

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ

ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ АВТОНОМНОЕ
ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ
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ЛИНГВИСТИЧЕСКИЕ ОСОБЕННОСТИ РАДИОТЕХНИЧЕСКИХ ТЕКСТОВ НА АНГЛИЙСКОМ ЯЗЫКЕ

Рекомендовано редакционно-издательским советом федерального государственного автономного образовательного учреждения высшего образования «Самарский национальный исследовательский университет имени академика С.П. Королева» в качестве практикума для обучающихся по основным образовательным программам высшего образования по направлениям подготовки 12.03.04 Биотехнические системы и технологии, 11.03.03 Конструирование и технология электронных средств, 11.03.01 Радиотехника, 11.03.04 Электроника и наноэлектроника, 12.03.05 Лазерная техника и лазерные технологии, 11.04.03 Конструирование и технология электронных средств и специальности 11.05.01 Радиоэлектронные системы и комплексы

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Цель практикума заключается в систематизации базовых знаний английской грамматики для совершенствования навыков устной и письменной речи на основе материалов, соответствующих радиотехническим специальностям. В данном практикуме в каждом разделе повторение сложных грамматических явлений и структур включает в себя грамматический справочник по изучаемой теме, обширную систему грамматических упражнений и аутентичный текстовый материал для отработки изученных грамматических явлений и закрепления умения анализировать и обобщать информацию.

Предлагаемый практикум разработан в соответствии с требованиями программы по иностранному языку для неязыковых вузов на кафедре иностранных языков и русского как иностранного и предназначен для обучающихся Института информатики и кибернетики, а также для широкого круга лиц, изучающих английский язык.

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ОГЛАВЛЕНИЕ

Общие характеристики глагола. Видовременные формы глагола. Система времен действительного залога (The Verb System. Tense Forms. Tenses in the Active Voice).....	4
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**ОБЩИЕ ХАРАКТЕРИСТИКИ ГЛАГОЛА.
ВИДОВРЕМЕННЫЕ ФОРМЫ ГЛАГОЛА.
СИСТЕМА ВРЕМЕН
ДЕЙСТВИТЕЛЬНОГО ЗАЛОГА
(The Verb System. Tense Forms.
Tenses in the Active Voice)**

Dealing with the English verb, we focus upon two main characteristics – the tense and aspect. The aspect is the form of a verb that characterizes an action and shows whether it is repeated, is continuing, is completed, or happens only once. There are three aspects in English: the simple aspect, the continuous (or progressive) aspect, the perfect aspect. The perfect and continuous aspects may be combined and in this case, we talk about the perfect continuous tense.

The tense is the form of a verb that shows when something happens. The tenses are the present, the past, the future.

Tenses in the Active Voice

Tense	Aspect			
	Simple	Continuous	Perfect	Perfect Continuous
Present	V, V-s I, you, } V we, they } He, she, } V-s it }	be V-ing I am V-ing He, she, } is V- it } ing We, you, } are they } V-ing	have V₃ I, you, } have we, they } V ₃ He, she, } has it } V ₃	have been V-ing I, you, } have we, they } been V-ing He, she, } has it } been V-ing

	Do } Does } - V?	Am } Is } - V-ing? Are }	Have } Has } - V ₃	Have } Has } - been V-ing?
	- do } - does } not V	- am } - is } not V- - are } ing	- have } - has } not V ₃	- have } - has } not been V-ing
Past	V ₂ I, you, } we, they, } he, she, it } V ₂	was } were } V-ing I, he, she, } w it } as V-ing We, you, } we they } re V-ing	had V₃ I, you, } we, they, } ha he, she, it } d V ₃	had been V-ing I, you, } we, they, } ha he, she, it } d been V-ing
	Did _ V?	Was } Were } - V- ing?	Had _ V ₃ ?	Had _ been V- ing?
	- did not V	- was } - were } not V- ing	- had not V ₃	- had not been V-ing
Future	will V I, you, } we, they, } he, she, it } will V	will be V-ing I, you, we, they, } he, she, it } will be V-ing	will have V₃ I, you, we, they, } he, she, it } will have V ₃	will have been V-ing I, you, we, they, } he, she, it } will have been V-ing

	Will _ V?	Will _ be V-ing?	Will _ have V ₃ ?	Will _ have been V-ing?
	_ will not V	_ will not be V-ing	_ will not have V ₃	_ will not have been V-ing

The Present tenses

We use **the present simple** to state truths and to describe things, which are facts or permanent situations.

- Things, which are generally true.
British people drink a lot of tea, while Americans drink more coffee.
- Facts. Water boils at 100 degrees Celsius.
- Permanent situations or states.

I live in the town where I was born. She likes soap operas and watches them on TV every week.

The present simple is used to describe repeated events or actions.

Students take exams twice a year.

We use the present simple with adverbs of frequency (*always, usually, often, sometimes, never*) and expressions of frequency (*every week (month, etc.), once a...*).

The present continuous refers to actions, which are in progress at the moment of speaking or around the time of speaking.

I am just finishing my report and I will join you in a few minutes.

We are studying the course of nanoelectronics now.

We also use this tense to describe temporary actions.

I am staying in a hotel until I find a flat.

Common adverbs with this form are *now, just, still, at the moment, currently*.

State verbs which describe states of being, thinking, possessing, feeling do not usually have a continuous form.

The most common of these verbs are:

verbs of existing or being – *be, consist of, contain, exist*

verbs of possessing – *belong to, have (=own), include, own, possess, lack*

verbs of feeling or wanting – *desire, dislike, envy, hate, like, love, need, prefer, trust, want, wish*

verbs of thinking or believing – *believe, doubt, expect, forget, imagine, intend, know, realize, remember, see (=understand), think, understand*

verbs of appearance – *appear, resemble, seem*

The present perfect simple connects the present to the past. It is used to show:

- Past experiences/events, which may have an obvious result in the present.

I have just seen him. If you hurry, you will catch him up.

Jim has had three car accidents.

- An unfinished state/habitual action.

She has worked here all her life.

I have lived here for the past ten years.

We usually use adverbs *ever, never, seldom, so far, already, yet, still, just, recently, lately* with the present perfect.

The present perfect continuous is used to talk about an ongoing state or action, which began in the past and is still continuing or has just finished.

This form refers to:

- A state which lasts up to the present moment

I have been waiting for you for three hours!

- An incomplete activity

They have been conducting an experiment for two days but they still have not finished.

- To emphasise duration

I have been writing letters all morning.

- A repeated activity

I have been taking French lessons this year.

It is common to use *since* or *for* with the present perfect continuous.

The simple form of the present perfect focuses on the fact that an action is completed, while the continuous focuses on the duration of an action.

- Simple: I have learnt how to play chess. (= I can play chess now.)
- Continuous: I have been learning how to play chess (=I am still learning).

The Past tenses

The past simple is used to talk about:

- Completed actions or situations, which took place at a particular time or over a definite period in the past. It is used with definite time expressions such as *yesterday*, *on Tuesday*, *two month ago*, *last week (year)*, *in 1995*.

I went to London last week.

I worked for a computer company when I was younger.

- Repeated situations in the past.

I travelled to work by bus every day for a year.

- Sequences of actions.

He ran to the car, jumped in and raced off.

- State in the past.

In those days, I did not like reading.

The past continuous describes an action in progress at a point of time in the past, i.e. the action began before this point of time and continued after it.

They were still discussing their project at half past three.

The past continuous is used to show that a past action was temporary, or was changing or developing.

I was finishing my sandwiches and enjoying the sunshine (a temporary situation).

The weather was getting worse (a changing situation).

The form is used for background descriptions to events. We often use the past simple for an action that happened against this background.

We went for a picnic. The sun was shining brightly.

We use the past continuous to contrast an ongoing action with a single event, which interrupts it. We use the past simple for the single event.

They were crossing the bridge when the earthquake struck.

I was drinking my coffee when the phone rang.

The past perfect simple is used to talk about an action or situation, which happened before a specific time in the past. We can include a specific time reference by which an action is completed.

By the time we arrived, they had taken a decision.

We can use the past perfect to make a sequence of events clear. We use the past perfect for the earlier action and the past simple for the later.

When we got to the station, the train had left.

Compare:

The train left five minutes before we got to the station.

When we talk about a sequence of past events in the order that they happened, we more commonly use the past simple, especially with quick, short actions.

The past perfect continuous is used to describe an ongoing situation or action, which continued up to, or stopped just before, a time in the past.

When John got back from work, I was exhausted, because I had been writing letters all day.

(Compare: By the time John got back from work, I had written six letters – the focus is on the completed activity.)

The Future tenses

We use **the future simple** to talk about predictions, which are based on guesswork, analysis or judgment.

He will like the idea; I am sure.

The laptop battery will give you about two hours' continuous use.

We also use this form to talk about a decision made at the time of speaking.

You look tired. I will help you with documents.

We can use *be going to + infinitive* to make a prediction, especially if there is evidence in the present.

Look at those black clouds. It is going to rain.

We use *be going to* for intentions (i.e. for actions that have already been decided on).

He is going to study nanomaterials next year.

We use **the future continuous** for a temporary action in progress at a particular point in the future.

The manager will be presenting the proposal at the next meeting.

We use **the future perfect** to make predictions about actions, which we expect to be completed by a particular time in the future. We usually use a time adverb/ phrase (such as *soon, by then, within the next week*) with this form.

You can have my report by the afternoon. In fact, I will have finished it within the next hour.

We use **the future perfect continuous** to talk about an action, which is still ongoing at a point in the future, to focus on the duration of the action.

We will have been living in this city for twenty years in December.

In time clauses (starting with *when, after, as soon as, once, until*), we do not use a future form, but we use a present form.

I will leave as soon as it stops raining.

Exercises

1. Choose the correct verb form in *italics*.

1. How long *does/is* it *taking/take* you to get to the office? It *takes/is taking* me half an hour to get there.
2. The students *prepared/were preparing* for their written test all evening yesterday.
3. My brother *graduates/will graduate* from the university in two years.
4. They *have been discussing/are discussing* a new project for some days.
5. What *do/are* you *read/reading* now? I *read/am reading* a new detective. I *like/am liking* to read detectives very much.
6. I *did not see/have not seen* Keith at all yesterday morning.
7. “You *speak/are speaking* very good Chinese.” “Thank you. It’s not surprising, I *will live/will have been living* in Beijing for eight years next month.”
8. She is a responsible student. She usually *meets/has met* a deadline and *hands in/has handed in* all her assignments in time.
9. I *will look/will be looking* through your report tomorrow.
10. Do you recognize that man? We *met/had met* him at the conference last year.

