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ENGLISH FOR SCIENCE AND ENGINEERING STUDENTS: Corrective Course

Учебно-методическое пособие по практической работе

для студентов направлений бакалавриата
РТФ, РКФ, ФВС, ФЭТ

Томск
ТУСУР
2017

Настоящее учебное-методическое пособие предназначено для студентов ТУСУР направлений бакалавриата РТФ, РКФ, ФВС, ФЭТ. Основной целью пособия является компенсация недостатка или отсутствия грамматических умений и навыков в рамках базового уровня школьной программы. Пособие состоит из 3 уроков (Lessons 1-3), которые содержат грамматический материал, представленный в схемах, и приложения (Appendix), включающего в себя микротексты профессиональной направленности. Рекомендовано для изучения в первом семестре (10 часов аудиторных занятий и 10 часов самостоятельной работы).

Contents

LESSON 1

a – an	*какой-то, один из*	**to be**	*являться, находиться*
the	*этот*	**I am**	
one, two, three …	*1, 2, 3…*	***he / she / it* is**	
eleven, twelve, thirteen …	*11, 12, 13…*	***we / you / they* are**	
twenty, thirty, forty…	*20, 30, 40*	***I / he / she / it* was**	
a hundred, a thousand, a million	*100, 1000, 1000000*	***we / you / they* were**	
first, second, third …	*1st, 2nd, 3rd…*	**will be**	
eleventh, twelfth, thirteenth …	*11th, 12th, 13th …*	**being**	*являющийся, находящийся,*
twentieth, thirtieth, fortieth …	*20th, 30th, 40th …*	**been**	*являвшийся, находившийся*
this – these	*этот – эти*	**to have**	*иметь, обладать*
that – those	*тот – те*		
all – any –	*все – любой –*	***I / you / we / they***	
some – no	*некоторый – никакой*	**have**	
another – other	*другой - другие*	***he / she / it* has**	
every, each	*каждый*	**had**	
such	*такой*	**will have**	
many (students)	*много (студентов)*	**having**	*имеющий(ся)*
much (time)	*много (времени)*	**had**	*имевший(ся)*
more	*больше*		
most	*больше всего, наибольший*	**to do**	*делать*
few (students)	*немного (студентов)*	***I / you / we / they*** **do**	
little (time)	*немного (времени)*	***he / she / it* does**	
less	*меньше*	**did**	
least	*меньше всего, наименьший*	**will do**	
I – he – she – it	*я – он – она – оно*	**doing**	*делающий*
we – you – they	*мы – вы – они*	**done**	*сделанный*
my – his – her – its	*мой – его – ее - его*	**there + to be**	*иметься, находиться*
our – your – their	*наш – ваш - их*	**there is – there are**	*имеется (-ются)*
me – him – her – it	*мне (меня), ему (его), ей (ее), ему (его)*	**there was – there were**	*имелся (-лись)*
us – you – them	*нам (нас), вам (вас), им (их)*	**there will be**	*будет иметься*

Exercise 1. Read and translate the numerals.

Nine, four, ten, eight, eleven, first, third, twelfth, seventeen, twentieth, hundred, second, thirteen, tenth, eighteenth, forty, nineteen, fifteen, seventieth, sixtieth, twenty, thousand, third, eighty, nineteenth, two hundred and sixty, seven hundred and thirty-first, one thousand five hundred and forty, fifty-fifth, one hundred and eighty seven, four thousand one hundred and ninety, twenty seventh.

Exercise 2. Read and translate the following words.

Many, every, another, no, all, such, those, this, least, little, much, each, other, less, some, that, these, any, more, few, some, the, most, those, no, every, these, most, some, more, few, any, that, less, each, little, this, some, other, much, least, those, all, another, many, such, no, every, some, that, other, any.

Exercise 3. Read and translate the pronouns.

Me, its, them, he, us, you, her, we, his, their, it, she, my, her, your, our, they, me, it – its – it, their, his, my, us, them, him, our, it, me, its, your.

Exercise 4. Read and translate the following groups of words.

It was, he had, they will be, I was, we were, it will be, there is, it has, there was, they were, she had, there will be, they will be, they will have, I did, we do, they have, he has, I will be, there were, they were.

Exercise 5. Read and translate the following words.

Twelfth, another, that, eleven, any, some, such, few, more, us, it, there was, were, having, those, no, other, most, each, its, had, there will be, was, doing, there are, them, another, does, us, done, being, less, much, did, few, doing, such, each, its, our, their.

Negative and interrogative forms of the verbs *to be, to have* and *there to be* construction

Exercise 6. Make the following sentences negative or interrogative, as in the model.

Model A: – **I am** seventeen. (–)
– **I'm not** seventeen.

– She **is** *my* daughter. (?)
– **Is** she *your* daughter?

Model B: – I **have** got a brother. (–)
– I **haven't got** a brother. (*or:* I **have no** brother.)

– He **has got** a car. (?)
– **Has** he **got** a car?

Model C: – There **is** a pen on the table. (–)
– There **isn't** a pen on the table. (*or:* There **is no** pen on the table.)

– There **are** *some* students in the class. (?)
– **Are** there *any* students in the class?

1. They are married. (–)
2. She is from Spain. (?)
3. I am a driver. (–)
4. There are some mistakes in your test. (?)
5. He has got some friends. (–)
6. They are from the USA. (–)
7. It is near the chair. (?)
8. They are programmers. (–)
9. I have got a personal computer. (?)
10. I am a student. (?)
11. He is a pilot. (–)
12. We are from Italy. (?)
13. There is some money in my pocket (-)
14. There is a marker on the desk. (?)
15. Her name is Julia. (–)

Exercise 7. Fill in the blanks with the appropriate forms of the verbs *to be or to have.*

1. Peter … a sister.
2. Her name … Ann.
3. They … students of the university.
4. Last year they … schoolchildren.
5. In five years they … engineers.
6. I … at home.
7. … you at home two hours ago? No, I … not. I … at the university.
8. … you got a brother? Yes, I … .

9. How old … you? I … 17.
10. How old … your mother? She … 45.
11. … there a picture on the wall? No, there … no picture on the wall.
12. … there chairs there? Yes, there … .
13. Yesterday there … many students in the library.
14. Will you … lessons tomorrow?

