coming months.
- 6) The instrument designed by this engineer was tested at our shop.
- 7) Having been tested, the new apparatus was recommended for work in all the laboratories.
- 8) Electrons forming an atom are in motion.
- 9) By testing the metal we can define its mechanical properties.
- 10) The deformation test of a metal property is performed in a laboratory.
- 11) Bronze is an alloy containing primarily copper and tin, but other elements may be added to the alloy to increase its properties.
- 12) Copper is made for making electrical contacts and wires, pipes, telephone cables, water heater, etc.
- 13) Tin is hardly used in pure form, but is employed as an alloying element.

- 14) Phosphorous bronze may be made by adding a little phosphorus to the mixture.
- 15) Much could be written about the application of engineering metals.
- 16) This discovery followed by many experiments was of great use to scientists.
- 17) The work done at the laboratory was of great importance.
- 18) The temperature having been raised, the vapour began forming again.
- 19) With the experiments having been carried out, we started new investigations.
- 20) Any element when combining with oxygen forms an oxide.
- 21) Some of the metals are characterized by being unusually strong.
- 22) The expansive force of water in freezing is enormous.
- 23) Heat-resistant steel is made by adding some tungsten and molybdenum.
- 24) Some alloying elements make steel rust-resistant.
- 25) High carbon steel should be hardened by heating it to a certain temperature and then quickly cooling in water.
- 26) There are many applications of non-ferrous metals in the unalloyed state, but in most cases, some alloying element is added.
- 27) The atmosphere contains about 0.03% carbon dioxide.
- 28) The increased concentration of the ions of water increases the effects caused by these ions.
- 29) Lead, which is one of the metals mentioned in the Bible, was used in Rome in making water pipes.
- 30) In medieval (средневековый) alchemy gold, silver, copper, tin, iron, lead, and mercury were known as "The Seven Metals".
- 31) No unexpected difficulties have been met with during these experiments.
- 32) The discovery of electricity was followed by its wide application in all branches of industry.
- 33) The new substance was allowed to stand overnight in a closed vessel.
- 34) The scientists had to create synthetic substances possessing better properties.
- 35) The higher the temperature, the quicker is the decomposition of a substance into its components.
- 36) When sodium hydroxide was allowed to dissolve in water, much heat was liberated.
- 37) It is to be remembered that the atmosphere is a mixture and not a chemical compound.
- 38) In shape, this input device is similar to an ordinary pen.
- 39) PostScript is a computer language that describes how to print text objects to different devices.
- 40) Multimedia is the integration of text, sound, graphics, animation and movies on the computer screen.
- 41) A database is used for storing, organizing and retrieving a large collection of related information.
- 42) "Updating" a file means making changes, adding new records or deleting old ones.
- 43) "Multitasking" means that several tasks are performed at the same time.
- 44) The processed water must be specially conditioned for obtaining high quality paper.

- 45) Chemicals produce a purifying effect on cellulose.
- 46) Scientists succeeded in developing means of obtaining a synthetic rubber with properties similar to those of natural rubber.
- 47) Gold is not the only metal that does not corrode.
- 48) Nearly in every machine shop you may find many machines for working metals: they are generally called "Machine-tools" and are extensively used in many branches of engineering.
- 49) Rust formed in iron is different from metallic iron.
- 50) According the plan, the blast furnaces will be converted to gas heating and oxygen blowing.



TEST YOURSELF:

1. the verbs:

- | | |
|-----------------|----------------------------|
| 1) to apply | 1) загружать |
| 2) to call | 2) вводить |
| 3) to differ | 3) производить, получать |
| 4) to combine | 4) требовать |
| 5) to drive | 5) применять. использовать |
| 6) to produce | 6) называть |
| 7) to melt | 7) соединять |
| 8) to process | 8) отличаться |
| 9) to cast | 9) плавить |
| 10) to perform | 10) отливать |
| 11) to require | 11) приводить в действие |
| 12) to load | 12) составлять |
| 13) to employ | 13) вводить |
| 14) to make up | 14) содержать |
| 15) to contain | 15) получать |
| 16) to input | 16) обрабатывать |
| 17) to generate | 17) применять |
| 18) to test | 18) занимать |
| 19) to design | 19) проверять, испытывать |
| 20) to occupy | 20) конструировать |

b) the nouns

- | | |
|---------------|-------------------|
| 1) alloy | 1) промышленность |
| 2) mixture | 2) содержание |
| 3) liquid | 3) обработка |
| 4) percentage | 4) отливка |
| 5) hardness | 5) вес |
| 6) weight | 6) прочность |
| 7) toughness | 7) сплав |

| | |
|-----------------|-----------------------|
| 8) casting | 8) смесь |
| 9) industry | 9) жидкость |
| 10) content | 10) трубка |
| 11) furnace | 11) хранение |
| 12) fuel | 12) устройство |
| 13) coke | 13) память |
| 14) coal | 14) проектор |
| 15) foundry | 15) волокно |
| 16) fibre | 16) литейный цех |
| 17) volume | 17) твердость |
| 18) pressure | 18) топливо |
| 19) application | 19) кокс |
| 20) beamer | 20) уголь |
| 21) memory | 21) процентный состав |
| 22) device | 22) давление |
| 23) tube | 23) применение |
| 24) storage | 24) давление |
| 25) treatment | 25) объем |
| 26) record | 26) свинец |
| 27) grey iron | 27) олово |
| 28) lead | 28) ржавчина |
| 29) tin | 29) серый чугун |
| 30) rust | 30) запись |

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ОБУЧЕНИЕ ЧТЕНИЮ НАУЧНО-ТЕХНИЧЕСКОЙ ЛИТЕРАТУРЫ

УЧЕБНОЕ ПОСОБИЕ

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