11. I *will be typing/will type* an article when you *come/will come*.
12. Turn off the radio if you *do not listen/are not listening*.
13. We had a busy morning. Steve *had been answering/answered* the phone calls and I *had been dealing/dealt* with the e-mails.
14. This plant *has been producing/is producing* electronic components for ten years.
15. There is not much sense in what you *suggest/are suggesting*.

2. Complete the text with verbs from the box. Use the suitable present form.

make	do	exist	radiate	find	send	represent
------	----	-------	---------	------	------	-----------

To observe objects that 1)... predominantly in the infrared band a researcher either 2)... measurements with special detectors through the few narrow infrared “windows” that 3)... in the atmosphere or 4)... instruments above the atmosphere in balloons or rockets. If he 5)... so, he 6)... that even at a wavelength of 20 microns the brightest objects are no longer ordinary stars. Instead, the principal sources of 20-micron radiation are large clouds of dust and gas. In some cases, the clouds were ejected from old stars; in other cases, the clouds seem 7)... proto-stars, cool masses of dust and gas in the earliest stages of stellar evolution.

3. Put each verb in brackets into an appropriate verb form.

1. She already (to read) the book which I (to buy) last Friday.
2. They (not to work) on Saturday, but they (to work) this Saturday because they (to have) a lot of work.
3. I hope you (not to forget) all I just (to tell) you by tomorrow.
4. When I (to switch) on the radio, they (to broadcast) a very interesting programme.
5. Their teacher often (to tell) them that they (to make) many mistakes because they (not to be) attentive at the lessons.

6. How are they getting on? I (not to know). I (not to see) them lately. They (to be) very busy all these days.
7. Mr. Robertson (to write) newspaper reports, he (not to write) books.
8. What he (to do) this time tomorrow? He (to interview) a foreign delegation.
9. She (to come) to our town three years ago. By that time she already (to graduate) from the university.
10. I am very sorry. I (not to look) through the papers yet.
11. Tell them again, perhaps they (to understand).
12. The power surge (to break) my computer.
13. She (to discuss) her course paper with the supervisor in the morning tomorrow.
14. They (to test) new systems since they (to install) them last month.
15. What she (to do)? She (to be) a lecturer at the university.

4. All of the sentences below contain grammatical mistakes. Find and correct the mistakes.

Example. My family ~~is living~~ in this country for over twenty years.

has been living/has lived

1. I am not never late for my classes.
2. I looked for a job at that time.
3. Hurry up! We have been waited for you for half an hour.
4. He is sure he finishes his work on time.
5. We guarantee that you will be disappointed with the performance of our new TV set.
6. They are repairing the engine. They were repairing it for three hours but have not complete the work yet.
7. He made some remarks when we discussed the new programme.

8. They did not know that he has completed his research.
9. It gets dark. Let us turn on the light.
10. Radio equipment of the early days has made use of the same materials as the electrical industry.
11. The reason why this tube have extremely large bandwidth is that the velocity of the electromagnetic wave propagation are constant over a very large frequency range.
12. As radio waves travelled away from their point of origin, they become attenuated or weakened.
13. The designer believes that he will be finishing the specifications by tomorrow afternoon.
14. We will not start the research until we will get all the necessary equipment.
15. The achievements of electronics has formed the basis of an industry that produce electronic equipment used in communication, automation, television, radar, computer technology, industrial control systems, as well as illuminating, infrared and x-ray equipment.

Text for reading

Read the extract. Explain the verb forms in each sentence. Give their Russian equivalents.

CO₂ – laser

The carbon dioxide laser (CO₂ laser) was one of the earliest gas lasers to be developed (invented by Kumar Patel of Bell Labs in 1964[1]), and is still one of the most useful. Carbon dioxide lasers are the highest-power continuous wave lasers that are currently available. They are also quite efficient: the ratio of output power to pump power can be as large as 20%.

The CO₂ laser produces a beam of infrared light with the principal wavelength bands centering around 9.4 and 10.6 micrometers.

The active laser medium is a gas discharge which is air-cooled (water-cooled in higher power applications). The filling gas within the discharge tube consists primarily of:

- Carbon dioxide (CO₂) (around 10–20%)
- Nitrogen (N₂) (around 10–20%)
- Hydrogen (H₂) and/or xenon (Xe) (a few percent; usually only used in a sealed tube.)
- Helium (He) (The remainder of the gas mixture)

The specific proportions vary according to the particular laser.

The *population inversion* in the laser is achieved by the following sequence:

1. Electron impact excites vibrational motion of the nitrogen. Because nitrogen is a homonuclear molecule, it cannot lose this energy by photon emission, and its excited vibrational levels are therefore metastable and live for a long time.
2. Collisional energy transfer between the nitrogen and the carbon dioxide molecule causes vibrational excitation of the carbon dioxide, with sufficient efficiency to lead to the desired population inversion necessary for laser operation.
3. The nitrogen molecules are left in a lower excited state. Their transition to ground state takes place by collision with cold helium atoms. The resulting hot helium atoms must be cooled in order to sustain the ability to produce a population inversion in the carbon dioxide molecules. In sealed lasers, this takes place as the helium atoms strike the walls of the container. In flow-through lasers, a continuous stream of CO₂ and nitrogen is excited by the plasma discharge and the hot gas mixture is exhausted from the resonator by pumps.

(<http://www.foxitsoftware.com>)

СТРАДАТЕЛЬНЫЙ ЗАЛОГ (THE PASSIVE VOICE)

We make the passive form of verbs in all tenses by using **be** in the appropriate tense and **the past participle of the main verb**.

Simple- be V₃

Continuous- be being V₃

Perfect- have been V₃

We do not use the passive of the perfect continuous tenses.

TV channels are changed by using the remote control.

The person or thing that performs an action in a passive sentence is called **the agent**. We often do not mention the agent in the passive.

A new road has been built.

If we mention the agent, it is introduced with **by**.

The system was attacked **by** a virus.

We use **with** to talk about the instrument, which is used to perform the action.

The laboratory was equipped **with** modern apparatus.

In the passive sentence the object, of the active verb becomes the subject of the passive verb. The subject of the active verb can be the agent of the passive verb.

The software company tested the computer with special software.

The computer was tested with special software by the software company.

Verbs, which have two objects, can be made passive in two ways.

I was handed a note. A note was handed to me.

Other common verbs of this type are: *bring, give, lend, pass, pay, promise, sell, send, show, tell.*

Most verbs with an object (transitive verbs) can be made passive. However, a few transitive verbs may not be used in the passive. They are *become, fit (be the right size), get, have, lack, let, like, resemble, suit*.

Verbs with no object (intransitive verbs) cannot be used in the passive.

~~The post has been arrived.~~

✓ The post has arrived.

We use the passive:

- When the agent is not known

Unfortunately, your letter has been lost. (We do not know by whom.)

- When the agent is obvious from the context or from general knowledge

They were given detailed instructions on using a device (by an engineer, teacher).

- When the agent is not important or relevant

Wars have been fought throughout history. (Who fought them is not important here.)

Using the passive is a way of avoiding the naming of a specific person who is responsible for an action.

I see nothing has been done about it (a person is not mentioned).

The passive is often used in formal English to:

- Focus on the issues rather than on the people involved

The research was carried out over a period of six months.

- Describe rules and procedures

All the questions must be answered.

Candidates will be interviewed in alphabetical order.

- Describe commercial, industrial and scientific processes

Components are electronically tagged and transported to the production line.

- Describe historical, economic and social processes

Twenty per cent of the world's oil is owned by Saudi Arabia.

Exercises

1. Complete the sentences with an appropriate auxiliary or modal verb.

1. I am sure, a lot of questions . . . be asked when he finishes his report.
2. The document . . . be sent immediately. It has . . . already signed.
3. His speech is . . . translated for the foreign guests.
4. Both digital and analogue meters . . . be used to measure voltage as well as other electric values.
5. The plan . . . been approved. Nothing . . . be changed.
6. The rate of the reaction . . . affected by the change in such parameters as concentration, temperature and pressure.
7. An important experiment . . . being made at the laboratory.
8. Special measures . . . be taken to improve the installation efficiency.
9. When radiotelephone messages . . . to be broadcast the carrier radiated from the central tower . . . modulated at regular voice frequencies.
10. This experiment . . . be carried out using the technique developed in our laboratory.
11. The data to be used . . . been carefully analyzed.
12. The equipment . . . be designed so that it . . . be operated by personnel with elementary knowledge of television.
13. The idea . . . subjected to severe criticism and rejected.
14. The new apparatus requirements necessary to conduct the research efficiently . . . be included into the program decisions.

15. Special training . . . required to handle the installation.
16. The equipment . . . be tested in various conditions.

2. Put each verb in brackets into an appropriate passive verb form.

Example. The boxes *have not been packed* yet (not/pack yet).

1. The new satellite . . . (launch) next week.
2. Hurry up, you . . . (wait for).
3. They . . . (teach) Spanish for about a year.
4. I am afraid that next week's meeting . . . (cancel).
5. Where is Ann? She still . . . (examine).
6. There was a time when radio communication . . . (consider) acceptable if communication could . . . (obtain) from 50 to 75% of the time.
7. She did not follow the advice she . . . (give).
8. The meeting . . . always (hold) on the first Monday of the month.
9. Would you give me a copy of your report as soon as it . . . (finish)?
10. The experiment . . . (not/finish yet). It . . . (finish) by the end of the week.
11. Those computers . . . (make) of the equipment which . . . (engineer) to be exceptionally accurate and reliable.
12. There are circuits which . . . (not/influence) by the temperature.
13. Although several approaches . . . (try), no useful solution . . . (obtain).
14. A number of enhanced devices . . . (develop) in the laboratory now.
15. His speech at the meeting was so interesting, that it . . . (speak about) much.
16. A TV set . . . (repair/just).