Exercise 8. Fill in the blanks with the possessive pronouns corresponding to the Russian pronoun *свой*.

1. He wants to read … translation to you.
2. She helps … sister.
3. They begin … work at nine o'clock.
4. We like … university.
5. In the morning my sisters take … books and go to school.
6. I work with … friend.
7. You must get … books from … bag and put them on the table.
8. He makes … experiment every day.
9. They make … experiment every day.

Exercise 9. Fill in the blanks with the appropriate pronouns.

1. …state helps … to get higher education.
2. Will you show … … new hostel?
3. Do … friends help … in … work?
4. I saw … yesterday.
5. … lessons begin at 9 o'clock.
6. My friend came to see … last night.
7. An old man asked … to help … .
8. My friends invited … to … party.
9. The student couldn't answer … questions.
10. I can't do this work without … help.

Exercise 10. Translate the following sentences from Russian into English.

1. У него нет уроков.
2. В лаборатории много современных приборов.
3. Их нет дома.
4. В нашей группе 20 студентов.
5. В нашем городе нет университетов.
6. В вашем городе есть институт?
7. Мы обычно бываем дома вечером.
8. У нас нет свободного времени.
9. Вчера его не было дома.
10. У них будет 4 экзамена в этом семестре.
11. В 5 часов вечера мы будем в библиотеке.
12. Там будет интересная лекция.

LESSON 2

Prepositions

Cases

of	*кого, чего*
for	*для*
to	*кому*
by	*кем, чем*
with	*чем, с*
without	*без*
about	*о*

Time

by	*к*
at	*в*
before	*перед (тем как)*
after	*после (того как)*
since	*с*
till (until)	*до*
during	*в течение*
for	*во время*
within	*в рамках*

in 2010, **in** winter, **in** May
on Monday, **on** the 1st of May
in the morning / evening / afternoon
at (mid)night
in a day
for a week

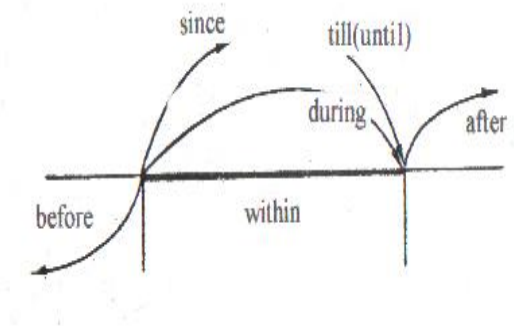
Place and movement

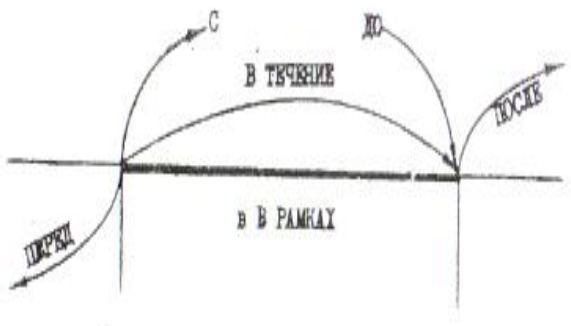
in	*в*
on	*на*
to	*к*
from	*из, от*
into	*внутрь*
out of	*изнутри*
near (at)	*рядом (у)*
behind	*позади*
over	*выше*
below	*ниже*
above	*над*
under	*под*
across	*поперек*
along	*вдоль*
around	*вокруг*
against	*напротив*
among	*среди*
between	*между*

Cause

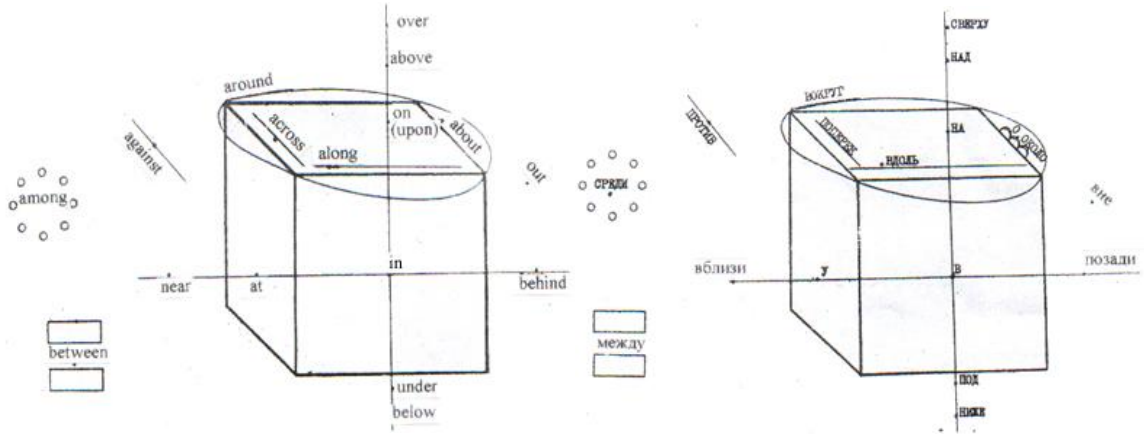
because	*потому что*
because of	*из-за*
since, as, for	*так как*

