Министерство образования Республики Беларусь
Белорусский национальный технический университет
Кафедра английского языка №1

Слесарёнок Е.В.
Хоменко С.А.
Яловик Е.И.

Английский язык

Пособие для студентов технических специальностей заочной формы получения высшего образования

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Зав. кафедрой английского языка естественных факультетов ФСК Белорусского государственного университета, кандидат филологических наукб доцент А.Э. Черенда

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Пособие предназначено для студентов технических специальностей заочной формы получения высшего образования. Целью пособия является расширение активного и пассивного словарного запаса в процессе самостоятельного изучения иностранного языка технической направленности.

Пособие состоит из трех частей: первая часть представляет собой курс, состоящий из 12 разделов, которые включают тексты и упражнения, направленные на изучение лексических и грамматических явлений, характерных для научно-технической литературы; вторая часть включает оригинальные тексты на английском языке для дополнительного чтения и перевода; в третьей части представлен краткий грамматический справочник, который охватывает материал, изучаемый на первом и втором курсах заочной формы получения образования.

Содержание

Unit 1 ENGINEERING

SECTION A. AN ENGINEERING STUDENT

1. Прочитайте диалоги и узнайте, как правильно представлять себя. Переведите на русский язык.

A

Teacher: Good morning! Let me introduce myself. I am your English teacher. I am here to help you with English. What are you? What do you do? What did you do? Why are you here?

Class: We are students.

Teacher: Are you first-year students? Are you freshmen?

Class: Yes, we are.

Teacher: Will you introduce yourselves? Who are you?

Student: I am Andrew Kolosov. I am here to study English.

Teacher: What is your name?

Student: My name is Kate Gomonova. I am a first-year student. I am here to master my English, too.

Teacher: Thank you. I am glad to meet you.

Students: We are glad to meet you, too.

B

Teacher: Allow me to introduce your supervisor.

Supervisor: How do you do?

Students: How do you do?

Supervisor: You are eager to study at our Technical University and become good specialists, aren't you?

Students: Yes, of course, we are.

Supervisor: You are lucky to study at our University. I wish you success.

Students: Thank you very much.

C

Teacher: (in whisper) Oh, I'm sorry, who is this student?

Monitor: This is Oleg Smirnov.

Teacher: I see. He is 18 years old, isn't he?

Monitor: Yes, he is.

Teacher: Is he from Moscow?

Monitor: No, he isn't. He is **Belarusian.** He is from Grodno, from the Republic of Belarus.

Teacher: OK. Thanks a lot.

D

Oleg: Hello, Kate. How are you?

Kate: Very well, thank you. And how are you?

Oleg: Quite well, thanks. Kate, this is Mike. He is my friend here at University and he was my friend at school.

Kate: Hello, nice to meet you.
Mike: Hi, rm glad to meet you, too.

2. Изучите примеры в таблице.

morning. Good afternoon. Evening.	morning. Good afternoon.
Hello.	Hello.
How do you do?	How do you do?
How are you?	I'm fine, thank you.
How are you doing?	I'm OK, thanks.
How are you getting on?	Not bad.
How are things?	Quite well.
Is everything fine?	Excellent, thanks.
Let me introduce myself.	Nice to meet you.
My name is ...	Pleased to meet you.
This is Mr., Mrs., Miss	I am ... Glad to meet you.

3. Вставьте *is* / *am* / *are* в беседу двух студентов. Переведите на русский язык.

Kate: Excuse me, are you Paul?
Michael: No, I, ... My name ... Michael.
Kate: Well, Mike, are you tired after your first day at University?
Michael: No, I ..., really. I ... eager to study here.
Kate: Me too. They say the Technical University ... a very exciting University to attend.
Andrew: I ... Andrew Kovalev. I ... fond of computers. And you?
Alice: I ... Alice. I ... fond of programming as well. And besides, I ... interested in graffiti arts.
Andrew: What is it?
Ann: Alexey, you ... good at drawing.
Alexey: Really? I ... glad to hear it.

4. Исправьте ошибки. Переведите на русский язык.

Hello! We am first-year students of the Technical University. Our names is Oleg, Mike and Kate. We is eager to know what it am like to be an American student. We is from Minsk. Minsk am the capital of Belarus. Minsk are about 750 kilometres far from Moscow. The transportation system in Minsk are rather complicated.

The average temperature in Belarus in winter months are about -10°C (14°F) and about +20°C (68°F) in summer months.

5. Заполните пропуски данными выражениями. Переведите предложения на русский язык.

to be busy *with,* to be impressed *by,* to be fed up *with,* to be interested *in,* to be fond *of,* to be crazy *ahout*

1. Tom is impressed ... the design of this tower.
2. They are fond ... geography.
3. I'm fed up ... this task.
4. We are busy ... our home task.
5. He isn't interested ... physics.
6. Our classmates are crazy ... programming.

6. Составьте предложения, обращая внимание на структуру английского предложения. Переведите на русский язык.

1. freshmen University at are we.
2. are students technical we.
3. fond of music am I.
4. is interested in he engineering.
5. good at are they programming.
6. never tired of we studying are.

7. Изучите названия разных профессий. Переведите предложения на русский язык.

1. He is a student of computer engineering. So he is a **programmer**.
2. He is a student of processing engineering. So he is a **technologist**.
3. He is a student of metrology. So he is a **metrologist**.
4. He is a student of economics. So he is an **economist**.
5. He is a student of construction engineering. So he is a **builder**.
6. He is a student of mechanical engineering. So he is a **mechanical engineer**.

8. Образуйте названия профессий. Переведите на русский язык.

physics - _____ mathematics - _____
ecology - _____ metrology - _____
technology -_____ programming - _____
economy - _____ architecture - _____

9. Подберите правильное определение. Переведите на русский язык.

1. physician	a) a student or expert in physics
2. physicist	b) a person whose profession is to keep and examine business accounts
3. accountant	c) a specialist in scientific and industrial fields
4. technician	d) a doctor of medicine or surgery
5. technologist	e) a skilled workman, especially who repairs

10. Составьте пары синонимов.

excellent	a second-year student
a sophomore	terrible
to be interested in	attractive
horrible	a first-year student
beautiful	to be fond of
I'm great	I'm fine
a freshman	brilliant

11. Заполните пропуски, переведите предложения на русский язык.

a) many, much, a lot of

1. Measure as ... objects as possible.
2. Add ... acid to the mixture.
3. Pour ... liquid into the beaker.
4. Are there ... instruments in the box?
5. There are not ... nuts on the shelf.

b) fow, a fow, little, a little

1. They have too ... time for experiment.
2. There is ... fuel in the tank. We need some more.
3. There are only ... nails on the worktable.
4. There is ...cement in the sack. That is enough.
5. There are ... spare tyres in my garage.

12. Исправьте ошибки. Переведите предложения на русский язык.

1. - How are you do? - Quite well, thank you.
2. Let me to introduce myself. My name's Alex Frolov.
3. My best friend isn't interested at graffiti arts.
4. Who is this man? - He's an engineer.

5. Are these objects have different shapes?
6. How wide is the block?
7. The screw is the shortest than the nail.
8. How many motor vehicles there are with mixed fuel engines?
9. Are there some motorcycles with gas engines?

13. Прочитайте текст и переведите на русский язык.

Engineering is a very practical activity. It is the process of applying the latest achievements of science and technology into practice. There are a lot of branches in engineering. Mechanical engineers are experts in the design and manufacture of tools and machines. Mechanical engineering has marine, automobile, aeronautical, heating and ventilating branches. Electrical engineering is about producing and applying electricity in various fields of national economy. It has the following branches: electrical installation, electrical generation, lighting, etc. Components and equipment for computing and communicating are the product of electronic engineering and bridges, roads and airports are the object of civil engineering.

UNIT 2 EXPERIMENTING

SECTION A. EXPERIMENTING WITH CAR DEVICES

Grammar: Present Continuous Active

1. Запишите глаголы с *-ing* окончанием.

move-	test-
pay-	measure-
perform-	indicate-
do-	work-
put-	study-

2. Составьте предложения и переведите их на русский язык.

EXAMPLE: *I / study English.* I am studying English.
They / watch TV. They are not watching TV now.

l. I / listen to the teacher.
2. We / practise a new grammar rule.
3. He / perform mathematical calculations.
4. I / drive a car.
5. We /sit in the class.
6. They /measure the dimensions of this room.

3. Составьте вопросы по образцу. Переведите на русский язык.

EXAMPLE 1: *to study the instrument panel of the car / car design*
- Are you studying the instrument panel of the car?
- Yes, I am. /No, I am not.

1. to look at the indications of a speedometer / tachometer
2. to repair the car / tyre
3. to test the new device / new engineering
4. materials to check the volume of the petrol / oil

EXAMPLE 2: *to measure the pressure in the tyre / to change the wheel*
- Are they measuring the pressure in the tyre?
- Yes, they are. / No, they aren't. They are changing the wheel.

1. to drive in nails / to tighten screws
2. to cut wooden blocks / to cut metal sheets
3. to use chisels /to use hammers
4. to shape workpieces / to measure their dimensions

EXAMPLE 3: *to test the new engine*
- What are you doing? / What is he doing?
- I am testing the new engine now. / He is testing the new engine now.

1. to perform mathematical operations;
2. to investigate the properties of copper;
3. to control the quality of engineering materials;
4. to work with wood.

4. Составьте утвердительные и отрицательные предложения, используя Present Continuous. Переведите на русский язык.

EXAMPLE: *Oleg - to drive a car- to do it carefully*
Oleg is driving a car carefully.
Oleg isn’t doing it very carefully.

1. Michael - to increase the speed - to watch the indications of the speedometer.
2. Paul - to test the device - to describe the results of the test.
3. Paul and Alex - to measure the pressure in the wheels - to put air in the tyres.
4. Ann - to draw different objects - to define their area.

5. Исправьте ошибки. Переведите на русский язык.

1. The speedometer is indicate 60 kph.
2. We not performing mathematical operations.
3. Are the car moving now?
4. The alternator is not produceing enough current now.
5. The engine not producing any power now.
6. We studying the main components of a motor vehicle.

6. Подберите правильный вариант перевода.

1) current, n	a) выполнять
2)perform, v	b) чинить
3) investigate, v	c) скорость
4) charge, v	d) ток
5) speed, n	e) изучать
6) repair, v	f) заряжать

7. Прочитайте текст и переведите на русский язык.

Your instrument panel contains the following:

Speedometer tells you the speed of your vehicle in MPH (miles per hour) or KPH (kilometres per hour). **Tachometer** shows how many rotations your engine is making per minute. **Odometer** shows how many miles your car has traveled in its lifetime. **Fuel Gauge** shows how much fuel remains in your car's tank. **Gear Display** shows which gear your car is currently in. **Turn Signal Indicators** flash when your turn signals are on; both will flash if you turn on your hazard lights. **Active System Lights** alert you to parts of the vehicle that are activated, such as an open trunk or door.

8. Подберите соответствующее определение и переведите на русский язык.

1) graph	a. relative size or extent
2) scale	b. a diagram that shows relationship between quantities
3) label	c. to put a note on an object
4) variable	d. something that varies

9. Прочитайте текст и переведите его на русский язык.

Graphs are very important for recording the results of any experiments. Now the students are drawing graphs in their exercise books. First, they are giving the graph a title. Then they are drawing the axes and putting the independent variable along the bottom of the graph paper (the horizontal axis). The other variable depends on this one

and the students are drawing it up the side of the paper (the vertical axis). It is also called the dependent variable. The origin of the graph is usually the point (0, 0).

For example, if you are measuring the speed of a car when it is moving, you choose the speed of the engine and put it along the horizontal axis (rpm). In this case the speed of the car is on the vertical axis.

Now the students are choosing the scales so that the graph fills most of the paper. After that they are numbering the scales evenly and labelling them (the scales) with the correct units. For example, "Speed in kph" or "Speed/kph".

10. Заполните пропуски данными словами. Переведите на русский язык.

dependent	giving	drawing
units	putting	horizontal axis
variable	choosing	numbering

Michael is studying how to draw graphs. He is at his class now. First, he is ... the graph a title. After that he is ... the axis and ... the independent ... along the bottom of the graph paper. It is known as the .... Then Michael is drawing the vertical axis. or the ... variable. Finally, he is ... the scales for the graph, he is ... the scales evenly and labelling them with the correct ....

SECTION B. *ELECTRICAL DEVICES*

Grammar: Past and Future Progressive Active

1. The following suffixes are used to form ***nouns*** from ***verbs****:*
   -tion, -sion, -ance, -ure, -er/-or
2. The following prefixes are used to give the ***opposite*** meaning to the word:
   dis-, in-, im-.

1. Образуйте существительные, консультируясь с таблицей выше:

resist-	restrict-	depend-
differ-	press-	absorb-
product-		

2. Дополните предложения. Используйте *was / were* + один из данных глаголов. Переведите предложения на русский язык.

writing, carrying out, drawing, measuring, determining, testing

1. Paul *was testing* a new device from 11 till 12 yesterday.
2. I ... a report on the latest achievements in electricity at 7 o'clock yesterday.

3. Alex ... the current in the circuit at 5.45 yesterday.
4. The students ... the resistance of new materials from 3 till 10 yesterday.

3. Составьте предложения по образцу и переведите их на русский язык.

EXAMPLE 1: *to work in the lab / to work at the workshop*
A: Were you working in the lab from 2 till4 o'clock yesterday?
Yes, I was. I was working in the lab at that time.
or *B:* No, I was not. I was working at the workshop.

1. to observe changes in the behaviour of the current / to measure the resistance of the lead;
2. to perform mathematical operations / to draw different shapes;
3. to study electrical devices / to watch their indications;
4. to use·crocodile clips /to connect two leads.

EXAMPLE 2: *to study electrical devices*
A: What were you doing at 2 o'clock yesterday?
B: I was studying electrical devices.

1. to connect two leads;
2. to measure the value of the current;
3. to turn on the function selector switch of the multi meter
4. to study the results of the test.

4. Дайте краткие ответы на вопросы. Переведите их на русский язык.

EXAMPLE: - *Will you be working in the workshop in half an hour?*
- Yes, I will. / No, I won't.

1. Will you be controlling the indications of a multimeter in half an hour?
2. Will you be testing a manometer tomorrow?
3. Will Julia be drawing shapes at 2 o'clock tomorrow?
4. Will your groupmates be experimenting with new devices at *5* tomorrow?

5. Составьте предложения по образцу и переведите их на русский язык.

EXAMPLE: *to study the properties of alloys*
A: What will you be doing in half an hour?
B: I'll be studying the properties of alloys.

1. to measure electrical units with a multimeter;
2. to decrease the voltage in the electrical chain;

3. to study electrical devices; to study the properties of conductors.

6. Сделайте данные предложения противоположными по смыслу и переведите их на русский язык.

1. The professor will be reporting the results of the tests at the class tomorrow.
2. My groupmates weren't increasing the voltage in the electrical chain in the lab.
3. They won't be studying any electrical instruments.
4. I was checking the battery at *5* o'clock on Thursday.

7. Для каждого слова в А найдите подходящий вариант перевода в В.

A	**B**		
1. to carry out	a) to wear	b) to perform	c) to move
2. to operate	a) to investigate	b) to charge	c) to work
3. to apply	a) to use	b) to choose	c) to accelerate
4. to observe	a) to determine	b) to watch	c) to calculate
5. to compile	a) to label	b) to make	c) to increase

8. Прочитайте текст и переведите на русский язык. Ответьте на вопросы.

l. What were the girls doing in the lab?
2. Were they using a multimeter or a tachometer?
3. What is a multimeter used for?
4. What are the main parts of a multimeter?
5. What are the students going to do next time?

Yesterday from 4 till 6 o'clock Nataly and Alice were working in the laboratory. They were studying different electrical devices and instruments. One of them, a multimeter, was on their demonstration table all the time. The multimeter is used for measuring three types of electrical units, namely: voltage, resistance and current. This device has several scales, a needle, a function selector switch, two leads, a crocodile clip and a probe. Then the girls were measuring the value of the resistance. Alice was using two small crocodile clips to make a good connection between the meter and the resistor. While she was connecting the two leads to the resistor, Nataly was turning the switch to the resistance range. The needle was indicating the value of the resistance on the ohms scale. Next time they are going to measure the current. They will be using the same multimeter.

9. Прочитайте текст и переведите его на русский язык.

The amount of electricity which is flowing (it is called the current) is measured in units called amps. The pressure of electricity, the voltage, is measured in volts. A unit of resistance is called an ohm. Current, voltage and resistance have a definite

relationship to one another. The current and the voltage determine the power, the rate at which electrical energy is used. A unit of power is a watt. In System International (SI) there are seven base units. They are the following:
- the metre (m) as the unit of length;
- the kilogram (kg) as the unit of mass;
- the second (s) as the unit of time;
- the ampere (A) as the unit of electric current;
- the kelvin (K) as the unit of (thermodynamic) temperature difference;
- the mole (mol) as the unit of substance;
- the candela (cd) as the unit of luminous intensity.

All other SI *units are derived from* the seven base units. They are the joule, the watt, the pascal, the newton and, the unit of charge, the coulomb.

10. Прочитайте и переведите текст на русский язык.

The students of the Technical University were carrying out an experiment with a multimeter in the lab last week. They were checking a mains socket in the wall and they were following all the safety instructions. Paul was using two probes that time. While he was inserting them into two terminals of the socket, his groupmate Alex was turning the function selector switch to the VAC (voltage alternating current) range. The needle was indicating the pressure of electricity, i.e., the voltage in the mains. Everybody was watching the indications on the volts scale. It was 220 volts. Next time they are planning to measure the current in a table lamp.

UNIT 3 COMPUTING

SECTION A. COMPUTER BASICS

Grammar: Present Simple (Active)

1. Образуйте существительные от данных глаголов.

to decide -	to add -
to instruct -	to operate-
to inform-	to multiply-
to divide-	to subtract -
to employ-	to perform-

2. Найдите для слов в А синоним в В.

A	**B**		
1. to supply	a) to process	b) to give	c) to accept
2.to employ	a) to define	b) to operate	c) to use
3.to store	a) to keep	b) to perform	c) to carry out
4.network	a) task	b) web	c) circuit
5.to embrace	a) to include	b) to solve	c) to communicate

3. Составьте предложения по образцу и переведите их на русский язык.

EXAMPLE 1: a. Michael and Ann seldom leave the work half done.
b. Paul always leaves the work half done.
c. I ...

How often do you ...	Michael and Ann	Paul	You
1. leave the work half done	seldom	always	?
2. employ minicomputers	frequently	sometimes	?
3. attend classes in programming	usually	seldom	?
4. compile computer programmes	often	never	?
5. use the Internet	every day	rarely	?
6. work at the Internet centre	regularly	once a month	?

EXAMPLE 2: a. Michael and Ann don't test computer programmes every day.
b. Paul doesn't test computer programmes every day.
c. I …

What do you do every day?	Michael and Ann	Paul	You
1. test computer programmes	-	-	?
2. solve different problems	+	-	?
3. study different programming languages	+	+	?
4. perform arithmetic operations	-	+	?
5. work on computer	-	_	?

4. Сделайте данные предложения противоположными по смыслу и переведите их на русский язык.

1. The computer doesn't usually make different types of decisions.
2. The computer stores information in its ‘memory’.
3. The new calculating machine does many kinds of calculations.
4. Modern personal computers don't perform work at high speeds.
5. The electronic machines receive and store information.

5. Составьте вопросы по образцу и дайте краткие ответы. Переведите предложения на русский язык.

EXAMPLE 1: *to prepare computer programmes*
Do you prepare computer programmes?
Yes, I do. / No, I don’t.

1. to work at the computer;
2. to perform arithmetic operations;
3. to print information on paper;
4. to solve different problems

EXAMPLE 2: *to carry out logical operations*
Does the computer usually carry out logical operations?
Yes, it does. / No, it doesn't.

1. to process information;
2. to increase the labour force;
3. to do the work at high speeds
4. to replace people in dull tasks

6. Для каждого компонента подберите соответствующую функцию. Переведите предложения на русский язык.

A component	A function
1. storage device	a. displays the processed data
2. input device	b. holds the programmes and data, which the processor uses
3. output device	c. does all the processing and controls the peripherals
4. main memory	d. provides permanent storage
5. processor	e. entets data

7. Прочитайте текст и переведите его на русский язык.

Computers are electronic machines. They communicate with the user, perform different kinds of arithmetic operations, such as addition, subtraction, division and multiplication, solve a series of logical problems and make thousands of logical decisions. Modern computers operate quickly and accurately. Every computer consists of software and hardware. Information in the form of programmes and data is called software, but the pieces of equipment that make up the computer system are known as hardware. The most important item of hardware is the CPU (Central Processing Unit). This is the electronic unit at the centre of the computer system. The brain of the computer is the processor. It does all the processing and controls all the devices in the computer system. The main memory stores all the programmes and data used by the processor. All the other devices in the computer system are known as peripherals. They include input devices, output devices and storage devices. An input device supplies information into the computer. The most commonly used input device is a keyboard. An output device such as a monitor or a printer displays the processed data. There are two types of storage devices used with computers: a primary storage device, such as

RAM, and a secondary storage device, such as a hard drive. Secondary storage can be removable, internal or external.

Computer is a complex electronic machine. Its basic job is the processing of information. For this reason, computers are known as devices, which accept two kinds of information in the form of instructions. The former is called programmes and the latter is known as data.

A modern computer today performs millions of logical operations and it doesn't get tired. Sometimes it seems that computer operates like a mechanical "brain". However, it cannot do anything unless a person tells it what to do and gives it the appropriate information. Computers replace people in dull, routine tasks, but they cannot replace human beings in every sphere of life. Nowadays scientists are trying to devise the 'Intelligent Computer'.

8. Прочитайте текст и переведите его на русский язык.

The Internet

The Internet is a global computer network that embraces millions of users all over the world. It dates back to 1969 when it began as a military experiment. Information that people send over the Internet takes the shortest path available from one computer to another. Because of this, any two computers on the Internet stay in touch with each other as long as there is a single route between them. This technology is called packet switching network. Owing to this technology, if some computers on the network fail, the information just routes around them.

One of the most popular Internet services is e-mail. Most of the people, who have access to the Internet, use the network only for sending and receiving e-mail messages.

However, some problems remain. The most important is security. When you send an e-mail message to somebody, this message travels through many different networks and computers. Special computers that are called routers direct the data towards its destination. That is why it becomes possible to get into any of computers along the route and even change the data that we send over the Internet. This happens because the Internet transmits nearly all the information, which we send without any form of encoding.

SECTION B. FROM THE HISTORY OF COMPUTERS

Grammar: Past, Future Simple Active

1. Назовите Past Simple данных глаголов.

to break	to understand	to change
to compile	to express	to be
to try	to break	to give
to read	to perform	to process
to think	to take	to drive
to find	to write	to know

2. Заполните пропуски данными глаголами в Past Simple. Переведите предложения на русский язык.

test read understand study solve

1. Andrew *compiled* a new programme yesterday.
2. I ... a book on the history of computers a week ago.
3. The students ... a calculating machine at the laboratory class last month.
4. All the students ... the basic concepts in computer science.
5. Julia ... a complicated problem at the lesson of Mathematics.
6. We ... scientific application of computers last week.

3. Поставьте глагол в отрицательной форме. Переведите предложения на русский язык.

1. The computer processed a lot of information.
2. First computers solved problems slower than a human being.
3. The computer changed my lifestyle to a great extent.
4. Mechanical devices increased labour productivity in industry.
5. The new computer stored data with high accuracy.

4. Составьте предложения по образцу и переведите их на русский язык.

EXAMPLE: *to work on computer/yesterday*
I worked on computer at the computer yesterday.

1. to study different kinds of computers	*yesterday*
2. to calculate complex mathematical equations	*last week (month)*
3. to study the advantages of minicomputers	*two days ago*
4. to prepare complicated programmes	*the day before yesterday*

5. Выберите правильную форму глагола и переведите предложения на русский язык.

1. The engineers *discussed /were discussing* new computer technology at 4 o'clock yesterday.
2. He *explained / was explaining* basic computer terms to us two days ago.
3. I was *testing /tested* a new device when you called me.

4. I was *writing down / wrote down* the results of the experiment from 9 to 10 a.m yesterday.
5. Helen *learned / was learning* two computer languages when she was studying at University.

6. Составьте предложения в утвердительной или отрицательной форме. Переведите на русский язык.

EXAMPLE: *The computer of the future will perform operations faster.*
The computer of the future will not (won't) be very big.

1. to change the conditions of our work to a great extent;
2. to differ from the computers in use today;
3. to use tiny integrated circuits;
4. to resemble a human being;
5. to replace a person in every sphere of life

7. Составьте вопросы и ответьте на них. Переведите на русский язык.

EXAMPLE: *to work on microcomputer*
- When will you work on microcomputer?
- I will work on microcomputer tomorrow.

1. to study the capabilities and limitations of a new computer	*tomorrow*
2. to discuss advantages and disadvantages of PC	*in a day (three days)*
3. to study the minicomputer technology	*the day after tomorrow*
4. to check the main components of computer	*next Monday (week, month)*

8. Исправьте ошибки в предложениях и переведите на русский язык.

1. I studied the capabilities of a new computer tomorrow.
2. The first-genration computers will come out in 1950.
3. The first calculating machine don't perform operations at high speeds.
4. Henry Briggs didn't invented calculus.
5. Soon a new generation of computers will appears.
6. The third-generation computers did appear in 1965.

9. Для каждого слова в А найдите подходящий вариант перевода в В.

A	**B**		
1. изобретать	a) to reduce	b) to invent	c) to employ
2. считать	a) to count	b) to operate	c) to communicate
3. продолжать	a) to produce	b) to embrace	c) to go on
4. разрабатывать	a) to work	b) to devise	c) to divide
5. много	a) a great deal of	b) a few	c) several
6. зависеть	a) to reduce	b) to define	c) to depend
7. счёты	a) counter	b) abacus	c) device

10. Прочитайте текст и переведите его на русский язык.

