

Министерство образования и науки Российской Федерации

Федеральное государственное бюджетное образовательное учреждение  
высшего профессионального образования  
«Комсомольский-на-Амуре государственный технический университет»

**Ю. В. Маркова**

**АНГЛИЙСКИЙ ЯЗЫК В ОБЛАСТИ  
МАШИНОСТРОИТЕЛЬНЫХ ТЕХНОЛОГИЙ  
И ОБОРУДОВАНИЯ**

Утверждено в качестве учебного пособия

Учёным советом Федерального государственного бюджетного  
образовательного учреждения высшего профессионального образования  
«Комсомольский-на-Амуре государственный технический университет»

Комсомольск-на-Амуре  
2015

УДК 811.111:621  
ББК 81.2Англ-9  
М268

*Рецензенты:*

Кафедра иностранных языков Института педагогики и психологии  
ФГБОУ ВПО «Амурский гуманитарно-педагогический государственный  
университет», зав. кафедрой кандидат филологических наук,  
доцент И. Б. Косицына;

К. В. Боровикова, кандидат филологических наук, декан факультета  
филологии и межкультурной коммуникации института педагогики и психологии  
ФГБОУ ВПО «Амурский гуманитарно-педагогический государственный  
университет»

**Маркова, Ю. В.**

М268 Английский язык в области машиностроительных технологий  
и оборудования : учеб. пособие / Ю. В. Маркова. – Комсомольск-на-  
Амуре : ФГБОУ ВПО «КнАГТУ», 2015. – 103 с.

ISBN 978-5-7765-1158-5

Пособие состоит из 11 тематических разделов, которые развивают и за-  
крепляют у бакалавров умения и навыки применения разных видов чтения с из-  
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исследовательской работе на английском языке.

Учебное пособие предназначено для бакалавров направлений 150100.62 –  
«Материаловедение и технологии материалов», 150400.62 – «Металлургия»,  
150700.62 – «Машиностроение», 151000.62 – «Технологические машины и обо-  
рудование», 151900.62 – «Конструкторско-технологическое обеспечение маши-  
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процессы в химической технологии, нефтехимии и биотехнологии» очной фор-  
мы обучения.

Рассчитано на 162 часа аудиторных занятий.

УДК 811.111:621  
ББК 81.2Англ-9

ISBN 978-5-7765-1158-5

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технический университет»,  
2015

## CONTENTS

INTRODUCTION.....	4
UNIT 1. MACHINE-BUILDING.....	4
UNIT 2. MATERIAL TECHNOLOGY.....	10
UNIT 3. WELDING.....	15
UNIT 4. TYPES OF WELDING.....	21
UNIT 5. FOUNDRY.....	26
UNIT 6. METALS.....	32
UNIT 7. FERROUS AND NON-FERROUS METALS.....	37
UNIT 8. MACHINE-TOOLS.....	44
UNIT 9. MILLING MACHINES.....	50
UNIT 10. LATHE.....	55
UNIT 11. DRILLING MACHINES.....	59
CONCLUSION.....	62
LITERATURE.....	62
THESAURUS.....	63
APPENDIX 1. WRITTEN TESTS.....	65
APPENDIX 2. TEXTS FOR EXTRA-CURRICULUM READING.....	71
APPENDIX 3. GRAMMAR REFERENCE.....	82
APPENDIX 4. MACHINE'S SCHEME PICTURES.....	101

## INTRODUCTION

Пособие включает в себя грамматические основы изучаемого языка; лексические основы чтения профессионально ориентированного текста на английском языке; лексико-грамматический материал для самоконтроля и самопроверки (прил. 1).

Учебное пособие состоит из последовательного изложения материала в одной части, включающей 11 уроков, а также введения, тезауруса, четырех приложений, заключения, библиографического списка. Весь учебный материал рассчитан на закрепление и контроль приобретенных навыков и умений лексико-грамматических основ английского языка.

Учебное пособие содержит следующие разделы:

1. Машиностроение; 2. Материаловедение; 3. Сварочное производство; 4. Способы сварки; 5. Литейное производство; 6. Металлы; 7. Черные и цветные металлы; 8. Станки; 9. Фрезеральный станок; 10. Токарный станок; 11. Сверлильный станок; 12. Современные компьютерные технологии.

Пособие способствует формированию, развитию и закреплению фонетических, грамматических и лексических умений и навыков в изучении английского языка, подготовке бакалавров к самостоятельной учебной и научно-исследовательской работе на английском языке. Материалы пособия развивают и закрепляют у бакалавров умения и навыки применения разных видов чтения с извлечением информации из научной и научно-популярной литературы (прил. 2).

## UNIT 1. MACHINE-BUILDING

### Active Vocabulary:

to deal with – иметь дело (с), работать, заниматься чем-либо

design – проект, конструкция (гл. to design)

device – прибор, устройство (syn. unit, tool, machine, mechanism, engine, apparatus, instrument, installation)

to depend – зависеть

origin – происхождение

to date back – относиться (к), восходить (к)

ancient – древний

to appear – появляться

tool-maker – мастер, инструментальщик

craftsman – ремесленник

to devise – изобретать

to erect – строить, возводить

forerunner – предшественник

steam – пар  
 source – источник  
 widespread – широко распространенный  
 to assume – принимать, допускать  
 creation – создание  
 reliability – надежность  
 to extend = to raise – повышать, увеличивать, продлевать  
 machining – механическая обработка  
 versatile – разносторонний, гибкий  
 machine-tool – станок  
 opportunity – возможность  
 demand – спрос, потребность  
 trend – направление, тенденция  
 to be concerned with – касаться, иметь отношение (к), быть связанным (с)  
 conversion – преобразование

Ex. 1. Choose the right word from the ones given in brackets:

1. Engineering (appears, deals with, extends) machinery of all types.
2. Theoretical research (depends, erects, assumes) on experimental data.
3. These methods of work (devise, raise, date back) to very ancient times.
4. Engineers are to (devise, raise, appear) new types of machine-tools and to improve the old ones.
5. Our main task is to (assume, extend, appear) the service life of the device and to (depend, assume, raise) its reliability.
6. Workers at machine-building plants (are concerned, depend, erect) with various types of equipment.
7. Many kinds of (devices, tool-makers, trends) were invented during the Middle Ages.

Ex. 2. Complete the sentences with a suitable word from the box.

opportunity   sources   origin   design   steam   ancient   reliability  
 demand

1. Many traditions are of recent \_\_\_\_\_, but some of them date back to \_\_\_\_\_ times.
2. He is working on the \_\_\_\_\_ of a new engine.
3. During the Industrial Revolution \_\_\_\_\_ engines appeared.
4. Many new \_\_\_\_\_ of energy are used nowadays.
5. We pay much attention to \_\_\_\_\_ of new devices.
6. We have a good \_\_\_\_\_ to work at industrial enterprises of our city.
7. The profession of an engineer is always in great \_\_\_\_\_.