Prepositions of time

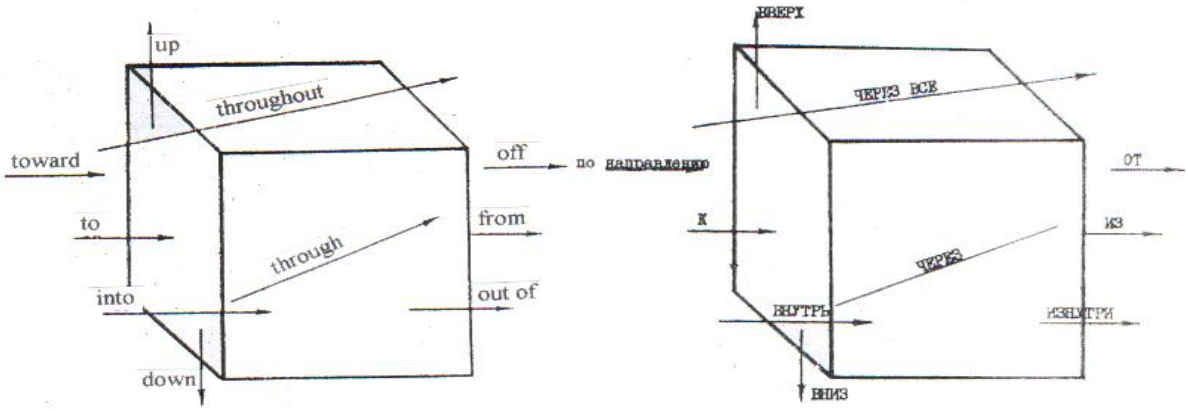




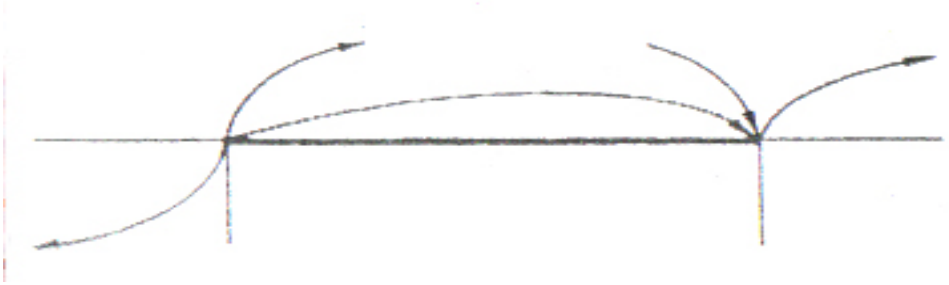
Prepositions of place

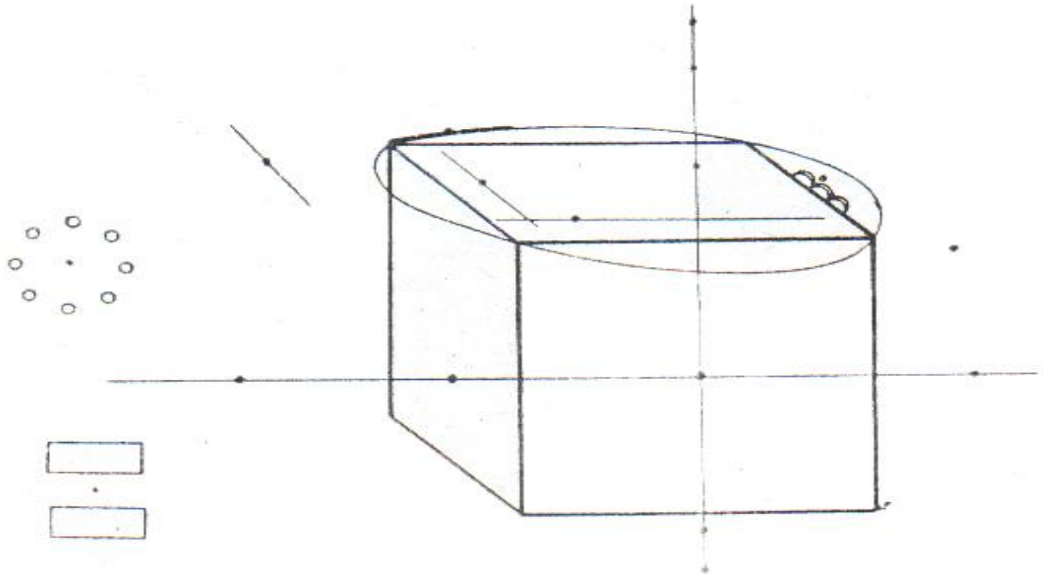


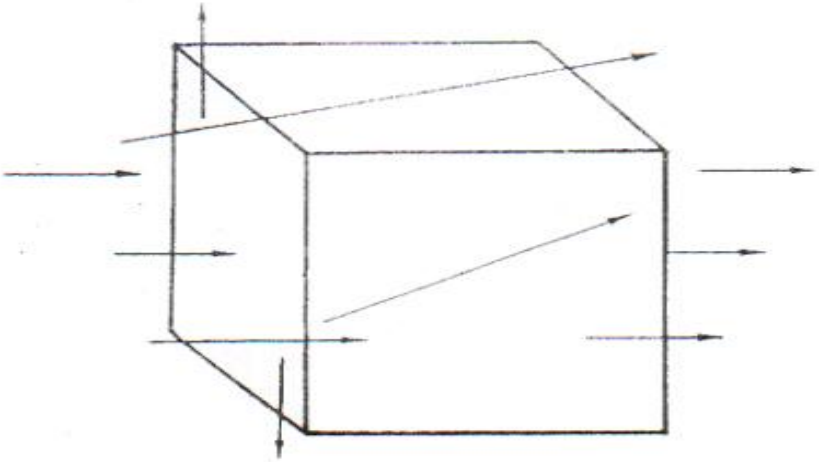
Prepositions of movement



Exercise 1. Write the appropriate prepositions.







Exercise 2. Read and translate the following prepositions.

By, with, without, as, because of, before, since, till, during, after, within, to, into, out of, from, of, near, at, in, behind, below, of, under, above, around, across, along, about, of, against, among, between, below, by, since, during, within, till, between, across, of, because of, for, as, along, under, into, to, with, without, by, during, of, since, behind, against, from, at, below, because of.

Exercise 3. Read and translate the following word-groups.

In the morning, in the afternoon, in the evening, at night, in September, in spring, in autumn, in winter, in 2000, in a day, in five days, on the first of September, on the fifth of February, on Sunday, on Monday, on Tuesday, on Wednesday, on Thursday, on Friday, on Saturday.

At three o'clock, at seven o'clock, by five o'clock, by the morning, at night, for three days.

At the temperature, at the voltage, at a speed, under the action of, under (in) some conditions, in fact, on the basis of, as a result.