History of Computer Systems

The very first calculating device was the ten fingers of a man's hand. This, in fact, is why today we still count in tens and multiples of tens. Then people invented the abacus (счеты), a bead frame in which the beads move from left to right. People went on using some form of abacus well into the 16th century, and it is used in some parts of the world because it's not necessary to know how to read in order to use it.

During the 17th and 18th centuries, many people tried to find easy ways of calculating. The French scientist Blaise Pascal invented the first adding machine in 1642. His machine was mechanical in nature and it used gears to store numbers. John Napier, a Scotsman, devised a mechanical way of multiplying and dividing. He also produced the first logarithms. All mathematicians today use logarithm tables. Leibnitz, a German mathematician, developed the binary system of mathematics in the 1600s. Binary mathematics uses only the 0 and the 1 and arranges them to represent all numbers.

The first real calculating machine appeared in 1820 as the result of several people's experiments. This type of machine, which saved a great deal of time and reduced the possibility of mistakes, depended on a series of gear wheels and used "punched cards" (перфокарты). In 1830 Charles Babbage, an Englishman, began to design a machine that was later called the "Analitical Engine". Babbage showed this machine at the Paris Exhibition in 1855. It contained all of the basic elements of an automatic computer – storage, working memory and input device. Many of his ideas were the basis for building today's computers.

11. Прочитайте текст и переведите его на русский язык.

Let's have a look at the history of computers. The first general-purpose electronic digital computer came out in the USA in 1946. It was called ENIAC (Electronic Numerical Integrator And Computer). ENIAC contained about 18,000 vacuum tubes, weighed more than 30 tons, occupied more than 1,500 square feet of floor space, and consumed 150 kilowatts of electricity during operation. The first-generation computer performed about 5,000 additions and 1,000 multiplications per second and was slow in

comparison with modern machines. In the late 1950s the second generation of computers appeared and these performed work ten times faster than the first computers. The reason for this extra speed was the use of transistors instead of vacuum tubes. The third-generation computers appeared in 1965. They performed a million calculations per second, which was 1,000 times as many as first-generation computers. Now tiny integrated circuits controlled computers.

By the late 1960s many large businesses depended on computers. Many companies linked their computers into networks and that made it possible for different offices to share information. During this time computer technology improved rapidly. In the 1970s there appeared a microprocessor. And in 1975 American engineers devised the first personal computer, Altair. Millions of individuals, families and schools began to use PCs.

Present-day computers complete millions of instructions per second. Some experts predict that a new generation of intelligent machines will process data with the help of beams of laser light, rather than electric current. They say that these computers will store data on individual molecules and that virtual reality will play a large role in education.

UNIT 4 ROBOTICS

SECTION A. ROBOTS COMPONENTS

Grammar: Present Perfect (Active)

1. Поставьте в Participle II следующие глаголы.

Go, learn, apply, know, make, begin, become, put, study, choose, pay, drive, bring, throw, cut, build, invent, find

2. Составьте предложения по образцу, используя Present Perfect Active. Переведите на русский язык.

EXAMPLE: Professor Frolov works at the Technical University.
invent / a new calculating method / recently
He has invented a new calculating method recently.

1. Andrew is a student of Robot Engineering.
study / robot components / recently
2. Helen is at the laboratory class.
carry out / an experiment with a robot / just
3. Professor Kosov is a famous engineer.
develop / a new design of a robot / lately
4. Paul is checking robot components.
check /the robot programme /already

3. Сделайте данные предложения противоположными по смыслу. Переведите на русский язык.

1. Scientists haven't made any important developments in technology over the last 10 years.
2. I have never been to the Museum of Technology in Amsterdam.
3. He has already studied robot history.
4. The laboratory has recently recieved a new model of a robot.

4. Составьте вопросы по образцу и дайте краткий ответ. Переведите на русский язык.

EXAMPLE: *to make a discovery- yet*
Have you made a discovery yet?
Yes, I (we, they) have. / No, I (we, they) haven't.

1. to develop a new technology - *just*
2. to design a modern robot - *recently*
3. to invent a new robot component - *yet*
4. to learn about robot's abilities - *this week*
5. to visit the exhibition of new robots - *lately*

5. Выберите правильную форму глагола, переведите на русский язык.

1. A group of engineers *has applied / applied* the new technology recently.
2. When *did you change / have you changed* the robot programme?
3. I have *never tested / never tested* the new equipment.
4. *Did you ever study / Have you ever studied* the robot history?
5. Andrew *has changed /changed* the robot application two days ago.

6. Исправьте ошибки в предложениях и переведите на русский язык.

1. The design and materials for robots has changed over the years.
2. Professor Levashov developed new moving devices lately.
3. I know Dr. Kosov from the Department of Mechanical Engineering since 1999.
4. Did you have carried out your research work yet?
5. Michal not has checked the programme.

7. Для каждого слова в А найдите подходящий вариант перевода в В.

A	**B**		
1. улучшение	a) advantage	b) advance	c) spring
2. важный	a) capable	b) available	c) essential
3. пружина	a) spring	b) capacity	c) actuator
4. даже	a) although	b) even	c) recently
5. растягивать	a) to straighten	b) to extend	c) to cause
6. приводить в действие	a) to manipulate	b) to switch on	c) to actuate

8. Прочитайте текст и переведите его на русский язык.

Although the development of robots seems a very modern idea, the principles behind this new technology were known thousands of years ago. Even ancient Greeks and Romans used mechanical cogs and gears which are now an essential part of robot technology. In the Middle Ages there was a real breakthrough in the development of robot engineering. At the end of the 17th century engineers already knew about most of the mechanical components that make up a modern robot.

Throughout history inventors have produced mechanical devices capable of quite life-like actions. These devices were simply performing a set of operations. Different scientists and engineers have applied many advances in this field since that time.

Today's robot is a very complex structure. A metal or plastic frame serves for a skeleton, and a variety of actuators provide muscle power. But the new humanoids are not just bodies; they are also sophisticated sensing machines with cameras, microphones, even specific sensors that imitate the sense of touch. And then there are the brains. Nowadays scientists haven't yet created such a robot that can think. But who knows, maybe in the future it will not only resemble a human being in appearance but will also have the capacity to think and feel.

9. Обратите внимание на новые слова.

shake, *v*	трясти, пожимать
shake hands with smb	пожать руку кому-либо
clamp, *n*	зажим, захват
jaw, *n*	тиски
rigid, *adj*	неподвижно закрепленный
ridged, *adj*	хребтообразный
deflect, *v*	прогибать(-ся), сгибать(-ся), отклонять(-ся)
grip, *v*	хватать, сжимать, брать
trunk, *n*	хобот
hose, *n*	шланг

10. Прочитайте текст и перведите его на русский язык.

Shake Hands with a Robot

Shake hands with Vorscht - that's what engineers at University in Edinburgh are saying. Recently they have devised this brand new robot. Vorscht's hand-shake is not the metallic, jaw-like clamp of the robots that are used on production lines in industry. It's asofter, gentler grasp, like gripping the trunk of an elephant, or even shaking hands with another person.

Take a rigid plastic tube, rather like a vacuum cleaner hose. Close one end, and blow air in the other. The tube stretches slightly. The increased pressure inside the tube causes it to extend. Take three of these tubes and mount them side by side to form an assembly called an actuator. Increase the pressure in two of the tubes, and the actuator bends. Reduce the pressure and it straightens up again. That's how the fingers on Vorscht's hands bend when they grip your hand.

An individual element is a plastic tube with ridged sides, like bellows. Increasing the pressure inside the tube causes it to extend. The sides of the tube are like a spring – reduce the pressure and it springs back to its original length. This occurs because of the elasticity of the material, like that of an elastic band.

With two elements, the actuator can move from side to side. Greater pressure in element 1 makes it bend to the right. This is called bending in a plane.

With three elements, the actuator can be made to bend in any direction. The greater the differences in pressure, the more the tip of the actuator is deflected.

11. Верны или нет данные утверждения?

1. Vorscht is the name of the company that produces robots.
2. The ridged plastic tubes that the robot consists of look like a vacuum cleaner hose.
3. When you increase pressure inside a ridged tube the tube springs back to its original length.
4. The tubes are made of elastic material.
5. When an actuator consists of three tubes it can't bend in any direction.

12. Прочитайте текст и перведите его на русский язык.

Man-made Man

In the past few years, we have seen important advances in computer science, biomechanics and material science, which have caused great changes in robot engineering.

Today a robot is not just a metal structure. It is already capable of expressing different emotions and imitating simple operations. Engineers and scientists have written a lot of complicated programmes for robots but it is still very difficult to make a thinking machine. Chess, for example, involves a great deal of human brainpower, but for robots playing chess is a simpler task than, say, making soup. A chess player

needs only information and logic but what about making soup? You cut some vegetables, boil some bones, add some spices. But what vegetables and how many? How to distinguish potatoes from chicken? And, by the way, whose bones to put? And how can a robot possibly add salt with no sense of what "saltness" means?

So you see that in order to have human-like machines that will work in real-world situations scientists still have a lot of work to do.

SECTION B. ROBOTS IN OPERATION

Grammar: Past and Future Perfect (Active)

1. Дополните предложения, используя глаголы в скобках. Переведите предложения на русский язык.

EXAMPLE: Alex had prepared everything for the experiment by the beginning of the lesson. *(to prepare)*

1. I ... the switches on the control panel when the Instructor came. *(to check).*
2. The students ... a series of exercises by the end of the week. *(to perform).*
3. Paul ... the necessary measuring devices before the classes began. *(to prepare).*
4. The scientist ... already ... a new model of a robot before he became famous. *(to develop).*

2. Составьте вопросы по образцу и дайте краткий ответ. Переведите на русский язык.

EXAMPLE 1: *to prepare everything by 5 o'clock*
Had you prepared everything by *5* o'clock yesterday?
Yes, I had. /No, I hadn't.

1. to develop a pew robot power system	*by that time*
2. to invent a new gripping device	*by the end of the week*
3. to widen the robot's abilities	*by 8 o'clock yesterday*

EXAMPLE 2: *to finish one's work by 5 o'clock*
Will you have finished your work by *5* o'clock?
Yes, I will/No, I won't.

1. to mount a new gripping device	*by 4 o'clock*
2. to finish the test with a new robot	*by that time*
3. to develop a new type of an actuator	*by the end of the month*

3. Поставьте предложения в отрицательной форме. Переведите на русский язык.

1. The students of our department will have passed all the exams by the end of May.
2. When the teacher entered the lab the mobile robot had already performed many different tasks.
3. When you come to me I will have already finished testing a new industrial robot.
4. My assistant had done all the preparatory work by the time I came to the lab.

4. Исправьте ошибки и переведите предложения на русский язык.

1. My brother had never study robot engineering before.
2. The teacher will has explain the new material by the time you come to the lecture.
3. People invented mechanical devices long before the first robot was designed.
4. The students didn't have finished the experiment by the end of the lecture.

5. Подберите правильный перевод.

1. research	a) движение
2. effector	b) возможность
3. force	c) оборудование
4. pressure	d) исследование
5. motion	e) опасный
6. equipment	f) давление
7. possibility	g) исполнительный орган
8. hazardous	h) сила

6. Прочитайте текст и переведите на русский язык.

Man widened his possibilities and relieved himself from monotonous and hazardous tasks after he had invented the robot. Nowadays there's an endless variety of robots in the size, shape and jobs they perform. Scientists and engineers devise robots both for industry and homes. Some of the robots are experimental and look more like living creatures. Many people are working today in the field of robotics and they are trying to find new applications for robots in the future.

Now let's have a look at some students of the Technical University that study Robotics. Yesterday they saw a robot in operation. They had never seen a robot before. After the operator had pushed some buttons the robot began to perform a sequence of operations. By the time the manipulator performed some actions, feedback devices had provided the necessary information about the robot's motions and positions.

The control system directed the manipulator's actions. After the manipulator had completed all the operations, it put all the workpieces into storage. With the help of a gripping device, the robot operated very accurately and precisely. When the robot

completed all the actions the operator switched it off. By the end of the term the students will have learned everything about robot design. i.e. the body structure, the power system, the control system and various sensors, actuators and manipulators.

7. Прочитайте текст и переведите на русский язык.

When engineers devised a steam engine in the 18th century, some people said that they had already invented everything possible. However, our mankind has produced a great number of other inventions since that time. Robots are one of them.

Nowadays people use 90% of robots for heavy, repetitive manufacturing work. These robots handle tasks that are difficult, dangerous or boring to human beings.

The most common manufacturing robot is the robotic arm. It typically consists of seven metal segments. Tiny motors or actuators put them into operation when a special computer gives them certain instructions.

An industrial robotic arm with six joints closely resembles a human arm - it has the equivalent of a shoulder, an elbow and a wrist. This type of robot has six degrees of freedom, i.e. it can turn in six different ways. A human arm, by comparison, has seven degrees of freedom. Your arm moves your hand from place to place. Similarly, the robotic arm moves an end effector from place to place. You can supply robotic arms with all sorts of end effectors, which will perform a certain task, for example it will grasp and carry different objects. Robotic hands often have built-in pressure sensors that tell the computer how hard the robot is gripping a particular object. That's why the robot doesn't drop or break whatever it's carrying. Robots do their work more efficiently than human beings because they are so precise. They always drill in the exactly the same place, and they always tighten bolts with the same amount of force, no matter how many hours they've been in operation.

Different companies all over the world are trying to improve robots. The engineers and scientists at the Technical University in Eindhoven reported that they had created a new mobile robot. Let's have a look at their "beautiful creature".

Hydraulic pistons move the robot legs back and forth. The pistons are attached to different leg segments just like muscles are attached to different bones. Engineers said it had been really difficult to make all these pistons work together properly. The robot figures out the right combination of piston movements in walking and it programs this information into the robot's computer. This mobile robot has a built-in balance system that tells the computer when it needs to correct its movements.

The engineers from this university are working at another type of a mobile robot now and they will have built a more stable robot walker by the end of the year. It will have six legs like insects because of their exceptionally good balance and the ability to adapt well to a wide variety of unfamiliar environments.

UNIT 5 AUTOMOTIVE ENGINEERING

SECTION A. SOME CAR SYSTEMS

Grammar: Present Simple Passive

1. Преобразуйте по образцу предложения в Present Simple Passive. Переведите на русский язык.

EXAMPLE: *We obtain petrol from petroleum.*
Petrol is obtained from petroleum.

1. The engine produces power.
2. We usually use oil in different branches of industry.
3. The engineer controls the fuel systems.
4. Nowadays they make pistons from plastics.

2. Сделайте предложения противоположными по смыслу и переведите их на русский язык.

1. This mechanism is used in the engine.
2. Power is not produced by the engine.
3. Fuel is burnt in the engine to produce power.
4. Fuel and air are not mixed in the carburettor.

3. Выберите правильную форму глагола и переведите предложения на русский язык.

1. This data is *calculated / calculates* by that electronic device.
2. Students *are always solved / always solve* complicated problems with the help of logarithm tables.
3. Our workshops *are equipped / equip* with automatic machinery.
4. A robot *packs / is packed* the necessary instruments for the experiment.

4. Исправьте ошибки и переведите предложения на русский язык.

1. This car be powered by the energy of the Sun.
2. Machines are not maked of wood.
3. This car are equipped with the experimental fuel system.
4. To this theory is often referred in scientific literature.
5. Is our engineer invite to the scientific conference in Denmark?
6. How different fuels to be produced?

5. Подберите подходящий вариант перевода.

1. steering	a. привод
2. accelerator	b. двигатель внутреннего сгорания
3. advantage	c. независимая подвеска
4. independent suspension	d. бак
5. internal combustion engine	e. топливная система
6. drive	f. педаль газа
7. fuel system	g. рулевое управление
8. tank	h. достоинство

6. Прочитайте текст и переведите его на русский язык.

A motor vehicle is a complex engineering construction. It is composed of several thousand parts. The smaller parts are joined together and form larger components, or units. One of the main components of any vehicle is the engine.

In addition to the engine itself, there are four separate mechanisms, which are used to feed the engine. These mechanisms are the fuel system, the lubrication system, the electrical system and the cooling system.

The fuel system is a separate mechanism that is used for feeding the engine. The fuel system consists of a tank, a fuel line or a pipe, a pump and a carburettor. The engine produces power when air and fuel are mixed and burnt.

So let's have a look at the fuel system operation. The fuel is stored in a fuel tank. The fuel tank is connected to a fuel pipe. The fuel pipe carries the fuel to the fuel pump. This pump can be either electric or mechanic in operation. Electric pumps are generally situated near the fuel tank whereas a mechanical pump is generally located beside the engine. It is driven by the camshaft. The fuel pump is connected to the carburettor. In the carburettor the fuel is mixed with air. It is important to have the right ratio of air to fuel. For example, the optimum ratio of air to petrol in the fuel mixture is 15 parts of air to 1 part of petrol. The fuel and the air are drawn into the combustion chamber, where they arc compressed by the piston. In the engine the fuel and air are burnt and they produce power.

7. Переведите на русский язык.

the automatic vehicle control
the microprocessor controller
the sensor information
the drive subsystem
the steering wheel
the steering device
the wheel motion system

8. Прочитайте текст и перведите его на русский язык.

The basic elements that control vehicle motion have changed little in their concept over the past few decades. Vehicles are still driven by an internal combustion engine, steering is achieved by driving a mechanical gear and brakes are actuated by physically pumping hydraulic pistons. All these actions are carried out by the driver.

The status quo is ready for change. Under development are fast-reacting, intelligent systems that increase the possibility of automatic vehicle control. In such vehicles the steering, accelerator and brake devices are connected to a sensor that monitors their position. The sensor passes this information as an electrical signal to the microprocessor controller.

The sensor information is processed and the actions for the steering, brakes and drive subsystems are calculated.

The automotive chassis differs from a conventional chassis as motion of each wheel is achieved by independent suspension, drive, brake and steering. The main control unit receives electrical signals from the steering wheel and pedals, and produces electrical signals that actuate the wheel motion systems.

In this design there is a possibility to modify the steering, brake and accelerator device. All these could be integrated into a single joystick. This possibility is a major advantage when we want to modify cars for the physically disabled.

9. Прочитайте текст и перведите его на русский язык.

A driver's response time is very slow in comparison to that of electronic systems. A quick human response is around 0.5 seconds, and some responses are as slow as 1 to 2 seconds. Let's consider a driver who is travelling at 40 mph and has a response time of 1 second. A simple calculation (distance = speed x time) shows that the car will travel 17.9 m before the vehicle motion is changed. In comparison, electronic systems operate at a tenth of a second and have the potential to operate in milliseconds. In severe maneuvers, the car stability is increased by this quicker response and people's life is saved.

SECTION B. DESIGNING CARS

Grammar: Past, Future Simple (Passive)

1. Измените следующие предложения, используя Past and Future Simple Passive. Переведите на русский язык.

EXAMPLE 1: *I saw her in the workshop.*
She was seen in the workshop.

1. They sold the cars all over Europe.
2. They measured the temperature of water *5* minutes ago.

3. We repaired the car yesterday.
4. They used this fuel for different engines.

EXAMPLE 2: *They will solve the problem tomorrow.*
The problem will be solved tomorrow.

1. I will control the work of this device.
2. We will explain the work of the carburettor next time.
3. They will improve the car design.
4. The new device will reduce the time of the operation.

2. Составьте предложения по образцу и переведите их на русский язык.

EXAMPLE: *A: Did you repair this mechanism? (the mechanic)*
B: No, it was repaired by the mechanic.

1. Did you check this device? (the engineer)
2. Did you improve the work of the fuel pump? (the mechanic)
3. Did you control the cooling system? (the engineer).
4. Did you repair the car yourself? (the workers)

3. Эти предложения имею разную структуру, но одинаковый смысл. Измените структуру предложения так, чтобы смысл остался прежним. Переведите на русский язык.

EXAMPLE: *We listened to his lecture with great pleasure.*
His lecture was listened to with great pleasure.

1. We sent for the mechanic two hours ago.
2. People spoke much about the new invention.
3. We will take care of the new equipment.
4. Teachers will refer to the results of this experiment.
5. The Professor paid attention to the work of this student.

4. Исправьте ошибки и переведите предложения на русский язык.

1. An interesting problem will to be discussed at the lecture tomorrow.
2. All the work was did by automatic machinery.
3. The testing of a new vehicle will be not completed by the end of the week.
4. The electric lamp was invented with Yablochkov.
5. To the work of this engineer was paid attention.

5. Переведите предложения, обращая внимание на суффиксы прилагательных.

Noun + **-ful-** adjective *(наличие качества)*
Noun +**-less**- adjective *(отсутствие качества)*

1. use - польза	useful -	полезный
	useless -	бесполезный
2. power - мощь	powerless-	
	powerful-	
3. care- забота	careful-	
	careless-	
4. help - помощь	helpful-	
	helpless-	
5. hope- надежда	hopeful-	
	hopeless-	
6. colour - цвет	colourful-	
	colourless -	

6. Выберите правильное определение и переведите на русский язык.

1. to adjust	a) smth which is used to carry people or goods from one place to another
2. to arise	b) to regulate for proper use
3. to reduce	c) to start or originate
4. to detect	d) a public road that is wide, well-paved and direct
5. to respond	e) to react, to answer
6. highway	f) to make or become smaller or less
7. vehicle	g) to discover the presence

7. Прочитайте текст и переведите его на русский язык.

Mini motor cars are sold all over Europe. The first Mini was produced in Britain in 1959 and it has become Britain's most popular and successful car since that time.

In the late 1950s, BMC, the British Motor Corporation, wanted to build a car that was different from other cars. They wanted a small, cheap and economical car - a family car that was big enough to carry four passengers. In the 1950s it was a difficult problem. At that time a typical family car was quite long, about three and a half meters. It had large wheels and large space for the engine. So there wasn't much room for the passengers. Besides that, it was very expensive to make.

The Mini was designed by Alec lssigonis. His design was revolutionary. First, the car was made half a meter shorter. Next, the wheels were made much smaller and they

were put right at the four corners of the car. Then the engine was turned sideways and the gearbox was put underneath. And there was still enough room for four passengers.

Today nearly every small car is based on the design of the Mini. So why is the Mini so popular? The answer is simple: it is well designed, very economical, it is easy to drive around the city and easy to park!

8. Прочитайте текст и переведите его на русский язык.

What Is Mechatronics?

The word *mechatronics* was first used in 1969 to describe the integration of *precision mechanical engineeringl* with electronic and computer control systems in order to make intelligent machines. Scientists wanted to bring together branches of engineering that are normally studied in isolation, in the hope that the design solutions will benefit both electrical and mechanical disciplines.

The range of applications of mechatronics is enormous and includes domestic appliances, automated assembly lines, computer peripherals and so on. Some specialists predict that mechatronic systems will be widely used in cars of the future. Mechanical devices will be controlled by the computer systems and thus the car's stability will be increased. On the whole a car will become a more efficient means of transport. All the mechatronic systems will operate independently and will help the driver control the motion of the vehicle.

UNIT 6 ENGINEERING DESIGN

SECTION A. TRACTOR TECHNOLOGY

Grammar: Present Perfect (Passive)

1. Измените предложения, используя Present Perfect Passive. Переведите на русский язык.

EXAMPLE: *They have equipped Ford tractors with climate control filters.*
Ford tractors have been equipped with climate control filters.

1. They have already cleaned the oil filter.
2. You have repaired your tractor already.
3. The engineers have provided these tractors with new equipment.
4. They have modified shock absorbers.

2. Ответьте на вопросы. Переведите на русский язык.

EXAMPLE: *A: Has the application of filters been explained by the teacher?*
Yes, it has been explained already.
or No, it hasn't. It hasn't been explained yet.

1. Have the new trucks been chosen by the customers?
2. Has the air cleaner been widely used since its invention?
3. Have oil filters been improved during the field testing?
4. Have Ford tractors been trusted by many farmers?
5. Has the new tractor been equipped with climate control filters?

3. Выберите правильную форму глагола. Переведите предложения на русский язык.

1. They *(have already increased, have already been increased)* the efficiency of a new tractor.
2. The oil filters in this vehicle *(have replaced, have been replaced)* recently.
3. This engine *(has just been tested, has just tested)* by our mechanic.
4. New refinements *(have introduced, have been introduced)* into this type of tractors.
5. The engineers *(have manufactured, have been manufactured)* the new acoustic system.'

4. Исправьте ошибки и переведите предложения на русский язык.

1. The transmission control has been imrove recently.
2. All these machines have been maked of metal.
3. A new model of a tractor has be delivered to the farm.
4. The driver's seat has provided with different comfort adjustments.

5. **Выберите правильный перевод слова.**

1. environment 2. to supply 3. performance 4. efficient 5. to operate 6. purpose 7. quality	a) работать b) цель c) качество d) успех e) снабжать f) эксплуатационные качества g) окружающая среда

6. Прочитайте текст и переведите на русский язык.

Farming today demands constant gains in productivity. That's why the Ford Company research and improvement programmes never cease.

The Ford Company is known as a technologically advanced manufacturer of vehicles. For many years the Ford Company has been deeply involved in the manufacture of tractors, cars and trucks. Ford tractors enable farmers to work quickly and efficiently. The cab is a comfortable and efficient workplace. Modern acoustic

systems have greatly reduced noise levels inside the cab. Transmission controls have been mounted on the flat floor. The driver's seat has been equipped with pneumatic suspension and it turns easily and gives the driver a more comfortable view. Air filtration, efficient heating and ventilation with air-conditioning further enhance comfort and the driver's efficiency. There's more. Individually adjustable halogen work lights have been installed into the cab roof.

These tractors have also been equipped with climate control filters and anti-burst door locks. Ford tractors are famous for their unique combination of outstanding performance, high reliability and cost efficiency.

They have been continually improved since their introduction. Dozens of fea-tures and refinements have been added during recent years. Ford tractors have been trusted by generations of farmers due to their high quality.

7. Ответьте на вопросы.

1. Why do the Ford Company research and improvement programmes never cease?
2. What is the Ford Company famous for?
3. Ford tractors have everything to work quickly and efficiently, don't they?
4. What have these tractors been equipped with?
5. Why have Ford tractors been trusted by generations of farmers?

8. Заполните пропуски словами ниже. Переведите на русский язык.