Ex. 3. Find the synonyms from the words in the first column to the words in the second column:

to deal with	unit
design	old
device	to be concerned with
origin	to build
to depend on	project
ancient	ancestor
to appear	source
craftsman	mechanism
to devise	to be based on
to erect	to invent
forerunner	to come into being
widespread	master
to assume	common
creation	flexible
reliability	change
to extend	to accept
machining	safety
versatile	formation
machine tool	to raise
opportunity	processing
demand	chance
trend	need
conversion	tendency

Ex. 4. Find an antonym to the first word in every line:

1. to depend – a) to be based; b) to be independent; c) to be concerned
2. ancient – a) modern; b) old; c) early
3. to appear – a) to date back; b) to invent; c) to go away
4. to erect – a) to build; b) to invent; c) to destroy
5. widespread – a) limited; b) broad; c) reliable
6. to assume – a) to take; b) to devise; c) to reject
7. reliability – a) unity; b) unsafety; c) stability
8. to extend – a) to shorten; b) to lengthen; c) to erect
9. to raise – a) to increase; b) to decrease; c) to devise
10. versatile – a) programmable; b) functional; c) one-sided

Ex. 5. Open the brackets using the right form of adjectives:

1. It is one of the (important) questions of our conference.
2. Your English is (good) now.
3. We have (little) interest in this work than you.
4. Today you worked (slowly) than usually.
5. He was one of the (experienced) workers at the factory.
6. It's the (bad) mistake he has ever made.
7. Oil is (light) than water.
8. He worked (hard) and (hard) as the end of the term came nearer.
9. He's not so keen on his studies. He's (interested) in sports and music.
10. You won't believe it but he is (talkative) than his sister.
11. He thought how much (advanced) and broadminded the (young) generation was.
12. The first edition of the dictionary is (good), the new one is still (good).
13. He turned out to be (angry) than I had expected.
14. He felt (bad) yesterday than the day before.

Ex. 6. Translate the international words:

specialty, machine, technology, construction, operation, activity, automobile, tractor, rocket, civilization, technician, irrigation, system, modern, mechanical, engineer, primitive, efficient, method, energy, Industrial Revolution, electricity, role, object, industrialized, diesel, locomotive, radio, function, automation, industry, service, intense, robot, process, programmable, computer, instruction, computerization, type, theoretical, practical, qualified, management, production, transport, gas, mechanism.

Ex. 7. Read and translate the text:

My specialty is called Machine-Building Technology. Machine-building **deals with the design**, construction and operation of machines and **devices** of all kinds and research and sciences upon which they **depend**.

People make use of machines in all their activities. Most of these machines are of recent **origin**. Some of them, however, **date back** to very **ancient** times. Automobiles, tractors, trains, planes and rockets **appeared** not so long ago. But without the first **tool-makers** and **craftsmen** of the **ancient** world our present-day civilization could never have developed. The skilled technicians who **devised** irrigation systems and **erected** the marvelous buildings of **ancient** times are the **forerunners** of modern mechanical and civil engineers. But the **tools** they used were rather primitive. During the Middle Ages people began to

seek more efficient **devices** and methods of work. Wind, water and animals were used to provide energy for these new **devices**. This led to the Industrial Revolution of the 18-th century. It began by putting water and **steam** to work; since then machines using electricity, gasoline and other energy **sources** have become **widespread** in the modern world, and it was the 20-th century that machines **assumed** such an important role.

The **machine-tool** is the original **source** of every object in our industrialized world. Automobiles, airplanes, diesel locomotives, washing machines, electric stoves and radio-sets are made by **machine-tools**. But without the engineer no **machine-tool** could function.

There are two main **trends** in modern machine-building. Firstly, it is automation, including the **creation** of unmanned industries. Secondly, **raising the reliability** and **extending** the service life of machines. This, certainly, requires new technology. Intense work is being carried out in our country on new robots. We also need machines that would trace the entire process of **machining**. New technologies and equipment are being constantly **designed** for most branches of engineering. We need automated machines that are **versatile** and programmable and can make different things according to computer instructions. That's why computerization is another important **trend** in machine-building technology.

**To design** various types of **machine-tools** engineers must have deep knowledge of theoretical sciences connected with their future specialty. That's why a lot of common and special subjects are included in the curriculum of our University. Students also have an **opportunity** to get practical training in the workshops of the University and at industrial enterprises of our city.

**Demand** for qualified engineers is high. Mechanical engineers have a wide range of job **opportunities**. They may be management, sales, research, design or production engineers both in heavy and light industry. They can also work in service industries such as transport and gas, water and electricity.

Mechanical engineers are concerned with machines, mechanisms and energy **conversion**. Mechanical equipment is at the core of<sup>1</sup> the plants, and mechanical engineers are at the core of production. Without them production would be impossible.

Ex. 8. Answer the questions to the text:

1. What is your specialty?
2. What does it deal with?
3. When did machines appear? Who were the forerunners of modern engineers?
4. What sources of energy were used in the Middle Ages?

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<sup>1</sup> to be at the core – находиться в центре, быть ядром чего-либо



5. When did the Industrial Revolution begin?
6. What is the source of all objects in our industrialized world?
7. What are the main trends in modern machine-building?
8. What kinds of machines do we need?
9. What is the third important trend in machine-building?
10. What does the training of future engineers include?
11. What special subjects do our students study?
12. What are the job opportunities for mechanical engineers?
13. What are mechanical engineers concerned with?
14. What is the role of mechanical engineers in modern production?

Ex. 9. Make up short stories on the following topics:

1. the subject of machine-building; 2. the history of machine-building; 3. machine-tools in modern world; 4. modern trends of machine-building; 5. training of future engineers; 6. job opportunities for mechanical engineers; 7. the role of engineers in industrial production; 8. why I chose this specialty.

Ex. 10. Put the verb in brackets into the Present Simple:

1. Modern machine-building (have) many trends.
2. Most of these machines (to be) of recent origin.
3. We also (need) machines that would trace the entire process of machining.
4. Machine-tools usually (work) materials mechanically but other machining methods have been developed lately.
5. Not all industries (require) the same degree of automation.
6. Each industry (have) its own concept of automation that (answer) its particular production needs.
7. Engineering (demand) knowledge of foreign languages.
8. The plant (deal) with metalworking.
9. We (study) many subjects, such as strength of materials and others.
10. Mechanical properties (play) an important role in materials selection.

Ex. 11. Retell the text.

## UNIT 2. MATERIAL TECHNOLOGY

### Active Vocabulary:

to deal with – иметь дело (с), работать, заниматься чем-либо  
processing – обработка (syn. – treatment, working)  
to work (to process, to treat) – обрабатывать  
fabrication – изготовление, производство  
property – свойство, качество  
to identify – отождествлять, определять, устанавливать  
to accelerate – ускорять  
selection – выбор, отбор  
complex – сложный  
materials strength – сопротивление материалов  
to withstand – выдерживать, противостоять  
creation – создание  
tremendous = great – огромный, великий  
to be engaged – заниматься, быть занятым  
rubber – резина, каучук  
alloy – сплав  
to reduce – уменьшать, сокращать  
weight – вес  
saving – экономия  
to carry out – выполнять, проводить  
advantage – преимущество  
dimension – размер, измерение  
fatigue resistance – усталостное сопротивление  
substitution – замена  
advanced – передовой, прогрессивный, повышенного типа  
application – применение  
semiconductor – полупроводник  
superconductor – сверхпроводник  
to require – требовать (syn. – to demand)  
opportunity – возможность  
demand – требование, потребность, спрос  
comprise – композитный материал

Ex. 1. Choose the right word from the ones given in brackets:

1. Materials Technology deals with materials (advantage, dimension, processing) and their (fabrication, opportunity, demand). 2. Composites combine the best (rubbers, properties, weights) of different materials. 3. The new method (accelerates, works, carries out) the process of metal working. 4. Some problems

are too (complex, saving, advanced) to solve. 5. We should consider in our work such properties as (materials strength, semiconductors, substitution) and (application, semiconductors, fatigue resistance). 6. New artificial materials can (withstand, progress, accelerate) high temperatures. 7. Scientists are finding new ways of advanced materials (dimension, creation, demand) and their (advantage, opportunity, application) in industry. 8. The engine rotated at a (sophisticated, complex, tremendous) speed. 9. The laboratory (is engaged, requires, identifies) in the research of new synthetic (rubbers, weights, dimensions).