Modal Verbs

can *могу, умею*	*I **can** swim / speak English.*	**may (might)** *могу (можно), может быть*	*May I come in?* *She may be at home.*
could *мог, умел*	*When I was 10, I **could** run fast, but now I can't.*	**must** *должен*	*Show must go on.*
be able to *мочь, быть способным*	*I think I **will be able** to write a program.*	**need** *нужно*	*I need money.*

Words to be learnt

that	*тот, что, который*	**though (although)**	*хотя*
what	*что, какой*	**however**	*однако*
who	*кто, который*	**thus**	*таким образом*
which	*который*	**then**	*затем, тогда*
where	*где*	**than**	*чем (сравнение)*
why	*почему, зачем*	**rather than**	*а не*
how	*как*	**as many as**	*так много, как*
how many (much)	*сколько*	**as well as**	*так же, как*
when	*когда*	**also**	*также*
while / whereas	*в то время как, когда*	**at least**	*по крайней мере*

Exercise 4. Read and translate the modal verbs.

Can, could, be able to, might, may, must, need, may, could, must, was able to, can, might, could, must, can, need, may, is able to, will be able to.

Can, that, what, because, was able to, how, though, must, could, where, while, might, need, when, also, could, which, at least, whereas, at least, is able to, after, could, as, must, that, can, though, might, while, how, since, as, for, why, how many.

Exercise 5. Read and translate the following words.

That, what, who, which, while, when, how, where, whereas, though, because, as, since, before, after, where, how many, as many as, when, while, which, who, what, that, since, as, for, after, before, although, whereas, how, why, as well as, that, which, where, when, than, since, as, for, what, because, while, though, after, then, whereas, although, rather than, when, that, least, at least, why, how many.

Exercise 6. Read and translate the following sentences. Pay attention to the modal verbs.

1. Students must take exams in January.
2. She can speak French well.
3. You may take this book till tomorrow.
4. We must learn new words every week.
5. You may come in.
6. We can take this book from the library.
7. She can't do this work in time.
8. They must go to Moscow for a few days.
9. We were able to read this article without dictionary.
10. Everyone must know a foreign language.
11. He could do this work without any help.
12. Students may ask a lot of questions after the lecture.
13. You couldn't translate the text as it had many new words.
14. You may enter any university in our country after you finish school.
15. You must pass all the exams well to enter the university.

Exercise 7. Read and translate the following sentences.

1. We can see electrical devices everywhere.
2. Today we can't imagine the world without telephone and television.
3. We will study electronics for two years.
4. Computers and robots are important for industrial use.
5. We may communicate over long distances with the help of satellite systems.

6. People couldn't solve many complex engineering problems without computers.
7. You may take part in our discussion.
8. We must measure the distance between the elements.
9. After the invention of engine the first industrial revolution started.
10. New robots will have some manipulators that will carry out many functions.

Exercise 7. Translate the sentences from Russian into English.

1. Она может читать и писать по-английски.
2. Он должен прочитать эту статью.
3. Вы можете идти домой.
4. Может быть, она во Франции.
5. Мне нужно больше времени, чтобы закончить это тест.

Suffixes

Nouns ***-er, -or, -tion, -ance, -ence, -ity, -ment, -ist, -ness, -age, -ogy, -ics, -sure, -ture***
conductor, transformer, invention, assistance, difference, activity, movement, measure, scientist, darkness, resistance, worker, operator, computer, calculation, inventor, structure
Adjectives ***-al, -ic, -ive, -ous, -able, -ful, -less, -y***
political, periodic, positive, various, suitable, useful, useless, rainy, atmospheric, cultural, negative, classical, numerous, variable, powerful, noiseless, stony
Adverbs ***-ly***
rapidly, greatly, widely, clearly, primarily, generally, differently, commonly, mainly, cheaply, independently, attentively
Verbs ***-ize, -fy, -en, -ate***
memorize, classify, widen, demonstrate, realize, electrify, deepen, calculate, , optimize, modify, broaden, separate

Prefixes

Re-, dis-, over-, super-, semi-, inter-, un-, in-, im-, il-, de-, counter-
reproduction, overload, superman, semiconductor, international, unlimited, invisible, illegal, impossible, decode, counteraction, retell, disconnection, overproduction, semicircle, interplanetary, unstable, incorrect, demount

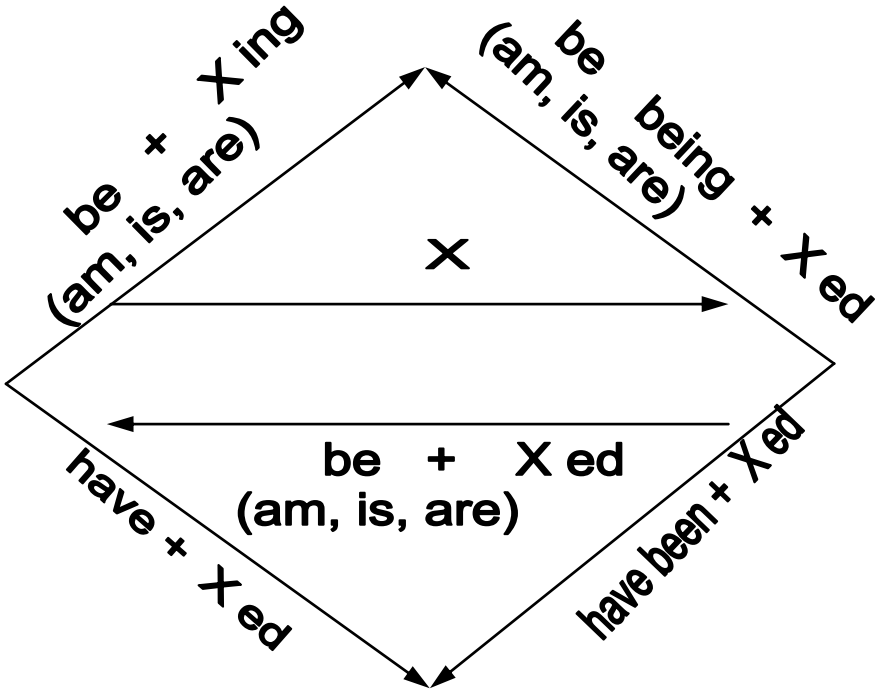
Exercise 8. Read and translate the following words.