The Ford Company produces not only cars, but also ... and .... Ford tractors are known all over the world for their high ... and ... and the Ford Company is always improving them. In a modern tractor you will see that ... controls have been mounted on the flat floor and six halogen work-lights have … into the cab…. Besides that, modern ... systems have greatly ... noise levels inside the cab. The tractors have also been ... with … filters and anti-burst ….

reliability	door locks	tractors	quality
been installed	trucks	equipped	transmission
acoustical	roof	climate control	reduced

9. **Прочитайте текст и переведите его на русский язык.**

Needless to say, one of the most important industrial achievements for farmers today is the introduction of agricultural tractors in their work. Horses and men have been almost entirely replaced by tractors in many heavy and time-consummg tasks that are carried out on the land. A tractor performs the work of numerous horses and, what is of greater importance, it doesn't need any rest in order to recover from fatigue. If necessary, attention is paid to its lubrication and it's constantly supplied with fuel, it will work on indefinitely. During the years since its introduction, a huge progress has

been made in developing a more efficient machine. Modern tractors have been constructed to meet all requirements of space, comfort, vision and safety. Many devices have been incorporated in the mechanisms of the tractor for this purpose. The 6-cylinder engines have been installed on them to improve productivity and reliability. Some tractors have been equipped with a hydraulic system, which gives the driver the choice of the right power for every operation.

Nowadays there exists a wide range of different types of tractors. Let's say, the most common type today is the general-purpose wheeled tractor that is used on most farms and has an engine of up to 100 hp. On the other hand, if you need to carry out heavy cultivation on farms, you can use either track-laying tractors with a large horse-power (up to 500 h.p.) or heavy-wheeled tractors. Most present-day tractors are powered by internal combustion engines, which operate on the same basic principles.

10. Верны ли следующие утверждения? Переведите предложения на русский язык.

1. The tractors are used instead of horses in many heavy tasks.
2. A tractor performs the work of one horse.
3. A tractor needs some time to recover from fatigue.
5. Nowadays there are two types of tractors: the general-purpose wheeled tractor and track-laying tractor.
6. The hydraulic system in the tractor enhances the driver's safety.

11. Прочитайте текст и переведите его на русский язык.

Minsk Tractor Works is the world's leading manufacturer of agricultural equipment. Since 1953 thousands of universal wheeled tractors under the manufacturer's brand "Belarus" have been produced. The well-known advantages of these tractors are their low fuel consumption, long service life, simplicity and convenience of maintenance. The modern tractors have been fitted with six-cylinder diesel engines. Thus, they can develop sufficient horsepower under most unfavourable conditions and show high efficiency. The nine-speed gearbox provides a wide range of speed for performance of all types of farm operations. A comfortable, safe and noise-proof cab provides excellent visibility and together with an adjustable soft seat, tinted glass, cab air filtering and a heating device ensures comfort for the driver throughout the whole working day. All the features of "Belarus" tractors meet international standard specifications.

SECTION B. MACHINERY ENGINEERING

Grammar: Past and Future Perfect (Passive)

1.В каждой строке найдите глагол в форме Perfect Passive.

a) are delivering	b) delivered	c) has been delivered
a) had received	b) is receiving	c) had been received
a) reduce	b) will have been reduced	c) will be reduced
a) will predict	b) had been predicted	c) had predicted
5. a) will be given	b) will have been given	c) are given
6. a) will have removed	b) was removed	c) had been removed
7. a) will have been adjusted	b) has adjusted	c) will have adjusted
8. a) had been repaired	b) will be repaired	c) was repaired

2. Измените предложения по образцу, используя Passive Voice. Переведите на русский язык.

EXAMPLE 1: *They had finished the experiment before the lesson was over.*
The experiment had been finished before the lesson was over.

1 He had completed the chemical reaction when the teacher came.
2. We had published the results of our work by the end of the year.
3. They had dried the sample before the experiment started.
4. They had begun the experiment before the assistant came.

EXAMPLE 2: *We will have published the article by the beginning of the conference.*
The article will have been published by the beginning of the conference.

1. By the end of the next month he will have repaired his car.
2. They will have brought the necessary tools by the beginning of the work.
3. We will have improved this tool by the end of the year.
4. They will have delivered new books to the library by the end of the week.

3. Составьте предложения и переведите их на русский язык.

EXAMPLE 1: *to perform a lot of different operations*
A lot of different operations had been performed by the end of the practice.
1. to study the operation of the milling machine;
2. to deliver a new model of a lathe;
3. to investigate the advantages of machine tools;
4. to obtain valuable practical experience.

EXAMPLE 2: *to write the course project*

The course project will have been written by the end of the year.

1. to carry out the research on machine tools;
2. to demonstrate the work of metal-cutting machines;
3. to perform various operations on the drilling machine;
4. to experiment with metal-forming machines.

4. Исправьте предложения и переведите их на русский язык.

1. New safety rules have been established by the end of the last year.
2. A new device will be designed by next week.
3. These new properties of the substance had predicted by the scientists before the experiment began.
4. The construction of the workshop will have be completed by next year.

5. Найдите слова, противоположные по значению и переведите их на русский язык.

1. hand tool	a. unimportant
2. advantage	b. automatic
3. accurate	c. single-purpose machine
4. give	d. disadvantage
5. important	e. inaccurate
6. multi-purpose machine	f. receive
7. manual	g. machine tool
8. simple	h. complex

6. Подберите определение к каждому слову и переведите на русский язык.

1. tool	a. to take away, to get rid of
2. workshop	b. a thing with the help of which an operation is carried out
3. to shape	c. to turn in a new direction
4. to cut	d. a room in which manufacture is carried out
5. to remove	e. to separate into slices or pieces
6. workpiece	f. to form, to make
7. to bend	g. a piece of metal/substance for work

7. Прочитайте текст и переведите его на русский язык.

Scientists consider that the oldest tools that are known to the mankind are 2,600,000 years old. They were used by people in manual operations and that is why they were called hand tools. By the beginning of the Industrial Revolution, people had

already devised simple hand tools for cutting and shaping different materials. But in the 18th century there appeared machine tools that made mass production a reality in the 19th century. A machine tool is a power-driven machine that is used to perform different operations with metal or other material. Basic machine tools use mechanical power to bend, cut, drill, grind and hammer metal into desired shapes. More advanced machine tools use such power sources as electrical or chemical energy, heat, magnetism and ultrasound.

Nowadays machine tools play an important role in the manufacture of almost all metal products. Machinists (people who operate machine tools) use them in making automobiles, radios, refrigerators, television sets and so on. Every mechanical engineering workshop is equipped with machine tools. They are the main source for the manufacture of component parts of all machines and mechanical devices.

There are about 500 kinds of machine tools. Some perform a single operation, such as grinding or drilling. Others, called machining centres, carry out several kinds of tasks. These numerous machine tool types fall into two categories. The first group is called ‘metal-cutting’. The machine tools of this group remove some material from the workpiece and they are much stronger than the workpiece itself. The examples of metal-cutting machines are lathes, drill presses, milling and shaping machines.

The second group is called ‘metal-forming’. They shape the workpiece without the removal of any material from it. For metal-forming operations we use a wide range of *forging machines* (ковочная машина), presses and *press brakes* (прессовые тормоза).

8. Верны ли следующие утверждения? Переведите на русский язык.

1. The first hand tool was used during the Industrial Revolution of the 18th century.
2. Machine tools never use such power sources as heat and chemical energy.
3. Machinists are the people who operate machine tools.
4. Machining centres perform a single operation, for example, drilling.
5. A lathe is an example of metal-forming machines.
6. The machine tools of the first group remove some material from the workpiece.

9. Прочитайте текст и переведите его на русский язык.

In 1775 John Wilkinson, an English ironmaker, invented the first modern machine tool. It was a boring machine that enabled the workers to drill precise holes in metal. By the middle of the 20th century some machine tools had been linked together in series for use in mass production. And in the 1950s the first machines with numerical control were introduced.

Numerical control, commonly called NC, is a system of automating machine tools. Let's have a look at some examples ofNC systems application. The system known as computer numerical control (CNC) has a number of machine tools, each of which is directed by its own computer. So when you want to adapt a CNC machine tool to a

different job you just change the control programme, or software of the computer. They are very easy in operation, their programming is simple and you can always test it. Moreover, they are cheaper to maintain and are generally more accurate in comparison with standard machine tools. CNC systems are used with a wide range of machine tools such as milling machines and lathes. Many are equipped with graphic displays that show the shapes of the workpiece and can even produce three-dimensional views of the components.

When several CNC machine tools receive instructions from a large central computer that stores and processes operational procedures, we can speak about a direct numerical control (DNC). This single computer controls more than 100 machine tools. A further development in the automation of machine tools is the "machining centre". This machine has automatic tool changers and performs a lot of machining operations on a workpiece with the help of more than 100 different cutting tools. One machining centre can do the work of eight or more standard machines. They are particularly useful when you need to produce large and complex components with the high degree of accuracy.

10. Верны ли следующие утверждения? Переведите предложения на русский язык.

1. John Wilkinson invented the first modern NC machine tool.
2. Nowadays NC systems are hardly ever used in industry.
3. CNC machine tools are more accurate in comparison with standard machine tools.
4. One machining centre may perform the work of 100 standard machines.
5. If a worker wants to produce a complex component with high degree of accuracy he should use one of the NC machine tools.

11. Заполните пропуски подходящими по смыслу словами. Переведите на русский язык.

1. Automation of machine tools began in the 20th century. In the 1950s the first machines with ... were ....
2. Numerical ... is a system of automating machine ....
3. Computer ... control mahine tool is directed by a ....
4. CNC machines are easy in ... and they are ... to maintain.
5. In ... system a single computer may ... more than 100 machine tools.
6. Machining centres may ... a lot of machining ... on a ... at a time. One machining centre may do the work of eight ... machines.
7. ... NC systems have ... advantages.

computer	in general	introduced	tools	perform
a lot of	numerical control	operation	numerical	operations
control	direct numerical control	standard	cheaper	workpiece

12. Прочитайте текст и переведите на русский язык.

By the beginning of the new millenium a great number of complex machine tools had been designed to speed up production. Although these tools include features of the basic machine tools and perform the same operations, they incorporate design modifications that let them perform complex operational sequences quicker. Furthermore, after the production machine has been set up by a skilled worker or machinist, a less skilled operator also can produce parts accurately and quickly.

There's one more improvement that had already been incorporated in machine tools by the 21st century. This is a highly automated machining system, called adaptive control that involves the use of a microprocessor. A microprocessor is a tiny electronic device that performs the work of computer. The microprocessor regulates variables in the machining process such as the speed of the spindle. That makes the process very efficient. It also receives information from sensors that measure force, temperature, and other variables. It uses the information to operate the system at the level that is safe for the machine tool and the workpiece. Specialists predict that by the year 2015 all major industrial works in Belarus will have been equipped with such machining centres.

UNIT 7 MATERIAL SCIENCE

SECTION A. COPPER

Grammar: Modal Verbs "can, could, be able to"

1. Составьте предложения по образцу. Переведите на русский язык.

EXAMPLE: I *can't use* the new apparatus now but I <u>*could use*</u> it yestrday at the lesson.

1. He can't do research on copper alloys this term but he ... it last term.
2. We can't compare the properties of these substances now but we ... them during our previous experiment.
3. We can't extract copper with the help of stone and bone tools but ancient people ... it in this way thousands of years ago.
4. I can't describe the results of his experiment today but he ... them yesterday.

2. Составьте предложения в прошедшем и будущем времени. Переведите на русский язык.

EXAMPLE: He can drive well.
He could drive well 10 years ago.
He will be able *to* drive well in a month.

1. He can continue his studies at the Mechanical Engineering faculty.
2. Our engineers can extract copper in several ways.
3. I can visit the Bingham Canyon copper mine.
4. This new car can move without a driver.

3. Составьте вопросы по образцу, дайте на них краткий ответ. Преведте на русский язык.

EXAMPLE: *copper* / *to be alloyed with iron*
Can copper be alloyed with iron?
Yes, it can. / No, it can't.

1. a ductile metal / to be worked into a new shape
2. copper / to be used as a conductor of electricity
3. tin /to be alloyed with copper
4. brass /to be used in bearings and gears

4. Исправьте ошибки, переведите предложения на русский язык.

1. We didn't can work in the laboratory on Sunday.
2. He could to use the old equipment in his experiment.
3. You will able to cut soft metal with greater speed than hard metal.
4. Can this technology to make the extraction of copper easier?

5. Подберите правильный вариант перевода.

1.оценивать	a. qualities
2.извлекать	b. conductor
3.проводник	c. purpose
4.домашний	d. to extract
5.вязкий (эластичный)	e. ductile
6.нержавеющий	f. domestic
7. качества	g. to estimate
8.цель	h. corrosion resistant

6. Прочитайте текст и переведите его на русский язык.

Copper is man's oldest metal as people could extract it more than 10,000 years ago. As it is rather soft and ductile, copper is alloyed with other elements. There is evidence that the first copper alloy - bronze (90% copper, 10% tin) - was produced around 2800 BC in countries such as India, Egypt and Mesopotamia. Bronze was harder and could be used for making reliable cutting tools. Its use characterizes the Bronze Age.

The workability and the ability for corrosion resistance made copper, bronze and brass the most important functional as well as decorative materials from the Middle Ages and on till the present day. With the beginning of the Electrical Age the demand for copper increased tremendously because it is an unusually good conductor of electricity and heat. Today more than 5 million tons of copper are produced annually and the copper metals are playing an increasingly vital part in all branches of modern technology.

The good news is that we will not run out of copper. The worldwide resources of this important and valuable metal can be estimated at nearly 5.8 trillion pounds of which only about 0. 7 trillion (12%) have been mined throughout history. Besides, nearly all of 700 billion pounds is still in circulation because copper's recycling rate is higher than that of any other engineering metal. Each year nearly as much copper is recovered from recycled material as is obtained from newly mined ore. Almost half of all recycled copper scrap is old post-consumer scrap, such as discarded electric cable, junked automobile radiators and air conditioners, or even ancient Egyptian plumbing The remainder is new scrap, such as chips and turnings from screw machine production. Engineers hope that we will be able to use copper for centuries on.

7. Ответьте на вопросы.

1. Is copper the oldest metal that is known to man?
2. What properties does copper possess?
3. What is bronze?
4. When, where and why did bronze appear?
5. What are the applications of copper and its alloys?
6. Why aren't we afraid of working out the resources of copper?

8. Верны ли утверждения? Переведите на русский язык.

1. Copper was extracted by man more than 10,000 years ago.
2. Copper alloys appeared because there was the shortage of pure copper.
3. Copper metals are important functional and decorative materials today.
4. In the 19th century the demand for copper greatly decreased.
5. The resources of copper will be worked out in the near future.
6. If Egyptian plumbing is recycled a lot of copper can be obtained.

9. Переведите слова.

weathering, *n*	nuclear, *adj*
clad, *v*	nonsparking, *adj*
serviceable, *adj*	explosion, *n*
cookware, *n*	remain, *v*
jet plane, *n*	undamaged, *adj*

10. Прочитайте текст и переведите его на русский язык.

Do you know that ..

- copper is essential to our health as an important constituent of skin, bones and blood. It is also biostatic - bacteria cannot grow on its surface. High-tech doctors save lives with the help of copper-clad scalpels.
- a copper plumbing system from the Pyramid of Cheops in Egypt is still in a serviceable condition after more than 5,000 years.
- copper has always been part of metal money.
- chefs around the world prefer copper cookware due to its properties of high heat transfer plus uniform heating (no hot spots).
- copper is the standard for electrical conductivity. It conducts electrical current better than any other metal except silver.
- IBM is replacing aluminium with copper in computer chips -up to 200 million transistors can be packed onto such a chip. The result is much faster operating speeds.
- about 2% (9,000 pounds) of the total weight of a Boeing 747-200 jet plane is copper. A typical diesel-electric locomotive uses about 11,000 pounds of copper while a Triton-class nuclear submarine uses about 200,000 pounds of copper.
- high-strength, nonmagnetic and corrosion-resistant copper alloy tools are also nonsparking, which is valuable in situations where explosions are feared.
- designers look at copper and brass as metals of quality, comfort and beauty.
- through one hundred years of sea winds, rains and sun, the copper skin of the Statue of Liberty not only has become more beautiful but also has remained virtually undamaged. Closer analysis shows that weathering and oxidation of the copper skin has come to just 0.005 of an inch in a century.
- copper clearly was a good idea a hundred years ago. With technological advances, copper is still a great idea today.

11. Переведите на русский язык.

Aluminium bronze is among the most varied and metallurgically interesting copper alloys. This metal is the first choice - and sometimes the only logical choice - for demanding applications owing to the exceptional mechanical and chemical qualities it offers such as great strength, high hardness, excellent corrosion resistance (especially in seawater and similar environments), wear resistance and superior bearing qualities as well as favourable castability, machinability, ductability and nonmagnetic behaviour. Evidently, all these properties are best applied where other materials can fail too soon or will be more expensive. Aluminium bronzes find wide-spread applications in petrochemical plants; power generation, aircraft, automotive, railway and marine engineering; in iron and steel making, elec-trical manufacturing and building industries.

SECTION B. STEEL

Grammar: The Modal Verb "may"

1. Составьте предложения в Past and Future по образцу. Переведите на русский язык.

EXAMPLE: *He may continue the research.*
He *was allowed to* continue the research.
He *will be allowed to* continue the research.

1. You may use carbon steel in the construction of this building.
2. She may extract iron from iron ores.
3. You may use manganese for changing properties of steels.
4. You may apply alloy steels for various engineering purposes.

2. Составьте вопросы по образцу, дайте краткий ответ. Переведите на русский язык.

EXAMPLE: *to use these substances for the experiment*
May I use these substances for the experiment?
Yes, you may. / No, you may not.

1. to experiment with alloying elements;
2. to carry out different operations on milling machines;
3. to demonstrate the properties of tool steels;
4. to observe the steel-making process.

3. Составьте вопросы по образцу, дайте ответ. Переведите на русский язык.

EXAMPLE: *to demonstrate the new applications of steels*
Were you allowed to demonstrate the new applications of steels?
No, I wasn't. But I will be allowed to do it tomorrow.

1. to work in the rolling mill;
2. to test the performance characteristics of alloy steels;
3. to study the structure of stainless steels;
4. to observe how steel is cast

4. Исправьте ошибки. Переведите на русский язык.

1. Metals which are used in industry may to be called engineering metals.
2. The majority of metals may to become harder after they have been cold-worked.
3. You doesn't may carry out the investigation here.

4. The students be allowed to practise in the rolling mill yesterday.
5. Will be I allowed to use the mobile equipment?

5. Подберите подходящий по смыслу вариант перевода.

1.hardness	a. закалять
2.to cast	b. твердость
3.pig iron	c. легированная сталь
4.malleable	d. лить, отливать
5.to temper	e. ковкий
6.alloy steel	f. чушковый чугун

6. Прочитайте текст и переведите на русский язык.

The value of alloys was discovered in very ancient times; brass (copper and zinc) and bronze (copper and tin) were especially important. Today the most important are alloy steels, which have a lot of special characteristics.

Steel is known as an alloy of iron and about 2% or less carbon. Pure iron is soft, ductile and malleable, useful only as an ornamental material. However, the addition of carbon hardens it greatly and changes its properties. Steels for special applications may contain other alloying elements beside carbon. This modifies and improves the physical properties of the base steel. For example, small percentages of nickel, chromium, manganese and vanadium may be used for strengthening steels for construction work. Heat treatment (i.e. tempering) and mechanical working at cold or hot temperatures may also give steel alloys superior qualities, such as strength, hardness, toughness, wear resistance, corrosion resistance, electrical resistivity and workability.

Steel making processes are known as melting, purifying (refining) and alloying at about 2,900 °F (1,600 °C). Molten steel may be first cast into ingots. Later ingots are worked into finished products. This may be done by two major methods: hot-working and cold-working. The latter is generally used for making bars, wire, tubes, sheets, and strips. Molten steel may also be cast directly into products.

7. Выберите подходящий по смыслу вариант. Переведите на русский язык.

1. Steel is a general name for
a) non-metals; b) ferrum; c) iron-and-carbon alloys.
2. Physical properties of iron may be modified greatly by the addition of
a) iron ore; b) hydrogen; c) carbon.
3. Pure iron is used
a) as an ornamental material; b) for construction work; c) in machine tools.
4. Steel for special applications usually contains
a) carbon; b) various alloying elements; c) vanadium.

5. Heat treatment and mechanical working at cold or hot temperatures result in ... of steel.
a) a different carbon content; b) better qualities; c) finished products.
6. Melting, purifying and alloying are the stages of steel
a) cold-working; b) refining; c) making.
7. Bars, wire, tubes, sheets, and strips are the result of
a) melting steel; b) hot-working; c) cold-working.

8. Прочитайте текст и переведите на русский язык.

Classes of Steel

Steels vary greatly but the major classes are carbon steels, low-alloy steels (up to 8% alloying elements, i.e. tool steels), and high-alloy steels (more than 8% alloying elements, i.e. stainless steels).

In carbon steels, the carbon content may range from 0.015% to 2%. The steel that was used for the Golden Gate Bridge, for instance, is carbon steel with the following average chemical composition: C - 0.81% (0.85), Mn - 0.66%, P - 0.026% (0.04), S - 0.028% (0.04), Si - 0.24%.

The addition of this tiny amount of carbon made the steel much stronger and harder. Carbon steels account for about 90% of the world's steel production. They may be used for automobile bodies, appliances, machinery, ships, con-tainers, and the structures of buildings.

Tool steels are special steels that are engineered to particular service requirements. These expensive alloys are exceptionally strong, hard, wear-resistant, tough and nonreactive to local overheating. They contain tungsten, molybdenum, vanadium, and chromium in different combinations, and often cobalt or nickel for better high-temperature performance. They are used for machine tools, aircraft undercarriages, in·buildings and bridges.

Stainless steels comprise any alloy steel that contains 10-30% chromium. The presence of chromium, together with the low-carbon content, gives a remarkable resistance to corrosion and heat. Other elements, such as nickel, molybdenum, titanium, aluminum, niobium, copper, nitrogen, sulphur, phosphorus, and selenium, may be added for obtaining better corrosion resistance and other valuable properties.

9. Верны ли данные утверждения? Переведите на русский язык.

1. Three major classes are carbide steels, low-alloy steels, and high-alloy steels.
2. Carbon steel was used in building the Golden Gate Bridge.
3. Great strength, hardness and other valuable mechanical properties are obtained by the addition of a great amount of carbon.
4. Low-alloy steels are the most popular kind of steel.
5. Tool steel is used for producing automobile bodies, ships and spoons.

6. Tungsten, molybdenum, vanadium, and chromium in different combinations may improve high-temperature performance of stainless steel.

10. Прочитайте и переведите текст на русский язык.

Owing to the valuable properties of stainless steel its application may vary from spoons to bank vaults. This steel does not rust because of the interaction between its alloying elements and the environment. Stainless steel contains iron, chromium, manganese, silicon, ·carbon and significant amounts of nickel and molybdenum. These elements react with oxygen from water and air and produce a very thin stable film of metal oxides and hydroxides, which may prevent additional corrosion because it limits the access of oxygen and water to the metal layers below. This film may not be seen without a powerful microscope that is why steel seems stainless when it is in fact corroded at the atomic level. In summary, stainless steel does not rust because it may form a corrosion product layer for the protection against further attacks of oxygen.

SECTION C. COMPOSITE MATERIALS

Grammar: The Modal Verb "must"

1. Составьте предложения по образцу. Переведите на русский язык.

EXAMPLE: *engineers / to finish the test in half an hour*
The engineers must finish the test in half an hour.
or *engineers / to break safety instmctions*
The engineers mustn't break safety instructions.

1. scientists / to perform all the experiments according to the instructions;
2. friends / to help each other in difficult situations;
3. students /to carry out a lot of experiments;
4. engineers / to work with faulty devices.

2. Составьте предложения в Present, Past и Future, используя модальный глагол *to have to (not to have to)* вместо *must (mustn't).*

EXAMPLE: *He must write a detailed report of the test.*
He *has to* write a detailed report of the test.
He *had to* write a detailed report of the test.
He *will have to* write a detailed report of the test.

1. The students must complete another series of experiments.
2. They must compare the results of two tests.
3. The engineers must develop new plastics.
4. The scientist must elaborate the plan of his research.

3. Исправьте предложения. Переведите на русский язык.

1. I will must to study all the peculiarities of this technological process next week.
2. He have to deliver a report on the applications of plastics.
3. I don't must switch on this machine without our teacher's permission.
4. Must be non-recycable plastics burnt?

4. Подберите подходящий вариант перевода.

1. thermoplastics	a) слоистый материал
2. thermosetting plastics	b) стекловолокно
3. glass fibre	c) полиэтилен
4. carbon fibre	d) термоактивные пластмассы
5. composite	e) ровный, гладкий
6. phenolic resin	f) композиционный материал
7. polythene	g) анизотропный
8. anisotrophic	h) термопластические смолы
9. laminate	i) феноло-альдегидный полимер
10. smooth	j) углеволокно

5. Для каждого слова в А найдите подходящий вариант перевода в В.

A	**B**		
1. изменять	a) to modify	b) to cover	c) to replace
2. благодаря	a) because of	b) due to	c) thank you
3. достаточный	a) essential	b) sufficient	c) efficient
4. популярность	a) popular	b) popularity	c) famous
5. жесткий	a) stiff	b) strong	c) soft
6. усиливать	a) to recycle	b) to enhance	c) to combine
7. улучшать	a) to decrease	b) to improve	c) to introduce
8. преимущество	a) disadvantage	b) advantage	c) edge

6. Прочитайте текст и переведите его на русский язык.

Sports Materials

Materials engineering is the study of materials - anything from tennis racket frames to turbine blades in aeroengines. The subject combines sciences with engineering and looks at the structure of materials, their properties and fabrication. Materials science has a dramatic impact on sporting records. Since 1896 the Olympic record in the pole vault, for example, has increased from 3 to about 6 metres largely due to the changes in materials technology. The first poles were made from solid hickory wood. In 1904 bamboo poles were introduced, which only 50 years later were replaced by bamboo poles were introduced, which only 50 years later were replaced by aluminium poles. The latter, however, gave little improvement in performance and

had to be replaced by lighter and less stiff glass-fibre composites. These account for the dramatic increase in performance.