Ex. 2. Put the words into the right world order:

1. machines, deals with, Engineering, engines, devices, and other.
2. to work, are used, Machine-tools, metals.
3. selection, their, depends on, Materials, properties.
4. an alloy, of, is, Steel, and, carbon, iron.
5. reduce, Automation, can, and, the, give, production cost, time, of, saving.
6. the weight, It, is, to reduce, the apparatus, of, necessary.
7. knowledge, The work, languages, of, foreign, of, requires, an engineer.
8. no, I, opportunity, languages, to study, have.
9. trends, Modern, many, machine-building, has.

Ex. 3. Find the synonyms from the words in the first column to the words in the second column:

to deal with	manufacture
processing	to process
fabrication	to be engaged
property	to speed up
to work	working
to identify	to classify
to accelerate	quality
selection	choice
complex	profit
strength	chance
to withstand	power
creation	economy
tremendous	complicated
alloy	progressive
to reduce	to bear
weight	great
saving	formation

to carry out	need
advantage	use
dimension	replacement
substitution	combination of metals
advanced	to perform
application	to decrease
opportunity	mass
demand	size

Ex. 4. Find an antonym to the first word in every line:

1. fabrication – a) manufacture; b) installation; c) breaking
2. to accelerate – a) to increase; b) to slow; c) to grow
3. complex – a) strong; b) simple; c) fast
4. strength – a) width; b) growth; c) weakness
5. creation – a) formation; b) destruction; c) fabrication
6. tremendous – a) huge; b) tiny; c) simple
7. to be engaged – a) to be busy; b) to be idle; c) to be glad
8. to reduce – a) to increase; b) to decrease; c) to induce
9. weight – a) weightlessness; b) uselessness; c) darkness
10. saving – a) economy; b) waste; c) saying
11. advantage – a) disadvantage; b) advice; c) disappearance
12. advanced – a) leading; b) progressive; c) backward
13. conductor – a) insulator; b) generator; c) operator
14. to require – a) to ask; b) to give; c) to use
15. opportunity – a) possibility; b) no chance; c) reliability
16. demand – a) need; b) chance; c) use

Ex. 5. Make general, special and alternative questions to the sentences:

1. The engineers carry out research in polymers, composites and other advanced materials.
2. The new material has a number of advantages such as reduced weight and dimension stability.
3. Advanced polymers for metal substitution are in great demand in industry.
4. Some ceramic materials are superconductors at high temperatures, while other materials are only semiconductors.
5. Plastics, polymers and composite materials are at the forefront of modern technology.
6. His work is concerned with energy conversion.
7. New versatile devices and installations were designed at our Institute.

8. Our research is aimed at the creation of new technologies.
9. Demand for qualified engineers is high.
10. People make use of machines in all their activities.

Ex. 6. Find the correct translation of each word:

A. to deal with, processing, property, to work, to identify, selection, to withstand, rubber, alloy, to carry out, dimension, fatigue resistance, substitution, application, composite.

В. обработка, выбор, сплав, применение, свойство, размер, композитный материал, усталостное сопротивление, замена, резина, обрабатывать, иметь дело с, выдерживать, выполнять, устанавливать.

Ex. 7. Read and translate the text:

My specialty is Materials Science and Technology. It **deals with** the study of materials, with the way of their **processing** and **fabrication** for the needs of modern industrial production.

Engineers have to know the best and most economical materials to use. They must also understand the **properties** of these materials and how they can **be worked**.

There are four main categories of structural materials. Metals, ceramics and polymers are traditionally **identified** as the main types of engineering materials. **Composites** are added as another category that involves some combination of the three fundamental types. They all have different mechanical, physical and other **properties** which play an important role in materials **selection**.

The science of materials technology has a long history. Its progress **accelerated** markedly in the 19-th century with the construction of railways, bridges, tunnels, with building ocean-going ships and **complex** machines. But it was only at the beginning of the 20-th century that research started in the physics of **materials strength**. It was the age of high speeds, pressures, and temperatures which could be generated and **withstood** only with the help of new materials. That's why **creation** of new materials with better **properties** was of **tremendous** importance.

Now scientists **are engaged** in producing new synthetic **rubbers**, light-weight metal **alloys** which could **reduce** the **weight** of machines and give considerable **saving** of materials. At present a great deal of research and development **is being carried out** to produce special grades of plastics which have additional **advantages** of ease of production, **dimension** stability, good **fatigue resistance**, corrosion resistance and ability **to withstand** variations in temperature. We also need "high-tech" ceramics for power generation, engineering polymers for metal **substitution**, **advanced composites** for aerospace **application**, **semi-**

**conductors** for increasingly sophisticated electronic devices, non-metallic superconducting magnets with increasingly high operating temperatures and many other sophisticated and unknown materials.

Further development of the very old science of materials technology **requires** much theoretical knowledge and practical skill. An engineer in materials technology must be well-educated in different sciences. That's why a lot of common and special subjects are included in the curriculum of our University. Students also have an **opportunity** to get practical training in the workshops of our University and at industrial enterprises of our city.

**Demand** for highly-qualified engineers in this field is rather high. Specialists in materials technology have a wide range of job **opportunities**. They can work at any industrial enterprise connected with materials **processing** and with machine building.

It is also worth noting that new **advanced** materials will play a key role in the economy of the 21-st century and thus Materials Science and Technology is at the forefront<sup>2</sup> of economic growth.

Ex. 8. Answer the questions to the text:

1. What is your specialty?
2. What does it deal with?
3. What are the main categories of structural materials?
4. What kind of materials are composites?
5. What plays an important role in materials selection?
6. What research started at the beginning of the 20-th century?
7. What is necessary for further development of Materials Science and Technology?
8. What kind of person should a future engineer be?
9. What are the job opportunities for specialists in materials technology?
10. What is the role of advanced materials and Materials Science in modern economy?
11. Why did you choose this specialty?

Ex. 9. Make up short stories on the following topics:

1. the subject of Materials Science and Technology; 2. what should engineers know about structural materials; 3. the main types of materials and their properties; 4. the history of Materials Science; 5. the present research in Materials Science; 6. new types of materials required for modern technology; 7. training of future engineers; 8. job opportunities for future engineers and their role in modern economy; 9. why I chose this specialty.

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<sup>2</sup> to be at the forefront – быть в центре

Ex. 10. Rewrite sentences into the Past Simple:

1. Students buy a lot of books at the beginning of the term.
2. This man knows from his experience what it means.
3. He is a complete mystery to me.
4. My great-grandmother is very old, but she hears, sees and understands everything quite well.
5. I remember that Margaret owns a villa on the Adriatic.
6. My mother doesn't like it when we play in the street.
7. Whenever my father faces difficulties, he always says to me to let things work themselves out in their own time.
8. He does a tremendous amount of work.
9. My friend teaches English for twenty-five years.
10. We don't buy anything because we don't have any money.

Ex. 11. Rewrite the text in the Future Simple:

On Tuesday I get up at half past six. I go to the bathroom and wash my hands and face and clean my teeth. Then I dress, go to the kitchen and cook breakfast for my family. At half past seven my son gets up and has breakfast. I have breakfast with my son. My son eats a sandwich and drinks a cup of tea. I don't drink tea. I drink coffee. After breakfast my son leaves home for school. I don't leave home with my son. On Tuesday I don't work in the morning. I work in the afternoon. In the evening I am at home. My husband and my son are at home, too. We rest in the evening. My son watches TV, my husband reads newspapers and I do some work about the house. At about eleven o'clock we go to bed.

Ex. 12. Retell the text of ex. 7.