17. When your article . . . (publish)? I . . . (tell), it . . . (publish) in the next issue of the journal.
18. Several outstanding contributions . . . (make) to the study of this phenomenon so far.
19. The resistivity of semiconductors . . . greatly (affect) by light, heat and the presence of impurities.
20. This book . . . often (refer to), though it . . . (write) some years ago.

3. Put the verb form from the active into the passive voice in the following sentences. Decide in which sentences the agent can be omitted.

1. Evidently, somebody had informed him of the news before they announced it.
2. When I turned on the radio, they were broadcasting a very interesting programme.
3. My supervisor recommended me several articles related to my research.
4. You will approximately arrive at this result whatever method you apply for estimating the quantities involved.
5. They asked him to help them with a new project.
6. We have not completed testing of the installation yet.
7. Closed circuit cameras are monitoring this area.
8. They collect information from various stations and enter it into the database.
9. Researchers have been designing highly sensitive equipment for under water operation since last month.
10. We usually classify energy into mechanical, heat and chemical kinds.
11. Manufacturers supply this appliance with a plug.
12. We do not hear you, speak louder.

13. Frequency modulation of the signal generator may cause errors in the measurement.
14. We will use this substance in the experiment provided it has the necessary properties.
15. You must check up the data, or the results will be wrong.
16. People will only be able to solve most of the urgent current problems by the proper science and technology application.

4. Put the verb form from the passive into the active voice in the sentences below.

1. Light is described as electromagnetic waves propagating through space by the electromagnetic theory.
2. The discovery of the double nature of electrons was followed by changes in the quantum theory.
3. The magnitude of this effect is affected by the strength of any electric field that happens to be present.
4. These questions were answered in a series of investigations both experimental and theoretical.
5. A few elementary substances such as gold, silver and copper have been known since ancient times.
6. The first scientific atom picture, which took account of a wide range of phenomena, was developed by Niels Bohr about 1913.
7. Originally, radio was used to communicate with ships at sea.
8. The amount of force applied must always be taken into consideration.
9. The deflection of X-rays was observed in both a magnetic and electric field.
10. The development of computers is so rapid that even new designs become obsolete before they have been put into practice.
11. Special properties of this material should be taken advantage of.

12. We will start a new course either in spring or in autumn. This depends on the program that is being discussed now.
13. Excessive computation time will be required to obtain the desired solution.
14. The acceleration of a falling object is affected by air resistance.

Text for reading

1) Read the extract. Explain the verb forms in the passive voice. Give their Russian equivalents.

2) Put them from the passive into the active voice.

CO₂ – laser

Construction and applications

Because CO₂ lasers operate in the infrared, special materials are necessary for their construction. Typically, the mirrors are silvered, while windows and lenses are made of either germanium or zinc selenide. For high power applications, gold mirrors and zinc selenide windows and lenses are preferred. There are also diamond windows and even lenses in use. Diamond windows are extremely expensive, but their high thermal conductivity and hardness make them useful in high-power applications and in dirty environments. Optical elements made of diamond can even be sand blasted without losing their optical properties. Historically, lenses and windows were made out of salt (either sodium chloride or potassium chloride). While the material was inexpensive, the lenses and windows degraded slowly with exposure to atmospheric moisture.

The most basic form of a CO₂ laser consists of a gas discharge (with a mix close to that specified above) with a total reflector at one end, and an output coupler (usually a semi-reflective coated zinc selenide mirror) at the output end. The reflectivity of the output coupler is typically around 5–15%. The laser output may also be edge-coupled in higher power systems to reduce optical heating problems.

The CO₂ laser can be constructed to have CW powers between milliwatts (mW) and hundreds of kilowatts (kW).[2] It is also very easy

to actively Q-switch a CO₂ laser by means of a rotating mirror or an electro-optic switch, giving rise to Q-switched peak powers up to gigawatts (GW) of peak power.

Because the laser transitions are actually on vibration-rotation bands of a linear triatomic molecule, the rotational structure of the P and R bands can be selected by a tuning element in the laser cavity. Because transmissive materials in the infrared are rather lossy, the frequency tuning element is almost always a diffraction grating. By rotating the diffraction grating, a particular rotational line of the vibrational transition can be selected.

Because of the high power levels available (combined with reasonable cost for the laser), CO₂ lasers are frequently used in industrial applications for cutting and welding, while lower power level lasers are used for engraving. They are also very useful in surgical procedures because water (which makes up most biological tissue) absorbs this frequency of light very well. Some examples of medical uses are laser surgery, skin resurfacing ("laser facelifts") (which essentially consist of burning the skin to promote collagen formation), and dermabrasion. Also, it could be used to treat certain skin conditions such as hirsuties papillaris genitalis by removing embarrassing or annoying bumps, podules, etc. Researchers in Israel are experimenting with using CO₂ lasers to weld human tissue, as an alternative to traditional sutures.

The common plastic poly (methyl methacrylate) (PMMA) absorbs IR light in the 2.8–25 μm wavelength band, so CO₂ lasers have been used in recent years for fabricating microfluidic devices from it, with channel widths of a few hundred micrometers. Because the atmosphere is quite transparent to infrared light, CO₂ lasers are also used for military rangefinding using LIDAR techniques.

(<http://www.foxitsoftware.com>)

СОСЛАГАТЕЛЬНОЕ НАКЛОНЕНИЕ (THE SUBJECTIVE MOOD)

Сослагательное наклонение выражает действие не реальное, а предполагаемое, условное или желаемое. На русский язык переводится сочетанием глагола в форме прошедшего времени с частицей “бы”.

Сослагательное наклонение выражается

- 1) синтетическими формами: **be, were, have, know** и т. д.
- 2) аналитическими формами: **should, would, could, may, might+ Infinitive.**

Обратите внимание на основные случаи употребления сослагательного наклонения в английской научно-технической литературе:

Типы предложений	Пример и перевод
<p style="text-align: center;">Сложные</p> <p>1. В придаточных предложениях-подлежащих после безличных оборотов типа: <i>it is necessary, it is important, it is desirable.</i></p> <p>2. В дополнительных придаточных предложениях после глаголов, выражающих приказание, совет, желание.</p> <p>3. В придаточных обстоятельственных предложениях цели после союзов: <i>so that-так чтобы, lest-чтобы...не, in order that- для того чтобы.</i></p>	<p><i>It is necessary</i> that they should apply the new method. <i>Необходимо</i>, чтобы они применили этот новый метод.</p> <p>He <i>insists</i> that the equipment should be brought in a week. Он <i>настаивает</i> на том, чтобы оборудование привезли через неделю.</p> <p>The students brought the dictionaries <i>so that</i> they might use them at the lesson. Студенты принесли словари, <i>чтобы</i> (могли) пользоваться ими на уроке.</p>

<p>4. В обстоятельственных сравнительных предложениях после союзов as if, as though (как будто бы, как если бы).</p>	<p>The man repaired our TV-set as if he were an expert in tele-mechanics. Этот человек починил нам телевизор, <i>как будто бы</i> он специалист по телемеханике.</p>
<p>5. В условных предложениях II и III типа.</p>	<p>If I were an engineer, I should repair this device. Если бы я был инженер, я бы починил этот прибор. If he had used this formula, he would not have made this mistake. Если бы он применил эту формулу, он не сделал бы этой ошибки.</p>

Если после вспомогательного глагола стоит перфектный инфинитив, то это означает, что действие относится к прошедшему.

We **should have introduced** this method long ago if it had been efficient. Мы **ввели бы** этот метод давно, если бы он был эффективным.

The Conditional Clauses

Тип предложения	Условное придаточное предложение	Главное предложение
I тип. Изъявительное наклонение	Present Indefinite	Future Indefinite
Реальное условие, относящееся к будущему времени. (Переводится <i>будущим временем</i>)	If we receive the necessary data, Если мы получим необходимые данные,	we shall inform you. мы сообщим вам.

II тип. Сослагательное наклонение.	Past Indefinite в значении сослагательного наклонения	Should (would, could, might)+Indefinite Infinitive
Нереальное условие (или маловероятное), относящееся к настоящему или будущему времени. <i>(Переводится глаголом в прошедшем времени с частицей “бы”)</i>	If there were no atmosphere, Если бы не было атмосферы,	the surface of the Earth would become too hot by day and too cold by night. то поверхность Земли была бы очень горячей днём и очень холодной ночью.
III тип. Сослагательное наклонение.	Past Perfect в значении сослагательного наклонения	Should(would, could, might)+Perfect Infinitive
Нереальное условие, относящееся к прошедшему времени. <i>(Переводится так же, как II тип)</i>	If he had worked hard last term, Если бы он работал усердно в прошлом семестре, If he had more time yesterday, Если бы у него вчера было больше времени,	he would have passed his exam. он сдал бы экзамен. he might have done this work. он бы выполнил эту работу.

Бессоюзные условные предложения

Во всех типах условных придаточных предложений условные союзы **if**, **provided** (*при условии*), **in case**(*в случае*), **on condition**(*при условии*) и т.д. могут быть опущены. В бессоюзных условных придаточных предложениях порядок слов обратный, т.е. сказуемое или часть сказуемого (вспомогательный глагол) выносится на место перед подлежащим.

	Условное придаточное предложение	Главное предложение
I тип	Should any repair be required (If any repair is required...) Если потребуется ремонт,	it will be made immediately. он будет произведён немедленно.
II тип	Had we enough time to spare (If we had enough time...) Было бы у нас достаточно времени,	we should attend the conference. мы бы пошли на конференцию.
III тип	Had we applied this method of work, (If we had applied...) Если бы мы применяли этот метод работы, (тогда)	we should have had the desired results. мы имели бы желаемые результаты.

Exercises

1. Translate the following sentences paying attention to the verbs in the Subjunctive Mood.

- 1) Without radio, we should hardly be able to observe artificial satellites and receive scientific information from space.
- 2) The solution of the problem requires that all the experimental data obtained be exact.
- 3) It is required that all measurements be done beforehand.
- 4) It is necessary that these data should be processed as soon as possible.
- 5) It is important that engineers should develop automatic control systems.
- 6) Atomic energy finds such wide and varied application in our life that our age might be called the age of atom.

- 7) It is important that safety measures be taken while working with the electric equipment.
- 8) It is desirable that the engine should combine high efficiency and lightness.
- 9) We suggested that his project be discussed in detail.
- 10) It is essential that he should inform us about the results of his research.