Movement, economist, electronics, biology, physical, religious, variable, powerful, useful, noiseless, identify, lighten, unimportant, invisible, disconnect, organize, defreeze, reproduce, counterrevolution, supersensitive, dependence, independently, conversion, literature, equipment, disadvantage, peaceful, weightless, decode, elementary, conductivity, weightlessness, stimulate, nationalize.

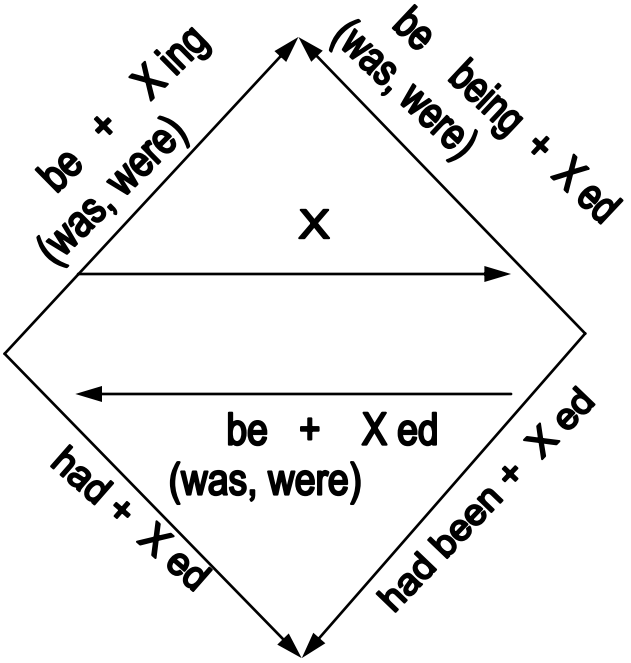
LESSON 3

Tenses of the Active and Passive Voices

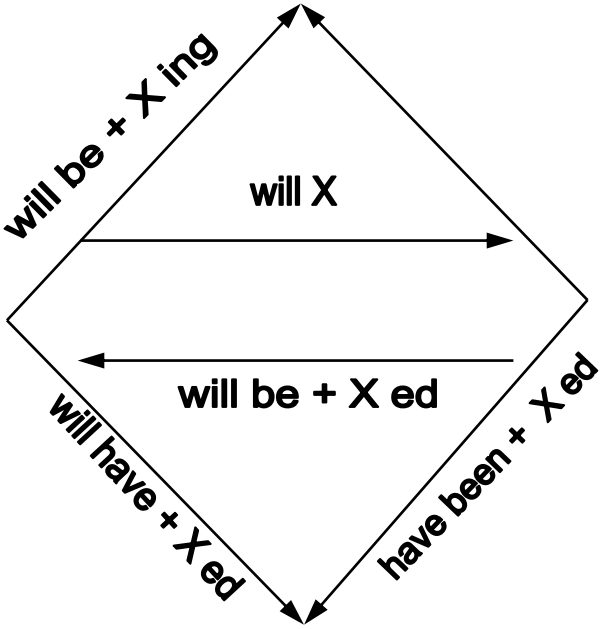
PRESENT

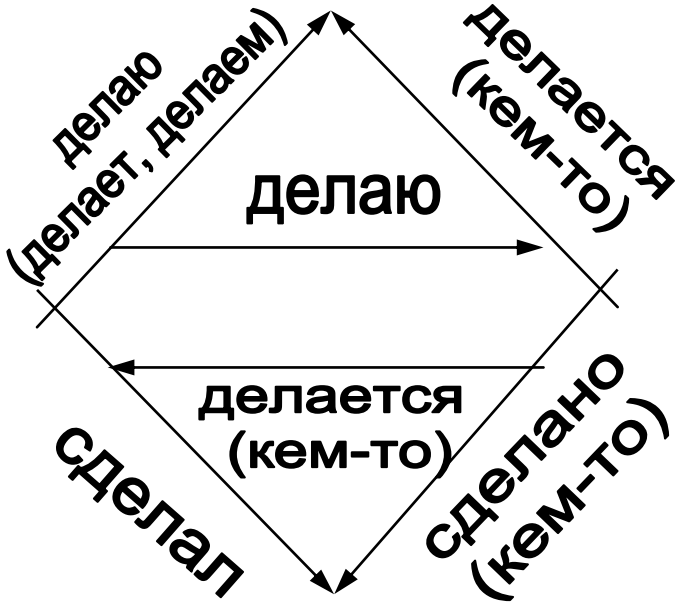


PAST



FUTURE





Exercise 1. Put the right pronouns instead of numbers and translate into Russian.

to decide (решать) – decided - decided

1 had decided, 2 will decide, 3 will have decided, 4 decided, 5s are deciding, 6 has decided, 7 decides.

8 was decided, 9 will be decided, 10 is decided, 11 has been decided, 12 was being decided, 13 will have been decided, 14s were decided, 15s are being decided.

Exercise 2. Put the correct pronouns instead of numbers and translate into Russian.

to divide (делить) – divided - divided

1 have divided, 2 will divide, 3 is dividing, 4 divided, 5 had divided, 6s were dividing, 7 will divide, 8 divides, 9 has divided, 10 will have divided.

11 will have been divided, 12s were divided, 13 is being divided, 14 will be divided, 15s are divided.

Exercise 3. Put the right pronouns instead of numbers and translate into Russian.

to write (писать) – wrote –written

1 wrote, 2 was writing, 3 have written, 4 writes, 5 were writing, 6 will have written, 7 will write.

8 have been written, 9 will be written, 10 is being written.

Exercise 4. Read and translate the following word-groups.

The century began, they are obtaining, the satellite was on its orbit, the observation has shown, the engineer is measuring, the student has written, the concept explains, scientist was applying, physics is studying.

A new radio set was demonstrated, new results are being obtained, the methods have been developed, the question has been solved, the energy had been converted, the particle will be divided, the data will be tested.

Exercise 5. Read and translate the following sentences.