### **UNIT 3. WELDING**

Active Vocabulary:

welding – сварка

joining – соединение

application – применение

heat – тепло

pressure – давление

widespread – широко распространенный

to employ – использовать, применять (syn. – to use, to apply)

fabrication = manufacture – изготовление, производство

erection – строительство, возведение  
 to appear – появляться  
 instead of – вместо  
 bolting – скрепление болтами  
 riveting – клепка, соединение заклепками  
 to subdivide – подразделять  
 arc welding – дуговая сварка  
 resistance welding – сварка сопротивлением  
 electron-beam welding – электронно-лучевая сварка  
 to depend – зависеть  
 property – свойство, качество  
 purpose – цель  
 available – доступный, имеющийся в наличии, наличный  
 to bring about – взрывать, совершать  
 complex – сложный  
 metal working – обработка металла (syn. – metal processing, metal treatment)  
 installation – установка, устройство  
 demand – требование, потребность  
 opportunity – возможность  
 skill – искусство, умение, навык

Ex. 1. Choose the right word from the ones given in brackets:

1. All gas (erection, welding, bolting) processes use oxygen. 2. There are several methods of (joining, building, erection) two like pieces of metal. 3. All welding processes are based on the application of (bolting, riveting, heat) and (joining, erection, pressure). 4. The electron-beam welding method has become (widespread, resistance, complex) in our country. 5. The plant deals with the (heat, resistance, manufacture) of heavy machinery. 6. Our nearest task is the (erection, bolting, riveting) of new buildings instead of the destroyed ones. 7. Welding replaced (erection, bolting, heat) and (riveting, pressure, resistance) which had been used in industry before. 8. The welding processes include (erection, bolting, arc) welding as well as (widespread, resistance, complex) welding and (electron-beam, complex, available) welding. 9. What is the (purpose, joining, fabrication) of new experiments? 10. We have no other (application, opportunity, demand) to use the new welding (pressure, purpose, installation).

Ex. 2. Put the appropriate preposition from the box into the gaps:

of	on	in	into	to	by	from	for
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1. Welding is a process when metal parts are joined together \_\_\_\_\_ the application \_\_\_\_\_ heat, pressure, or a combination \_\_\_\_\_ both.
2. Arc welding has a wide range \_\_\_\_\_ application.
3. Thermit welding can be employed only \_\_\_\_\_ low carbon steels.
4. Welding is widely used \_\_\_\_\_ the fabrication \_\_\_\_\_ machine components.
5. All metal working processes can be subdivided \_\_\_\_\_ several groups.
6. The quality \_\_\_\_\_ welding depends \_\_\_\_\_ many factors.
7. Welding is necessary almost \_\_\_\_\_ all productions where metals are used.
8. Welding processes are classified according \_\_\_\_\_ the sources \_\_\_\_\_ heat and pressure used.
9. Gas welding is a non-pressure process using heat \_\_\_\_\_ a gas flame.
10. Arc-welding is the most important welding process \_\_\_\_\_ joining steels.

Ex. 3. Find the synonyms from the words in the first column to the words in the second column:

welding	use
application	warmth
joining	fusion
heat	manufacture
pressure	aim
widespread	metal processing
to employ	connecting
fabrication	chance
erection	force
to subdivide	building
to depend	equipment
purpose	to use
available	to be based
to bring about	to require
complex	to separate
metal working	to cause
installation	broad
to demand	obtainable
opportunity	complicated

Ex. 4. Find an antonym to the first word in every line:

1. joining – a) riveting; b) bolting; c) disconnection
2. heat – a) warmth; b) cold; c) strength
3. widespread – a) narrow; b) broad; c) common
4. fabrication – a) manufacture; b) installation; c) breaking
5. erection – a) destruction; b) building; c) construction
6. to subdivide – a) to unite; b) to use; c) to install
7. to depend – a) to be based; b) to be independent; c) to be built
8. available – a) missing; b) changeable; c) able
9. to bring about – a) to express; b) to suppress; c) to impress
10. complex – a) strong; b) simple; c) fast
11. to demand – a) to ask; b) to give; c) to use
12. opportunity – a) possibility; b) no chance; c) reliability

Ex. 5. Translate sentences in the Passive Voice:

1. A lot of rice is eaten in Asia.
2. These new houses were built about twenty five years ago.
3. Our flight was delayed.
4. Everything will be explained to you later.
5. The rules will be revised at the next lesson.
6. They were told to wait.
7. The tourist will be shown most of the sights in London.
8. The lecture will be attended by many students.
9. Was Ann offered a job?
10. Our students are given a lot of home work to do every day.

Ex. 6. Put the verbs from the brackets into the Passive Voice:

Example: The book (to published) last year. The book was published last year.

1. Every term parent (to invite) to school to meet the teachers.
2. Doctors (to pay) more than teachers.
3. Some paintings (to steal) from the museum.
4. In Britain football matches usually (to play) on Saturday.
5. Cars (to keep) in a garage.
6. The treaty (to sign) in a week.
7. The song soon (to forget).
8. The letter (to type) by the secretary two days ago.
9. The car (to sell) to pay the debts<sup>3</sup>.
10. The rules must (to obey).

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<sup>3</sup> debts - долги

Ex. 7. Translate the following word combinations:

welding equipment, welding technology, welding production, non-contact joining, joining two pieces of metal, narrow application, widespread application, broad application, a range of application, application of heat and pressure, fusion heat, to heat metal, the heated metal, to apply pressure, high pressure, no pressure is required, a widespread process, widespread use, to be widespread in industry, to employ new methods, to employ welding equipment, to be extensively employed, the methods employed, fabrication of machine components, fabrication of steel structures, manufacture of machines and equipment, manufacture of metal parts, steel manufacture, erection of buildings, erection of plants and factories, to use bolting and riveting, bolting and riveting instead of welding, to subdivide into groups, to subdivide into several categories, to be subdivided into the following types, arc welding, resistance welding, electron-beam welding, to depend on many factors, to depend on theoretical research, to depend on new methods of work, it doesn't depend on me, the purpose of work, the purpose of investigation, the purpose of application, to determine the purpose of research, the available materials, available equipment, available methods of welding production, to bring about fusion of metals, to be brought about by different processes, complex task, complex curriculum, complex procedure, metal working plant, metal working equipment, installations for metal working, a welding installation, installation of new machinery, to demand knowledge and skill, to demand experience, to demand time, to be in great demand, a demand for specialists, a good opportunity, to give an opportunity, to have no opportunity, job opportunities.

Ex. 8. Read and translate the text:

My specialty is **Welding** Equipment and Technology.

**Welding** is a process of **joining** together pieces of metal or metallic parts by the **application** of **heat**, **pressure** or a combination of both. **Welding** finds **widespread application** in almost all branches of industry. It is extensively **employed** in the **fabrication** and **erection** of steel structures in industrial construction and civil engineering.

The history of **welding** is not very long. It appeared only in the first half of the 20-th century. Nowadays it is used instead of **bolting** and **riveting** in the construction of bridges, buildings and ships. It is also a basic process in the manufacture of machinery, in motor and aircraft industries. It is necessary almost in all branches where metals are used.

There are two main groups of **welding** processes: **pressure welding** and **heat welding** which are further **subdivided** into the following types: gas welding, electric welding, **arc welding**, as well as laser welding, **electron-beam welding** and some other types. The **welding** process **depends** greatly on the metal **properties**, the **purpose** of their **application** and the **available** equipment.

The science and technology of **welding brought about** a real technical revolution in heavy engineering, shipbuilding, power engineering and the construction industry. It also has an important part to play in the future world. Without **welding** interplanetary liners cannot be built, **welding** is necessary for building launching sites on other planets and in outer space. All **metal-working** plants of the future will include **welding installations**. Without **welding** modern production would be impossible.