2. Translate the sentences. Mind the means of expressing the Subjunctive Mood.

1. Provided all of the requirements were met, the efficiency of the apparatus would be increased
2. Without the new instrument, this experiment would not have been successful.
3. If you classified the data, fewer tests would be needed.
4. If you had known about semiconductors more, you would have understood the arrangement of this device.
5. You could have done this work better.
6. You might have asked me about the work of this machine before putting it into operation.
7. They suggest that he should begin the test immediately.
8. It is required that those devices be used in this case.
9. Had he informed me in time I should have sent this device.
10. Without proper care and maintenance, this equipment wouldn't operate so well.
11. If the machine were repaired, it would be set in motion immediately.

12. If he had been able to get all the books on that subject, his report would have been much better.

13. Had you taken all the safety measures the machine would not have been broken.

3. Define the types of conditional clauses in the following complex sentences. Translate them into Russian.

A

1. If a solid body or a liquid is heated, it will usually expand.

2. If you want to carry out your experiment successfully, you thoroughly prepare all the necessary ingredients.

3. The measurements were always correct provided the necessary instruments were used.

4. If you want to speak a language, you must hear it spoken.

5. If a machine is to make usable translations, the machine itself must be able to extract some meaning of the text.

6. If we are to believe some forecasts, computers may become a common thing of every day used by almost everybody.

7. If the model fits well, the observed data will be correct.

B

1. If sound could propagate in interplanetary space, it would cover this distance in 14 years.

2. If the earth were as hot as Venus, the oceans would evaporate.

3. Were it not for ionosphere, radio waves would propagate like light waves only within the limits of visible horizon.

4. If I were to see your experiment, I should get a clear conception of this phenomenon.

5. But for electricity little could be done in a modern research laboratory.
6. If a new telephone system were installed on the line, we should be able to improve the reliability of telephone service.
7. If life existed on the Venus, we should know it.
8. It would be better if some experiments were repeated.
9. If the Earth did not rotate, it would not take the shape of a ball.

C

1. If he had prepared the material beforehand, he might have done the work quite easily.
2. If they had completed the research, the results would have been discussed at the conference.
3. The manned spaceships might not have been launched into the cosmos, unless scientists had studied the information received from the space satellites.
4. Could these observations have been proved theoretically they would have done much to advance our knowledge in the field of space research.
5. If he had been able to get all the books on that subject, his report would have been much better.
6. Had he taken into account the properties of the substance under investigation, he would have been careful when working with it.

Text for reading

- 1) Read the extract. Define the types of conditional clauses in complex sentences. Translate them into Russian.**
- 2) Find and mind the means of expressing the Subjunctive Mood.**

Baseline Correction with Asymmetric Least Squares Smoothing

When relatively large “pure baseline” regions are present, guidance for a good value of the asymmetry parameter p can be obtained from the procedure that we sketch here. If p is chosen well, a histogram of the residuals $y - z$ will have two components: a more or less normally distributed peak near zero, representing noise around the baseline, and an asymmetric component on the positive axis, representing the peaks in the signal. When the peak of the “normal” distribution is at zero, the baseline will “cut through the middle of the noise” and this is what we want. One varies p to get this result.

Finding the optimal smoothing parameter λ is harder. We did some calculations to see if for a given p , a good value of λ might be found by asymmetric cross-validation. The idea is to leave out all the even observations (i.e those with i even) by giving them zero weights. The smoother will automatically compute interpolated values for them. These are compared to the real data by computing the asymmetrically weighted sums of squares of differences between interpolated and real values, say CV . One searches for the value of λ that minimizes CV . We remark that this only works well when the noise is nearly white (uncorrelated). Otherwise too small values of λ will be found. We recommend to always check results by inspection.

This procedure seems to work reasonably well for a fixed value of p . If we try to include p in the cross-validation, we run into an unpleasant property of AsLS: the sum of asymmetrically weighted squared residuals depends strongly on p . A simple example illustrates this. Let $x_i = i/100$, $i = 1 \dots 99$ be our “data”, for which we compute the asymmetric mean $g_p = \sum w_i x_i / \sum w_i$, with asymmetric weights w_i . We also compute $WSS = \sum w_i (x_i - g_p)^2$ and $CSS = WSS / \sum w_i$. One sees that larger p gives larger WSS and CSS . This phenomenon wrecks cross-validation, as we experienced in our simulations. We could not find a theoretical principle or satisfactory empirical formula to calibrate WSS or CSS . As an ad-hoc solution we offer the following approach: compute WSS for the left-out data and divide it by as computed from WSS as computed from the left-in data. In general, we advise always to check by visual inspection.

(https://www.researchgate.net/publication/228961729_Baseline_Correction_with_Asymmetric_Least_Squares_Smoothing)

МОДАЛЬНЫЕ ГЛАГОЛЫ (MODAL VERBS)

Наиболее употребимые модальные глаголы и их эквиваленты

Модальные глаголы и их эквиваленты	Present	Past	Future
can <i>(возможность совершения действия)</i>	can Modern computers can multiply two numbers in one microsecond. Современные вычислительные машины могут умножать два числа в течение одной микросекунды.	could You could use these data in your research work. Вы могли использовать эти данные в нашей научной работе.	
to be able to	am (is, are) able to He is able to cope with the testing of this device. Он может справиться с испытанием этого прибора.	was (were) able to He was able to cope with the testing of this device. Он смог справиться с испытанием этого прибора.	shall (will) be able to He will be able to cope with the testing of this device. Он сможет справиться с испытанием этого прибора
must <i>(долженствовани е)</i>	must The atom must be used for the good of mankind. Атом должен служить человеку.		

<p>to have to (необходимость выполнения действия)</p>	<p>have (has) to The engineer has to examine this device. Инженер должен осмотреть этот прибор.</p>	<p>had to The engineer had to examine this device. Инженер должен был осмотреть этот прибор.</p>	<p>shall (will) have to The engineer will have to examine this device. Инженер должен будет осмотреть этот прибор.</p>
<p>to be to (запланированность действия)</p>	<p>am (is, are) to We are to begin our experiment this week. Мы должны начать эксперимент на этой неделею</p>	<p>was (were) to We were to begin our experiment last week. Мы должны были начать эксперимент на прошлой неделе.</p>	
<p>may (разрешение, позволение)</p>	<p>may The engineers may examine this device. Инженеры могут осмотреть это устройство.</p>	<p>might The engineers might examine this device. Инженеры могли осмотреть это устройство.</p>	
<p>to be allowed to</p>	<p>Am (is, are) allowed to The engineers are allowed to examine this device. Инженерам разрешают осмотреть это устройство.</p>	<p>Was (were) allowed to The engineers were allowed to examine this device. Инженерам разрешили осмотреть это устройство.</p>	<p>Shall (will) be allowed to The engineers will be allowed to examine this device. Инженерам разрешат осмотреть это устройство.</p>

В языке научной литературы действие, выраженное перфектным инфинитивом, обычно относится к прошедшему времени. Глагол **must** с последующим **Perfect Infinitive** переводится *должен был, должно быть, вероятно*, глагол **could** – *возможно, мог, мог бы*, **may** – *возможно, может быть*, **might** – *мог бы*.

1) He must have found out about the conference from the newspaper.

Он, вероятно, узнал о конференции из газеты.

2) I could have gone to the conference. But I was not invited.

Я мог бы поехать на конференцию. Но я не был приглашен.

3) You might have made the experiment more carefully.

Вы могли бы провести эксперимент более тщательно.

Exercises

I. Translate the following sentences into Russian. Pay attention to the modal verbs.

1. Heat is a form of energy and may be measured in the units in which energy is measured.
2. We must say that the discovery of atomic energy is as important as the discovery of fire.
3. Electronic machines can add, subtract, multiply and divide much quicker than man.
4. The origin of automation can be traced back to the early days of the first industrial revolution.
5. She may use different methods in her research work.
6. For a long time scientists could not discover the secret of the atom.
7. This equipment can work with high accuracy.
8. You may use these devices in your research work.
9. The atom is a great force that must be used for the good of mankind.
10. Chemists must create the materials, which do not exist in nature.
11. Naturally, this circuit can be modified if necessary.
12. This kind of energy must find application in transport.

II. Choose the sentences where the verbs *to have* and *to be* are used

in the functions of modal verbs and translate them.

1. These devices have been used in our experiment.
2. Scientists have to work hard to create a new atomic technique.
3. A modern computer has two main parts: a memory and a computing unit.
4. As the known resources of coal and oil are limited, man has to find new sources of power.
5. Very difficult calculations in mathematics and electrical engineering have to be solved by computers.
6. People of good will have to struggle for the peaceful use of atomic energy.
7. When technology reaches a very high stage of development, new methods of work will become possible.
8. We are to take into consideration all the advantages and disadvantages of this device for the future work.
9. We are to take special steps to reduce the weight of this mechanical part.
10. These new data were obtained after our experiment.
11. At present our engineers are to develop the most advanced methods of production.
12. Our design bureau has to construct a new machine.
13. This device has been used in our experiment.
14. The experts are to inspect this plant.

III. Translate the sentences into Russian. Pay attention to the use of modal verbs and their equivalents.

1. Without a computer scientists will not be able to solve complicated problems.
2. Modern computers can multiply two numbers in a microsecond.
3. This machine can do the work of hundreds of workers.
4. He has to finish his experiment in time.
5. She was allowed to carry out this research as she had taken part in the scientific symposium.

6. Every student must know the difference between automation and mechanization.
7. With the help of radioactive elements we were able to measure the thickness of various materials.
8. Every engineer must improve his technical knowledge.
9. Scientists of different countries must cooperate in their research and peaceful application of their discoveries.
10. In fact, there is hardly any sphere of life where the atom may not find useful application.
11. The computer can perform different mathematical operations.
12. Our plant is to increase its output.
13. Every plant must fulfill its plan in time.
14. Workers must apply new methods of production.

IV. Translate the following sentences into Russian paying attention to modal verbs with Perfect Infinitive.

1. The engineer might have overlooked something that may turn out to be important in carrying out this experiment.
2. All the preparations must have been completed long ago.
3. He may have got the device he needed for the experiment.
4. He cannot have broken the tube while making the experiment.
5. You should have changed the current strength at all points of the circuit.
6. He may have got the article he needed.
7. You should have helped your friend.