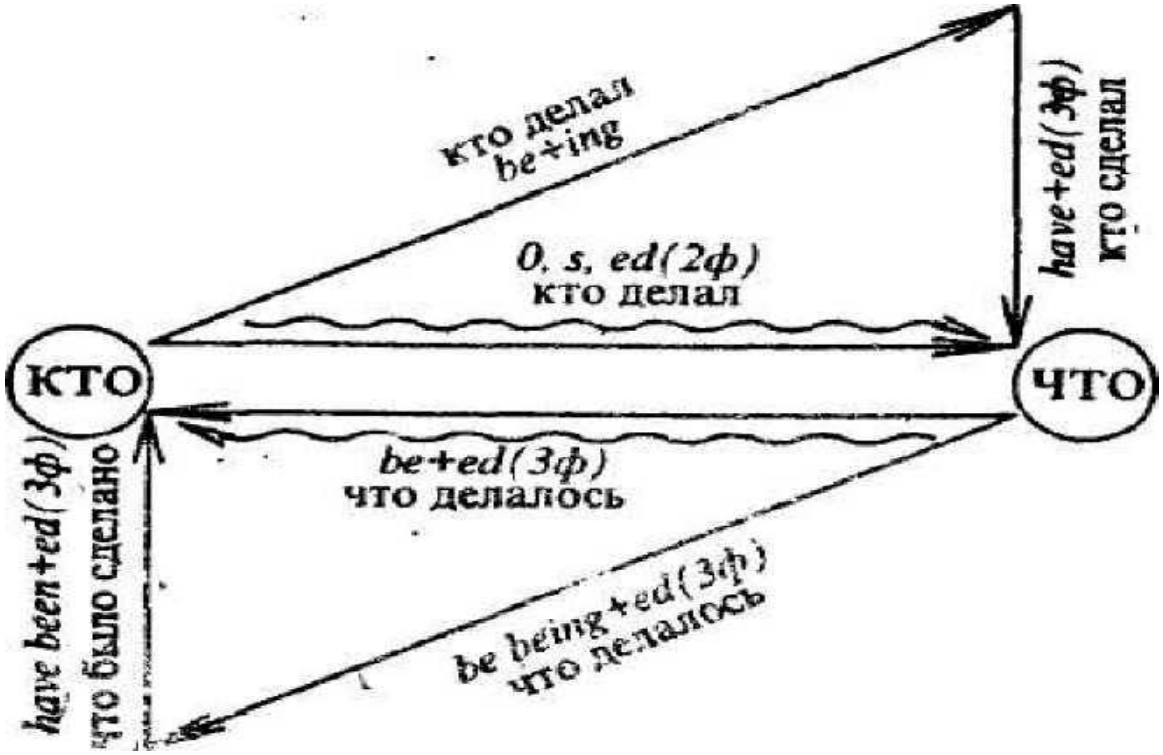
to catch (ловить) – caught – caught

I. 1. We were catching. 2. I will be caught. 3. He has caught. 4. I am caught. 5. She is catching. 6. He will catch. 7. I was being caught. 8. She has been caught. 9. You will have caught. 10. They will be caught. 11. She caught. 12. He is catching.

to teach (учить чему-л.) – taught – taught

II. 1. He teaches. 2. I was taught. 3. She will be taught. 4. They had taught. 5. I will teach. 6. She is taught. 7. They have been taught. 8. He will have taught. 9. We taught. 10. He was being taught. 11. We were teaching. 12. She will have been taught. 13. They were taught. 14. He has taught. 15. They are teaching.

Using tense forms



V1	**V_2**	**V_3**	**V_{ing}**
ask	**asked**	**asked**	**asking**
спрашивать	*спрашивал, спросил*	*спрошенный*	*спрашивающий*
write	**wrote**	**written**	**writing**
писать	*писал, написал*	*написанный*	*пишущий*

Active	***Passive***
Simple (Indefinite)	
V **$V_{ed/2}$ делал** *(yesterday)* **$V_{(s)}$ делаю(-ет)** *(every day)* **will V будет делать** *(if...)*	**(will) be + $V_{ed/3}$** **was (were) + $V_{ed/3}$ делалось** **am (is, are)+ $V_{ed/3}$ делается** **will be + $V_{ed/3}$ будет делаться**
Progressive (Continuous)	
(will) *be* + V_{ing}	***be*** **+ being+ $V_{ed/3}$**
was (were) + V_{ing} делал *(yesterday at 5)* **am (is, are)+ V_{ing} делаю (-ет)** *(now)* **will be + V_{ing} будет делать** *(tomorrow at 5)*	**was (were) + being + $V_{ed/3}$ делалось** **am (is, are)+ being + $V_{ed/3}$ делается**
Perfect	
(will) *have* + $V_{ed/3}$	**(will) *have* been + $V_{ed/3}$**
had + $V_{ed/3}$ сделал *(by 5)* **have (has) + $V_{ed/3}$ сделал** *(just/already)* **will have + $V_{ed/3}$ сделает** *(by 5)*	**had + been + $V_{ed/3}$ было сделано** **have (has) + been +$V_{ed/3}$ было сделано** **will have + been + $V_{ed/3}$ будет сделано**

Words to be learnt

to develop	*развивать, разрабатывать*	**device**	*устройство, прибор*
to obtain	*получать*	**equipment**	*оборудование*
to measure	*измерять*	**research**	*исследование*
to carry out	*выполнять*	**advantage**	*преимущество*
to solve	*решать*	**article**	*статья*
to overcome	*преодолевать*	**observation**	*наблюдение*
to amplify	*усиливать*	**quality**	*качество*
to improve	*усовершенствовать*	**data**	*информация, данные*
to repair	*ремонтировать*	**wire**	*провод*
to attach	*присоединять*	**pressure**	*давление*
to complete	*заканчивать*	output	*продукция*
to succeed	*преуспевать*	**in order to**	*для того чтобы*

Exercise 6. Read and translate the following word-groups.

Scientists are developing, they were obtaining, the device was produced, a new radio set was demonstrated, the scientist was using, the student is measuring, she has read, the methods have been developed, the experiment has shown, the phenomenon was studied, the problem has been solved, physics is studying, the scientist discovered, the observation shows, the energy has been converted, the radio is broadcasting, the data will have been obtained, the new device will have been produced, the distance has been measured, the signal was amplified, the student used, the researcher invented.

Exercise 7. Read and translate the following sentences.