**Welding** processes are rather **complex** and **demand** much theoretical knowledge and practical **skill**. A **welding** engineer must be well educated in different sciences. That's why a lot of common and special subjects are included in the curriculum of our University. Students also have an **opportunity** to get practical training in the workshops of our University and at industrial enterprises of our city.

**Demand** for highly-qualified welders is rather high. Engineers in this field have a wide range of job **opportunities**. They can work at any industrial enterprise connected with **welding** processes. **Welding** plays an important role in modern production and the main task of young engineers is to apply all their **skill** and knowledge for further development of **welding** industry.

Ex. 9. Answer the questions to the text:

1. What is your specialty?
2. What is welding?
3. Where is it used?
4. When did it appear?
5. What processes were used before the invention of welding?
6. What are the main types of welding?
7. What does the welding process depend on?
8. What is the role of welding in modern industry?
9. What kind of person should a welding engineer be?
10. Where do students have practical training?
11. What is the main task of young engineers?

Ex. 10. Make up short stories on the following topics:

1. the subject of welding technology; 2. the main types of welding; 3. the history, present situation and future prospects of welding; 4. training of future engineers; 5. job opportunities for welding engineers and their role in welding production; 6. why I chose this specialty; 7. my personal opinion about further development of welding industry.

Ex. 11. Retell the text.

## UNIT 4. TYPES OF WELDING

### Active Vocabulary:

to join – соединять  
pressure welding – сварка давлением  
heat welding – сварка нагреванием  
instead – вместо, взамен  
basic – основной  
to manufacture – изготавливать  
to depend – зависеть от  
purpose – цель  
available – имеющийся в наличии  
equipment – оборудование  
source – источник  
gas welding - газосварка  
arc welding – электродуговая сварка  
resistance welding – контактная сварка  
laser welding – лазерная сварка  
electron-beam welding – электронно-лучевая сварка  
flame – пламя  
edge – край  
simultaneously – одновременно  
filler – наполнитель  
wire – проволока  
rod – прут, стержень  
to melt – плавить(ся)  
joint – соединение, стык  
advantage – преимущество  
to require – требовать, нуждаться  
surface – поверхность  
coated – покрытый  
flux – флюс  
fusible – плавкий  
to shield – заслонять, защищать  
shielded metal arc welding – дуговая сварка металлизированным электродом  
touching – касание  
tip – кончик

Text A. Read and translate the text:

## Gas Welding

**Gas welding** is a non-pressure process using heat from a gas **flame**. The **flame** is applied directly to the metal **edges** to be **joined** and **simultaneously** to a **filler** metal in the form of **wire** or **rod**, called the welding **rod**, which is **melted** to the **joint**. **Gas welding** has the **advantage** of using **equipment** that is portable and does not **require** an electric power source. The **surfaces** to be welded and the welding **rod** are **coated** with **flux**, a **fusible** material that **shields** the material from air, which would result in a defective weld.

**Arc Welding** **Arc welding** is the most important welding process for joining steels. It **requires** a continuous supply of either direct or alternating electrical current. This current is used to create an electric arc, which generates enough heat to **melt** metal and create a weld.

**Arc welding** has several **advantages** over other welding methods. **Arc welding** is faster because the concentration of heat is high. Also, **fluxes** are not necessary in certain methods of **arc welding**. The most widely used **arc welding** processes are shielded metal arc, gas-tungsten arc, gas-metal arc, and submerged arc.

## Shielded Metal Arc Welding

In **shielded metal arc welding**, a metallic electrode, which conducts electricity, is **coated** with **flux** and connected to a source of electric current. The metal to be welded is connected to the other end of the same source of current. An electric arc is formed by **touching** the **tip** of the electrode to the metal and then drawing it away.

The intense heat of the arc **melts** both parts to be welded and the point of metal electrode, which supplies **filler** metal for the weld. This process is used mainly for welding steels.

Ex. 1. Answer the questions to the text:

1. What are the principles of gas welding?
2. What kinds of welding can be used for joining steels?
3. What does arc welding require?
4. What is the difference between the arc welding and shielded metal welding?

Ex. 2. Find the following words and word combinations in the text:

1. сварка давлением;
2. тепловая сварка;
3. болтовое (клепаное) соединение;
4. процесс сварки;
5. зависеть от свойств металлов;
6. имеющееся оборудование;
7. сварочный электрод;
8. плавкий материал;
9. дефектный сварной шов;
10. непрерывная передача электрического тока;
11. электрическая дуга;
12. источник электрического тока.

Ex. 3. Define if the statements are true. If they are not, correct them:

1. Gas welding is a pressure process.
2. Gas welding has the disadvantage of using equipment that is portable.
3. Arc welding is the most significant welding process for joining steels.
4. Arc welding has several advantages over gas welding.
5. Shielded metal arc welding is used mainly for welding steels.

#### Active Vocabulary:

gas-tungsten – сварка оплавлением вольфрамовым электродом в среде инертного газа  
inert – инертный  
edge – край  
bare – голый  
rate – скорость  
gas-metal arc – аргоно-дуговая сварка  
considerably – значительно, гораздо  
surrounding – окружающий  
carbon dioxide – углекислый газ  
droplet – капелька  
liquid – жидкость, жидкий  
beneath – под, ниже, внизу  
layer – слой  
weld seam – сварной шов  
resistance – сопротивление  
clamp – зажим, зажимать

sheet – лист  
fusible – плавкий  
granular – зернистый  
semi-automatic – полуавтоматический  
to create – создавать  
to submerge – погружать

Text B. Read and translate the text:

### **Non-Consumable Electrode Arc Welding**

As non-consumable electrodes tungsten or carbon electrodes can be used. In gas tungsten arc welding a tungsten electrode is used in place of the metal electrode used in shielded metal arc welding. A chemically **inert** gas, such as argon, helium, or **carbon dioxide** is used to shield the metal from oxidation. The heat from the arc formed between the electrode and the metal melts the **edges** of the metal. Metal for the weld may be added by placing a **bare** wire in the arc or the point of the weld. This process can be used with nearly all metals and produces a high-quality weld. However, the **rate** of welding is **considerably** slower than in other processes.

### **Gas-Metal Arc Welding**

In **gas-metal** welding, a **bare** electrode is shielded from the air by **surrounding** it with argon or **carbon dioxide** gas and sometimes by coating the electrode with flux. The electrode is fed into the electric arc, and melts off in **droplets** that enter the **liquid** metal of the **weld seam**. Most metals can be joined by this process.

### **Submerged Arc Welding**

Submerged arc welding is similar to **gas-metal arc** welding, but in this process no gas is used to shield the weld. Instead of that, the arc and tip of the wire are **submerged beneath** a **layer** of **granular, fusible** material that covers the **weld seam**. This process is also called electroslag welding. It is very efficient but can be used only with steels.

### **Resistance Welding**

In **resistance** welding, heat is obtained from the **resistance** of metal to the flow of an electric current. Electrodes are **clamped** on each side of the parts to be welded, the parts are subjected to great pressure, and a heavy current is ap-



plied for a short period of time. The point where the two metals touch **creates resistance** to the flow of current. This **resistance** causes heat, which melts the metals and **creates** the weld. **Resistance** welding is widely employed in many fields of **sheet** metal or wire manufacturing and is often used for welds made by automatic or **semi-automatic** machines especially in automobile industry.

Ex. 4. Answer the questions to the text:

1. What is the difference between the arc-welding and non-consumable electrode arc welding?
2. What are the disadvantages of the non-consumable electrode arc welding?
3. How is electrode protected from the air in gas-metal arc welding?
4. What is submerged arc welding?
5. What is the principle of resistance welding?
6. Where is semi-automatic welding employed?