The materials and design of hockey sticks have also changed a lot. Hockey sticks used to be made from wood, and they failed quickly. Modern hockey sticks are made from carbon-fibre and glass-fibre composites, which increase stiffness. As the failure can be dangerous, researchers still have to improve the performance of composite sticks.

Early tennis rackets were made from solid wood (ash or maple). Because of its cellular structure, wood is anisotropic, i.e. its properties are not the same in each direction. This limited the size and stiffness of the rackets. The anisotropy was overcome by the introduction of wood laminates, but there was still the problem of water absorption, which caused the deformation of the racket. In the 1970s aluminium alloy frames were introduced. The greater stiffness of the aluminium meant that frames could be lighter. However, these were soon replaced by even stiffer and lighter carbon-fibre rackets. The research continues and materials engineers have not said their last word yet.

7. Выберите подходящий вариант. Переведите на русский язык.

1. Since 1896 the Olympic record in the pole vault ...
a) has decreased from 6 to 3 metres.
b) has increased from 3 to 7 metres.
c) has increased from 3 to 6 metres.
2. The poles used in 1896 were made from ...
a) bamboo b) hickory wood c) glass-fibre composites.
3. The performance in pole vaulting has increased greatly because ...
a) composite poles were made from aluminium.
b) composite poles were lighter and less stiff.
c) composite poles were made longer.
4. First hockey sticks were made from ...4
a) wood; b) carbon-fibre composites; c)carbon-fibre and glass-fibre composites.
5. Anisotropy is ... of solid wood rackets.
a) an advantage b) a disadvantage c) an improvement
6. In order to improve tennis rackets ... was introduced in the 1970s.
a) carbon-fibre composites b) aluminium c) solid wood

8. Заполните пропуски подходящими по смыслу словами. Переведите на русский язык.

changed	performance	made	improvements	improve
equipment	carbon-fibre	replaced	aluminium	alloys
composites	producing	mcrease	dangerous	stiff
stiffness	lighter	rackets	however	

The materials technology has ... a lot over the past years. New more reliable materials have ... the old ones. Other advances in materials science may lead to further ... in performance. Let's have a look at some examples of sport ....

Poles are often ... from glass-fibre ... that increase their .... Such poles are lighter and less ... than ... poles.

... and glass-fibre composites are also used for ... hockey sticks. This helps to ... stiffness. ..., such hockey sticks can be ... for players. That is why researchers are trying to ... their performance. Carbon-fibre composites have also replaced aluminium in tennis .... Such composite rackets have a higher … than aluminium …, so rackets can be even stiffer and ....

9. Прочитайте текст и переведите на русский язык.

Plastics

Whether you are aware of it or not, plastics play an important part in your life. From the car you drive to work to the television you watch when you get home, plastics help make your life easier and better. How?

Plastics are polymers - long chains of many units that are usually made of carbon, hydrogen, oxygen, and/or silicon. Polymers have been with us since the beginning of time - tar, amber and horns are the easiest examples. In the 1800s these natural polymers were chemically modified and many materials such as vulcanized rubber and celluloid were produced. The first truly synthetic polymer Bakelite was developed in 1909 and was soon followed by the first synthetic fibre, rayon, in 1911.

Polymers come in a great variety of characteristics and colours. This fact alone must be considered as an advantage of these materials. They are cheaper and easier to make than, say, paper. Besides, polymers possess the properties of easy processing, durability, light weight, sufficient strength, thermal and electrical insulation and resistance to chemicals, corrosion and shock. These valuable qualities of polymers can be further enhanced by a wide range of additives, which broaden their uses and applications.

Unfortunately, we have to admit that plastics pollute the environment. Luckily, most polymers are thermoplastic (e.g. nylon, polythene), i.e. they can be heated and reformed again. The recycled plastics keep all their properties when they are combined with virgin plastics (пластмассы, которые ранее не перерабатывались). The other group of polymers, thermosets (e.g. bakelite, phenolic resin), must not be recycled, as reheating causes their deformation. However, the controlled incineration of thermosets converts waste into heat energy.

The usefulness of plastics can only be measured by our imagination. These are definitely the materials of past, present, and future generations.

10. Ответьте на вопросы.

1. What are the applications of plastics?
2. What is a polymer?
3. Are there any natural polymers?
4. What was the flrst synthetic polymer and when was it developed?
5. Do polymers possess valuable properties?
6. What is the disadvantage of plastics?

11. Верны ли утверждения? Переведите на русский язык.

1. Conventional polymer constituents include carbon, nitrogen, oxygen, and/or silicon.
2. Tar, amber and horns are the easiest examples of synthetic polymers.
3. Plastics both conserve and produce energy.
4. Polymers do not conduct electricity and heat.
5. All polymers are divided into two distinct groups: thermoplastics and thermostatics.
6. Unwanted thermoplastics should be recycled.
7. Bakelite and phenolic resin produce heat energy when they are incinerated.

12. Прочитайте текст и переведите на русский язык.

Despite well-grounded criticism, plastics possess numerous advantages. The most important of them is certainly energy conservation. Here are some simple examples. Food must be kept fresh and healthy. In fact, each pound of plastic packaging reduces up to 1.7 pounds of food waste. Besides, plastics make packaging more efficient, which ultimately conserves resources. For example, you need 2 pounds of plastic for the delivery of 1,000 ounces of juice. You will have to use 3 pounds of aluminum, 8 pounds of steel or 27 pounds of glass for the same amount of juice. Plastics also help conserve energy in your home. Vinyl windows lower your heating and cooling bills. Plastic parts and insulation help major appliances - like refrigerators or dishwashers - resist corrosion, last longer and operate more efficiently. Indeed, their energy effciency has improved by 50 percent since the 1970s. Health, safety, high performance - plastics help make these things possible.

UNIT 8 MECHANICAL TECHNOLOGY

SECTION A. WELDING

Grammar: Infinitive

1. Составьте предложения и переведите на русский язык.

EXAMPLE: *To mark a hole on the plate you should use a pencil.*

to drive in the nail	use this new method of welding
to get a strong joint	use these two gases use a
to cut holes in metal	transformer
to create a suitable flame	use a hammer
to provide the necessary electric current	use gas welding
to join two steel plates	use an electric drill

2. Два предложения в примере имеют разную структуру, но одинаковый смысл. Измените структуру предложения по образцу, но сохраните смысл. Переведите на русский язык.

EXAMPLE: *It is very important to make a strong joint.*
To make a strong joint is very important.

1. It is impossible to store gas in an open tank.
2. It is quite necessary to make metal electrodes.
3. It is very essential to provide a hot enough flame.
4. It is not difficult to adjust the welding flame.

3. Используйте следующие прилагательные, чтобы составить предложения. ***important, essential, valuable, easy, dfficult, necessary.*** **Переведите предложения на русский язык.**

EXAMPLE: *to put on protective clothing*
It is absolutely necessary to put on protective clothing.

1. to weld metal joints;
2. to follow the safety rules;
3. to use an electric arc;
4. to join two workpieces of the same material;
5. to provide a powerful electric current;
6. not to use a transformer when welding.

4. Переведите предложения на русский язык. Обратите внимания на разницу при переводе.

1. a) To check the ammeter is necessary.
   b) To check the ammeter it is necessary to connect it to the circuit.
2. a) To improve the quality of welding is very important.
   b) To improve the quality of welding we use lasers.
3. a) To make strong joints you should weld two pieces of the same metal.
   b) To make strong joints is essential in automobile industry.
4. a) To follow these instructions is really difficult.
   b) To follow these instructions you should read them attentively first.

5. Исправьте предложения. Переведите на русский язык.

1. You should to put on special clothing to protect yourself.
2. The overalls should to be dry and clean.
3. Take workpieces of the same metal in order make a strong joint.
4. Important not to move the electrode too quickly.
5. To join these plates it is rather difficult.

6. Для каждого слова в А найдите подходящий вариант перевода в В.

A	**B**			
1. луч	a) beam	b) bead	c) sunshine	d) laser
2. сварной шов	a) bead	b) cut	c) weld	d) beam
3. свойство	a) property	b) substance	c) quantity	d) trait
4. соединение	a) unit	b) joint	c) particle	d) meeting
5. трещина	a) crack	b) cracker	c) canyon	d) web
6. влиять	a) to effect	b) to avoid	c) to affect	d) to impress
7. сваривать	a) to cook	b) to weld	c) to meet	d) to damage

7. Прочитайте текст и переведите на русский язык.

Welding is one of the most important operations that are used in industry. Many parts of machines, automobiles, airplanes, ships, bridges and buildings are welded.

In order to join two metal pieces it is necessary to soften them with heat and then to press, hammer or fuse them together. The most widely used method of welding is electric arc welding where the work pieces are joined by means of electricity at the temperature of about 7,232 °F. This is the hottest heat that can be obtained for engineering purposes.

In electric arc welding two workpieces are welded by an electric arc. In order to create the arc a powerful electric current should be provided. The current must be at least 60A and for thicker workpieces it may be 250A or more.

To supply the current it is necessary to use a transformer. The latter must be switched on to strike the arc. To join the workpieces the electrode holder should contain an electrode rod. When the arc is struck the electrode must brush against the workpiece

at 80° to its surface. As the current flows between the electrode and the workpiece the tip of the electrode melts and falls onto the workpiece. Thus a joint is created.

It is essential to hold the electrode approximately 4 mm from the surface of the workpiece. One should not leave the electrode too long in the same position because it will become attached to the workpiece. The electrode must be moved across the joint continuously backwards in a straight line. However, if it is moved too quickly neither the electrode nor the workpiece will melt.

And it is important to remember that to weld plates by an electric arc is quite dangerous. In order to protect yourself you should always follow certain safety rules. For example, it is absolutely necessary to wear overalls with long sleeves, gloves, an apron, a cap, and rubber boots. A mask or helmet is used to protect the face and especially eyes from sparks.

8. Ответьте на вопросы.

1. What is welding? What processes does it involve?
2. What method of welding is the most widely used today?
3. What device is used to supply the current?
4. How is a joint created?
5. Why is it dangerous to leave the electrode in the same position?
6. What safety rules should you follow in the process of welding?

9. Заполните пропуски подходящими словами из текста. Переведите на русский язык.

1. ... two workpieces an electric ... is used.
2. It is necessary ... a powerful electric ... for arc welding.
3 .... the workpieces the electrode holder must contain an electrode ....
4. The electrode should be ... some millimeters from the ... of the workpiece.
5 .... a strong joint the workpieces must be of the same ... .
6. The electrode can become ... the workpiece.
7. The electrode must be ... across the ... continuously.

10. Прочитайте текст и переведите на русский язык.

Laser Beam Welding

The unique properties of lasers account for their widespread application in manufacturing industry. Laser beam welding is currently used in order to weld steels, aluminum alloys and dissimilar materials. This high power density welding process has unique advantages of cost effectiveness, deep penetration and narrow bead in comparison with conventional welding processes. As the thermal cycles of laser beam

welding are generally much faster than those of arc welding it is possible to form a rather small weld zone that exhibits locally high hardness.

However, it is important to point out that the metallurgical and mechanical properties of laser welds and the response of conventional materials to this new process have not been fully established yet. It is currently difficult to determine the tensile properties of the laser welded joint area owing to the small size (2-3 min) of the fusion zone. Therefore, an experimental investigation of the mechanical properties of laser-welded joints was carried out. To determine the hardness profile of the welded metal three similar joints were produced by a CO_2 laser and microhardness measurements were conducted at three locations. It is important to mention that the microhardness test results, however, exhibited no significant difference between these three locations for all the welded joints.

The welding process may lead to drastic changes in the microstructure with accompanying effects on the mechanical properties and, hence, on the performance of the joint. Laser welded joints, like all other welded joints, may contain defects in the form of cracks in the narrow weld area. The size and location of such cracks directly affect the joint performance and the life-time of a structure. Nevertheless, it is essential to remember that laser beam welding has a number of advantages over conventional processes. Despite the high investment cost of laser welding equipment, it is expected that laser beam welding will have a great impact on fabrication and manufacturing industries within the next decade.

SECTION B. MECHANISMS

Grammar: Infinitive

1. Составьте предложения по образцу и переведите на русский язык.

EXAMPLE: A: *This paper describes important properties of new engineering materials.*

B: The purpose (aim, goal, object) of this paper is to describe properties of new materials.

1. This experiment establishes the relations between these two quantities.
2. This book gives the description of the electrical instruments in the car.
3. The speedometer is used to indicate the speed of a car.
4. The filter is used to clean petrol.

2. Два предложения имеют разную структуру, но одинаковый смысл. Измените структуру предложения так, чтобы смысл не изменился. Переведите на русский язык.

EXAMPLE: *The substance that should be analysed is ofgreat value.*

The substance to be analysed is of great value.

1. The petrol that should be delivered from the petrol tank should be clean.
2. The new battery that should be used in the car is very effective.
3.The car emissions that should be controlled are very harmful to the environment.
4. The automobile that should be developed will run on hydrogen.

3. Исправьте ошибки. Переведите предложения на русский язык.

1. The aim of an instrument panel is provide the driver with certain information.
2. When the driver notices some fault it essential to repair it at once.
3. The function of the tachometer to indicate the engine speed in revolutions per minute.
4. The speed limit to was adopted in populated areas is 30 mph.
5. Drivers must don't speed, especially when they see speed limit signs.

4. Для каждого слова в А найдите подходящий вариант перевода в В.

A	**B**		
1. воск	a) substance	b) mix	c) wax
2. транспортное средство	a) transport	b) means	c) vehicle
3. потребление	a) use	b) need	consumption
4. охладитель	a) engine	b) carburettor	c) coolant
5. предотвращать	a) to perform	b) to prevent	c) to avoid
6. клапан	a) piston	b) radiator	c) valve
7. заряжать	a) to charge	b) to discharge	c) to fill
8. количество	a) quality	b) quantity	c) a lot

5. Прочитайте текст и переведите на русский язык.

The Instrument Panel of a Car

A modern car is a complex means of transport. However, it is relatively easy to operate as a number of devices help you to keep control. An instrument panel in a modern car, for example, provides the driver with valuable information. It includes such instruments as a speedometer, a fuel gauge, a tachometer and an ammeter.

The function of the speedometer is to indicate the speed of the car. A speed limit to be adopted for towns and built-up areas is 30 miles per hour or 60 km per hour.

The purpose of the fuel gauge is to indicate the amount of fuel to be contained in the petrol tank. If its level in the tank is very low, the warning light switches on in the car. When this happens it is necessary to put some more petrol into the tank.

The tachometer is necessary to indicate the engine speed in revolutions per minute. When the engine turns slowly at the minimum speed the alternator also turns slowly. It doesn't produce enough current for the engine. Therefore, the battery must supply the necessary current.

A car battery can easily become discharged in quite a short time. The function of the ammeter is to indicate whether the battery is charging or discharging.

Instrument panels in the cars in the near future will become much more complicated. The common devices will soon be replaced by onboard computer systems, as intelligent vehicles are the field to be researched nowadays. The idea is to create automatic cars on automatic highways. The vehicles to be introduced will move with the minimum supervision on the part of man since they will communicate with one another and with the road sensors on the way. This is necessary in order to reduce the load on drivers and to ease the stress on the road network. The leading engineering companies are using advanced mechatronics to achieve this goal.

6. Ответьте на вопросы.

1. Does the instrument panel include such instruments as a multimeter and a fuel gauge?
2. Is the speed limit for towns and built-up areas 30 mph or more?
3. What is the function of the fuel gauge?
4. Why does the warning light switch on?
5. What instrument indicates if the battery is charging or discharging?

7. Заполните пропуски подходящими по смыслу словами из текста и переведите на русский язык.

1. An ... panel provides the ... with valuable information.
2. The .... of the ... is to indicate the amount of the petrol to ... in the petrol tank.
3. An instrument panel in the car ... a speedometer, ..., a fuel gauge and ....
4. The tachometer indicates the ... of the engine in ... per minute.
5. The battery must ... the necessary ....
6. A car ... can easily ... discharged.
7. The function of the ... is to indicate whether the ... is ... or discharging.

UNIT 9 ELECTRICITY

SECTION A. ELECTRICITY BASICS

Grammar: Complex Object

1. Составьте предложения по образцу. Переведите на русский язык.

EXAMPLE: *water / to flow down - wheel / to turn*

The water flows down- This makes (lets) the wheel turn.

1. temperature /to increase - liquid / to expand
2. valve / to be open - water / to flow in the system

3. contact / to be closed -current / to flow in the circuit
4. leads /to be connected - current /to pass through the conductor
5. batteries / to discharge - electric car / to stop

2. Два предложения имеют разную структуру, но одинаковый смысл. Измените структуру предложения так, чтобы смысл не изменился. Переведите на русский язык.

EXAMPLE: *This allowed him to follow the rules.*
This allowed the rules to be followed.
1. This device enables the students to measure the current in the circuit.
2. The information enables us to predict the properties of the new substance.
3. This result forced them to check the circuit again.
4. Modern equipment caused us to introduce new methods.

3. Для каждого слова в А найдите подходящий вариант перевода в В.

A	**B**		
1. непроводник	a) dielectric	b) discharge	c) domestic
2. выпрямитель	a) condenser	b) rectifier	c) capacitor
3. обмотка	a) voltage	b) winding	c) insulator
4. первичный	a) primary	b) secondary	c) early
5. передавать	a) to keep	b) to store	c) to transmit
6. нить накала	a) filament	b) gap	c) coil
7. частота	a) resistance	b) frequency	c) alteration
8. светиться, накаляться	a) to reverse	b) to rotate	c) to glow

4. Прочитайте текст и переведите на русский язык.

Electricity Basics

Electricity is something we do not notice until we do not have it. However, few people understand what it is and still fewer can explain it. Let us try it anyway. So, what is electricity? Electricity is simply a movement of charged particles through a closed circuit. The electrons, which flow through this wire, carry a negative charge. A lightning discharge is the same idea, just without the wire. Electricity is made by converting some form of energy into flowing electrons at the power plant. The type of power plant depends on the source of energy used: thermal power (coal, oil, gas, nuclear, underground steam), solar power (photovoltaic), kinetic power (water, wind) and chemical power (fuel cell).

After it is made, electricity is sent into a system of cables and wires called a transmission grid. This system enables power plants and end users to be connected together.

The basic notions in electricity include the following: an Amp (A) is a unit measure of the amount of current in a circuit. An ammeter permits the current to be measured.

The pressure that forces the current to flow is measured in Volts (V). A transformer is used to change the voltage of electricity. This allows electricity to be transmitted over long distances at high voltages, but safely used at a lower voltage.

A Watt (W) is a unit measure of electric power that depends on amps and volts. The more watts the bulb uses the more light is produced. Watts = Volts x Amps.

An Ohm (O) is a unit measure of materials resistance to a flowing current. The filament in this light bulb glows because its high resistance makes it hot. Low resistance of the support wires does not let them glow. The glass has a resistance so high that it does not allow the current to move through it this property makes glass a good insulator.

5. Ответьте на вопросы.

1. What is electricity and an electron?
2. How is electricity produced?
3. What types of power plants do you know?
4. What is the function of the transformer?
5. How does the light bulb work?

6. Прочитайте текст и переведите на русский язык.

Electricity Basics (continued)

There are two different kinds of electrical current. One is called direct current because electrons are made to move in one direction only. It is usually abbreviated to DC. This kind of electricity is produced by a battery. AC stands for alternating current, which is generated by power stations for domestic and industrial use. The wires in the centre of the generator rotate past the North and South poles of the (red) magnet. This movement forces the electrons in the circuit to reverse the direction of their flow. The number of these alterations (or cycles) per second is known as frequency.

As domestic supply requires alternating current it is therefore necessary to change it to direct current inside most electrical appliances. A rectifier allows AC to be converted into DC.

Power stations are designed to provide electrical energy to large housing developments. This causes the necessity to transmit power from its source, the generating station, to wherever it is required for use, which may be far away, with minimal energy losses. It is cheaper and easier to carry a very high voltage but low current, over long distances. It can be done with the help of thinner overhead conductor wires, with an air gap between them to act as an insulator.

A transformer is used to increase or decrease the voltage of an electric power supply. This is a static machine since it has no moving parts. It consists of two coils of

wire that are wound around an iron core. The coils are called windings, one is the primary, or input winding, and the other is the secondary, or output winding.

When current passes through the primary winding, a magnetic field is created around the iron core, which induces a voltage in the secondary winding. If the number of turns in the secondary winding is greater than that in the primary winding it is a step-up transformer and the output voltage is greater than the input voltage. And vice versa, a step-down transformer enables the input voltage to be reduced.

A device, which allows an electrical charge to be built up and stored for some time is known as a capacitor (or a condenser). A simple capacitor is made from two metal plates (electrodes), which are separated by an insulator such as air, paper or mica (the dielectric).

7. Верны ли утверждения? Переведите на русский язык.

1. There are two different kinds of electricity: AD and BC.
2. Direct current is received from a battery.
3. AC is used for domestic and industrial purposes.
4. The frequency is the number of cycles per second.
5. Conversion is brought about by means of an insulator.
6. Air is a rather good insulator.
7. High voltage is supplied by a transformer.
8. To decrease voltage a step-down transformer should be used.

SECTION B. SOLAR ENERGY

Grammar: Complex Subject

1. Найдите продолжение предложения. Переведите на русский язык.

1. Second-year students are expected to ...	a) generate 100 kilowatts of electricity.
2. The kilowatt-hour is known to ...	b) know the basics of electricity.
3. Alternative sources of energy are considered to ...	c) be the unit measure of electricity.
4. The solar village was reported to ...	d) be inexhaustible
5. The resources of fossil fuels seem to ...	e) produce no pollution.
6. Solar-powered cars turned out to ...	f) be connected.
7. A small windmil1 is likely to ..	g) come to an end.
8. Electricity and magnetism are sure to ...	h) be built in Australia.

2. Два предложения имеют разную структуру, но одинаковый смысл. Измените структуру предложения так, чтобы смысл не изменился. Переведите на русский язык.

EXAMPLE 1: *It is found that the battery is dead.*
The battery is found to be dead.

1. It is believed that asingle PV cell produces approximately 0.5 V.
2. It is likely that the energy crisis will soon begin.
3. It seems that the results of the solar project are very important.
4. It is unlikely that engineers will find a solution to the problem quickly.

EXAMPLE 2: *We expect this method to offer some advantages.*
This method is expected to offer some advantages.

1. They consider this housing development to be unique.
2. The car mechanic believes the solar-powered car to have many advantages.
3. We assume the solar power to be tremendous.
4. He supposes the Sun to run water turbines.

3. Составьте предложения по образцу. Переведите на русский язык.

EXAMPLE 1: *This method gives good results.*
This method seems (appears, is likely, is said) to give good results.

I. This new substance has valuable properties.
2. Solar collectors are very efficient.
3. These batteries are overcharged.
4. The results of the experiment are inaccurate.

EXAMPLE 2: *I believe that he will become a good specialist.*
He is sure (certain) to become a good specialist.

I. I believe that this problem is of vital importance.
2. We suppose that electric cars will find a wide application.
3. We assume that hot water will be supplied by solar thermal heating systems.
4. We think these new car batteries are long lasting.

4. Исправьте ошибки. Переведите предложения на русский язык.

1. The system reports to be pollution-free.
2. The water seem to be heated naturally.
3. The nuclear power stations were turned out to be dangerous.
4. We are likely exhaust our fossil fuels quickly.
5. This information said to be of utmost importance.

5. Выберите подходящий вариант перевода.

1. The scientists are said to be developing solar thermal heating systems nowadays.
a) разработали b) разрабатывают
2. They seem to have improved previous results.
a) улучшают b) улучшили
3. An experimental solar heating system proves to have been built in this region.
a) строится b) была построена
4. Our total solar energy consumption is estimated to be increasing.
a) увеличивается b) увеличится
5. The sufficient amount of electricity is likely to be generated by a small windmill.
a) вырабатывается b) вырабатывает

6. Прочитайте текст и переведите его на русский язык.

Olympic Solar Energy

Four months before the start of the Sydney games, Olympic officials stood with a magnifying lens in the ancient temple of Zeus in Olympia,

Greece - the site of the first Olympic Games. Like the original Olympians, they focused the rays of the Sun onto dry grass in order to make it burn, and from that 'Mother Flame' the Olympic torch was lit.

As the lightning of the Olympic flame shows, the solar energy that strikes the Earth is tremendous, despite travelling nearly 150 min km across space to get here. In fact, every minute enough energy arrives at the Earth to meet our demands for a whole year. However, we do not use it efficiently. For example, Australia is estimated to consume only 0.02% of the solar energy that falls on it annually.

Capturing Energy from the Sun

Solar energy can be collected in three main ways: photovoltaic (PV) cells, solar collectors and solar furnaces. The solar collectors and solar furnaces. The first are used to convert sunlight directly into electricity. They are known to be first introduced in 1958 in order to power satellites in space. Now the cells seem to run everything from lighting systems to water pumps not to mention pocket calculators. At the Sydney Olympic village more than 8,000 photovoltaic panels that cover over 6,000 square metres provide 650 kilowatts of electricity. All houses in the Olympic village have PV cells built into the roof, to make the most of sunlight that falls on them.

Hot water for the village is supplied by solar thermal heating systems. Such systems include solar panels on the roof and large solar collectors. These are normally dark in order to absorb more sunlight. Their surface is covered with glass to let in the rays but hold heat. The heat is transferred to water, which runs through small pipes. The hot water is then circulated through the house. Solar thermal heaters are believed to reduce water-heating costs by about 50% as some still use natural gas as a back up on cloudy days. It is estimated that 40 million solar heated buildings will be constructed in the near future.

Solar furnaces use a huge array of mirrors to concentrate the Sun's energy into a small space and achieve temperatures up to 33,000°C. They are likely to be used for scientific experiments but they are also known to generate electricity.