Text for reading

Read the text. Find all modal verbs and pay attention to their use and their equivalents.

Five Free Open Source Testing Tools You Can Trust

Free open source testing tools have never been more popular, necessary or front of mind. Recent news coverage of the open source Kayenta suite of canary testing tools launched by Google and Netflix

not only demonstrates that industry has an increasing appetite for automated testing, but also that the need for such tools is far more widely accepted.

There are a few major pitfalls for the unwary when choosing open source testing tools, perhaps the most important being to be clear about is the difference between ‘free’ tools and open source tools, a distinction that often gets muddled. Indeed, there are legions of ‘free’ tools that are not truly open source, which can be an unwelcome discovery – too late – if not checked carefully first.

Open source tools should have been peer reviewed, a process that will weed out key vulnerabilities and omissions, as well as highlighting any commercial bias in the results they generate. Without labouring the point, the quality of the tools will have a direct impact on the quality of their results, and thus the quality of the end product. This fact is undoubtedly one of the planks that spurred Microsoft to release a new IntelliCode feature just days ago, designed to help developers “code with confidence” by providing AI-assisted code development support.

Another essential element in choosing an open source tool is due diligence – the licensing, user reports and any previous bug fixes should be thoroughly checked before committing time and effort to the tool. The community is also a great indicator – most good tools have a large and friendly open source community and their help can prove invaluable in the event of issues arising during use.

Here are just a few of the best open source testing tools that we would recommend:

1. Selenium

Selenium is a suite of tools that allow you to automate the testing of web applications, and includes Selenium WebDriver, the most widely used test tool for browser test automation. It drives a browser as if it was a user and can be run locally on your desktop.

2. SoapUI

SoapUI allows you to perform functional testing on web applications, and is mainly used to test SOAP and REST (JSON) Web services but can also be used to test messaging layers, databases and Rich Internet Applications.

It makes writing test cases simple and easy by using its drag and drop feature, and also allows you to run a test in multiple environment just by changing the test setup.

3. Katalon Studio

Katalon is a powerful testing tool that uses Selenium as a foundation and adds in even more flexibility and features. Katalon Studio is built as a unified bundle which includes almost all necessary things like Java, Android SDK, Web drivers to drive browsers, and required dependencies, so there's less downloading and setting up time required.

In addition, Katalon Studio can handle Windows controls such as Windows popups and embedded objects (Flash, Flex, Media) that can cause issues for other test platforms.

4. VirtualBox

VirtualBox can be run on any operating system to create VMs, that can then have different operating systems (and different versions of OS's) and the whole gamut of browsers installed. The result is multiple VMs with different operating systems, on the same desktop, allowing you to test multiple browsers and operating systems quickly and inexpensively.

5. Google Test

It has been used on a wide range of platforms including Linux, Windows, Mac OSX and Symbian.

Overall, while there are plenty of open source testing options out there, ensuring a good fit with your testing regime requires some time and effort. In addition, making sure your shortlist contains only well-supported and trusted options is essential. By conducting a due diligence programme and also interacting with the developer community around your chosen tool you'll be much more likely to ensure your testing delivers full value.

(<https://informationsecuritybuzz.com/five-free-open-source/>)

ИНФИНИТИВ (THE INFINITIVE)

The infinitive is a non-finite verb form that combines properties of the verb and noun. Being a verbal form, the infinitive names an action (to make an experiment) or state (to be sick), but does not show person, number, or mood. The infinitive has active and passive forms (to take; to be taken), can be followed by a direct object (He plans to visit an exhibition) and modified by an adverb (He tried to walk quickly).

The infinitive does not show tense. The time reference is shown by the context or by the tense of the verb in the main clause.

The action indicated by the infinitive can be simultaneous with the action expressed by the verb.

Their proposal was the first one *to be debated* at yesterday's planning meeting (past). He is trying *to solve* a problem (present).

We use **the perfect infinitive** for an event that happened before the main clause.

It is nice *to have talked* to you. *.Not to have acted* sooner is his greatest regret.

Forms of the infinitive

	Active	Passive
Simple	to mend	to be mended
Continuous	to be mending	to be being mended (is not common)
Perfect	to have mended	to have been mended
Perfect continuous	to have been mending	-----

I asked him *to write* a report. He is supposed *to be writing* a report now. He appears *to have written* a report already. He seems *to have been writing* a report for two hours already. I expect his report *to be written* tomorrow. I expect his report *to have been written* by now.

The infinitive also possesses some properties of the noun, which determine its syntactical functions in sentences. The infinitive can function as the subject, part of the compound predicate, an object, an attribute, an adverbial modifier.

Functions of the infinitive

<p>The subject</p>	<p><i>To link</i> theory with practice is of great importance. (Связь теории с практикой чрезвычайно важна.)</p> <p>It was quite necessary <i>to implement</i> the project. (Было необходимо осуществить проект.)</p>
<p>Part of the compound predicate</p> <p>1) the predicative</p> <p>2) part of the compound verbal predicate (with modal verbs and the verbs to begin, to continue, to finish)</p>	<p>1) His duty is <i>to register</i> the results of experiments. (Его обязанность (заключается в том, чтобы) регистрировать результаты экспериментов.)</p> <p>2) They had <i>to improve</i> the device to obtain more accurate data. (Они были вынуждены усовершенствовать прибор, чтобы получить более точные данные.)</p> <p>He began <i>to conduct</i> the experiment last week. (Он начал проводить эксперимент на прошлой неделе.)</p>
<p>The object</p>	<p>He tried <i>to use</i> this device in his research. (Он попытался использовать устройство в своем исследовании.)</p>

<p>The attribute</p>	<p>Attempts <i>to develop</i> the machine were made last century. (Попытки разработать этот механизм предпринимались в прошлом веке.)</p> <p>It is not the right time <i>to discuss</i> the question. (Сейчас не совсем подходящее время обсуждать этот вопрос.)</p> <p>The project <i>to realize</i> was rather complicated. (Проект, который необходимо было осуществить, был достаточно сложным.)</p> <p>He was the first <i>to apply</i> this approach to research. (Он первым применил этот метод исследования.)</p>
<p>The adverbial modifier</p> <p>1) of purpose</p> <p>2) of result</p>	<p>1) <i>To study</i> the properties of the substance they made a series of experiments. (Для того чтобы изучить свойства вещества, они провели ряд экспериментов.)</p> <p>2) The method is not accurate enough <i>to give</i> reliable results. (Метод недостаточно точен, чтобы дать надежные результаты.)</p>

Certain verbs can be followed by an infinitive functioning as **an object**.

Verb+ infinitive afford, agree, aim, appear, ask, attempt, beg, choose, decide, demand, deserve, expect, fail, forget, hate, hesitate, hope, intend, learn, like, love, manage, mean, need, offer, plan, prefer, prepare, pretend, promise, refuse, regret, remember, seem, tend, threaten, trouble, try, wait, want, wish

He *refused to help* them. She has *decided to apply* for the job.

The verbs *allow, permit, ask, tell, order, force, advise, warn, encourage* can be used in the passive voice with the infinitive in the function of an object after them.

She allowed us to go there. – We *were allowed to go* there.

They warned me not to do it. – I *was warned not to do* it.

He advised her to find a good lawyer. – She *was advised to find* a good lawyer.

Many adjectives, especially those describing feelings, can be followed by to+ infinitive: able, afraid, amused, anxious, ashamed, astonished, careful, delighted, determined, disappointed, eager, free, frightened, glad, grateful, happy, interested, lucky, pleased, prepared, proud, ready, relieved, reluctant, sad, shocked, sorry, surprised, terrified, willing.

We are *ready to start*. She was *reluctant to go* there alone.

The infinitive as **an attribute** follows the noun (or indefinite pronoun) that it modifies.

Can you give me *a book to read*? I have a lot of *work to do* today.

Infinitives as attributes are used after many nouns: ability, advice, attempt, capacity, chance, command, decision, desire, eagerness, effort, excuse, failure, intention, invitation, necessity, need, offer, opportunity, order, permission, power, promise, reason, recommendation, refusal, reluctance, right, time, way, willingness, wish.

Her *ability to memorize* words is amazing. I have no *intention to work* there.

The infinitive functioning as **the subject** often precedes the predicate.

To know the rules is necessary. *To ask* him for help was a mistake.

However, it is more common to use the pronoun *it* as the formal subject and put the infinitive after the predicative adjective or noun.

It is *necessary to know* the rules. It was *a mistake to ask* him for help.

The predicative adjectives and nouns are the following: advisable, amazing, awful, bad, convenient, careless, correct, cruel, dangerous, desirable, difficult, easy, foolish, funny, good, great, hard, helpful, important, impossible, interesting, intolerable, natural, necessary, nice, pleasant, possible, reasonable, ridiculous, silly, strange, surprising, terrible, unbearable, undesirable, unnecessary, unpleasant, unreasonable, useful, useless, wise, wonderful, wrong; duty, fun, idea, mistake, pleasure, surprise, thing, time.

It is *useless to talk* to him. It was *dangerous to stay* there.

It is *time to leave*. It was a terrible *thing to say*.

Exercises

1. Complete the sentences with the correct infinitive form of the verbs in brackets. There is an example at the beginning (0).

0. I am sorry (disturb) you, but the matter is urgent.

I am sorry **to disturb** you, but the matter is urgent.

1. We pretended not (notice) the mistake he had made not (embarrass) him.
2. She does not like (disturb) during her work.
3. We are happy (travel) in Europe for a month.
4. She is smiling all the time. She must (read) something funny.
5. After the first successful demonstration of his wireless A. S. Popov started (perfect) it.
6. Our task is (develop) technological processes without a direct participation of man.
7. She is lucky (give) such an opportunity.
8. The material (use) has been carefully examined.
9. (Tell) the truth, I do not think this is the kind of question (discuss) in public.
10. He read a lot (broaden) his mind.
11. The goods are (delivered) next week.

12. He appears (forget) about the meeting.
13. I am delighted (discuss) this important question with you now.
14. It takes a long time (become) a personality.
15. He has a talent (make) the best of any bad situation.