1. While the experiment **was being carried out**, nobody **left** the laboratory.
2. A new type of computing equipment **is being produced** at our plant.
3. At present scientific work **is being done** mostly by large groups of researchers.
4. The solar battery **is converting** the energy of sun rays directly into electric energy.
5. The experiment **was being carried out** under low pressure.
6. Scientists and engineers **are developing** new types of electronic and devices.
7. We **were looking** for a more simple method but couldn't find it.
8. The engineers **will discuss** the advantages of this new system.
9. Many different devices **have been produced** in order to improve the quality of communication.
10. This question **has already been discussed** at the scientific conference.
11. By the end of the year various semiconductor devices **will have been produced**.
12. That equipment **had been repaired** before you came.

13. This text **has** just **been translated**.
14. Mendeleyev's periodic law **has been accepted** as a universal law of nature.
15. Scientists **are using** the energy of atom in various spheres of life.
16. The engineers **were attaching** the wires to the devices when I **came in**.
17. When we **listen** to a radio program we **use** the rays that **are called** radio waves.
18. The scientist **was solving** a new problem when we **visited** the laboratory last week.
19. My friend **is writing** an article for the newspaper.
20. The student **was carrying out** the experiment for twenty minutes.
21. Molecules in gas **are** constantly **moving**.
22. The electron **is circling** in an orbit around a nucleus.
23. He **understood** the text after he **had read** it again.
24. He **will have finished** his work by the end of the week.
25. The operator **will have recorded** the data before you come.
26. I **have not seen** him since he **graduated** from the university.
27. We **will have completed** our experiments by the next month.
28. Many difficulties **had been overcome** before the researcher succeeded in his work.
29. After the new device **had been tested** it **was installed** in our laboratory.
30. We **analyzed** the data that **have been obtained** by our investigators.

APPENDIX

Microtexts for Reading

Physics

Physics is the science studying various phenomena in nature. Its object is to determine exact relations between physical phenomena. Physics is divided very naturally into two great branches, experimental and theoretical. The task of the former is to make observations and carry out experiments. On the basis of the experimental facts theoretical physics is to formulate laws and predict the behaviour of natural phenomena. Every law is based on experiments. It was the study of natural phenomena that made it possible to formulate various laws. There are still a lot of problems to be solved. Scientists all over the world are doing their best to find answers to numerous unsolved problems.

SMS History

SMS was created during the late 1980s to work with a digital technology called GSM (global system for mobile communications), which is the basis for most modern cell phones. The Norwegian engineers who were inventing it wanted a very simple messaging system that worked when users' mobile phones were turned off or out of signal range. Most sources agree that the first SMS message was sent in the UK in 1992.

As SMS was born in Europe, it's not surprising that it took a little longer to make its way to the United States. Even today it is much more popular in Europe. A July 2005 study found that 37 percent of U.S. mobile phone owners had sent or received at least one text message in the previous month.

Everything under the sun at Google

What is Google? A search engine? A media conglomerate? Or an energy provider? The company has announced that it will provide $75 million to build 3,000 residential solar electricity systems across the US this week.

Under the plan, homeowners can install a $30,000 solar electricity systems with little or no money upfront. Google will own the panels and homeowners pay a monthly fee for the energy.

To get the project off the ground, Google is creating a fund with a San Francisco company called Clean Power Finance that local solar installers will be able to tap so they can offer financing plans to prospective buyers.

This is the latest in a string of investments worth about $850 million that Google has made in renewable energy as part of its long-standing aim of reducing the environmental impact of the business. But it`s not all altruistic. As the owner of the panels, Google will get the benefit of federal and state renewable energy subsidies.

Radio waves

Radio waves make up part of the electromagnetic spectrum. These waves are packets of energy with different wavelengths, similar to visible light waves, X-rays or Gamma rays, except longer.

The smallest radio waves are called microwaves. Shortwaves are not quite so small. There are also medium and long waves. Antennas designed to send and receive radio waves are usually similar in size to the wavelength they are to use. Many radio antennas (like those on cars) are made long because they receive signals of FM radio (a few meters, several feet) or AM radio (hundreds of meters, about a thousand feet).

Manmade radio waves have been used for a long time for communication, and to 'see' objects. Radar uses radio waves to 'see' distant objects. Radios also use these waves to send and receive information. Natural radio waves were first discovered in the 1930s by Karl Guthe Jansky. Radio waves are widely being used now. Broadcasting and communications satellites and mobile phones and many computers communicate by radio waves.

Wireless

Originally, radio technology was called 'wireless telegraphy', which was shortened to 'wireless'. Wireless is an old-fashioned term for a radio transceiver or for a radio receiver. Now the term is used to describe modern wireless connections such as those in cellular networks and wireless broadband Internet. In modern usage, wireless is a method of communication that uses low-powered radio waves to transmit data between devices. The term refers to communication without cables or cords, chiefly using radio frequency and infrared waves. High powered transmission sources usually require government licenses to broadcast on a specific wavelength. This broadcast platform which has historically carried voice and music, has grown into a large industry, with many thousands of broadcasts around the world. Low-powered radio waves are often unregulated. Wireless is now increasingly being used by unregulated computer users. Software and hardware developers are creating smaller computer networks which form special wireless network, with protocols such as WiFi and ZigBee.

Transistors

Transistors are devices that control the movement of electrons. They can both switch or amplify electronic signals.

One of the first computers, the famous ENIAC (Electronic Numerical Integrator and Calculator) weighed 30 tons and contained more than 17,000 vacuum tubes. In 1954, George Teal created the first silicon transistor. Soon after, manufacturers developed methods for mass-producing silicon transistors, which were cheaper and more reliable.

Silicon transistors helped computers make great numbers of calculations in a short time. The simple task switch operation of transistors enables your computer to complete very complex tasks.

The transistors are a part of an integrated circuit (also known as a microchip), in which many transistors work together to help the computer complete calculations. These circuits, usually called just "chips" contain billions of very small transistors.

Cell Phone Parts

The electronic components of a cell phone include the battery, display screen, keypad, memory chip, and parts of the circuit board.