The Olympic village is likely to be converted to housing for ordinary citizens now the games are over, and the houses are expected to generate electricity for years to come. The village is one of the largest housing developments in the world to use solar electric power.

7. Ответьте на вопросы.

1. What source of energy is used to light the Olympic torch?
2. What is the total solar energy consumption in Australia?
3. What are the ways to obtain solar energy?
4. How is sunlight converted into electricity?
5. How much electricity is generated in the solar village?
6. Why are collectors normally dark?
7. Are solar heaters efficient?
8. What is the purpose of solar furnaces?

8. Прочитайте текст и переведите на русский язык.

Solar-powered Cars

One of the ways we can reduce the amount of pollution from traffic seems to power our vehicles using renewable resources. To demonstrate this, the World Solar Challenge Car Race from Darwin to Adelaide annually involves dozens of cars that are powered only by the energy of the Sun. The cars are reported to use photovoltaic (PV) cells to convert sunlight into electricity. A single PV cell is known to produce only a small amount of electrical power (approximately 0.5 volts). To increase the power, lots of PV cells are connected together to make a 'solar panel'. Panels can be linked to form a large solar array that is certain to produce enough electricity to power a car. When the World Solar Challenge teams design their electrical systems, they have to take into account variations in the intensity of sunlight. The Sun's energy is supposed to power the car's motor and also charge a battery for use at night or at times when the Sun is hidden by a cloud. If a car is designed to put all its energy toward driving and keeps nothing in reserve, it is sure to stop completely in cloudy weather. If too much energy is diverted to the battery, the engine is found to run too slowly.

Engineers still have many questions and problems to tackle before solar power becomes an efficient and economical way to fuel vehicles. Today's solar-powered cars are rather expensive but as the pressure on fossil-fuel resources is certain to increase scientists will continue to search for alternative energy sources, including harnessing the Sun's energy to drive vehicles. The most fascinating part of using solar power as an energy source is that it is considered to be pollution-free and inexhaustible. If research continues, stopping for petrol is likely to become a thing of the past.

9. Верны ли утверждения? Переведите на русский язык.

1. Energy from renewable sources is reported to cut pollution.
2. Only solar-powered cars are reported to take part in the World Solar Challenge Car Race.
3. The intensity of sunlight is sure to be taken into consideration when electrical cars are designed.
4. A solar-powered car is unlikely to operate in cloudy weather.
5. The overcharged battery doesn't let the car win the race.
6. Many problems still have to be solved.
7. Solar power as an energy source appears to have no particular advantages.
8. Alternative energy sources are expected to replace fossil fuels in the future.

UNIT 10 ENGINEERING PROBLEMS

SECTION A. ENERGY PROBLEMS

Grammar: Participle

1. Составьте предложения по образцу. Переведите на русский язык.

EXAMPLE 1: *The engineers who researched fossil fuels came to disappointing results.*
The engineers researching fossil fuels came to disappointing results.

1. In the future we are certain to have vehicles that will move at a greater speed.
2. The person who changes a burnt bulb must switch off the power first of all.
3. Windmills that make 100 kW can provide enough electricity to power several houses.
4. Man that consumes a lot of energy is faced with the energy shortage.

EXAMPLE 2: *Students were carrying out a test in the lab. They were discussing it.*
They were discussing the test being carried out in the lab.

1. The battery is producing a current. I'd like you to measure it.
2. Engineers are constructing solar villages worldwide. They are very economical.
3. Man is exhausting fossil fuels quickly. They are not likely to last long.
4. The teacher is checking an electric circuit. It is broken.

2. Составьте предложения по образцу. Переведите на русский язык.

EXAMPLE: *Scientific investigations were of great value. (to carry out in this lab)*
Scientific investigations carried out in this lab were of great value.

1. The results of the check of the complete electric circuit have revealed many faults. (to describe in the engineer's report).
2. Numerous advantages of a new personal computer interested scientists from different countries. (to enumerate in the report).
3. The car does not pollute the environment. (to supply with solar batteries).
4. Robots have made our life much easier. (to develop recently)

3. Выберите правильный вариант. Переведите на русский язык.

1. The engineers *tackling / tackled / being tackled* the energy problem did not reach a compromise.
2. The coils *connecting / connected / being connected* to each other will be attached to a battery through an on-off switch.
3. Tests of the properties of the electromagnetic circuit *carrying / carried / being carried* out by this team have shown good results.
4. The high voltage circuit *checking / checked / being checked* now will be used soon.
5. Many people are against power plants *burning / burnt / being burnt* waste.

4. Выберите подходящий вариант перевода.

1. essential	a. пар
2. steam	b. десятилетие
3. available	d. почти
4. reason	e. неотъемлемый
5. evident	f. постоянно
6. nearly	g. доступный
7. decade	h. причина
8. constantly	i. очевидно

5. Прочитайте текст и переведите его на русский язык.

Energy is an essential part of our civilization. A million years ago primitive·man used only 6,000 (kJ) a day, which he got from the food he ate. A hundred thousand years ago people had learnt to make fire and used four times as much energy (the equivalent of 25,000 kJ). By the 15th century man using animals, windmills and waterwheels, and a little coal, was already consuming nearly twenty times as much energy (120,000 kJ). By 1875 the steam engine made 340,000 kJ a day available to industrial man in England. Today's technologicalman uses 1,000,000 kJ a day, or one hundred and fifty times as much as primitive man, about one third in the form of electricity.

Why is our energy consumption constantly increasing and accelerating? The reasons are evident. Technological man lives four times as long as primitive man and twice as long as man in the 15th century. Nearly half of man's life today is spent on

educating himself, leisure and creative activities. Medieval man spent only a quarter of his thirty-five years in these pursuits, and primitive man only one sixth in his short life of eighteen years.

What do we need energy for? Comfort and lighter work, first of all. Energy consumed in great quantities falls into two kinds: a) energy needed every day (lighting, heating, etc.) and b) energy used to produce necessary objects (house, clothes, etc.). Take a man building a small house (10 tons of oil-equivalent), heating (3 tons of oil-equivalent) and lighting (200 kg of oil-equivalent or 700 kWh) it for a year and having a car (1.3 tons of oil-equivalent + 1.3 tons for every 12,000 km run). The energy cost of these basic things is tremendous but multiply it by 6 billion to get the real picture of man's needs. Besides, energy consumption is sure to increase since the more energy is consumed, the easier our life becomes.

The current energy problem caused by many interrelated factors must be tackled quickly. Strange as it sounds, there is no shortage of primary energy. The sun provides ten thousand times as much energy as we require today, in many forms ranging from solar radiation through wind and waves to trees and plants. The problem is to convert these resources into mechanical work or other usable forms of energy. The history of energy has been the history of converters- man's body itself converting food into warmth and mechanical work, animals doing such work more powerfully, the waterwheel, the windmill, the steam engine, the nuclear reactor and in the near future, the solar cell.

6. Ответьте на вопросы.

1. How did primitive man get the energy he needed?
2. How much energy does man consume today?
3. What does technological man do half of his life?
4. In what two ways is energy used?
7. Why ts tt essential to cut energy consumption?
8. What is the primary source of energy?

7. Прочитайте текст и переведите его на русский язык.

Alternative Sources of Energy

It is not a secret that energy consumption has increased immensely in the last decades. But do we have enough fossil fuels to satisfy our needs? As fossil fuels are nonrenewable we are highly interested in developing alternative sources of energy.

Solar Power is renewable. It is used for heating houses. Solar cells and furnaces make electricity from sunlight. Solar cells are expensive. Solar power isn't much use unless you live somewhere sunny. It doesn't cause pollution and doesn't need fuel.

Wind Power is renewable as well. It doesn't cause pollution, doesn't need fuel. However, a lot of generators are needed to get a sensible amount of power. It is necessary to put them where winds are reliable. And the noise can drive you nuts.

Hydroelectric Power plants are built for getting energy from flowing water. Usually we build a dam, and let the water turn turbines and generators as it goes through pipes in the dam. Renewable. No pollution, no fuel needed, no waste. Very expensive to build. Building a dam we flood a lot of land.

Waves Power. There's a lot of energy in waves on the sea. However, it is not easy to get it. A wave power station needs to be able to stand really rough weather, and yet still be able to generate power from small waves. This source of energy is renewable - the waves will come whether we use them or not.

Geotlrermal Energy means heat from underground hot rocks. Hot water comes up and we use the heat to make steam to drive turbines, or to heat houses. It is renewable - so long as we don't take out too much, the energy keeps on coming. However, there are not many places you can do it - the rocks must be suitable. Sometimes we get poisonous gases coming up too.

"Biomass" means burning wood, dung, sugar cane or similar. It is renewable- we can always plant more trees. We burn the fuel to heat water into steam, which drives turbines, which drive generators. Burning anything we pollute the environment.

Nuclear (atomic) power stations use uranium as fuel. It is nonrenewable. Heat from the reactor turns water into steam, which drives turbines, which drive generators. It doesn't cause pollution unless something goes wrong.

8. Ответьте на вопросы.

1. Why do we have to develop alternative sources of energy?
2. What is solar energy used for?
3. What are the disadvantages of wind power?
4. What requirements should hydroelectric power stations meet?
5. Why can the use of geothermal energy be dangerous?
6. Are nuclear power plants considered safe?

SECTION B. AUTOMOTIVE PROBLEMS

Grammar: Participle

1. Составьте предложения. Переведите на русский язык.

EXAMPLE: *to repair the car / to follow the mechanic's instructions*
(When) repairing the car I followed the mechanic's instructions.

1. to park your car	to remember about the speed limit
2. to maintain the car in order	to take into account the safety of traffic
3. to press the accelerator	to start the engine
4. to push a car forwards and backwards	to save yourself a lot of trouble
5. to introduce automated vehicles	to consider road signs
6. to drive a car	to keep the distance

2. Переделайте предложения по образцу. Переведите на русский язык.
EXAMPLE: *When removed the particles o fdirt can't cause damage.*
When the particles of dirt are removed, they can't cause damage.

1. When repaired and repainted, the car looked as good as new.
2. If removed impurities cannot block the carburettor.
3. When removed from the pump, the filter is cleaned with a brush.
4. If added to the engine, oil decreases friction between the moving parts.

3. Переведите предложения на русский язык.

1. a) A car running on hydrogen was invented long ago.
   b) Running on hydrogen this car is not likely to cause pollution.
2. a) Students attending classes regularly study better.
   b) Attending classes regularly students understand the material quicker.
3. a) The exhaust system being repaired at the moment produces too much smoke.
   b) Being repaired by a skilful mechanic the exhaust system is now in order.
   c) If not repaired, the exhaust system will have to be replaced.
4. a) When redesigned the engine will perform better.
   b) Being redesigned completely the engine became more efficient.
   c) The engine redesigned and improved by the researchers showed excel-lent performance.

4. Заполните пропуски. Переведите предложения на русский язык.

clockwise, anticlockwise, to the right, to the left, in front of, upwards, downwards, forwards, backwards

1. To start the car the key should be turned ....
2. Take the first turn ..., the second ... and you will see the service station ... you.
3. If the starter is jammed, you should try to push the car ... and ....
4. It is necessary to turn the bulb ... in order to take it out of the socket.
5. The pistons in this car move ... and ....

5. Для каждого слова в А найдите подходящий вариант перевода в В.

A	**B**		
l. количество	a) amount	b) quality	c) count
2. чистить	a) to change	b) to block	c) to remove
3. свободный	a) difficult	b) easy	c) free
4.увеличивать	a) to reduce	b) to decrease	c) to increase
5.примесь	a) starter	b) particle	c) spark
6. тщательный	a) clockwise	b) thorough	c) backwards
7.ремонт	a) overhaul	b) research	c) maintenance

6. Прочитайте текст и переведите на русский язык.

Finding a Fault in the Car

Servicing your car regularly you prevent it from becoming unreliable. Of course, you can't foresee everything. Having failed to start the car in the morning you had better check three things first: the battery, the fuel level and the spark plugs. It is quite easy to repair these faults.

If the battery appears to be flat, it is necessary to recharge it. If this doesn't work, you should replace it.

An empty tank is another common fault in the car. Having noticed a fuel warning light on the instrument panel of your car you should fill up the tank with more petrol.

Dirty spark plugs are also certain to cause a problem. To drive the car it is important to clean them regularly and adjust the gap in the spark plugs to the proper width. If the gap is not correct, the engine will not run well.

If your car still does not start, the petrol pump may be broken, or the fuel pipe may be blocked. Having discovered a broken pump, it is a good idea to repair or replace it. If the fuel pipe is blocked, take it off and unblock it.

Having heard a loud CLICK when you turn the key, you are sure to realize that the starter motor may be jammed. If it is, you can try to release it pushing the car forwards and backwards (in the 2nd gear). If the car still doesn't start, the starter motor should be repaired or even replaced.

And don't forget about the air filter. Its function is to remove particles of dirt, dust and other impurities from the air passing to the carburettor. A blocked filter decreases the airflow to the carburettor thus increasing the amount of fuel in the mixture. This causes the engine to operate inefficiently. Cleaning and changing filters regularly you prevent a considerable damage that is certain to be caused inside the cylinders. In this case the engine will need a thorough overhaul.

If you are a poor mechanic, stopping at service stations periodically you will save at least time and money. As they say, prevention is better than cure.

7. Ответьте на вопросы.

1. Do modern cars need servicing regularly?
2. What are the three most common faults in the car?
3. What should you do if the battery appears to be dead?
4. What does a fuel warning light show?
5. Why is there no spark sometimes?
6. What is likely to happen to the petrol pump?
7. How can the fuel pipe become blocked?
8. How do you know that the starter motor is likely to be jammed?
9. Is the air filter an important part of the engine?

UNIT 11 ADVANCES IN TECHNOLOGY

SECTION A. HOLOGRAMS

Grammar: Participial Constructions

1. Два предложения имеют разную структуру, но одинаковый смысл. Измените структуру предложения так, чтобы смысл не изменился. Переведите на русский язык.

EXAMPLE: *We found that a laser beam is split by means of a beam-splitter device.*
We found a laser beam being split by means of a beam-spliter device.

1. We found that a laser beam is split into two separate beams.
2. The students assumed that laser beams are reflected off the two mirrors.
3. I'd like to watch how they are working with a holographic plate.
4. We consider that a hologram is a three-dimensional image.

2. Измените структуру предложения так, чтобы смысл не изменился. Переведите на русский язык.

EXAMPLE: *It is found that a laser produces a powerful beam of light.*
A laser is found producing a powerful beam of light.

1. It is known that lasers produce multidimensional images.
2. It is found that a laser beam is split into two beams.
3. It is assumed that holograms are widely used in industry.
4. It is observed that the student explains the principles of hologram production.

3. Для каждого слова в А найдите подходящий вариант перевода в В.

A	**B**		
1) пленка	a) image	b) film	c) coating
2) видимый	a) visible	b) seen	c) sensitive
3) разбивать	a) to split	b) to remove	c) to record
4) одноцветный	a) ultrasonic	b) sound	c) monochromatic
5) отражать	a) to reflect	b) to emboss	c) to belong
6)первоначальный	a) first	b) original	c) early

4. Прочитайте текст и переведите его на русский язык.

Holography and Holograms

History. Holography and hologram are normally referred to as a process and as a plate or film itself respectively. In 1947 Dennis Gabor (the father and the first theorist of holography, awarded with the Nobel Prize for his research) coined the term *hologram* from the Greek words 'holos' meaning *whole* or *complete* and 'gram' meaning

message. Gabor's theory was originally intended to increase the resolving power of electron microscopes. Incidentally, it was proved not with an electron beam, but with a light beam. The result was the first hologram ever made. Gabor's hologram was clear, but imperfect, as he lacked the correct light source - the LASER, which was first seen operating in 1960.

Types. The latest achievements in laser technologies being applied, holography has developed considerably. The following types of holograms re considered the most frequent: *Transmission holograms*. They are viewable with laser light when both beams approach the film from the *same* side; *Reflection (white-light) holograms*. These are viewable with white light rom a suitable source (spotlight, flashlight, the sun, etc.) when both beams approach the film from the opposite sides; *Multiple-channel (rainbow) holograms*. These holograms with several images are not only visible from different angles; they also change colour at each new angle; *Real-image holograms*. They produce the image in front of the plate towards the viewer. Most holograms in holography museums are of this type.

Application. Holography being an art that attracts people's attention, colourful multidimensional images are widely used in advertising, stamps, jewelry, with holography museums exhibiting masterpieces. Holographic lenses are lighter than traditional lenses and mirrors and can be designed to perform more specialized functions, for instance, to make the panel instruments of a car visible in the windshield in order to increase safety. The list of applications may be continued indefinitely.

5. Ответьте на вопросы.

1. What is the difference between holography and a hologram?
2. Who discovered the holographic effect?
3. How was the word *hologram* coined?
4. Why were first holograms imperfect?
5. When was the first laser operated?
6. What are the basic types of holograms?

6. Выберите подходящий вариант перевода.

1. laser beam	a) интерференционная картина
2. beam splitter	b) луч лазера
3. reference beam	c) разделитель луча/расщепитель
4. object beam	d) опорный луч
5. interference pattern	e) объектный луч

7. Прочитайте текст и переведите его на русский язык.

How Holograms Are Made

A hologram is a three-dimensional image, special equipment being necessary for producing it. A hologram is created when laser light is recorded on a holographic plate (a piece of glass coated with a substance, sensitive to light). The laser beam is split into

two separate beams by means of a device called a beam splitter. One beam is reflected off the mirror directly onto the holographic plate, while the other beam is reflected off another mirror onto an object. The former is called the reference beam, the latter being called the object beam.

When reflected off the object onto the holographic plate, the object beam meets the reference beam and an "interference pattern" is produced. It is this interference of the two beams that is recorded on the plate to produce a hologram. If a hologram is illuminated in the direction of the reference beam, a three-dimensional image of the object appears where the object was originally. Some holograms are viewed with laser or monochromatic (single-colour) light, others with white light.

Holograms being mass-produced, it is advisable to divide them into categories: *Embossed holograms*. These are stamped on foil backed Mylar ftlm using a metal master (most common method). *Polymer holograms*. These are made from light sensitive plastic. The Polaroid Corporation mass produces holograms by this method. *Dichromate holograms*. Very bright holograms on jewelry, watches, etc., which are recorded on a light sensitive coating of gel containing dichromate.

Holograms can be homemade as well. The easiest type of holography for amateurs requires a holographic model, a stable table, a laser, a lens, a holographic plate and some darkroom supplies (e.g. green safelights). Freedom from any (air and sound) vibrations within millionths of a centimeter must be assured. The greater the number of optical components, the greater the destructive effect of vibrations. One more thing must be always kept in mind - SAFETY RULES.

SECTION B. THE AGE OF ROBOTS

Grammar: Gerund

1. Составьте предложения, используя таблицу. Переведите на русский язык.

EXAMPLE: *In my opinion, the idea of performing operations in this way is quite new*.

the idea the method the way the purpose the necessity the importance the technique	of	-compiling new programs -exploring space -calculating the dimensions -supervising robots -imitating humans -using robots -gathering data	is seems appeared sounds proved	very quite rather	important simple specific obvious modern necessary strange

2. Прочитайте текст и переведите его на русский язык.

Robots in Perspective

If you think robots belong to space movies, think again. Right now, all over the world, robots are on the move. Putting chocolates into boxes, walking into live volcanoes, driving trains in Paris and defusing bombs in Northern Ireland are their common tasks. Today's robots are doing more and more things humans can't do or don't want to do.

The idea of creating an intelligent machine is very old. Homer described gold girls, mechanical helpers built by Hephaistos, the Greek god of smiths. In 1495, Leonardo da Vinci designed a mechanical man. But only the invention of transistors and integrated circuits in the 1950s and 1960s made real robots possible. Compact, reliable electronics and computers added brains to already existing machines. In 1959, researchers demonstrated the possibility of robotic manufacturing ashtrays.

The Czech word 'robota', meaning hard work, was first used by the writer Karel Chapek in the story where robots are invented to help people by performing simple tasks, but being used to fight wars, they turn on their human masters and take over the world.

There's no precise definition of a robot. It is normally defined as a programmable machine imitating an intelligent creature. Getting information from its surroundings and doing something physical (moving or manipulating objects) qualify a machine as a robot.

Name a boring or dangerous job. Somewhere, a robot is probably doing it. Robots are ideal for doing jobs that require repetitive, precise and fast movements. Robots are good at doing the same thing without asking for a safe working environment, salary, breaks, food and sleep, without getting bored or tired, without making mistakes. Factories are so highly automated that most human workers carry out only supervising and maintaining the robots.

People keep finding new uses for robots - making and packing drugs and foods, soldering tiny wires to semiconductor chips, inserting integrated circuits onto printed circuit boards used in electronics, working in radioactive ‘hot zones’, exploring space.

All work and no play make anyone dull - even a robot. Soccer-playing robots gather each year at RoboCup, an international event collecting over 100 teams from 35 countries. Robotic players use radio signals to coordinate their actions with their teammates. Teams are placed in divisions based on size, ranging from the size of a pizza box. By 2050, the organizers of RoboCup count on developing a team of fully autonomous humanoid robots that can beat the human world champion team in soccer.

3. Прочитайте текст и перведите его на русский язык.

Advances in Robotics

A robot is a machine that gathers information about its environment (senses) and uses that information (thinks) to follow instructions to do work (acts).

Imitating humans, robots also sense magnetic fields and ultrasonic waves. Robotic light sensors work by creating or changing an electric signal when light falls on them. When navigating, the robot sends out a beam of infrared light, which bounces off objects and returns to a light sensor of the robot. However, making 3D images requires large amounts of computer memory.

The ability to move sets robots apart from computers.

A mechanical device for producing motion is known as an actuator. A single robot is supplied with dozens of actuators, each chosen to do a specific task. Electric motors are actuators that produce motion from electricity by the electromagnetic effect. Their high speed and a small turning power make a gearbox necessary. Special stepper motors turning in precise 'steps' are ideal for adjusting position. A servomotor is used for turning only 90° to the right or left. If you've ever driven a toy car, boat, or plane by remote control, a servomotor was probably responsible for the steering. Solenoids are electric motors for producing linear or in-and-out motion. Solenoids are used in switches turning things off and on. Although making a robot move like a person is not easy, engineers at Honda have designed robots capable of walking, climbing stairs and keeping their balance - no two-legged robot has ever done it before.

How to make robots think? There are three approaches to artificial intelligence.

Most robots have a microcomputer for 'brains', which allows programming a lot of information. But they work only according to their programme and cannot learn. Neural networks are modelled after the human brain. A neural net 'learns' by exposure to lots of input and corresponding output. Once trained, the neural net responds to an input with a likely output. Unlike rule-based systems, neural networks are incapable of giving definite answers. Stimulus-response robots pioneered by Rodney Brooks at MIT have no memory and no logical decision-making - only hard-wired responses to stimulation.

Can a robot be conscious in the way that we are? So far, no artificial intel-ligence has ever shown such signs of life. However, if robots eventually think like us, detect and express emotions, pursue their own interests and even make copies of themselves, drawing the line between machines and living things will be increasingly difficult.

4. Ответьте на вопросы.

1. What kind of machine is a robot?
2. What can a robot sense?
3. What are the functions of the light sensors?
4. How does a robot 'see'?
5. What is the difference between a robot and a computer?
6. Is the actuator a device for thinking?

UNIT 12 DANGERS OF NEW TECHNOLOGIES

SECTION A. *LASER*

Grammar: Gerund and Participle I

1. Составьте предложения по образцу двумя способами. Переведите на русский язык.

EXAMPLE: *experimenting with lasers*
Experimenting with lasers is very dangerous.
Experimenting with lasers you must observe safety rules.

1. Studying industrial gases ...
2. Converting the energy of wind into electricity ...
3. Travelling at the speed of light ...
4. Applying laser technologies ...

2. Два предложения в примере имеют разную структуру, но одинаковый смысл. Измените структуру предложения по образцу, но сохраните смысл. Переведите на русский язык.

EXAMPLE: *To make a hologram is rather difflcult.*
Making a hologram is rather difficult.

1. To produce a powerful beam of light is possible with the help of a laser.
2. To establish relationship between natural phenomena is a major task of his theory.
3. To point out the mistakes to some people proves quite difficult.
4. To analyze the evidence correctly requires a lot of attention.

3. Выберите определение для каждого слова. Переведите на русский язык.

1. laser, n	a) to send out heat, light, sound
2. behaviour, n	b) in only one colour
3. cavity, n	c)the larger number or amount
4. majority, n	d) an apparatus for producing a very hot narrow beam of light used for cutting metals
5. amplifier, n	e) acting in a particular way
6. to emit, v	a hole or hollow space in a solid mass
7. monochromatic, adj	f) an instrument for making a signal stronger

4. Прочитайте текст и переведите на русский язык.

The Past and the Future of the Laser

A laser is a source of light but unlike anything that had ever been seen before 1960 when Theodore H. Maiman of Hughes Aircraft placed a specially prepared synthetic ruby rod inside a powerful flash lamp similar to the type used for high-speed photography. Activating the flash lamp produced an intense pulse of red light, which possessed the unique properties of monochromicity (the light is of the same wavelength or colour), coherence (all the waves move precisely in step), and directionality (the beam can be easily manipulated). These features account for the enormous difference between the output of a laser and that of an incandescent light bulb.

With Maiman's invention the laser age was born. Everybody became interested in exploring this promising area of science. Within a very short time, numerous solid-state materials, gases, liquids, and semiconductor crystals were found possessing laser qualities. Almost every imaginable material was tried in order to produce new and interesting lasers. Even some varieties of jelly brand dessert were announced emitting xenon light, and according to this legend, they are supposed to work fairly well.

In many ways, the laser was a solution looking for a problem. Well, the problems soon followed in great numbers. It would be hard to imagine the modern world without lasers. They are used in everything from CD players to laser printers, fibre-optics and free-space communications, industrial cutting and welding, medical and surgical treatment, holography and light shows, basic scientific investigations in dozens of fields, including Star Wars weapons research. The unique characteristics of laser light make these and numerous other applications possible. In fact, it is safe to say that the vast majority of laser applications have not yet even been suggested.