Ex. 5. Translate into English:

1. вольфрамовый электрод;
2. инертный газ;
3. окисление;
4. высококачественный сварочный шов;
5. скорость сварки;
6. аргон, гелий, углекислый газ;
7. жидкий металл;
8. слой плавкого материала в виде гранул;
9. листовой металл;
10. полуавтоматические сварочные станки.

Ex. 6. Translate into Russian:

1. In resistance welding, heat is obtained from the resistance of metal to the flow of an electric current.
2. The heat from the arc melts the edges of the metal.
3. A bare electrode is shielded from the air by surrounding it with argon or carbon dioxide gas.
4. Submerged-arc welding is similar to gas-metal arc welding.
5. Electrodes are clamped on each side of the parts to be welded.
6. Resistance causes heat which melts the metals and creates the weld.

Ex. 7. Insert somebody, anybody, nobody or everybody:

1. The question was so difficult that ... could answer it. 2. ... left his bag in our classroom yesterday. 3. Has ... in this group got a dictionary? 4. I am afraid there is ... in the office now. It is too late. 5. ... knows that water is necessary for plants. 6. Is there ... here who knows English? 7. You must find ... who can help you. 8. ... knew anything about our home task. 9. ... can answer this question. It is very easy. 10. There is ... in the next room. I don't know him. 11. Please tell us the story ... knows it. 12. Is there ... in my group who lives in the hostel? 13. Has ... here got a red pencil?

Ex. 8. Circle 20 words from Units 3, 4

Q	W	E	D	R	O	P	L	E	T	R	T	A	Y	B	U
P	O	P	Y	H	J	G	D	S	O	E	M	P	L	O	Y
P	Z	R	X	C	O	V	B	N	W	D	P	P	M	L	L
U	W	E	L	D	I	N	G	O	I	G	R	L	I	T	U
R	E	S	R	T	N	B	N	M	D	E	O	I	S	I	C
P	Q	S	M	W	I	R	E	N	E	B	P	C	E	N	O
O	S	U	D	F	N	A	C	V	S	H	E	A	T	G	M
S	B	R	N	M	G	L	K	J	P	G	R	T	F	D	P
E	R	E	C	T	I	O	N	W	R	Q	T	I	P	S	L
Q	W	E	R	T	F	L	A	M	E	X	Y	O	Z	V	E
E	Q	U	I	P	M	E	N	T	A	J	M	N	N	B	X
A	S	D	F	D	E	P	E	N	D	Y	U	B	A	R	E

## UNIT 5. FOUNDRY

### Active Vocabulary:

foundry – литье, литейный завод, литейный цех, литейное производство

complex – сложный

to consider – считать, рассматривать

metal-working – обработка металла (syn. – metal treatment, metal processing)

casting – отливка, литье

workpiece – деталь, заготовка

furnace – печь

open-hearth furnace – мартеновская печь

Bessemer converter – бессемеровский конвертер

cupola – вагранка  
 blast furnace – доменная печь  
 owing to – благодаря, вследствие  
 rapid – быстрый  
 ferrolyte – центролит, крупный литейный завод  
 shop – цех, мастерская  
 cast iron – чугун  
 ferrous metal – черный металл  
 non-ferrous metal – цветной металл  
 to demand = to require – требовать  
 to compose – составлять, соединять  
 property – свойство, качество  
 correct = proper – правильный, верный, подходящий, нужный  
 hardening – закалка, упрочнение  
 cooling – охлаждение  
 mold (mould) – литейная форма  
 strength of materials – сопротивление металлов  
 heat treatment – тепловая обработка  
 opportunity – возможность  
 experience – опыт  
 achievement – достижение  
 to apply – применять, прикладывать  
 to investigate – исследовать

Ex. 1. Choose the right word from the ones given in brackets:

1. I choose (foundry, casting, furnace) as my specialty. 2. We (compose, apply, consider) him to be a good student. 3. We must (work, cool, apply) new methods in our work. 4. Our task is to (compose, demand, achieve) different kinds of materials. 5. The plant deals with (experience, achievement, metal-working). 6. Most (castings, properties, shops) are produced in sand molds. 7. These (shops, workpieces, furnaces) serve as detail or component parts of complex machines. 8. Cupola is the most economical type of (furnace, shop, steel). 9. There are 3 stages in the operation of (strength of materials, an open-hearth furnace, cast iron). 10. One of the oldest types of furnace is (cupola, mold, steel).

Ex. 2. Insert much, many, little, a little, few, a few:

1. I'd like to say ... words about my travelling. 2. She gave him ... water to wash his hands and face. 3. He had ... English books at home, so he had to go to the library. 4. After the lesson everybody felt ... tired. 5. There were ... new

words in the text and Peter spent ... time learning them. 6. There was ... sugar in the bowl, and we had to put ... sugar there. 7. My mother knows German ... and she can help you with the translation of this text. 8. When we walked ... farther down the road we met another group of pupils. 9. Have you got ... time before the lesson? 10. ... of these students don't like to look up words in the dictionary.

Ex. 3. Find the synonyms from the words in the first column to the words in the second column:

foundry	complicated
complex	oven
to consider	fast
metal-working	to require
workpiece	metal-processing
furnace	casting
owing to	to regard
rapid	quality
ferrous metal	thanks to
non-ferrous metal	proper
to demand	power
to compose	working
property	chance
correct	to use
strength	accomplishment
treatment	to study
opportunity	practice
experience	a part
achievement	metal containing iron
to apply	metal not containing iron
to investigate	to construct

Ex. 4. Find an antonym to the first word in every line:

1. complex – a) strong; b) simple; c) fast
2. rapid – a) fast; b) slow; c) quick
3. ferrous metal – a) cast metal; b) cooled metal; c) non-ferrous metal
4. to demand – a) to ask; b) to give; c) to use
5. to compose – a) to built; b) to treat; c) to employ
6. correct – a) wrong; b) strong; c) rapid
7. proper – a) right; b) useful; c) incorrect
8. hard – a) soft; b) heavy; c) bright
9. cool – a) cold; b) hot; c) light

10. strength – a) weakness; b) brightness; c) length
11. heat treatment – a) cold working; b) metal processing; c) warm forming
12. opportunity – a) possibility; b) no chance; c) reliability
13. experience – a) lack of knowledge; b) lack of job; c) lack of hope
14. achievement – a) shortcoming; b) experience; c) strength

Ex. 5. Find the correct translation of each word:

A. foundry, to consider, metal working, casting, workpiece, open-heart furnace, cupola, owing to, shop, steel, cast iron, property, mold, to apply, to investigate.

В. считать, вагранка, сталь, отливка, цех, деталь, литейное производство, свойство, обработка металла, мартеновская печь, чугун, благодаря, литейная форма, исследователь, применять.

Ex. 6. Translate the words with the same root:

to found – foundry – foundryman

complex – complexity – to complicate – complicative – complicated – complication

to consider – consideration – considering – considered

to cast – casting – caster

rapid – rapidly – rapidity

to compose – composing – composed – composite – composition

correct – correctly – correctness – incorrect – to correct – correction – corrective – corrector

hard – to harden – hardening – hardly – hardness

cool – cooling – cooled – coolant – cooler

mould – to mould – moulding – moulder

Ex. 7. Read and translate the text:

I am going to be an engineer-foundryman. My specialty is **foundry** technology and **foundry** equipment.

**Foundry** processes are very **complex**. They are **considered** to be the basis of modern industry. One of the basic processes of **metal-working** industry is the production of metal **castings**. All metal **castings** and **workpieces** are produced at powerful **foundries** or at special plants. A number of **open-hearth furnaces**, modern **Bessemer converters**, electrical **furnaces**, **cupolas** are operating in our country.