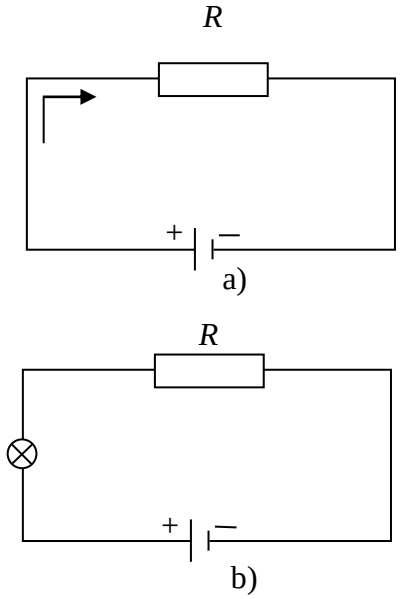
The brain of the cell phone is the CPU. It tells the different parts of the phone how and when to perform tasks.

The display screen and keypad are used for multiple tasks, including typing in phone numbers, text messaging, and in some phones, taking photos. When the screen and keyboard are used for photography functions, the display screen acts more like a TV screen and the keypad becomes the shutter-release button.

The memory card can either be installed as a chip on the mother board or it can be a separate card that can be removed. The memory chip stores information for the phone's operating system and the contact list directory.

The battery provides the energy required to power the phone. Cell phones generally use rechargeable batteries. One of the most popular batteries for cell phones these days is the lithium-ion battery. Lithium-ion batteries have no memory effect and they hold their charge better than most other battery types.

Electric Circuit



This is a circuit. It consists of voltage source, a resistor and a conductor. A voltage source supplies current. A resistor reduces current. A conductor connects the elements of the circuit.
Compare circuit 'a' with circuit 'b'. What is the difference between them? Current passes through circuit 'a' while no current passes through circuit 'b'. Circuit 'b' has an open. No current through circuit 'b' results from an open. An open and a short are troubles in a circuit. A trouble in a circuit may result in no current in it.

Diodes

We can define electronics as the study of conduction of electricity in a vacuum, in gases and in semiconductors. The conduction of electricity in a vacuum, for example occurs in vacuum tubes. Though in some vacuum tubes current flows from one element to the other through a gas.

Every vacuum tube diode has a cathode with a heater and a plate. When the circuit is completed (*замкнута*) the cathode emits electrons. Negative voltage on the cathode repels the electrons. Positive voltage on the plate attracts the electrons. The current flows through the tube. If a negative voltage is applied to the plate current does not flow. Thus, a diode permits current to flow in only one direction.

A semiconductor diode also conducts current in one direction, but the physical principles, which permit it to do this, are different. Diodes are used as rectifiers of alternating voltages, as detectors of radio signals, as switching devices, *etc*.

Semiconductors

Semiconductors are solids whose resistivity lies between those of electrical conductors and insulators. Semiconductors are used in computers, in radio and TV receivers, and in other electronic products.
Semiconductor devices perform many control functions. They may be used as rectifiers, amplifiers, detectors, oscillators and switching elements. Some characteristics, which make the semiconductors such as attractive member of the electronics family, are as follows:

- Semiconductors are small and light in weight.
- Semiconductors are solids. There is therefore little chance that element will vibrate. Element vibration in vacuum tubes was the cause of microphonics.
- Semiconductors require little power and radiate less heat than tubes. They do not need warm up time and operate as soon as power is applied.
- Semiconductors do not undergo the chemical deterioration which occurs in tube cathodes. The deterioration of tube cathodes eventually results in unacceptable tube performance. (***зд***. *плохая работа электронной лампы*).

Silicon is the material of which most semiconductor devices are presently constructed.

Resistors

A resistor is a circuit element designed to insert resistance in the circuit. A resistor may be of low value or of high value.

Resistors in electronic circuits are made in a variety of sizes and shapes.[1] They are generally classed as[2] fixed, adjustable or variable, depending upon their construction and use.

The resistance value of small fixed resistors is sometimes indicated by a code colour.

Resistors required to carry a comparatively high current[3] and dissipate high power[4] are usually of the wire-wound ceramic type.

Radioactivity

Radioactivity is invisible and inaudible, and we cannot feel it until we get too much of it and become ill. But in our nuclear age we have a very important tool, the Geiger counter, which is used for detecting radioactivity. It was invented by Hans Geiger, a German physicist, and has the ability to register cosmic rays as well as gamma-rays. Geiger counters are used for all kinds of purposes – light ones for uranium prospecting, built-in types for atomic power stations and research establishments; counters with warning signals for factory workers who deal with radioactive materials and whose hands and clothes must be checked and so on.

Means of Communication

Electrical communication over a great distance was first demonstrated in 1844 by Samuel Morse, who sent a dot-dash message along a single wire between Baltimore and Washington. In later years it was demonstrated that the human voice could be electrically transmitted along wires.

A transatlantic telegraph cable was completed and the first radio telegraph message was sent across the Atlantic in 1901. Transatlantic telephone calls finally became popular with the opening of the high quality 36-channel cable in 1956. Six years later the first active experimental communication satellite relayed the first live television pictures between the US and Europe.

Today a lot of communication satellites are in synchronous orbits over the Atlantic, Pacific and Indian oceans. They send telephone, television, telegraph and other signals to the ground stations all over the world.

Rays

The kind of ray that mankind has known for the longest time is light. It helps us to see the objects that surround us, when the objects reflect the light into our eyes. As our eyes can detect light, we call it a visible ray. The other rays are invisible.

We find three types of invisible rays in use in our homes. When we listen to a radio program, we are using the rays that are called radio waves. When we cook a meal on an electric cooker, we are using infrared rays, sometimes called heat waves. When we sit under sun-tan lamp, we are using ultraviolet rays.

We meet the other three types of rays outside the home. Inside the hospital we will find X-rays that are used for taking pictures of the insides of our body. At airports everywhere we will find microwaves that are used with radar equipment to detect planes in the air or guide them to land. Also in hospitals we find gamma rays used as invisible bullets to kill cancer cells.

These seven types of rays are all electromagnetic waves. But they are different from each other in their frequency and their wavelength. The distance that the wave moves during the time that it takes for one complete cycle of vibration is called the wavelength. The frequency is the number of cycles in a second. Notice that radio waves are the longest of the electromagnetic waves and have the lowest frequency.