However, if treated inadequately, an extremely powerful beam of laser light can be a source of destruction. You must never stand in the way of the cutting laser beam. Only by looking directly into the beam or its reflection from a shiny object you can damage your eyes. Besides, laser power supply being typically 2500 V or more, a qualified person must provide external power supply, as ordinary insulation is not enough. Thus, no matter how advantageous and useful they are, lasers *are* dangerous. Hence, safety rules must be strictly observed.

5. Ответьте на вопросы.

1. What is a laser? What other sources of light do you know?
2. What was the first laser like?
3. Why is it difficult to imagine our life without lasers?
4. What are the most common uses of lasers?
5. Why are lasers considered dangerous?

SECTION B. INDUSTRIAL GASES

Grammar: Gerundial Constructions

1. Объедините два предложения в одно, обращая внимание на предлоги. Переведите предложения на русский язык.

EXAMPLE: *Nitrogen is used in metal industry. We know that.*
We know of nitrogen being used in metal industry.

1. Silver and copper are very good conductors of electricity. We are aware of that.
2. Freon destroys the ozone layer. We are afraid of that.
3. Robots will replace men. The idea of that goes back to ancient times.
4. Radioactive carbon should be used to date ancient things. The scientists recommend that.

2. Прочитайте текст и переведите на русский язык.

Industrial Gases

We know of many gases used in industry for making various products. They are called industrial gases. Some of them are man-made and some are found in their natural state. Let us consider the most important ones.

Colourless, odourless, tasteless, non-toxic, and non-flammable, nitrogen has many uses, including glass making, food conserving, preventing semiconductors from oxidation.

Oxygen is the second largest volume industrial gas used in producing steel, building bridges and making electric equipment.

Being the most abundant element (98%) in the universe hydrogen has almost as many industrial uses as nitrogen and oxygen. It is needed in metal industry, in food industry for preparing margarine and in oil processing. Also, power stations depend on hydrogen cooling their high-speed turbine generators.

Can you imagine your life without eating ice-cream, spraying deodorants, drinking sodas, and fire fighting devices? All these things are possible due to carbon dioxide.

Some people believe that balloon flying is for children. Still, helium is a serious gas capable of rays detecting and aircraft lifting. It is also used in arc welding.

It is impossible to imagine present-day life without air conditioning, refrigerators, spraying aerosols, and packaging foam. However, freon, necessary for making these common things, is found depleting the ozone layer, which protects us from the destructive solar ultraviolet radiation. That is why scientists all over the world insist on fluorocarbon refrigerants being banned.

Argon is a noble gas comprising 0.98% of the atmosphere and forming unknown chemical compounds. Colourless, odourless, tasteless and non-toxic, argon is mainly used in producing high-quality welding in stainless steel and aluminium industry.

Chlorine gas is very toxic; nevertheless it protects us from falling ill by purifying drinking and swimming water. It also takes part in making many chemicals, including solvents, plastics, rubbers and pesticides.

Water-based paints and vinyl records are made with the help of acetylene, which has many other applications. Stored in a liquid state it is also used as a fuel producing a large amount of heat and the highest flame temperature (about 6,000°F, or 3,300°C) of any known mixture of combustible gases. When burnt with the correct amount of air, acetylene gives a pure white light. For this reason it was once used for illuminating places where electric power was not available.

The air itself is used as an industrial gas. It acts as a protective envelope for metals during the welding process because it does not react chemically with these metals or other elements.

3. Заполните пропуски подходящими по смыслу словами. Переведите на русский язык.

rubbers	foam	acetylene	toxic
helium	dioxide	man-made	noble
non-flammable	air	oxygen	odourless

Gases used in industry for making all kinds of products are known as industrial gases. They can be classified as natural and .... The examples of natural gases are nitrogen, ... , and hydrogen. The first largest industrial gas is nitrogen. It is colourless, tasteless, ..., ... and non-toxic. Breathing and combustion are impossible without oxygen. Hydrogen is the most abundant gas in the universe. Carbon ... is used in producing lemonades and conserving food. Balloons are normally filled with .. . The gases depleting the ozone layer are known as fluorocarbons. They are necessary in air conditioning, refrigeration and making packaging .... Argon is a ... gas applied in welding.

Chemicals, such as solvents ..., plastics, and pesticides are available due to chlorine, which is a very ... gas. Water-based paints and vinyl records are made with the help of ... that is also known for producing an extremely hot flame. Even the ... is used as an industrial gas because it will not react chemically with any elements.

4. Прочитайте текст и переведите на русский язык.

Air Pollution as the Major Problem of the Day

Since the 19th century we are getting increasingly worried about industry polluting breathing air in densely populated cities where the great majority of people live.

Not all air pollutants are man-made. For billions of years the air has been polluted by volcanoes throwing out tons of ash and smoke, dust stirred by the wind, gases given off by growing plants or by rotting animal and vegetable matter, salt particles from the

oceans, etc. However, having discovered fire man added much to natural pollutants by burning fossil fuels. Sherlock Holmes for example, observed London *pea-soupers* blanketing the city for days. That's because Londoners used soft coal for heating their houses.

Let us review what we know about combustion. All fossil fuels naturally contain hydrogen, carbon and sulphur, present in plants and animals. Uniting with oxygen during combustion these gases result in forming water and releasing carbon monoxide, carbon dioxide and sulphur dioxide. Besides, oxides of nitrogen are produced in the air whenever there are high temperatures, be it a car spark or a lightning stroke. These natural processes have far-reaching consequences.

The oxides reacting with water in the air produce carbonic, nitric, nitrous, sulphurous and sulphuric acids. Acid rains have damaging effects on materials and the environment. An excess of nitrogen in the air, greater than the ecosystems are able to absorb results in destroying the biological balance of the soils and water (eutrophication). In the layers of the air close to the ground photochemical pollution causes the formation of 'bad ozone', called so because of its destructing effect on human health and vegetation. And vice versa, the 'good ozone' protecting us from solar ultraviolet (UV) radia tion in the stratosphere is being depleted by NO (mainly from traffic) and by chlorofluorocarbons. The ozone layer depletion has damaging effects on human health and environment. The greenhouse effect consists in atmospheric gases ($C0_2$, CH_4, 0_3, N_20, CFCs) absorbing infrared (IR) radiation, reflected from the surface of the earth. When not reflected back into space the energy is absorbed and transformed into heat. Without the natural greenhouse effect the average temperature on the earth would be -18 °C. However, since the industrial revolution, the concentration of greenhouse gases proves increasing. Thus, today we are facing the prospect of global warming with all its unpleasant consequences.

5. Заполните пропуски подходящими по смыслу словами. Переведите на русский язык.

1 dioxide	4 aircraft lifting	7 refrigerators	10 ordourless
2 helium	5 arc welding	8 orone layer	11 tasteless
3 destructive	6 noble gas	9 radiation	12 rubbers

Can you imagine your life without eating ice-cream, spraying deodorants, drinking sodas, and fire fighting devices? All these things are possible due to carbon .... Some people believe that balloon flying is for children. Still, ... is a serious gas capable of rays detecting and .... It is also used in .... It is impossible to imagine present-day life without air conditioning, ... , spraying aerosols, and packaging foam. However, freon, necessary for making these common things, is found depleting the ..., which protects us from the ... solar ultraviolet .... That is why scientists all over the world insist on fluorocarbon refrigerants being banned.

Argon is a ... comprising 0.98% of the atmosphere and forming unknown chemical compounds. Colourless, ..., ... and non-toxic, argon is mainly used in producing high-quality welding in stainless steel and aluminium industry.

Chlorine gas is very toxic; nevertheless it protects us from falling ill by purifying drinking and swimming water. It also takes part in making many chemicals, including solvents, plastics, ... and pesticides.

ДОПОЛНИТЕЛЬНЫЕ ТЕКСТЫ ДЛЯ ЧТЕНИЯ И ПЕРЕВОДА

1. Для студентов заочной формы обучения автотракторного факультета всех специальностей (АТФ)

A

Almost all cars today use a reciprocating internal combustion engine because this engine is relatively efficient, relatively inexpensive and relatively easy to refuel.

Internal Combustion

If you put a tiny amount of high-energy fuel (like gasoline) in a small, enclosed space and ignite it, an incredible amount of energy is released in the form of expanding gas. For example, if you can create a cycle that allows you to set off explosions like this hundreds of times per minute, and if you can use that energy in a useful way, what you have is the core of a car engine!

Almost all cars currently use what is called a four-stroke combustion cycle to convert gasoline into motion. The four-stroke cycle is also known as the Otto cycle, in honor of Nikolaus Otto, who invented it in 1867. They are - intake stroke, compression stroke, combustion stroke and exhaust stroke.

Understanding the Cycles

The piston is connected to the crank shaft by a connecting rod. Here's what happens as the engine goes through its cycle:

The piston starts at the top, the intake valve opens, and the piston moves down to let the engine take in a cylinder-full of air and gasoline. This is the intake stroke. Only the tiniest drop of gasoline needs to be mixed into the air for this to work. Then the piston moves back up to compress this fuel/air mixture. Compression makes the explosion more powerful. When the piston reaches the top of its stroke, the spark plug emits a spark to ignite the gasoline. The gasoline charge in the cylinder explodes, driving the piston down. Once the piston hits the bottom of its stroke, the exhaust valve opens and the exhaust leaves the cylinder to go out the tail pipe. Now the engine is ready for the next cycle, so it intakes another charge of air and gas. Notice that the motion that comes out of an internal combustion engine is rotational. In an engine the linear motion (straight line) of the pistons is converted into rotational motion by the crank shaft. The rotational motion is smooth because we plan to turn (rotate) the car's wheels with it anyway.

B

Displacement. The combustion chamber is the area where compression and combustion take place. As the piston moves up and down, you can see that the size of the combustion chamber changes. It has some maximum volume as well as a minimum volume. The difference between the maximum and minimum is called the displacement and is measured in liters or CCs (Cubic Centimeters, where 1,000 cubic centimeters equals a liter). For example: A motorcycle might have a 500 cc or a 750 cc engine, while a sports car might have a 5.0 liter (5,000 cc) engine. Most normal car engines fall somewhere between 1.5 liter (1,500 cc) and 4.0 liters (4,000 cc)

If you have a 4-cylinder engine and each cylinder displaces half a liter, then the entire engine is a "2.0 liter engine." If each cylinder displaces half a liter and there are six cylinders arranged in a V configuration, you have a "3.0 liter V-6."

Generally, the displacement tells you something about how much power an engine can produce. A 2.0 liter engine is roughly half as powerful as a 4.0 liter engine. You can get more displacement in an engine either by increasing the number of cylinders or by making the combustion chambers of all the cylinders bigger (or both).

Other Parts of an Engine. ***Spark Plug.*** The spark plug supplies the spark that ignites the air/fuel mixture so that combustion can occur. The spark must happen at just the right moment for things to work properly.

Valves. The intake and exhaust valves open at the proper time to let in air and fuel and to let out exhaust. Note that both valves are closed during compression and combustion so that the combustion chamber is sealed.

Piston. A piston is a cylindrical piece of metal that moves up and down inside the cylinder.

Piston rings. Piston rings provide a sliding seal between the outer edge of the piston and the inner edge of the cylinder. The rings serve two purposes:

- They prevent the fuel/air mixture and exhaust in the combustion chamber from leaking into the sump during compression and combustion.
- They keep oil in the sump from leaking into the combustion area, where it would be burned and lost.

Connecting rod. The connecting rod connects the piston to the crankshaft. It can rotate at both ends so that its angle can change as the piston moves and the crankshaft rotates.

Crank Shaft. The crank shaft turns the piston's up and down motion into circular motion just like a crank on a jack-in-the-box does.

Sump. The sump surrounds the crankshaft. It contains some amount of oil, which collects in the bottom of the sump (the oil pan).

2. Для студентов заочной формы обучения факультета горного дела и инженерной экологии всех специальностей (ФГДЭ)

A

Mineral resources should be protected primarily from non-productive use. For example, much coal is lost in underground fires, large amounts of gas are lost when it is burned at the oil fields, and so on.

The economical and comprehensive use of mineral raw materials is aimed at exploiting the existing (already developed) mineral deposits in such a way as to make them last longer. In nature, ores do not contain only iron or only copper, zinc, or lead. The overwhelming majority of ores are complex with one main component and a number of additional ones. For example, in addition to their main element, iron ores often contain titanium, vanadium, cobalt, copper, zinc, phosphorus, and sulfur; polymetallic ores contain tin, copper, nickel, cobalt, tungsten, molybdenum, gold,

silver, and a whole range of rare metals (in different amounts);

Mining enterprises sometimes extract only the main mineral and only from the richest layers. Adjacent poorer layers are not exploited but left in the ground or extracted and dumped. By-products requiring additional separation processes are also dumped. This method of mining mineral raw materials is now outdated.

Certain success has been achieved in comprehensive use of mineral raw materials. Non-ferrous metallurgical plants make as by-products nearly all the silver, bismuth and platinum, about 30 per cent of the sulfur, and up to 10 per cent of the zinc, lead and copper. Indium, gallium, selenium, tellurium, cobalt, and other valuable elements are extracted from polymetallic ores. It should be noted that fuller use of mineral raw materials raises efficiency of production.

B

The need for economical and comprehensive use of mineral resources also applies to fossil fuels.

Coal is used not only as a source of energy but also in metallurgy (coke) and as a raw material for the chemical industry. Coal when processed yields about 300 kinds of products: asphalt, household gas, engine lubricant, carbolic acid, xylene, naphthalene and others.

Like coal, oil and gas are not only energy sources but also valuable chemical raw materials. Oil refining yields petrol, kerosene, lubricants, masut, tar, vaseline, and paraffin. Synthetic rubber is made of gases which are the by-products of oil extraction. Natural gas is the raw material for obtaining plastics and nitrogen fertilizers.

The replacement of mineral raw materials in short supply by other resources becomes necessary as mineral deposits are depleted. In many cases metal may be replaced by plastics, oil by coal, thermal power produced in burning coal by atomic power and so on.

Metal recycling is very important in saving mineral raw materials. In Britain, for example, more than half the steel produced is made of scrap-metal. In the future, metal recycling will probably grow in all countries which will increase the length of service of mineral deposits.

As we deplete existing deposits, we are compelled to switch to the use of deeper deposits. Geochemists in many countries are working on the technical and physico-chemical aspects of exploitation at greater depths of the earth.

Mineral resources are non-renewable, and their conservation means economical and rational use of them.

Continuous exploration, the economical and total use of mineral resources, and the replacement of mineral raw materials in short demand by other resources are carried out with the aim of rational use of mineral resources. The repeated use of scrap-metal is very important to save mineral raw materials. In addition, measures must be envisaged to prevent and eliminate the harmful impact of mining operations on the environment.

3. Для студентов заочной формы обучения машиностроительного факультета и механико-технологического факультета всех специальностей (МСФ, МТФ)

A

Mechanics is the science which describes and predicts the conditions of rest or motion of bodies under the action of forces. It can be applied science, not an abstract or pure one. It is to be noted that mechanics is the foundation of most engineering sciences and is an indispensable prerequisite to their study. Fundamental concepts of mechanics are the following:

- SPACE. It is associated with the notion of the position of a point P given in terms of three coordinates measured from a reference point of origin.
- TIME. The definition of an event requires specification of the time and position at which it occurred.
- MASS. It is used to characterize and compare bodies, e.g., response to Earth‘s gravitational attraction and resistance to changes in translational motion.
- FORCE represents the action of one body on another. A force is characterized by its point of application, magnitude, and direction, i.e., a force is a vector quantity. In Newtonian Mechanics space, time and mass are absolute concepts independent of each other. Force, however, is not independent of the other three. The force acting on a body is related to the mass of the body and the variation of its velocity with time.

Mechanics can be divided into sub-disciplines:

1. Statics is the study of forces in the absence of changes in motion or energy.
2. Dynamics is the branch of mechanics that deals with both motion and force together. Dynamics may be broken down into kinematics and kinetics. Kinematics is the study of motion without regard to the forces or energies that may be involved. It is the simplest branch of mechanics. Kinetics deals with the forces and moments involved in making the body move along with the measurement of various parameters describing the motion.

B

A metal is a material that is typically hard, has high electrical conductivity, high thermal conductivity, and high density. Metal ores are often extracted from the Earth by means of mining. Once the ore is mined, the metals must be extracted, usually by chemical or electrolytic reduction. The methods used depend on the metal and their contaminants. About 91 of the 118 elements in the periodic table are metals. Metals are materials most widely used in industry because of their properties. The study of the production and properties of metals is known as metallurgy. The separation between the atoms in metals is small, so most metals are dense. The atoms are arranged regularly and can slide over each other. That is why metals are malleable (can be deformed and bent without fracture) and ductile (can be drawn into wire). Metals vary greatly in their properties. For example, lead is soft and can be bent by hand, while iron can only be worked by hammering at red heat. The regular arrangement of atoms in metals gives them a crystalline structure, irregular crystals are called grains. The properties of the

metals depend on the size, shape, orientation, and composition of these grains. In general, a metal with small grains will be harder and stronger than one with coarse grains. Heat treatment such as quenching, tempering, or annealing controls the nature of the grains and their size in the metal. Small amounts of other metals (less than 1 per cent) are often added to a pure metal. This is called alloying and it changes the grain structure and properties of metals. All metals can be formed by drawing, rolling, hammering and extrusion, but some require hot-working. Metals can be worked using machine-tools such as lathe, milling machine, shaper and grinder. One can say that the ways of working a metal depend on its properties. Many metals can be melted and cast in moulds, but special conditions are required for metals that react with air. Demand for metals is closely linked to economic growth. During the 20th century, the variety of metals uses in society grew rapidly.

C

There are some distinctions between metals and nonmetals. Metals are distinguished from nonmetals by their high conductivity for heat and electricity, by metallic lustre and by their resistance to electric current. Their use in industry is explained not only by those properties, but also by the fact that their properties, such as strength and hardness, can be greatly improved by alloying them with other metals. There are several important groups of metals and alloys. The common metals such as iron, copper, zinc, etc. are produced in great quantities. The so-called precious metals include silver, gold, platinum and palladium. The light metals are aluminium, berillium and titanium. They are important in aircraft and rocket construction. Many elements are classified as semimetals (bismuth, for example) because they have much poorer conductivity than common metals. Nonmetals (carbon, silicon, sulphur) in the solid state are usually brittle materials without metallic lustre and are usually poor conductors of electricity. Nonmetals show greater variety of chemical properties than common metals do. Metals can undergo corrosion, changing in this case their chemical and electromechanical properties. In order to protect metals from corrosion the products made of metals and steel are coated by some films (coatings). Organic coatings protect metals and steel from corrosion by forming a corrosion-resistant barrier between metal or steel and the corrosive environment.

4. Для студентов заочной формы обучения энергетического факультета всех специальностей (ЭФ)

A

Electricity is something that people cannot live without in the modern day. Without it, life would be so much difficult and slow. People need to learn how to value electricity and learn how to produce it from renewable sources.

Hundreds of years ago, people never imagined that they could make lives very easy through technology. In the modern day, people cannot imagine life without electricity. Why is electrical power so important for people today? Let us discuss some aspects of life that electricity has improved a lot.

Communication. This is probably the most improved aspect in people's lives. With electrically powered gadgets and computers, people now communicate with each other no matter how far the distance is. As long as you have a source of power to use your mobile phone or the internet, you will not have any problem with long distance communication. Can you still imagine the world without your smart phones and laptops?

Entertainment. Electricity has improved entertainment a lot too. People can use televisions and radios because of electricity. It is also used for printing books and for powering microphones during events. Imagine life without these entertainment appliances and equipment. Let's face it. Life would become very dull without it. No more game consoles to kill time with.

Work. Tell me a kind of work or profession that does not need electricity. There is none. From construction to corporate jobs, from white-collared to blue-collared work, people need electricity to operate some equipment needed to finish their daily tasks. This is the reason why when there is a shortage of energy, companies suffer a lot because they cannot operate and provide the service they promised to their clients.

B

Transportation. Electricity is starting to transform the transportation system in many countries. Aside from trains, cars and other vehicles are now being designed to be powered not by gas but by electricity. This is because it is eco-friendly and it does not create harmful by-products such as carbon emissions. If all modes of transportation do not use gas, air pollution and global warming will definitely be solved.

Food. The food industry also needs power to operate. It is a lot faster and easier to produce food items now because of machines. Imagine fast food chains or restaurants having no source of power. Surely, you would have to wait hours before you could eat the meal you ordered.

Home. Electricity is also very efficient for households. Homes can use air-conditioners when there the summer is on. They can also deviate from traditional heaters and choose electric heaters during the winter season. The family can bond together by watching movies on DVD or by playing games together. These are just some of the advantages of electricity. There are also some disadvantages and issues concerning it as well. For instance, it is most commonly made by burning crude oil or fossil fuels. The bad thing is that these things are non-renewable. Once these resources disappear, the world will definitely suffer. The good thing is that there are now renewable sources of electricity that are being discovered and developed. One example is the solar energy which uses the heat from the sun. Hydroelectric uses the power of running water that moves turbines. Geothermal energy produces electricity through the heat from the ground.

5. Для студентов заочной формы обучения факультета информационных технологий и робототехники (ФИТР)

A

Materials are the primary part of all things surrounding us. In fact, some materials have given the name to various ages in human history, for example, Stone Age, Bronze Age, Iron Age, Synthetic Materials Age, Smart Materials Age. The materials used for manufacturing of engineering products are called engineering materials. The research and development of new engineering materials is a continuous process. Currently many institutions and laboratories are working on the development of new materials to cope with the changing demands of industries.

Engineering materials can be classified according to the branch of engineering like mechanical engineering materials (iron, steel etc.), electrical engineering materials (conductors, insulators, magnetic materials, etc.), civil engineering materials (cement, stone, etc.) and so on. The structures, components, and devices that engineers design are limited by the properties of the materials that are available and the techniques that can be used for fabrication.

Basically, engineering materials can be classified into two categories: metals and non-metals. Most metals are solid at room temperature. However, mercury is the only metal that is liquid at room temperature. Examples of metals include silver, copper, gold, aluminium, iron, zinc, lead, tin etc. All metals have high thermal and electrical conductivity.

Pure metals have very low mechanical strength, which sometimes does not match with the mechanical strength required for certain loads. To overcome this drawback alloys are used. Alloys are the composition of two or more metals or metal and non-metals together. Generally, alloys have better strength and durability than their main metals. Examples are steel, brass, bronze, invar etc.

B

Metals can be further divided into two groups: ferrous and non-ferrous metals. All ferrous metals such as cast iron and steel have iron as a basic substance. Non-ferrous metals do not contain iron. Non-ferrous metals include silver, copper, gold, aluminium etc. Ferrous metals are prized for their tensile strength and durability thanks to a high carbon content. However, ferrous metals tend to rust when exposed to air and water. There are two exceptions to this rule: wrought iron resists rust due to its purity and stainless steel is protected from rust by the presence of chromium. Most ferrous metals are magnetic which makes them very useful for motor and electrical applications.

The main advantage of non-ferrous metals over ferrous materials is their malleability. They also don't contain iron that gives them a higher resistance to rust and corrosion. They are non-magnetic, which is important for many electronic and wiring applications.

Non-metals are poor conductors of heat and electricity. Examples include plastics, rubber, ceramic, leather etc. Non-metals have very high resistivity which makes them suitable for insulation purpose in electrical machines.

6. Для студентов заочной формы обучения приборостроительного факультета всех специальностей (ПСФ)

A

Most metals are good conductors of electricity; most glass and porcelain materials are not. Metals conduct well because they contain many free electrons. In glass and porcelain insulators, electrons are tightly bound to their atoms and cannot conduct current.

Semiconductors fall somewhere in the range between conductors and insulators. In their pure state, at room temperature, they can conduct only slightly because they have only a few free electrons. The most common semiconductors are silicon and germanium.

But semiconductors possess properties that set them apart from other materials and make them vitally important to the new technology. Their most important characteristic is their versatility. For example, they can be made to give off light when an electrical current is applied, or, conversely, to convert light into electrical current. Their level of conductivity can be raised or lowered significantly. Moreover, conductivity can be maintained at varying levels in different local areas within a single tiny square of semiconductor material. Thus we can have a tiny object which is a strong conductor in many local areas and an insulator in others. In addition, it is possible to change an insulating area to a conducting area, or vice versa, in a fraction of a second.

As a result designers can build electrical devices like switches right in the semiconductor material itself. In fact, it would be possible to build entire miniature versions of household wiring circuits within a single tiny block of semiconductor material. This ability of semiconductors to change their state and to maintain conductive and nonconductive areas or spots, as needed by circuit requirements, has made them the cornerstone of electronics and has resulted in the creation of a new branch of science called solid-state physics.

B

Semiconductors are the materials, which by their conductivity are situated between conductors and insulators. The main property of these materials is conductivity increase by temperature rise. Common semiconducting materials are crystalline solids, but amorphous and liquid semiconductors are known. In their normal state, semiconductor atoms share electrons with their neighbors to form a tight structure that depends on the proper ratio of electrons to nuclei. Because of this balanced structure, semiconductor materials have few free electrons and cannot conduct current to any great extent. However, this orderly structure can be disrupted by introducing minute quantities of ‘impurities’ into the material (this is referred to as ‘doping’). Some ‘impurity’ atoms will bond with some of the semiconductor atoms and free up electrons. The ‘doped’ part of the semiconductor will then be capable of conducting current. In the case of silicon, this change can be brought about by injecting tiny quantities of phosphorus. The segment so treated will now have conducting electrons within it and is referred to as an ‘n’ (for negative) type carrier. Alternatively, an impurity such as boron can be injected, and its interaction with the silicon atoms will produce a surplus of positive carriers in the treated segment. The positive carriers produced this way are referred to as ‘holes’ (because, in essence, they represent the

absence of an electron). A silicon segment doped with boron is referred to as a ‘p’ (for positive) type carrier. A p-n junction is formed by joining p-type and n-type semiconductors together in very close contact. P-n junctions are elementary ‘building blocks’ of almost all semiconductor electronic devices such as diodes, transistors, solar cells, LEDs, and integrated circuits; they are the active sites where the electronic action of the device takes place. For example, a common type of transistor, the bipolar junction transistor, consists of two p-n junctions in series, in the form n-p-n or p-n-p.