2. Insert *to* before the infinitive where necessary.

1. We did everything we could... make him... join us.
2. You cannot... make me... do what I do not want....
3. You ought... have told me all this before.
4. Will you be able... let your son... decide his future?
5. "First of all I'd like... introduce myself", said the lecturer.
6. If you fail, why not...take a chance again, you may... be luckier next time... become a winner.
7. Let me... help you... solve the problem.
8. I wonder what made him... take such a decision.
9. Are you sure you can... afford... waste another year?
10. He was seen... enter the house through the back door.
11. I'd rather... come early than... be late.
12. We stepped aside... let them... pass.
13. What made you... decide... enter that competition?
14. Several requirements are... be met... make such a device... operate efficiently.
15. Do not let that... bother you.
16. Julie made the insurance company... pay for the repairs.

3. In the sentences below, define the form and function of an infinitive.

1. Nowadays it is hardly possible to solve complex engineering problems without the help of computers.

2. Valves at the transmitting station are used to keep the electric circuits oscillating.
3. To communicate information of some sort must be transferred.
4. Electronic technology has made it possible to establish automatic communication systems.
5. The report is to be handed in first thing tomorrow morning.
6. I do not know this subject well enough to discuss it with you.
7. The most convenient way to change alternating to direct current is by means of a rectifier.
8. To read books means to enlarge one's horizons.
9. They were glad to have been invited to participate in this famous scientist's research.
10. To meet the requirements the circuit must be assembled using cutting-edge technology.
11. To have been recognized as a talented designer gave him great satisfaction.
12. Internet gives everyone the power to share information and ideas, the power to move business forward.
13. The objective is not only to identify the problem, but also to solve it.
14. The circuit can be broken to interrupt the flow of electricity.
15. Solar and atomic batteries are used to supply power to transmitters in spacecraft because of their long life.
16. The Rolex Company was the first to develop the idea of a modern watch.
17. The classical laws of mechanics and electricity fail to predict the behavior of atoms.
18. The term "integrated circuit" is used to describe a group of electronic elements connected together by a variety of circuit assembly techniques to perform a given electronic function.

19. As the voltage applied between the electrodes in an ionization chamber is comparatively low, each quantum of X-rays absorbed produces only a small burst of current, too small to be recorded individually by any conventional method.

4. Replace the subordinate clause with an infinitive. Define the function of an infinitive. There is an example at the beginning (0).

0. The problem, which will be discussed, is very important. The problem to be discussed is very important (an attribute).

The negative poles in this case are so far away that they do not influence the positive poles. The negative poles in this case are far enough away so as not to influence the positive poles (an adverbial modifier of result).

1. This is an interesting fact, which you can mention in your speech.
2. There is no one who could explain it better than you.
3. You are so experienced – you ought to know better.
4. If you intend to do the work well, you must be very careful.
5. The thickness of the product, which should be measured, determines the choice of radioisotope, which will be used as the source.
6. There was nothing that could attract our attention.
7. If one needs to determine the magnitude of anything, it necessitates making a measurement.
8. The penetrating power of the new radiation was an obvious phenomenon that scientists had to investigate.
9. The detectives needed special equipment because they had to investigate the mystery thoroughly and accurately.
10. All the attempts that were aimed to explain the processes of emission and absorption through the electromagnetic theory of light have failed.

5. Make the sentences passive.

0. They saw him **do** it. – He was **seen to do** it.

1. They made the customer accept their terms.
2. They consider him to be an expert in his sphere.
3. She regards her father a perfect example to follow.
4. Everybody knows that this theatre was built by a famous architect.
5. We expect that they have learnt the truth.
6. It was announced that the foreign delegation had arrived.
7. It is understood that the partners have come to an agreement.
8. It was reported that the verdict was announced.
9. Everyone heard her say that.
10. We heard the postal worker come up to the front door and then we saw him slip a thick envelope into the box.
11. The teacher made me write the test again.
12. They saw the device begin to operate.

Text for reading

Read the text. Define the form and function of infinitives and pay attention to their use and their equivalents.

General Structure & Transmission of Fibre optics

Optical fibres are made up of two concentric cylindrical glasses. The light is "guided" down the centre of the fibre called the "core". The inner core is surrounded by a concentric core made up of glass and of lower refractive index known as cladding. Glass fibre is coated with a protective plastic covering called the "primary buffer coating" that protects it from moisture and other damage. More protection is provided by the "cable" which has the fibres and strength members inside an outer protective covering called a "jacket".

The core is designed to have a higher index of refraction, an optical parameter that is a measure of the speed of light in the material, than the cladding, which causes "Total Internal Reflection" to trap light in the core up to a certain angle, which defines the "numerical aperture" of the fibre.

The total internal reflection takes place at the cladding – core interface. The core diameter ranges in a few microns and is not much larger than the wavelength of light used. When high data transmission rates are not required, core with comparatively large diameters are used which may be of a few hundred microns. To understand the benefits of fibre for telecommunications purposes, let's explain how transmissions are sent:

- An optical signal is created using a transmitter.
- The signal is relayed via the fibre, ensuring the signal is not distorted or diminished.
- The signal is received and converted into an electrical signal.

Fibre optic links work by sending optical signals over fibre. Fibre optic transmission systems all use data links that work similar to the diagram shown above. Each fibre link consists of a transmitter on one end of a fibre and a receiver on the other end. Most systems operate by transmitting in one direction on one fibre and in the reverse direction on another fibre for full duplex operation. Transmitters are semiconductor LEDs or lasers and receivers are semiconductor photodetectors. Fibre optics transmit data in the form of light particles - or photons -- that pulse through a fibre optic cable. The glass fibre core and the cladding each have a different refractive index that bends incoming light at a certain angle. When light signals are sent through the fibre optic cable, they reflect off the core and cladding in a series of zig-zag bounces, adhering to a process called total internal reflection. The light signals do not travel at the speed of light because of the denser glass layers, instead traveling about 30% slower than the speed of light. To renew, or boost, the signal throughout its journey, fibre optics transmission sometimes requires repeaters at distant intervals to regenerate the optical signal by converting it to an electrical signal, processing that electrical signal and retransmitting the optical signal.

By White paper (<http://www.optronicsplus.net>)

ГЕРУНДИЙ (THE GERUND)

The gerund is a non-finite form of the verb with some noun features. It is formed by adding the suffix *-ing* to the stem of the verb.

As a noun, it can function as the subject of a sentence, a direct object, as a predicate nominative, etc. As a verb, it can be followed by a predicate nominative or a predicate adjective; it can, if it is transitive, take a direct object; and it can, if it is a verb of saying, giving, or showing, take an indirect object. As a noun, it can be modified by adjectives and by words functioning as adjectives (nouns, prepositional phrases, etc.). When functioning as an attribute or an adverbial modifier, the gerund, like a noun is preceded by a preposition.

There is a chance of *catching* the train (the gerund as an attribute).

The gerund has grammatical categories of tense, and (in the case of transitive gerunds) voice, but not person and number. As a verb, it can be modified by adverbs and by words functioning as adverbs (adverbial objectives, prepositional phrases, etc.).

Reading (the gerund) *quickly* (an adverb) tires me.

A gerund with its complements, objects, and modifiers constitutes a *gerund phrase*. Gerund phrases can, like simple gerunds, function as subjects, predicate nominatives, direct objects, objects of prepositions and adverbial objectives.

- The subject of the sentence. **Finding a needle in a haystack** would be easier than what we are trying to do.
- The **direct object of a verb**. I hope that you appreciate **my offering** you this opportunity.
- The **object of a preposition**. You might get in trouble for **faking an illness** to avoid work.

Forms of Gerund

	Active	Passive
Simple	Writing	being written
Perfect	having written	having been written

The simple gerund expresses an action simultaneous with that expressed by the finite verb in the main clause.

*I hate **arguing** with you* (*arguing* refers to the same time as *hate*: I hate when we argue.).

The **simple gerund** can also refer to a time before that of the verb in the main clause.

*I do not remember **saying** anything like that* (*saying* refers to a time before *do not remember*: I do not remember that I said anything like that.).

*She regretted **not studying** harder when she was at school* (*not studying* refers to a time before *regretted*: She regretted that she had not studied harder when he was at school.).

The **perfect gerund** expresses an action prior to that expressed by the finite verb in the main clause. However, it is only used if the time of the action expressed by the gerund is not obvious from the context:

*He denied **telling a lie*** (the simple gerund *telling* refers to the same time as *denied*- He denied that he told a lie.).

*He denied **having told a lie*** (the perfect gerund *having told* refers to a time before *denied* - He denied that he had told a lie.).

The gerund of transitive verbs possesses voice distinctions. Like other verb forms, **the active gerund** points out that the action is directed from the subject (whether expressed or implied), whereas **the passive gerund** highlights that the subject is somehow affected and the action is directed towards the subject.

*I hate **being lied to*** (the passive simple gerund - I hate it when people lie to me.).

*He complained of **having been unjustly accused*** (the passive perfect gerund - He complained that they had unjustly accused him.)

Functions of Gerund

In sentences the gerund functions as the subject, predicate, part of a compound verbal predicate, attribute, adverbial modifier (of time, manner, attendant circumstances, condition, cause).

1. *Analyzing* the facts is the first stage in the work of a scientist (the subject).
2. The purpose of solar batteries is *converting* the energy of the sunrays directly into electric energy (the predicative, part of the compound predicate).
3. The scientists began *utilizing* this practically unlimited source of energy (part of the compound verbal predicate).
4. He remembered *inspecting* the system for leaks (a direct object with the verbs *to remember, to avoid, to doubt, to mention, to respect, to suggest, to mind, to excuse, to forgive, to enjoy, to require*).
5. He succeeded *in performing* the experiment (a prepositional object).
6. The thermometer is an instrument for *measuring* temperature (an attribute).
7. After *finishing* the experiment, they discussed the results (an adverbial modifier of time). We can improve the device by *making* it lighter (an adverbial modifier of manner). Compressors are used for *obtaining* strongly compressed gas (an adverbial modifier of purpose). Solids expand in case of *heating* (an adverbial modifier of condition).

Note.