**Foundry** has a long history and numerous methods have been developed through the ages for producing metal **castings** which serve as details or component parts of **complex** machines and products.

At present the **foundry** industry is going through a process of **rapid** transformation, **owing to** modern development of new technological method, new machines and new materials. Now we have highly developed modern powerful **foundries**-plants, called **centrolytes**, and large mechanized shops.

The processes for producing steel, **cast iron** and **non-ferrous castings** are **complex** and **demand** much theoretical knowledge and practical skill. An engineer-foundryman must be well-educated in different sciences. He has **to compose** different kinds of steel and **cast iron**, to use physical **properties** of materials and to know many other things for better operating and controlling a **foundry** process, for **correct** and **proper** exploitation of **furnaces**, for controlling the processes of **hardening** and **cooling** casts in **molds** and for producing **proper** cast **workpieces**. That's why he must know chemistry, physics, **strength of materials**, thermal technique, hydraulics, **heat treatment** and other sciences. Many special subjects are included in the curriculum of our University, such as theoretical mechanics, electrical engineering, theory of machines and mechanisms, physical metallurgy and some others. Our students also have a good **opportunity** to work in the shops of our University and at industrial enterprises of our city. And, of course, it is necessary for an engineer to know, at least, one foreign language to study and investigate foreign **experience** in this field.

Demand for highly qualified foundrymen is rather high. Engineers in this field have a wide range of job **opportunities**. They can work at any industrial enterprise connected with **foundry** processes. But in spite of all the **achievements** in this branch there is still a number of scientific, technical and manufacturing problems in **foundry**. Young engineers must **apply** their skill and knowledge for solving all these problems.

Ex. 8. Answer the questions to the text:

1. What is your specialty?
2. What is the role of foundry processes in modern industry?
3. What is one of the basic processes of metal working industry?
4. What kind of furnaces are operating in our country?
5. Where are metal castings used?
6. What kind of specialist should an engineer-foundryman be?
7. Why is it necessary for an engineer to know foreign languages?
8. What is the task of young engineers in foundry industry?

Ex. 9. Make up short stories on the following topics:

1. the subject of foundry technology and its role in modern industry; 2. the history of foundry and its present situation; 3. training of future engineers; 4. job opportunities for foundry engineers; 5. the role of young engineers in foundry

production; 6. why I chose this specialty; 7. my personal opinion about future prospects of foundry.

Ex. 10. Find an appropriate ending for the first part of the sentence:

1. The curriculum is rather complex	a. large mechanized shops were put in-
2. Mechanical properties plays an	to operation.
3. Owing to rapid development of	b. requires much experience.
foundry technology	c. and includes many subjects.
4. Metal treatment includes hardening	d. quite new and unknown fields.
5. The steel may be	e. important role in material selection.
6. Proper exploitation of furnaces	f. science are known all over the world.
7. Great achievements of our	j. made from a refractory material.
8. The scientists investigate	k. of metals and their cooling.

Ex. 11. Everyday English. Say the numbers.

15 50 406 72 128

90 19 850 36 1,520

247 5,000 100,000  
2,000,000

Ex. 12. Say the numbers:

**Money**

£400 50p €9.40 €47.99 ¥5,000 \$100

**Fractions**

12

**Decimals and percentages**

6.2 17.25 50% 75.7% 100%

**Dates**

1995      2020      1789      15/7/94      30/10/02

**Phone numbers**

01865-556890      800 451-7545      919 677-1303

Ex. 13. Retell the text of ex. 7.

**UNIT 6. METALS****Active Vocabulary:**

metallurgy – металлургия  
separation – разделение  
dense – плотный  
arrangement – расположение  
regularly – регулярно, правильно  
to slide – скользить  
malleable – ковкий, способный деформироваться  
bend – гнуть  
to fracture - ломать  
ductile – эластичный, ковкий  
to draw – волочить, тянуть  
wire – проволока  
lead – свинец  
iron – железо, чугун  
grain – зерно  
size – размер, величина  
shape – форма, формировать  
composition – состав  
coarse – грубый, крупный  
treatment – обработка  
quenching – закалка  
tempering – отпуск после закалки, нормализация  
annealing – отжиг, отпуск  
rolling – прокатка  
to hammer – ковать  
extrusion – экструзия  
metal fatigue – усталость металла  
creep – ползучесть  
stress – давление, напряжение  
failure – повреждение, разрушение



vessel – сосуд, котел, судно  
lathe – токарный станок  
milling machine – фрезерный станок  
shaper – строгальный станок  
grinder – шлифовальный станок  
to melt – плавить, плавиться, расплавлять  
to cast – отливать  
mould – форма (для отливки)

Ex. 1. Translate the words with the same root:

design – to design – designer – designing – designed  
to depend – dependent – dependence – independence  
origin – original – originally – originality – to originate  
to appear – appearance – to disappear – disappearance  
to assume – assumption – assuming – assumed – assumptive  
to create – creation – creature – creator – creative  
to rely (on) – reliable – unreliable – reliability  
to extend – extended – extending – extension – extensible – extensibility  
machine – to machine – machining – machinery – machinist  
versatile – versatility

Ex. 2. Put the appropriate preposition from the box into the gaps:

into	of	upon	for	in	with	on	by	to	from
------	----	------	-----	----	------	----	----	----	------

1. Engineer must know the characteristics \_\_\_\_\_ engineering material.
2. Properties depend \_\_\_\_\_ the chemical composition and the physical structure \_\_\_\_\_ the material.
3. Metals are important \_\_\_\_\_ industry because they can be easily deformed \_\_\_\_\_ useful shapes.
4. A lot \_\_\_\_\_ metalworking processes have been developed \_\_\_\_\_ certain applications.
5. Among various recent trends \_\_\_\_\_ the engineering profession computerization is the most widespread.
6. Computers are increasingly used \_\_\_\_\_ solving complex problems.
7. Engineers \_\_\_\_\_ industry work not only \_\_\_\_\_ machines but also \_\_\_\_\_ people.
8. Modern engineering is characterized \_\_\_\_\_ the broad application \_\_\_\_\_ what is known as systems engineering principles.
9. The most important thing \_\_\_\_\_ me now is \_\_\_\_\_ study well and \_\_\_\_\_ graduate \_\_\_\_\_ the University.

Ex. 3. Put the verb in brackets into the Present Simple or Present Continuous:

1. He (to learn) English now because he (to want) to get a better job.
2. I (to call) my son in Chicago now. I (to want) to call him every month but it (to be) very expensive.
3. Listen to the man! You (to understand) what language he (to speak)?
4. Hurry up! We (not to have) much time left. – I (to come)!
5. It (to take) me forty minutes to get to university.
6. I (not to work) in my office now.
7. My friend (to live) in St Petersburg.
8. What you (to do) here now? – We (to listen) to tape recordings.
9. I (not to know) what to give my brother for his birthday.
10. They (to be) good dances but they (not to go) to discos very often.
11. She (to show) the latest collection of new designs.
12. All the talk tonight is about the house which he (to renovate).

Ex. 4. Translate the international words:

material, technology, fabrication, modern, industrial, production, category, structural, traditionally, type, composite, combination, fundamental, role, history, progress, construction, tunnel, ocean, temperature, to generate, special, stability, corrosion, variation, electronic, magnet, practical, theoretical, economy.

Ex. 5. Read and translate the text:

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 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<sup>4</sup> and it changes the **grain** structure and properties of metals.