ГРАММАТИЧЕСКИЙ СПРАВОЧНИК

Структура простого повествовательного предложения

Простое повествовательное распространенное предложение в английском языке имеет строгий порядок слов. Каждый член предложения занимает определенное место, условно обозначаемое римской цифрой:

I – подлежащее

II – сказуемое

III – прямое дополнение

IIIo – косвенное беспредложное дополнение, которое обычно предшествует прямому дополнению

IV – предложное дополнение или обстоятельство;

0 – обстоятельство, если оно стоит перед дополнением в начале предложения.

I II III IV

[Some metals] [exhibit] [different crystal structure] [at different temperatures]

Определение условной цифры не имеет, т.к. оно может входить в состав любой из вышеперечисленных групп. В зависимости от его положения по отношению к слову, которое оно определяет, мы условно называем определение «левым» или «правым».

В именной группе, состоящей из цепочки существительных, не разделенных ни предлогом, ни запятой, последнее слово, как правило, будет являться основным, а все остальные слова будут определениями к основному слову.

Перевод такой группы следует начинать с последнего существительного, а предшествующие слова могут переводиться на русский язык как левыми, так и правыми определениями.

Например:

The metal quality **–** *качество металла**;***

The temperature limit determination **–** *определение температурного режима;*

Corrosion losses **–** *потери от коррозии**.***

Предложение может начинаться только с групп подлежащего или обстоятельства. Наличие групп **I**, **II** обязательно! Групп **III** и **IV** может не быть.

В зависимости от места в предложении одно и то же слово может быть различным членом предложения.

1. **The device measures the temperature inside the furnace. –** *сказуемое (измеряет)*
2. **They took measures to improve the work of the laboratory. –** *прямое дополнение (меры)*
3. **The measures taken were not enough. –** *подлежащее (меры)*

Признаки сказуемого в предложении

Анализ предложения следует начинать с выделения группы сказуемого. Его признаки:

1. Все формы вспомогательных (***to be, to have, to do***) и модальных глаголов (***can, may, must, ought, shall, will, should, would***).

Это правило, из которого нет исключений!

2. Окончание глагола ***-(e)s*** в 3-ем лице ед. ч. **Present Simple**. Не путать с окончанием ***-(e)s*** множественного числа в существительных.

The **result** of his work leaves to be desired. – существительное (мн.ч.) (*результаты*)

His bad work **results in** our lagging behind. – **Present Simple** глагола (*приводит к)*

3. Окончание глаголов – ***ed*** **(Past Simple**), либо II-ая форма неправильных глаголов. Не путать с Participle II (причастие II)!

He **played** a great game. – **Past Simple** (*сыграл*)

The game **played** wasn't honest. – **Participle II** (*сыгранная*)

He **read** this book. – **Past Simple** (*прочитал*)

The book **read** wasn't interesting. – **Participle II** (*прочитанная*)

4. Подлежащее, выраженное личным местоимением.

5. Наречие, стоящее перед сказуемым или после него.

We still leave behind for future generations a beautiful world.

6. Прямое (*беспредложное*) дополнение, которое занимает III место и всегда стоит после группы сказуемого.

These boundaries play an important role in metal properties.

ПОРЯДОК СЛОВ В ПОВЕСТВОВАТЕЛЬНОМ ПРЕДЛОЖЕНИИ

Повествовательные предложения служат для того, чтобы сообщить что-то собеседнику или читателю. Они содержат утверждение какого-либо факта (повествовательные утвердительные предложения) или отрицание какого-либо факта (повествовательные отрицательные предложения). В английском языке повествовательные предложения имеют твердый порядок слов, т. е. каждый член предложения имеет свое определенное место.

Поскольку место слова определяет его роль в предложении, следует при построении английского предложения располагать слова в строго определенном порядке. Следующий порядок слов является обычным для английского повествовательного предложения:

1) подлежащее,
2) сказуемое,
3) дополнения,
4) обстоятельства:

The students (подлежащее) *Студенты*	**carried out** (сказуемое) *провели*	**the experiment** (дополнение) *эксперимент*	**yesterday.** (обстоятельство) *вчера.*

Определение не имеет постоянного места в предложении и может стоять при любом члене предложения, выраженном существительным

*A steamer **of 10,000 tons** has arrived at the port.* Пароход в 10 000 тонн прибыл в порт.

*We have found an **important** information.* Мы нашли важную информацию.

*They live in a **new** house.* Они живут в новом доме.

Структура общего вопроса

Вспомога-тельный глагол, модальный глагол	**Подлежащее**	**Сказуемое (или его часть)**	**Второстепенные члены предложения**	**Ответ на вопрос**
Is	your friend	a student?		Yes, he is.
Are	you	reading	a book now?	No, I am not.
Do	our students	go	to the sportsground?	Yes, they do.
Does	Kate	live	in Minsk?	No, she does not.
Did	you	see	that film yesterday?	No, I did not.
Do	they	have	these devices?	Yes, they do.
Has	his friend	translated	the text?	Yes, he has.
Will	they	go	to the cinema today?	No, they will not.
Must	we	read	newspapers every day?	Yes, we must.

Структура специального вопроса

Вопроситель-ное слово	**Вспомогательный глагол, модальный глагол**	**Подлежащее**	**Остальная часть сказуемого**	**Второстепенны е члены предложения**
Where	do	you	go	every morning?
What	can	one	get	in the library?
What book	did	you	read	yesterday?
What	is	he	doing	now?
Why	were	you	absent	yesterday?
When	do	you	have to leave	for London?
When	will	you	go	to London?

Структура разделительного вопроса

Вопрос	Ответ, выражающий	
	согласие	несогласие
Your friend speaks English, doesn‘t he?	Yes, he does.	No. he doesn‘t.
You have finished your work, haven‘t you?	Yes, I have.	No, I haven‘t.
Your friend doesn‘t speak English, does he?	No, he doesn‘t.	Yes, he does.
You haven‘t finished your work, have you?	No, I haven‘t.	Yes, I have.

Структура вопроса к подлежащему или к определению подлежащего

Вопросительное слово-подлежащее или определение подлежащего	Сказуемое	Второстепенные члены предложения
Who	is absent	today?
Whose book	is	on the table?
What	is	on the desk?
What season	comes	after summer?
Who	will go	to the theatre?
Who	saw	the film yesterday?
Who	is speaking?	right now?
Who	has been	to London?

Времена действительного залога

Для выражения времени совершения действия — настоящего, прошедшего и будущего — английский глагол имеет своеобразную систему глагольных времен (Tenses). Глагольные времена делятся на четыре группы:

1. Группа «неопределенных» времен (Indefinite Tenses). Эта группа состоит из настоящего неопределенного времени (Present Indefinite Tense), прошедшего неопределенного времени (Past Indefinite Tense) и будущего неопределенного времени (Future Indefinite Tense):

Present Indefinite	Past Indefinite	Future Indefinite
*I **write** letters every day.* Я пишу письма каждый день.	*I **wrote** a letter yesterday.* Я писал (написал) письмо вчера.	*I **will write** a letter* tomorrow. Я буду писать (напишу) письмо завтра.

Времена группы Indefinite употребляются, в отличие от времен других групп, только для констатации факта совершения действия в настоящем, прошедшем и будущем, без указания на его длительность, законченность и безотносительно к какому-либо другому действию или моменту. В русском

языке этим временам соответствуют времена глагола как несовершенного, так и совершенного вида, в зависимости от смысла предложения.

2. Группа «длительных» времен (Continuous Tenses). Эта группа состоит из настоящего длительного времени (Present Continuous Tense), прошедшего длительного времени (Past Continuous Tense) и будущего длительного времени (Future Continuous Tense):

Present Continuous	Past Continuous	Future Continuous
*I **am writing** a letter (at the present moment).* Я пишу письмо (в на стоящий момент).	*I **was writing** a letter at five o'clock.* Я писал письмо в пять часов.	*I **will be writing** a letter at five o'clock.* Я буду писать письмо в пять часов.

Времена группы Continuous употребляются для выражения длительного действия, которое началось до определенного момента в настоящем, прошедшем или будущем и которое все еще совершается, совершалось или будет совершаться в этот момент. Они описывают действие в процессе его совершения, выражая, таким образом, незаконченное длительное действие. В русском языке этим временам соответствуют времена глагола несовершенного вида.

3. Группа «совершенных» времен (Perfect Tenses). Эта группа состоит из настоящего совершенного времени (Present Perfect Tense), прошедшего совершенного времени (Past Perfect Tense) и будущего совершенного времени (Future Perfect Tense):

Present Perfect	Past Perfect	Future Perfect
*I **have written** the letter.* Я (уже) написал письмо (к настоящему моменту).	*I **had written** the letter by five o'clock.* Я (уже) написал письмо к пяти часам.	*I **will have written** the letter by five o'clock.* Я (уже) напишу письмо к пяти часам.

Времена группы Perfect выражают действие, совершенное к определенному моменту в настоящем, прошедшем или будущем. В русском языке этим временам соответствуют времена глагола совершенного или несовершенного вида, в зависимости от смысла предложения.

4. Группа «совершенных длительных» времен (Perfect Continuous Tenses). Эта группа состоит из настоящего совершенного длительного времени (Present Perfect Continuous Tense), прошедшего совершенного длительного времени (Past Perfect Continuous Tense) и будущего совершенного длительного времени (Future Perfect Continuous Tense):

Present Perfect Continuous	Past Perfect Continuous	Future Perfect Continuous
*I **have been writing** the letter for an hour.* Я пишу письмо (уже) час.	*I **had been writing** the letter for an hour when he came.* Я писал письмо (уже) час, когда он пришел.	*I **will have been writing** the letter for an hour when he comes.* Я буду писать письмо (уже) час, когда он придет.

Времена группы Perfect Continuous употребляются для выражения длительного действия, начавшегося до определенного момента в настоящем, прошедшем или будущем и длившегося известный период времени, включая этот момент. Времена этой группы могут выражать длительное действие, продолжавшееся известный период времени и закончившееся непосредственно перед определенным моментом в настоящем, прошедшем или будущем. В русском языке этим временам соответствуют времена глагола несовершенного вида.

Таким образом, английский глагол имеет для выражения настоящего, прошедшего и будущего времени в изъявительном наклонении действительного залога 12 глагольных времен:

https://drive.google.com/open?id=1sH5hfMvb_KzZ3v7x6zcQBH8tsYtvp-5i

Образование времен страдательного залога

1. Если подлежащее обозначает лицо или предмет, совершающий действие, то глагол употребляется в форме действительного залога:

*The sun **attracts** the planets.* Солнце притягивает планеты.

*Lomonosov **discovered** the law of conservation of matter.* Ломоносов открыл закон сохранения материи.

Если же подлежащее обозначает лицо или предмет, подвергающийся действию со стороны другого лица или предмета, то глагол употребляется в форме страдательного залога:

*The planets **are attracted** by the sun.* Планеты притягиваются солнцем.

*The law of conservation of matter **was discovered** by Lomonosov.* Закон сохранения материи был открыт Ломоносовым.

2. Времена страдательного залога образуются при помощи вспомогательного глагола **to be** в соответствующем времени и формы причастия прошедшего времени (Past Participle) смыслового глагола. Таким образом, при спряжении глагола в страдательном залоге изменяется только глагол **to be**, смысловой же глагол имеет во всех временах одну и ту же форму — Past Participle. Следовательно, время, в котором стоит глагол в страдательном залоге, определяется формой, в которой стоит вспомогательный глагол **to be:**

https://drive.google.com/open?id=1sH5hfMvb_KzZ3v7x6zcQBH8tsYtvp-5i

При образовании вопросительной формы вспомогательный глагол ставится перед подлежащим: *Was it shown?* Если вспомогательный глагол употребляется в сложной форме (*have been, will have been* и т. д.), то только первый вспомогательный глагол ставится перед подлежащим: *Has it been shown? Will it have been shown?*

При образовании отрицательной формы частица **not** ставится после вспомогательного глагола: *It was not shown.* Если вспомогательный глагол употреблен в сложной форме (*have been, will have been* и т. д.), то частица **not** ставится после первого вспомогательного глагола: *It has not been shown, It will not have been shown.*

МОДАЛЬНЫЕ ГЛАГОЛЫ И ИХ ЭКВИВАЛЕНТЫ

Модальными называются глаголы, которые выражают не действие, а отношение говорящего к действию, выраженному последующим инфинитивом, т.е. возможность, вероятность или необходимость совершения действия. Модальные глаголы имеют следующие особенности:

1. Смысловой глагол стоит после них без частицы **to**:

*New technologies **must be used**.*

2. Вопросительную и отрицательную формы образуют без помощи вспомогательного глагола:

***Can** you **solve** the problem?*

*I **cannot solve** this problem.*

3. Не изменяются по лицам и числам.

He
They } *must complete the work on the road in time.*

4. Не имеют неличных форм: инфинитива, причастия, герундия.

5. Не имеют формы будущего времени, а глагол **must** не имеет и формы прошедшего времени. Для восполнения недостающих форм модальные глаголы имеют равнозначные словосочетания, которые называются эквивалентами модальных глаголов.

Таблица модальных глаголов и их эквивалентов

Модальный глагол	Значение	Present Simple	Past Simple	Эквивалент
can **may**	возможность, способность совершения действия	**can** **may**	**could** **might**	**to be able (to)** **to be allowed (to)**
must	долженствование, т.е. необходимость совершения действия	**must**	**--**	**to be (to)** **to have (to)**
ought (to) **should**	долженствование (для выражения морального долга)	**ought (to)** **should**	**--** **--**	**--** **--**

СОГЛАСОВАНИЕ ВРЕМЕН

В английском языке время глагола в придаточном предложении зависит от времени, в котором употреблен глагол в главном предложении. Употребление времен в придаточных предложениях, главным образом дополнительных, подчиняется следующим правилам, называемым правилами последовательности времен:

Если сказуемое главного предложения выражено глаголом в одной из форм настоящего времени (обычно **Present Indefinite** или **Present Perfect**) или будущего времени (обычно **Future Indefinite**), то глагол в придаточном предложении употребляется в любом времени, которое требуется по смыслу:

*He **knows** that*	*you **are** busy.*	Он знает, что	вы заняты.
	*you **were** busy.*		вы были заняты.
	*you **will be** busy.*		вы будете заняты.
*He **has said** that*	*he **receives** letters from her.*	Он сказал, что	он получает от нее письма.
	*he **has received** a letter.*		он получил письмо.
	*he **received** a letter yesterday.*		он получил письмо вчера.
	*he **will receive** a letter tomorrow.*		он получит письмо завтра.
*He **will think** that*	*you **do** it.*	Он подумает, что	вы это делаете.
	*you **have done** it.*		вы это сделали.
	*you **did** it yesterday.*		вы это сделали вчера.
	*you **will do** it.*		вы это сделаете.

Инфинитив *(the Infinitive)* - это неличная форма глагола, которая называет действие, но не указывает на лицо, число и наклонение. Формальный признак инфинитива - частица **to**, которая в некоторых случаях опускается. В английском языке имеются следующие формы инфинитива:

	Active Voice	**Passive Voice**
Simple	to use	to be used
Continuous	to be using	-
Perfect	to have used	to have been used
Perfect Continuous	to have been using	-

Перевод инфинитива на русский язык зависит от его функции в предложении. Инфинитив в английском предложении может выполнять следующие функции:

1. **Подлежащего.** Стоит перед сказуемым, переводится на русский язык неопределенной формой глагола или существительным:

***To complete** this laboratory experiment will not take much time.* Завершить этот лабораторный эксперимент не займет много времени.

To build *good roads is one of the most important tasks.* Строительство хороших дорог - одна из наиболее важных задач.

2. **Части сказуемого:**

а) именной части составного именного сказуемого после глагола-связки **to be**. Переводится неопределенной формой глагола или существительным:

The task is ***to keep*** *low pressure.* Задача заключается в том, чтобы поддерживать низкое давление.

Another possibility was ***to use*** *quartz.* Другая возможность заключалась в применении кварца.

б) часть составного модального сказуемого после модальных глаголов и их эквивалентов:

The vibration must ***be eliminated***. Вибрацию нужно (следует) устранить.

в) часть составного глагольного сказуемого, после глаголов, обозначающих начало, продолжение или конец действия:

The temperature begins ***to rise*** *sharply.* Температура начинает резко повышаться.

3. **Дополнения** (простого). Переводится неопределенной формой глагола:

The geologist helped ***to calculate*** *the stability of the building.* Геолог помог рассчитать устойчивость здания.

4. а) **Обстоятельства цели.** Отвечает на вопрос *для чего?;с какой целью?*. Может вводиться союзами **in order (to);** и **so as (to)** - чтобы; для того чтобы. Переводится на русский язык инфинитивом с союзами *для того чтобы, чтобы* или отглагольным существительным с предлогом *для*.

(In order) ***to understand*** *the phenomenon the laws of motion should be considered.* Чтобы понять это явление (для понимания этого явления), необходимо рассмотреть законы движения.

б) **Обстоятельства следствия.** В этой функции инфинитив соотносится

с наречиями **too** - слишком; **enough, sufficiently** -достаточно. Инфинитив имеет модальный оттенок возможности и переводится на русский язык неопределенной формой глагола с союзом *чтобы, для того чтобы* и с добавлением глагола *мочь*:

Some molecules are large enough ***to be seen*** *in the electron microscope.* Некоторые молекулы достаточно большие, что их можно было увидеть через электронный микроскоп.

The foundation is too unstable ***to install*** *existing machines.* Основание слишком неустойчиво, чтобы можно было устанавливать существующее оборудование.

5. **Определения,** которое стоит после определяемого существительного. Может переводиться на русский язык:

а) существительным (когда инфинитив в активном залоге):

Gases have the ability ***to become*** *ionized.* Газы обладают способностью к ионизации.

б) неопределенной формой глагола (когда инфинитив в активном залоге):

Energy is defined as the capacity ***to do*** *work.* Энергия определяется как способность совершать работу.

в) придаточным определительным предложением (когда инфинитив в страдательном залоге), сказуемое которого имеет оттенок долженствования, возможности или будущего времени:

The apparatus ***to be assembled*** *is very complicated.* Прибор, который нужно (можно) собрать (будут собирать), очень сложный

Примечание:

1. Как определение к порядковым числительным и к прилагательному **last** инфинитив переводится личной формой глагола в том времени, в котором стоит сказуемое английского предложения:

Newton was the first ***to discover*** *the basic laws of motion.* Ньютон первым открыл основные законы движения.

2. Если инфинитив в функции определения выражен глаголом, соответствующий эквивалент которого в русском языке требует после себя предлога, то этот предлог при переводе на русский язык ставится перед союзным словом *который*:

Here are some more figures ***to be referred to*** *later.* Вот еще несколько цифр, на которые будут ссылаться позже.

Сложные обороты с инфинитивом

Сложное дополнение (или Объектный падеж с инфинитивом) (Complex Object)

должно выражать:

1. Мнение, суждение, предположение: (инфинитив с частицей “to”)

to assume – допускать, предполагать,
to believe – думать, полагать, считать**,**
to consider – считать, полагать**,**
to declare – заявлять, объявлять**,**
to expect – думать, полагать, предполагать**,**
to find – считать, полагать,
to know – считать, полагать,
to prove - доказывать,
to suppose – думать, полагать, предполагать,
to think – думать, полагать, считать.

2. Чувственное восприятие (после них инфинитив стоит без частицы "to"):

to see - видеть,
to hear - слышать,
to feel – чувствовать,
to notice - замечать,
to observe - наблюдать,
to watch - наблюдать.

3. Желание, просьбу, требование, приказание: (инфинитив с частицей “to”)
to want – хотеть,
to wish - желать,
to desire - желать,
to like (would/should like) - хотеть,
to require - требовать,
to order – приказывать,
to hate – ненавидеть, не выносить,
to ask – просить.
4. Разрешение, принуждение: : (инфинитив с частицей “to”)
to allow – позволять,
to let – позволять (без частицы “to”),
to permit - разрешать,
to enable - позволять,
to cause - заставлять,
to force - заставлять,
to make – заставлять (без частицы “to”).

Оборот “сложное дополнение” после глаголов первых трех групп переводится придаточным дополнительным предложением с союзами *что, чтобы, как.* При этом дополнение становится подлежащим, а инфинитив – сказуемым придаточного предложения:

*The ancients thought **a molecule to be** the smallest particle of a substance.* Античные ученые думали, что молекула – это наименьшая частица вещества.

*During the experiment they saw **the temperature fall** rapidly.* Во время опыта они видели, что (как) температура быстро падала.

*We want **them to take part** in this conference.* Мы хотели, чтобы они приняли участие в этой конференции.

При переводе на русский язык оборота “сложное дополнение” после глаголов **to make, to cause, to force**, как правило, сохраняется порядок слов английского предложения.

*An increase in temperature makes **particles of any substance move** more rapidly.* Повышение температуры заставляет частицы любого вещества двигаться быстрее.

При переводе оборота “сложное дополнение” после глаголов **to allow, to enable, to permit** можно:

1) сохранить порядок слов английского предложения, если инфинитив имеет форму активного залога:

*This enables **the scientists to state** the laws of planetary motion.* Это позволило ученым сформулировать законы движения планет.

2) переводить инфинитив сразу после сказуемого, если он имеет форму страдательного залога:

*This enabled **the laws of planetary motion to be stated.*** Это позволило сформулировать законы движения планет.

Сложное подлежащее (или Именительный падеж с инфинитивом) (Complex Subject)

должно быть выражено:

1. Личной формой глаголов, обозначающих умственную деятельность или чувственное восприятие, в страдательном залоге:

to assume - предполагать,
to believe – думать, полагать,
to consider - считать,
to claim – заявлять, утверждать,
to conclude – делать вывод,
to declare - объявлять,
to expect - ожидать,
to find - оказываться,
to feel – полагать, считать,
to formulate – формулировать, излагать,
to guess - полагать,
to hear - слышать,
to know - знать,
to mention – упоминать, ссылаться,
to notice – замечать, упоминать,
to observe - замечать,
to predict - предсказывать,
to prove - доказывать,
to say - говорить,
to see - видеть,
to suggest - предполагать,
to suppose - предполагать,
to think – предполагать,
to report – сообщать,
to estimate – считать, полагать.

1. Глаголами в действительном залоге.

to appear - казаться,
to seem - казаться,
to happen - случаться,
to prove - оказываться,
to turn out – оказываться.

3. Выражениями:

to be likely - вероятно,
to be unlikely - маловероятно,
to be certain - определенно,
to be sure - конечно.

Возможны два способа перевода оборота “сложное подлежащее”:

1. Перевод начинается со сказуемого, которое переводится неопределенно-личным предложением (соответствует 3-му лицу множественного числа, например, *сообщают, предположили, известно* и т.п.). Сам оборот переводится придаточным дополнительным предложением с союзом *что* (реже *чтобы, как*), в котором инфинитив становится сказуемым.

2. Порядок слов английского предложения сохраняется, инфинитив переводится сказуемым, а сказуемое английского предложения переводится вводным предложением с союзом *как*:

***The prices** are expected to fall.*

1. Ожидают, что цены упадут (будут падать).

1. Цены, как ожидают, упадут (будут падать).

***This reaction** turned out to lead to good results.*

1. Оказалось, что эта реакция дает хорошие результаты.

2. Эта реакция, как оказалось, дает хорошие результаты.

Примечания:

1. Глагол to find в обороте «сложное подлежащее» часто переводится *оказываться*:

Coal was found to be rather abrasive.

Оказалось, что уголь имеет значительные абразивные свойства.

2. Если в обороте «сложное подлежащее» глагол **to prove** стоит в активном залоге, он имеет значение *оказываться*, если в страдательном залоге, то он означает *доказывать*:

***Gold** proved **to be unattacked** by moisture.* Оказалось, что на золото не действует влага.

***Gold** was proven **to be unattacked** by moisture.* Доказали, что на золото не действует влага.

3. Если в обороте «сложное подлежащее» инфинитив выражен глаголом-связкой **to be**, то глагол **to be** можно не переводить:

***The interpretation** was found **to be convincing**.* Объяснение оказалось убедительным.

ПРИЧАСТИЕ (THE PARTICIPLE)

Причастие (*the Participle*) – это неличная форма глагола, которая обладает признаками как прилагательного, так и глагола. К глагольным свойствам причастия относится его способность иметь прямое дополнение, определяться наречием и иметь формы времени (которое носит относительный характер) и залога.

Формы причастия

	Participle I		**Participle II (or Past Participle)**
	Simple	**Perfect**	
Active Voice	asking	having asked	-
Passive Voice	being asked	having been asked	asked

Причастие в английском предложении может выполнять функции:

1) левого или правого определения (Participle I, Simple и Participle II);

2) обстоятельства (все формы причастия);

3) части составного сказуемого.

Причастие, за которым следуют поясняющие слова (дополнение или обстоятельство), образует причастный оборот. Функции определения и обстоятельства может выполнять как одиночное причастие, так и причастный оборот.

Функция определения

1. Participle I, Simple; Active Voice без поясняющих слов, как правило, стоит перед определяемым существительным и переводится на русский язык причастием действительного залога настоящего времени.

*The distance from the initial point to the **travelling** body is called the co-ordinate of the body.* Расстояние от начальной точки до движущегося тела называется координатой этого тела.

2. Participle I, Simple, Passive Voice в функции определения употребляется реже, чем Participle I, Active Voice и, как правило, стоит после определяемого существительного. Переводится на русский язык причастиями, оканчивающимися на *–мый* или *–щийся (-вшийся),* или придаточным определительным предложением.

*The investigations **being carried out** were of great importance.* Проводимые (Проводившиеся) исследования имели большое значение.

3. Participle II, Passive Voice в функции определения без поясняющих слов может стоять как после определяемого существительного, так и перед ним. Переводится на русский язык страдательным причастием с окончанием *–мый, -ный, -тый*.