- * As an adverbial modifier of time, the gerund is preceded by the prepositions *after, before, on (upon), in, at* and *through*.
- * The prepositions *for, for (with) the purpose of, for the sake of, with a (the) view of* precede the gerund functioning as an adverbial modifier of purpose.
- * The prepositions *by, by means of, without, in, like* precede the gerund functioning as an adverbial modifier of manner.
- * As an adverbial modifier of attendant circumstances, the gerund is preceded by the prepositions *without, instead of, besides, apart (aside) from, in addition to, together with, beyond*.

- * The prepositions *without, in case of, in the event of, subject to* precede the gerund in the function of an adverbial modifier of condition.
- * The prepositions *for, for fear of, owing to, on account of, because of* precede the gerund in the function of an adverbial modifier of cause.

The gerund and the infinitive are very common forms in English having similar features and functions. Therefore, we should be aware in which cases either verbal is possible and in which ones only the gerund or only the infinitive occurs.

Certain verbs can be followed by a gerund, but not by an infinitive.

admit, appreciate, avoid, can't help, consider, delay, deny, dislike, endure, enjoy, escape, excuse, face, fancy, feel like, finish, give up, imagine, involve, justify, keep, mention, mind, miss, postpone, practice, prevent, put off, recall, recommend, resist, risk, save, suggest, tolerate, understand

I **avoid travelling** in the rush hour whenever possible.

Certain verbs can be followed by an infinitive, but not by a gerund.

afford, agree, aim, appear, arrange, ask, attempt, care, choose, decide, demand, deserve, expect, fail, fight, forget, guarantee, happen, help, hesitate, hope, intend, manage, need, neglect, offer, pause, plan, prepare, pretend, promise, propose, prove, refuse, seem, tend, threaten, trouble, try, undertake, wait, want, wish

She has **decided to apply** for the job.

Some verbs can be followed by a gerund or an infinitive, with no difference in meaning: *attempt, begin, bother, can't bear, can't stand, cease, continue, deserve, fear, hate, intend, like (= enjoy), love, prefer, start*.

We **began translating** this article an hour ago. / We **began to translate** this article an hour ago.

Some verbs can be followed by either a gerund or an infinitive, but there is a difference in meaning.

verb	+ gerund	+ to + infinitive
forget/remember	=forget/remember an earlier action: Do you remember going to school for the first time? I will never forget meeting him.	=forget/remember to do a future action: I must remember to set my alarm clock tonight. Don't forget to lock the door.
go on	= continue: They went on planning their project.	= change to another action: After opening the hospital the chief went on to meet the staff.
mean	= involves or will result in: This new job means living abroad.	= intend to do something: The designers mean to finish by Friday.
regret	= feel sorrow about the past: I really regret getting that tattoo when I was eighteen.	= announce bad news: We regret to inform you of delays in today's service.
stop	= finish an action: They stopped making fax machines about ten years ago.	= finish one action in order to do another one: We stopped to get petrol.
try	= do something to see what will happen: Try using another reading strategy.	= make an effort to do something difficult: We tried to get tickets but the show was sold out.

The Gerundial Complex

The doer of the action denoted by a gerund may be expressed by
a) a noun in the possessive case or a possessive pronoun;

b) a noun in the common case;

c) a pronoun in the objective case.

These combinations are called **the gerundial complex** whose functions are similar to those of a simple gerund.

I insist on doing it. I insist on **your doing it**.

There is another form in English ending in *-ing* known as a verbal noun. It should be differentiated from a gerund since it is an ordinary noun and possesses all noun features. For instance, in the sentence – *We were caught in traffic and missed the beginning of the game* – *beginning* is a verbal noun; however, *beginning* is a gerund in the sentence – *You cannot read most novels successfully by beginning in the middle*.

Exercises

1. Complete the sentences with the appropriate gerund form of the verbs in brackets. There is an example at the beginning (0).

0. There is no chance of (convince) him.

There is no chance of *convincing* him.

1. (Put) things tomorrow can no longer be tolerated.
2. In spite of (be busy), he did not refuse to help us.
3. The thing I most enjoy about my job is (help) people with their problems.
4. You will not find any spare parts; they stopped (make) them ages ago.
5. I hate (interrupt) people as well as I hate (interrupt).
6. We know of his (complete) the research.
7. The engineers were busy (test) a new engine.

8. We insisted on the meeting (put off).
9. After (record) the results, they started (analyze) them.
10. I hate (bother) when I work.
11. The rules of (operate) this machinery are very simple.
12. Specialists were not sure, if it was possible to continue (modernize) the electronic equipment of this kind since the costs were too high.
13. I remember (read) this article.
14. On (complete) the course, he got a special certificate.
15. I am so grateful to you for (explain) me everything.

2. In the sentences below, define the function of a gerund. Insert prepositions where necessary.

1. The act... transmitting a signal from one frequency band to another is called modulation.
2. We can increase the current... reducing the resistance of the circuit.
3. Committee objected...taking any decision without a thorough discussion.
4. ...Being informed of the conference, he immediately decided...participating in it.
5. Research is carried out...modifying known polymers with the purpose...developing desired properties in them.
6. ...Repeating experiments one gets more data that help...arriving at right conclusions.
7. It is no use...discussing the question.
8. He was accused...selling the information to firms-competitors.
9. It is possible to facilitate the escape of an electron from a conductor...increasing its speed.
10. ..Leaving the earth means...moving upwards against gravity and this requires work.

11. ..Converting electrical energy into mechanical energy, we use a special machine called a motor.

12. One of the most effective aids...planning is...simulating.

13. ..Translating from one language into another has been accomplished by a computer.

14. A wide variety of instruments capable...detecting and measuring different types of radiation are applied nowadays.

15. The classical laws of both mechanics and electricity fail...predicting the behavior of atoms.

16. Researchers have obtained data about the distribution of nuclear charge...carefully studying the optical spectra.

17. Microelectronics also includes the technique...putting large numbers of electronic elements on silicon chips when making electronic devices.

18. Connecting two conductors of the same material and of the same length and size in parallel provides the same effect as a single conductor twice as large as either of the two.

3. Replace the subordinate clause with a suitable gerundial construction. Use prepositions where necessary. There is an example at the beginning (0).

0. I hope you will forgive me that I have disturbed you.

I hope you will forgive *my disturbing* you.

I insist that you show me your work today.

I insist *on you showing* me your work today.

1. Once he decides something, it is impossible to talk him out of it.

2. Do you think there is any opportunity that the problem will be solved in the near future?

3. The velocity of a moving object can change as it speeds up, slows down or changes the direction of motion.
4. I insist that you should tell us what the real reason is.
5. Nobody objected that he would be appointed head of the department.
6. I see no reason why you should not sign the agreement.
7. They took a decision to reduce their expenses because they wanted to save money.
8. I do not like when you speak like this.
9. We know that the house was destroyed by a stroke of lightning.
10. The fact that I had failed merely made me try again.
11. Satellites travel successfully in case they have been set on a proper orbit.
12. I was surprised that she omitted very important details.
13. There is a chance that I get this job.
14. His friends grew tired because he pretended to be someone he was not.
15. We know that the input signal is perfectly reproduced at the output of an amplifier.
16. You can rely on them as they always keep their promise.

4. State whether the *-ing* form is a gerund, a participle or a verbal noun.

1. In their investigation, researchers applied a device for converting an optical image into an electrical signal.
2. While working at a new transmitter for deaf people, Bell invented a telephone.
3. In the past few years, technology has radically changed our ways of living and working.

4. I like reading science-fiction books because the reading of such books develops my imagination.
5. Moving through the magnetic field, the coil of wire cuts the lines of force.
6. The key in life is setting goals.
7. We are surprised at your having not known about it before.
8. Being properly adjusted, the machine works efficiently.
9. The sharing of information is the core of the Internet.
10. Being rather absent-minded, he tends to forget things.
11. Being absent-minded can cause serious troubles.
12. Not wanting the responsibility of deciding I tossed a coin.
13. Measuring any quantity means comparing it with an accepted unit for that quantity and finding out how many times it is larger or smaller than the standard unit is.
14. In two or three years with the proper coaching, she could be brought up to university standard.
15. Being ambitious, he hopes to get promotion.

Text for reading

Read the extract. Explain and define the function of gerunds. Give their Russian equivalents.

Deciding on an Ultrasound Machine Basic Ultrasound Principles

There are three main types of US machines: consoles, portables, and handhelds. The console machines are big and bulky, but they have stronger processors and thus give a better image. The portables, often laptop format, are easy to move to the exam table or cageside and their image quality is constantly improving. There are several small handheld machines now on the market. Some have pretty decent depth and resolution capabilities. Just make sure they don't walk out of your

clinic. It's very easy to put these in a lab jacket pocket and forget about them. You may be limited to whatever you currently have in your veterinary practice, but if you are thinking of buying a new unit, consider what your main use is going to be, and get the best US machine you can afford for that purpose. The axiom holds true — the better the machine, the better the image, and the better the diagnostic information.

Probes, or transducers, come in two basic types, mechanical and electronic. Mechanical probes are by many accounts considered outdated but there are still some around with their working parts visibly rotating or rocking under their translucent covers. Newer ultrasounds come standard with electronic probes. Electronic probes come in various arrangements. Probes are generally described by the size and shape of their face, referred to as their “footprint,” which is represented by the gray rubber probe covering. Selecting the right probe is essential to getting good images, although there may be times when more than one probe may be appropriate for a given exam.

Three basic types of probes are used in general practice, emergency, and critical care point-of-care ultrasound: linear, curvilinear, and phased-array (also known as sector). Linear probes are typically of higher frequency and have a rectangular footprint. Curvilinear probes are arranged along a convex face and are typically of lower frequency than the linear probes. A phased-array (sector) probe generates an image from an electronically steered beam in a close array, generating an image that comes from a point and is good for getting between ribs, such as in cardiac ultrasound. Both curvilinear and phased-array probes generate sector or pie-shaped images, narrow in the near field and wide in the far field. Phased-array probes are typically lower frequency. Because of their smaller footprint, pie-shaped image, and common frequencies, the curvilinear probes are generally the most versatile and ideal for the focused, COAST3, and FAST3 studies.