*The problem **considered***
*The **considered** problem* } *was of great interest.*

Рассматриваемая (Рассмотренная) проблема представляла большой интерес.

Примечания:

1. Причастный оборот, т.е. причастие с поясняющими словами, в функции определения стоит, как правило, после определяемого существительного и переводится на русский язык соответствующим причастным оборотом или придаточным определительным предложением.

*Electrons **forming an atom** are in motion.* Электроны, образующие атом, находятся в движении.

*The problems **discussed at the conference** were interesting.* Проблемы, обсужденные (которые обсуждались) на конференции, были интересными.

2. Одиночные причастия в функции определения, стоящие в английском языке после определяемого существительного, при переводе ставятся перед определяемым словом.

*The substance **obtained** was pure.* Полученное вещество было чистым (не содержало примесей).

3. В функции правого определения Participle II, образованное от глаголов, имеющих после себя предлог, переводится на русский язык определительным придаточным предложением, начинающимся с соответствующего предлога, который ставится перед относительным местоимением *который*.

*The data **referred to** in this paper are reliable.* Данные, на которые ссылаются, заслуживают доверия.

4. Если после глагольной формы с окончанием **–ed** стоит предлог с последующим существительным, то это, как правило, Participle II.

*The work **performed by** this scientist showed good results.* Работа, выполненная этим ученым, дала хорошие результаты.

5. Если в предложении рядом стоят две глагольные формы с окончанием **–ed**, то первая форма, как правило, является причастием в функции определения, а вторая – сказуемым в Past Simple.

*The substance **obtained** contain**ed** some admixtures.* Полученное вещество содержало примеси.

Функция обстоятельства

1. Participle I, Simple, Active Voice в функции обстоятельства переводится деепричастием несовершенного вида *(что делая?)* или придаточным обстоятельственным предложением. В этой функции данная форма причастия часто имеет перед собой союзы **when, while**. В этом случае возможен перевод с предлогом *при + существительное*.

*When **working** with the microorganisms we found that they produced a variety of antibiotics.*

Работая с микроорганизмами, При работе с микроорганизмами Когда мы работали с микроорганизмами,	мы убедились, что они вырабатывают различные антибиотики.

2. Participle I Perfect, Active Voice в функции обстоятельства переводится на русский язык деепричастием совершенного вида *(что сделав?)* или придаточным обстоятельственным предложением, сказуемое которого должно предшествовать действию, выраженному сказуемым английского предложения.

***Having passed** a short distance the car stopped*. Пройдя короткое расстояние, автомобиль остановился. (После того как автомобиль прошел короткое расстояние, он остановился).

3. Participle I Simple, Passive Voice в функции обстоятельства переводится на русский язык, как правило, придаточным обстоятельственным предложением, в котором английское причастие становится сказуемым.

Being invited *too late he could not take part in the conference*. Так как его пригласили слишком поздно, он не смог принять участие в конференции.

4. Participle I Perfect, Passive Voice в функции обстоятельства переводится на русский язык придаточным обстоятельственным предложением с союзом *после того как*.

Having been tested *the new equipment was installed in the shops*. После того как новое оборудование было испытано, его установили в цехах.

5. Participle II, Passive Voice в функции обстоятельства, как правило, вводится союзами **when, while** *когда*, **if** *если*, **unless** *если…не*, **until** *пока…не*, **though** *хотя* и др. Причастные обороты с предшествующими союзами переводятся на русский язык придаточным обстоятельственным предложением с соответствующим союзом или отглагольным существительным с предлогами *при* (для союзов **when, while**), *без* (для союза **unless**).

When ***heated****, magnetized steel loses its magnetism.* Когда магнитную сталь нагревают, она теряет свои магнитные свойства. (При нагревании магнитная сталь теряет свои магнитные свойства).

Unless ***heated*** *this substance does not melt.* Если это вещество не нагревают, оно не плавится.

Без нагревания это вещество не плавится.

Participle II с предшествующим союзом as в функции обстоятельства переводится обычно краткой формой страдательного причастия с союзами *как; так, как*.

He solved the problem as ***stated*** *above.* Он решил эту задачу, как указано выше.

Participle II от глаголов **to give, to see, to state** в функции обстоятельства, стоящего в начале предложения, переводится следующим образом: **given** *если дано; если имеется; при условии;* **seen** *если рассматривать*; **stated** *если сформулировать*.

Given *the weight and the specific gravity of a body you can calculate its volume.* Если дан (имеется) вес и удельный вес тела, вы можете вычислить его объем.

Независимый причастный оборот

Это оборот, в котором перед причастием стоит существительное в общем падеже или личное местоимение в именительном падеже, т.е. стоит свое собственное подлежащее, отличное от подлежащего всего предложения. К этому подлежащему и относится действие, выраженное причастием. Независимый причастный оборот логически связан с предложением и выполняет в нем функцию обстоятельства. Независимый причастный оборот всегда отделяется запятой и может стоять в начале или в конце предложения.

Если независимый причастный оборот стоит в начале предложения, то он переводится на русский язык придаточным обстоятельственным предложением с союзами: *когда; если; так как; после того, как; хотя* и др.

Если независимый причастный оборот стоит в конце предложения, то он переводится самостоятельным предложением с союзами: *а, и, но, причем* или без них.

В обоих случаях причастие переводится личной формой глагола в функции сказуемого.

The road conditions being unchanged*, the automobile can travel at a constant speed.* Когда (если) дорожные условия не изменяются, автомобиль может двигаться с постоянной скоростью.

The term "speed" means the rate of motion, ***the term "velocity" meaning the speed in a definite direction.*** Термин "speed" означает темп движения, а термин "velocity" означает скорость в определенном направлении.

Примечания:

1. Независимый причастный оборот может вводиться предлогом **with**, который на русский язык не переводится.

With the experiments having been carried out*, they started new investigations.* После того как опыты были закончены, они начали новые исследования.

2. В независимом причастном обороте -ing форма глагола **to be (being)** может опускаться при переводе.

The work (being) finished*, he went home.* Когда работа была закончена, он пошел домой.

Сложное дополнение (или Объектный падеж) с причастием

выражено, как правило, глаголами чувственного восприятия: **to feel, to hear, to see, to notice, to observe, to watch** и др.

They watched ***the temperature*** *gradually* ***rising****.* Они следили (за тем), как температура постепенно повышалась.

Оборот "сложное дополнение с причастием" переводится на русский язык придаточным дополнительным предложением с союзом *что* или *как*, причем причастие становится сказуемым (т.е. передается личной формой глагола), а дополнение – подлежащим этого придаточного предложения.

Хотя оборот "сложное дополнение с причастием" переводится, как и оборот "сложное дополнение с инфинитивом", между этими оборотами имеется смысловая разница. Причастие выражает длительный характер действия, т.е. действие в процессе его совершения, а инфинитив выражает в большинстве случаев законченное действие. Поэтому оборот с причастием переводится на русский язык придаточным предложением с глаголом несовершенного вида, а оборот с инфинитивом – придаточным предложением с глаголом совершенного вида (иногда может переводиться и глаголом несовершенного вида).

Сравните:

They saw ***the temperature*** *gradually* ***rising.*** Они видели, что (как) температура постепенно повышалась.

They saw ***the temperature*** *gradually* ***rise****.* Они видели, что температура постепенно повысилась.

Сложное подлежащее (или именительный падеж) с причастием выражено, как правило, глаголами, обозначающими умственную деятельность или чувственное восприятие**: to assume, to consider, to expect, to feel, to see, to observe, to notice** и др.

Перевод следует начинать со сказуемого, которое переводится неопределенно-личным предложением (соответствует 3-ему лицу множественного числа, например, считают, наблюдали и т.п.). Сам оборот переводится придаточным дополнительным предложением с союзом *как* или *что*, в котором причастие становится сказуемым.

***He** was seen **repairing** the engine.* Видели, как (что) он ремонтировал двигатель.

Герундий (THE GERUND)

Voice	Simple	Perfect
Active Voice	asking	having asked
Passive Voice	being asked	having been asked

Герундий (*the Gerund*) – это неличная форма глагола, совпадающая с формами причастия I (Simple и Perfect) и обладающая свойствами как глагола, так и существительного. Как глагольная форма, герундий может выражать категории залога и времени, может иметь при себе прямое дополнение и определяться наречием. К именным свойствам герундия относятся следующие:

а) перед герундием может стоять предлог;

б) герундию может предшествовать существительное в общем или притяжательном падеже или притяжательное местоимение;

в) герундий может выполнять такие же синтаксические функции, что и существительное, т.е. функцию подлежащего, части сказуемого, дополнения, обстоятельства и определения.

Итак, герундий или герундиальный оборот (т.е. герундий с зависимыми словами) может выполнять в предложении следующие функции:

1. **Подлежащего**. В этой функции герундий переводится на русский язык отглагольным существительным или инфинитивом.

***Lifting** this heavy weight is impossible without necessary appliances.* Поднятие этого тяжелого груза (Поднять этот тяжелый груз) невозможно без использования необходимых приспособлений.

2. **Части сказуемого**:

а) составного именного после глагола **to be** и сочетания глагола **to be** с предлогами **for** и **against**. В этой функции герундий переводится на русский язык отглагольным существительным или инфинитивом, а после предлогов **for** и ***against** – придаточным предложением.*

One of the effects of heat is changing a solid into liquid. Один из результатов воздействия тепла – это превращение твердого тела в жидкость.

They are against ***postponing*** *the negotiations.* Они против того, чтобы переговоры были отложены.

They are for ***discussing*** *this problem as soon as possible.* Они за то, чтобы эту проблему обсудили как можно быстрее.

б) составного глагольного после глаголов, указывающих на начало, продолжение или конец процесса, а также после глаголов **to like, to love, to hate, to prefer, to avoid, to enjoy** и после сочетаний **to be worth…, to be busy….**

They have finished ***discussing*** *the results of the experiment.* Они окончили обсуждать результаты эксперимента.

He likes ***taking part*** *in conferences.* Ему нравится принимать участие в конференциях

It is worth ***entering into*** *a contract with this company.* Стоит заключить контракт с этой компанией.

He was busy ***drawing up*** *a contract.* Он был занят составлением контракта.

3. **Дополнения прямого и предложного**. В этой функции герундий можно переводить отглагольным существительным, инфинитивом или придаточным дополнительным предложением.

This forging press needs ***repairing***. Этот штамповочный пресс нуждается в ремонте.

He insisted on ***using*** *these substances in the experiment.* Он настаивал на использовании этих веществ в эксперименте.

4. **Обстоятельства.** В этой функции перед герундием всегда стоит предлог: **in** *при, во время, в процессе*; **on** *после, по;* **by** *при помощи, посредством, путем;* **after** *после*; **before** *до, перед*; **without** *без…*

In solving the problem *he made some mistakes.* При решении (Решая) задачи он допустил несколько ошибок.

On reaching the boiling point *the water temperature is no longer increased.* После достижения (Достигнув) точки кипения температура воды больше не повышается.

One can perform work ***by lifting a weight.*** Можно совершить работу, поднимая груз (посредством поднятия груза).

Gas volume can be changed ***without changing its temperature***. Объем газа можно изменить, не изменяя (без изменения) его температуру.

5. **Определения**. Определяет существительное и, как правило, вводится предлогом **of** (реже предлогом **for**). Переводится на русский язык существительным в родительном падеже, инфинитивом или придаточным предложением.

There are different methods ***of obtaining*** *forgings.* Существуют различные методы получения штамповок.

Energy is defined as capacity ***for doing*** *work.* Энергия определяется как способность выполнять работу.

A thermometer is an instrument ***for measuring*** *temperature.* Термометр – это прибор для измерения температуры.

Герундиальный комплекс (Сложный герундиальный оборот)

Стоящее перед герундием существительное в общем или притяжательном падеже или притяжательное местоимение указывает на предмет или лицо, производящее действие, которое выражено герундием. Такой сложный оборот можно назвать герундиальным комплексом, который может выполнять в предложении функцию подлежащего, именной части составного именного сказуемого, дополнения, обстоятельства, определения. Как правило, герундиальный комплекс переводится на русский язык придаточным предложением, причем существительное в общем или притяжательном падеже или притяжательное местоимение соответствует в русском языке подлежащему придаточного предложения, а герундий – сказуемому.

We know of ***work*** *and* ***energy being*** *closely* ***related****.* Мы знаем, что работа и энергия тесно связаны между собой.

I. Newton's having formulated *this law was of great importance.* То, что И. Ньютон сформулировал этот закон, имело огромное значение.

Примечание:

1. После таких глаголов как **to like, to dislike , to prefer** в качестве дополнения может употребляться как герундий, так и инфинитив:

I like skiing in winter.

I like to ski in winter.

2. После таких глаголов как **to avoid, to intend, to need, to mind** возражать, **to remember, to enjoy, to require, to finish, to excuse, to deny, to forgive, cannot help, to postpone** в качестве дополнения употребляется только герундий.

Would you mind my smoking?

3. Глаголы **to stop, to forget** в зависимости от того, следует ли за ними герундий или инфинитив имеют разное значение:

He stopped to speak to me. Он остановился, чтобы поговорить со мной.

He stopped speaking. Он перестал разговаривать.

4. Только герундий употребляется после следующих глаголов с предлогами, а также после следующих словосочетаний с предлогами:

to depend on	to think of	to be interested in
to insist on	to go on	to be pleased (displeased) at
to know of	to give up	to be proud of
to object to	to consist in	to be busy in
to prevent from	to be capable of	to be surprised at
to thank for	to be fond of	to be worth of

Сравнение герундия и причастия

	Герундий	Причастие
Подлежащее	***Heating*** *copper wire from 0° to 100° increases its resistance by 40%.* **Нагревание** медной проволоки от 0º до 100º увеличивает ее сопротивление на 40%.	-

Обстоятельство	***In heating*** *copper wire from 0° to 100° its resistance is increased by 40%.* **При нагревании** медной проволоки от 0º до 100º ее сопротивление увеличивается на 40%.	***Heating*** *copper wire from 0° to 100° we increase its resistance by 40%.* **Нагревая** медную проволоку от 0º до 100º, мы увеличиваем ее сопротивление на 40%.
Определение	*The* ***boiling*** *point of water is one hundred degrees Centigrade*. Точка **кипения** воды – 100 градусов Цельсия.	***Boiling*** *water is changing into steam.* **Кипящая** вода превращается в пар.

СЛОВООБРАЗОВАТЕЛЬНЫЕ МОДЕЛИ (СУЩЕСТВИТЕЛЬНОЕ, ПРИЛАГАТЕЛЬНОЕ, НАРЕЧИЕ. ГЛАГОЛ)

В английском языке различают два способа образования слов:

1. Словопроизводство, т. е. образование одного слова из другого.

2. Словосложение, т. е. образование одного слова путем соединения двух слов.

СЛОВОПРОИЗВОДСТВО

Образование одного слова из другого производится следующими способами:

а) без всякого изменения произношения и написания слова;

б) при помощи изменения места ударения;

в) при помощи чередования звуков;

г) при помощи аффиксов (префиксов и суффиксов).

СЛОВОПРОИЗВОДСТВО БЕЗ ИЗМЕНЕНИЯ ПРОИЗНОШЕНИЯ И НАПИСАНИЯ СЛОВА

В английском языке во многих случаях слова, являющиеся различными частями речи, совпадают в произношении и написании. Вопрос о том, какой частью речи является такое слово, разрешается на основании его формальных и синтаксических признаков.

Такое совпадение форм особенно часто встречается у существительных и глаголов:

Существительные	Глаголы
answer ответ	*to answer* отвечать
change изменение	*to change* менять
measure мера	*to measure* мерить
order приказ	*to order* приказывать
place место	*to place* помещать
purchase покупка	*to purchase* покупать
work работа	*to work* работать

Совпадение форм встречается также у прилагательных и глаголов:

Прилагательные	Глаголы
clean чистый	*to clean* чистить
dirty грязный	*to dirty* грязнить
empty пустой	*to empty* опустошать
free свободный	*to free* освобождать

В некоторых случаях совпадение форм встречается у нескольких частей речи. Так, например, слово **light** может быть существительным со значением *свет*, прилагательным — *светлый* и глаголом — *зажигать, освещать.*

СЛОВОПРОИЗВОДСТВО ПРИ ПОМОЩИ ИЗМЕНЕНИЯ МЕСТА УДАРЕНИЯ

Формы многих существительных совпадают с формами глаголов, но отличаются от них ударением — существительные имеют ударение на первом слоге, а соответствующие им глаголы на втором:

Существительные	Глаголы
'increase увеличение	*to inc'rease* увеличивать (-ся)
'decrease уменьшение	*to dec'rease* уменьшать (-ся)
'export экспорт	*to ex'port* экспортировать
'import импорт	*to im'port* импортировать
'insult оскорбление	*to in'sult* оскорблять

СЛОВОПРОИЗВОДСТВО ПРИ ПОМОЩИ ЧЕРЕДОВАНИЯ ЗВУКОВ

Многие существительные и глаголы, образованные от одного корня, различаются чередованием последнего согласного звука, который является глухим в существительном и звонким в глаголе. При этом в ряде случаев чередование последнего согласного звука сопровождается чередованием корневого гласного звука и изменением написания слова:

Существительные	Глаголы
excuse [iks'kju:s] извинение	*to excuse* [iks'kju:z] извинять
use [ju:s] употребление	*to use* [ju:z] употреблять
advice [əd'vais] совет	*to advise* [əd'vaiz] советовать
belief [bi'li:f] вера, убеждение	*to believe* [bi'li:v] верить, думать
life [laif] жизнь	*to live* [liv] жить
proof [pru:f] доказательство	*to prove* [pru:v] доказывать
choice [tʃɔis] выбор	*to choose* [tʃu:z] выбирать
loss [lɔs] потеря	*to lose* [lu:z] терять

Некоторые существительные и глаголы различаются только чередованием корневых гласных звуков при соответствующем изменении написания слова:

Существительные	Глаголы
blood [blʌd] кровь	*to bleed* [bli:d] кровоточить
food [fu:d] пища	*to feed* [fi:d] питать (-ся)
shot [ʃɔt] выстрел	*to shoot* [ʃu:t] стрелять
song [sɔŋ] песня	*to sing* [siŋ] петь

СЛОВОПРОИЗВОДСТВО ПРИ ПОМОЩИ АФФИКСОВ

Образование слов может происходить при помощи аффиксов — префиксов и суффиксов. Префиксы стоят в начале слова, а суффиксы — в конце слова.

Префиксы изменяют значение слова, но не меняют его принадлежности к той или иной части речи:

order (существительное) порядок	***dis****order* (существительное) беспорядок
happy (прилагательное) счастливый	***un****happy* (прилагательное) несчастный
to appear (глагол) появляться	*to* ***re****appear* (глагол) вновь появляться

Суффиксы служат для образования одной части речи из другой:

beauty (существительное) красота *strength* (существительное) сила *happy* (прилагательное) счастливый *calm* (прилагательное) спокойный *to read* (глагол) читать	*beautiful* (прилагательное) красивый *to strengthen* (глагол) усиливать (-ся) *happiness* (существительное) счастье *calmly* (наречие) спокойно *reader* (существительное) читатель

Наиболее употребительные префиксы

Префиксы	Значение	Примеры	Перевод
un-	отрицательное	unequal unimportant	неравный неважный
	противоположное действие	to unload to unpack	разгружать распаковывать
in-	отрицательное	inexperienced inability	неопытный неспособность
il- ir- im-	отрицательное	illogical illegal irresponsible irregular immovable impossible	нелогичный незаконный безответственный нерегулярный неподвижный невозможный
dis-	отрицательное	to disapprove to dislike	не одобрять не любить

	противоположное действие	to disappear to disconnect	исчезать разъединять
non-	отрицательное	non-conductor non-ferrous	непроводник цветной
re-	снова, заново, вновь	to reconstruct to re-export to re-open to re-read to resell to re-use	перестраивать реэкспортировать вновь открывать перечитывать перепродавать вновь использовать
mis-	неправильно, неверно	to misuse to mishear to misinform to misunderstand	неправильно употреблять ослышаться неправильно информировать неправильно понимать
over-	сверх, чрезмерно	to overload to overpay to overvalue overproduction	перегружать переплачивать переоценивать перепроизводство
under-	недостаточно	to underpay to undervalue underproduction	оплачивать низко недооценивать недостаточное производство
pre-	перед, ранее	prehistoric pre-war to preheat	доисторический довоенный предварительно нагревать
post-	после	post-war	послевоенный
anti-	анти-, противо-	antifriction antiphase anti-aircraft antiwar	антифрикционный противофаза противовоздущный антивренный
counter-	контр-, противо-	to counteract counteraction countershaft counter-pressure counter-offer	противодействовать противодействие контрпривод противодавление контрпредложение
inter-	между, взаимно	intergranular international interdependent intertown intercoagulation interaction	межзернистый международный зависящий один от другого междугородный взаимная коагуляция взаимодействие
sub-	под-	subprogram subscale subdivision submarine	подпрограмма подокалина подразделение подводный

Наиболее употребительные суффиксы

Суффиксы существительных

Суффикс	Значение	Пример	Перевод
-er, -or	обозначение лица	buyer inventor producer seller supplier	покупатель изобретатель производитель продавец поставщик
-ist	обозначение принадлежности к политическому или научному направлению	idealist terrorist extremist physicist	идеалист террорист экстремист физик
-ee	обозначение лица, на которое направлено действие	addressee consignee payee trustee	адресат грузополучатель получатель платежа доверенное лицо
-ian	обозначение национальной принадлежности	Russian Belarusian Bulgarian Hungarian Norwegian	русский белорус болгарин венгерец норвежец
-age	обозначения отвлеченных существительных	leakage marriage passage	утечка брак проход
-ance, -ence		importance difference insistence resistance	важность различие настойчивость сопротивление
-dom		freedom wisdom kingdom	свобода мудрость королевство
-hood		brotherhood childhood manhood motherhood neighbourhood	братство детств мужественность материнство соседство
-ion (-ation, -tion, -sion, -ssion)		connection combination introduction production restriction transmission	соединение комбинация введение производство ограничение передача
-ment		agreement development government improvement payment settlement	согласие, соглашение развитие управление, правительство улучшение платеж урегулирование
-ness		coldness darkness weakness	холодность темнота слабость

-ship		friendship leadership membership	дружба руководство членство
-ure		departure pleasure pressure	отъезд удовольствие давление

Суффиксы прилагательных

Суффикс	Значение	Пример	Перевод
-able, -ible	возможность подвергнуться действию, указанному соответствующим глаголом	changeable eatable comparable convertible	изменчивый съедобный сравнимый обратимый
-al		central cultural intellectual postal	центральный культурный интеллектуальный почтовый
-ant, -ent		different insistent resistant	различный настойчивый сопротивляющийся
-ful	наличие качества	beautiful careful fruitful useful	красивый заботливый плодородный, плодовитый полезный
-less	отсутствие качества	hopeless useless fruitless shameless homeless helpless	безнадежный бесполезный бесплодный бесстыдный бездомный беспомощный
-ish	1) национальная принадлежность	Danish Polish Scottish Swedish	датский польский шотландский шведский
	2) слабой степени качества	reddish brownish stoutish	красноватый коричневатый толстоватый
-ive		active comparative effective restrictive talkative	деятельный сравнительный действительный ограничительный разговорчивый
-ous		courageous dangerous famous glorious	смелый опасный знаменитый, известный славный
-y		cloudy dirty	облачный грязный

		foggy frosty rainy sunny thirsty windy	туманный морозный дождливый солнечный жаждущий ветреный

Суффиксы глаголов

Суффикс	Значение	Пример	Перевод
-en	*делать* или *делаться, становиться*	to blacken to sharpen to shorten to strengthen to widen	чернить (делать черным) точить (делать острым) укорачивать (делать коротким) усиливать (делать сильным) расширять (делать широким)
-fy		to falsify to simplify to purify	фальсифицировать упрощать очищать
-ize		to characterize to crystallize to sympathize	характеризовать кристаллизовать (-ся) сочувствовать

Суффиксы наречий

Суффикс	Значение	Пример	Перевод
-ly		easily weekly firstly	легко еженедельно во-первых
-wise		crosswise clockwise	крест-накрест по часовой стрелке
-ward (-wards)	направление	backward afterwards homewards	назад потом, позже домой, на родину

СЛОВОСЛОЖЕНИЕ

Многие слова в английском языке являются составными, т. е. образуются путем соединения двух слов в одно слово. Некоторые составные слова пишутся слитно, а другие через черточку (дефис).

СОСТАВНЫЕ СУЩЕСТВИТЕЛЬНЫЕ

bedroom спальная (bed кровать + room комната)
blackboard классная доска (black черный + board доска)
ice-box ледник (ice лед + box ящик)
newspaper газета (news новость + paper бумага)
opera-glasses бинокль (opera опера + glasses очки)

reading-room читальня (reading чтение + room комната)
schoolboy школьник (school школа + boy мальчик)
shoemaker сапожник (shoe ботинок + maker тот, кто делает что-л.)
steamship пароход (steam пар + ship судно)

Некоторые составные существительные состоят из двух существительных с предлогом между ними, В этом случае они всегда пишутся через дефис:

father-in-law тесть
son-in-law зять
commander-in-chief главнокомандующий
man-of-war военное судно
mother-of-pearl перламутр

СОСТАВНЫЕ ПРИЛАГАТЕЛЬНЫЕ

dark-blue темно-синий (dark темный + blue синий)
first-class первоклассный (first первый + class класс)
red-hot раскаленный докрасна (red красный + hot горячий)
black-bearded чернобородый (black черный + bearded бородатый)

СОСТАВНЫЕ МЕСТОИМЕНИЯ

somebody кто-то,
nothing ничего,
everyone каждый и др.

СОСТАВНЫЕ ГЛАГОЛЫ

to whitewash белить
to broadcast передавать по радио

Составные глаголы этого типа встречаются редко. Распространенным типом составных глаголов является сочетание глаголов с наречиями:

to go in входитьto
to go out выходить
to go up подниматься
to go away уходить
to go on продолжать
everywhere везде и др.
to put on надевать
to take off снимать
to pick up поднимать
to ring up звонить по телефону
to make out понимать