Probes are generally named for the primary frequency they emit. For example, a General Electric (GE) 8C probe indicates that 8 MHz is its primary frequency and the C represents the probe's curvilinear

footprint. Moreover, a GE 9 L probe indicates a 9 MHz primary frequency in a linear (L) probe, and a GE 7S as having 7 MHz as its primary frequency in a sector (S) probe. However, modern probes are capable of emitting a range of frequencies known as bandwidth. In choosing the best frequency, we need to go back to the basics. Remember that higher frequencies are attenuated more, and that means less penetration but better detail. Lower frequencies are attenuated less, and that means deeper penetration but less detail.

(<https://onlinelibrary.wiley.com/doi/book/10.1002/9781118760772>)

ПРИЧАСТИЕ (THE PARTICIPLE)

The participle is a non-finite form that possesses verbal features as well as characteristics of adjective and adverb, which determine its syntactical functions. The participle can be used in sentences to give extra information or to describe the result, cause or time of the information in the main clause.

There are several participle forms in English.

	Active	Passive
Present (simple)	Developing	being developed
Past	-----	Developed
Perfect	having developed	having been developed

The Present Participle (I) is formed by adding the suffix **-ing** to the stem of the verb, and the Past Participle (II) – by adding the suffix **-ed** to the stem of the regular verbs, while the irregular verbs have special forms of participle II. Participles have active and passive forms but they do not have a tense. Their time reference is usually clear from the verb in the main clause. The simple forms, both active and passive, are used to describe an action or a state simultaneous with that expressed by the predicate of the sentence (the finite verb).

Making experiments researchers carefully **put down** the results (simultaneous actions).

The perfect forms, both active and passive, express an action or a state, which preceded that expressed by the predicate of the sentence (the finite verb).

Having made a set of tests the engineers **obtained** results of great importance (the perfect participle emphasizes that the first action is completed before the second one starts).

The simple forms may perform two syntactic functions: that of an attribute and that of an adverbial modifier, while the perfect forms may

fill only the position of an adverbial modifier, and are never used as attributes.

When participles qualify a noun, they can be used attributively or predicatively.

It is an *exciting* story. The news was *disappointing*.

Like adjectives, single participles in an attributive position usually precede the noun they qualify. When an attributively used participle forms a phrase, the participle phrase should be put after the noun it modifies.

The *splitting atoms* release much energy. His words had the *desired effect*.

Here is a *leaflet giving* full particulars of the project.

Participle I passive is not often used as an attribute. However, when it is used in this way, it should not be confused with participle II since there is a certain difference in meaning. Participle II expresses merely a state, while participle I passive expresses rather a progressive passive action represented as a state. A participle phrase with participle II is usually rendered in Russian with the help of a participle phrase; while a participle phrase with participle I passive corresponds to a Russian attributive clause with the verb in the form of the imperfect aspect.

I always enjoy reading letters *written* by my sister. – Я всегда получаю удовольствие, читая письма, *написанные* моей сестрой.

The director will sign the letters *being written* by the engineer. - Директор подпишет письма, *которые сейчас пишет* инженер.

Participles can often function like clauses of reason, condition, result and time.

	Full clause	Participle phrase
reason (cause)	She will be unable to answer your queries because she is not qualified.	Not being qualified, she will be unable to answer your queries.

condition	If you treat it carefully , the device should last for years.	Treated carefully , the device should last for years.
result	The corporation shut down the plant, with the result that many workers were left unemployed.	The corporation shut down the plant, leaving many workers unemployed.
time	When they were questioned , they gave very careful answers not to make a mistake.	Being questioned they gave very careful answers not to make a mistake.

Participles can also function as adverbial modifiers:

– of attendant circumstances:

I wrote him a friendly letter, *thanking* him for his help.

– of comparison:

She paced up and down the room restlessly as if *trying* to make some decision.

– of concession:

Though *astonished* by her interest in the details of the accident, I went on with my story.

Participles in the adverbial function may be preceded by conjunctions: *when, while, if, as if, as though, though, unless*.

Participle I may also be used as a parenthesis, i.e. it is not logically related to the subject of the verb but serves to introduce a new idea, to connect two ideas or to add a comment. In this case, a number of set expressions are mostly used: *generally speaking, strictly speaking, roughly speaking, granting it to be true, judging by, judging from* etc.

Generally speaking, they are pretty friendly people.

We can use an adverb to modify a participle. This describes the particular aspect of something that we are commenting on. The adverb can come before or after the participle.

Speaking quickly at the exam, he made several mistakes.

Exercises

1. Complete the sentences with the correct participle form of the verbs in brackets. There is an example at the beginning (0).

0. While (design) a new device, the inventor made many tests.

While *designing* a new device, the inventor made many tests.

The problem (discuss) now is of great importance.

The problem *being discussed* now is of great importance.

1. When (compare) elements one notices the outstanding stability of some electronic structures.
2. In physics and chemistry as well as in other exact sciences the quality of the instruments (use) can be safely (rely upon).
3. You should not waste time (dwell) on that old situation.
4. (Consider) the problem for an hour already, they could not achieve the conclusion yet.
5. The article (type) will (publish) in the next issue of the journal.
6. The transformer operates (use) two coils of wire or inductors (call) the primary and the secondary.
7. (Heat) for several hours, the substance began to melt.
8. For astronauts on months' or even years' long journeys to distant planets, biological batteries might solve a dual problem. They could serve as a waste disposal system while (provide) power for equipment and instruments.
9. Unless (speak), he never says a word himself.
10. (Not to know) the instructions we could not use the equipment.
11. The speaker kept silent as if (wait) for the statement to be interpreted.

12. The questions (discuss) were (include) into the agenda of the meeting.

13. (Do) all that was required, he left the office.

14. Before the discovery of the structure of atomic, it was thought that there existed two types of forces (explain) all natural phenomena: electrical and gravitational forces.

15. The photograph shows the light (produce) by a helium-selenium laser, one of a class of lasers that operate with a vaporized metal (mix) with another gas.

2. The sentences below contain mistakes in the use of participles. Find and correct mistakes.

1. While having looked through the documents he found several errors in them.

2. Been a good mixer she easily makes friends.

3. Solving the main problem the scientist made a report on his discovery.

4. The colour of the light been seeing is determining by the frequency of the light waves affected the human eye.

5. The forces held the individual atoms together as a unit are much greater than those, which are acted when being combined with other atoms.

6. A capacitor is a device consisted of conductors having separated by a dielectric, which may be air or vacuum, intending for introducing capacitance into an electric circuit or system or providing the storage of electricity.

7. When made observations from above the ionosphere radio telescopes can be using at much lower frequencies.

8. The properties being discovered required further investigation.

9. The scientist theoretically predicted complicating interactions between the components involving in the process.

10. The world's first nuclear-powered lighthouse having been operated by a radiation-powered isotopic generator that keeps recharging an energy storage system has recently being put into operation.

11. If the type of particle been detected can be identifying, then its energy can be calculated.

12. Charging particles having passed through matter experience collisions because of which they are scattering and lose kinetic energy.

13. Superconductivity is the name giving to a phenomenon showing by some conductors of electricity, which lose electrical resistance when having cooled below a certain temperature.

14. The letter begun with "Dear sir" was not signing.

3. Replace the subordinate clause with a suitable participle phrase. Define the function of participles. There is an example at the beginning (0).

0. Since I saw that she did not understand me, I said it again.

Seeing that she did not understand me, I said it again (an adverbial modifier of cause).

The article that was written ten years ago has not lost its significance.

The article written ten years ago has not lost its significance (an attribute).

1. As I am not very good with figures, I will let you do the accounts.

2. If you give them enough time, the engineers will be able to find the fault.

3. When we arrived at the airport, we learned that our flight was delayed because of weather conditions.

4. Because all bodies have a constant downward acceleration, which is produced by the pull of gravity, the equations of uniformly accelerated motion can be applied to any bodies, which are falling.

5. An Earth satellite if it is launched into an orbit sufficiently distant from the Earth's surface can circulate for months or even years.

6. One short pulse of light that is emitted as a parallel beam, when it is focused by a lens carries sufficiently concentrated energy.

7. The motor is overheated unless it is cooled.

8. Though the test was conducted with great care, it did not give the results that were expected.
9. When the chemical energy is transformed into electric energy, it is partially changed into heat.
10. She looked as if she was frightened by something.
11. Because he had been unemployed for so long, Jack despaired of ever finding a job.
12. While one is solving a problem, he should take into consideration all the existing methods that are related to the problem in question.
13. Although the substance was discovered long ago, only now it is widely used in industry.
14. According to Newton's first law of motion an object remains at rest or in a straight-line motion unless it is acted upon by some external force.
15. The instruments were broken while they were being transported.

Text for reading

Read the extract. Explain and define the function of participles. Give their Russian equivalents.

Spintronics: Deciphering a material for future electronics

Future electronics will most likely utilize an intrinsic property of electrons called spin. The state spin takes is either "up" or "down", which in a classical picture corresponds to a clockwise or counterclockwise rotation of the electron around its axis. The electron spin can also be viewed as an extremely small magnetic field surrounding the electron. Already tested in hard drives, spintronics is believed to replace current information technology, providing increased data transfer speeds, processing power, memory density and storage capacity.

As conventional electronics requires switching between high and low current states, spintronics involves controlling electron spin states and switching between "up" and "down". Controlling electron spin can be achieved with topological insulators, a novel class of materials that behave as insulators on the inside, but are highly conductive on their surfaces. However, it has been unclear so far how exactly a normal material can become a topological insulator, and how

to implement them for real technological impact. EPFL scientists offer solutions to both problems by studying the spin structure of few atoms-thick films of a common topological insulator.

An international team of researchers led by Hugo Dil at EPFL has now shown how spin-polarised electrons evolves on the surface of atomically flat bismuth-selenide topological insulator films no more than 30 atoms thick. The researchers used a spectroscopic technique called SARPES, which allowed them to determine the different spin states of electrons travelling across the conducting surface of a topological insulator. They found that the ability of the topological insulator to control the electron spin depends on its interface to the substrate and not on the film thickness.

The team's findings show that tuning the chemical make-up of a topological insulator can directly manipulate the spin of electrons flowing across its surface. The discovery not only contributes to the understanding of the function of topological insulators, but also provides a fundamental means of designing spintronics devices in the future.

(<https://actu.epfl.ch/news/spintronics-deciphering-a-material-for-future-elec/>)

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