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<sup>4</sup> alloying - легирование

All metals can be formed by **drawing, rolling, hammering** and **extrusion**, but some require hot-working. Metals are subject to **metal fatigue** and to **creep** (the slow increase in length under **stress**) causing deformation and **failure**. Both effects are taken into account by engineers when designing, for example, airplanes, gas-turbines, and pressure **vessels** for high-temperature chemical processes. Metals can be worked using machine-tools such as **lathe, milling machine, shaper** and **grinder**.

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.

Ex. 6. Answer the questions to the text:

1. What are metals and what do we call metallurgy?
2. Why are most metals dense?
3. Why are metals malleable?
4. What is malleability?
5. What are grains?
6. What is alloying?
7. What is crystalline structure?
8. What do the properties of metals depend on?
9. What changes the size of grains in metals?
10. What are the main processes of metal forming?
11. How are metals worked?
12. What is creeping?

Ex. 7. Find the following words and word combinations in the text:

1. свойства металлов;
2. расстояние между атомами;
3. правильное расположение;
4. сильно отличаются по своим свойствам;
5. кристаллическая структура;
6. размер зерен;
7. форма зерен;
8. закалка;
9. отжиг;
10. волочение;
11. прокатка;
12. ковка;
13. экструзия;
14. структура и свойства зерна;
15. горячая обработка;

16. усталость металла;
17. ползучесть металла;
18. плавка и отливка в формы;
19. способы обработки металлов.

Ex. 8. Complete the following sentences:

1. Metals are ...
2. Metallurgy is ...
3. Most metals are ...
4. The regular arrangement of atoms in metals ...
5. Irregular crystals ...
6. The properties of the metals depend ...
7. Metals with small grains will be ...
8. ... controls the nature of the grains in the metal.
9. Alloying is ...
10. All metals can be formed by ...
11. Creep is ...
12. Metals can be worked using ...

Ex. 9. Explain in English the meaning of the following words:

1. malleability;
2. crystalline structure;
3. grains;
4. heat treatment;
5. alloying;
6. creep.

Ex. 10. Insert something, anything, nothing or everything:

1. My husband taught his son ... he knows.
2. Her patient has a bad memory. She can't remember ... .
3. I think there is ... wrong with my watch.
4. We've got ... to eat. We've got only ... to drink.
5. The student didn't understand ... because she heard ... .
6. Does he know ... about computers? – Yes, he knows ... because he is the best specialist in computer science in Harvard University.
7. He felt terrible. He couldn't do ... else.
8. Is there ... interesting in the theatre program?
9. I didn't take any money with me, so I couldn't buy ... .
10. My new eyeglasses are very good, I can see ... now.

Ex. 11. Translate into English:

1. Металлы – плотные материалы, потому что между атомами в металлах малое расстояние.
2. Металлы имеют кристаллическую структуру из-за правильного расположения атомов.
3. Чем меньше зерна, тем тверже металл.
4. Закалка и отжиг изменяют форму и размер зерен в металлах.
5. Легирование изменяет структуру зерен и свойства металлов.
6. Металл деформируется и разрушается из-за усталости и ползучести.

## UNIT 7. FERROUS AND NON-FERROUS METALS

Active Vocabulary:

suitable – подходящий, соответствующий  
member – элемент, конструкция  
strength – сопротивление  
ductility – эластичность, ковкость, тягучесть  
toughness – прочность, вязкость  
fatigue – усталость  
resistance – сопротивление, устойчивость  
stiffness – жесткость  
shock – сотрясение, удар, толчок  
wear – износостойкость  
frictional – фрикционные  
casting – литье, отливка  
lead – свинец  
cast iron – чугун  
carbon – углерод  
tension – упругость  
shear – сдвиг, срез, срезающее усилие  
impact – сопротивление удару  
cupola – вагранка  
furnace – топка  
pig – болванка  
coke – кокс, коксовать  
moderately – умеренно  
brittle – хрупкий, ломкий  
malleable – ковкий, тягучий  
airtight – герметичный  
pot – резервуар

semisteel – сталистый чугун  
wrought – кованый, обработанный давлением  
iron – сварочная сталь  
ductile – ковкий  
roll – прокатывать  
draw – вытягивать  
forge – ковать  
weld – сваривать  
slag – шлак  
tonnage – тоннаж, вес

Ex. 1. Find the Russian equivalents for the following word combinations:

A. engineering processes; machine member; casting and forging properties; strong in compression; in the free or graphite state; moderately brittle; in the combined state; when castings of considerable strength are required; forged steel; alloy steel; the addition of carbon; because of high electric conductivity; cooling of metals; to reduce the hardness; rapid cooling; by immersion in cold water; to reduce brittleness; to restore ductility.

В. машиностроительные процессы; кованая сталь; свойства отливки иковки; станочный элемент; когда отливка значительной крепости необходима; в смешанном состоянии; крепкий на сжатие; умеренно ломкий; в чистом и графитовом состоянии; добавление углерода; из-за высокой электрической проводимости; легированная сталь; структуральные металлы; охлаждение металлов; быстрое охлаждение; уменьшить прочность; погружением в холодную воду; уменьшить хрупкость; восстановить ковкость (эластичность).

Ex. 2. Insert *to be* in the right form:

1. There ... some new pupils in our group. 2. There ... no book on the table. 3. There ... a conference next week. 4. There ... nobody in the room. 5. There ... much work last week. 6. There ... many new books in our library. 7. ... there ... a flight for Moscow tomorrow? Yes, there ... . 8. There ... a lot of stars and planets in space. 9. ... there any lectures yesterday? No, there ... . 10. ... there a test last lesson? No, there ... . 11. Soon there ... a new film on. 12. Excuse me, ... there ... a restaurant near hear? 13. There ... a football match on TV last night. 14. There ... somebody at the airport to meet you when you arrive tomorrow.

### Word combinations for connected reading:

to be hammered – быть выкованным

to select suitable materials – выбрать соответствующие материалы

machine member – станочный элемент

strength – сопротивление материалов

fatigue resistance – усталостная прочность

shock resistance – прочность на сотрясение

frictional qualities – фрикционные качества

in turn by – по очереди

to be weak in tension and shear – слабый в упругости и в срезающем усилии

to be remelted in contact with coke – переплавляться во взаимодействии с коксом

easily machined – легко обрабатываемый

wrought iron is quite ductile – сварочная сталь вполне тягучая (ковкая)

to be used to replace – применяется, чтобы заменить

#### Ex. 3. Text A. Read and translate the text:

In studying engineering process an engineer who is to built a machine must **select suitable materials** for each **machine member**. One must know the characteristics of engineering materials. These are as follows: **strength, stiffness, ductility, toughness**, elasticity, **fatigue resistance, shock resistance**, corrosion **resistance, wear resistance**, hardness resistance, **frictional qualities**, machinability, **casting** and forging properties. They depend upon the chemical composition and the physical structure of the material.

From the point of **tonnage** produced and used, **iron** is the world's most common metal, followed in turn by copper, zinc, **lead** and aluminium.

**Cast iron** is a general term applied to iron-**carbon** alloys containing more than 1.7 per cent of **carbon**. **Cast iron** without the addition of alloying elements **is weak in tension and shear**, strong in compression and has low **resistance to impact**. It is obtained from the **cupola furnace** where pig iron **is remelted in contact with coke**. Grey **cast iron** has the **carbon** present in the free or graphite state and is soft, **easily machined**, and only **moderately brittle**. **Malleable cast iron** is made by heating white **iron castings** for a period of several days in **air-tight** pots filled with an oxide of **iron**.

Steel is a ferrous material with a **carbon** content from 0.1 to 1.0 %. **Semisteel** is a name to a metal made by melting 20 to 40 % of steel **scrap** with **cast iron** in the **cupola**. Steel **castings** are more expensive but stronger and tougher.

**Wrought iron** is quite **ductile** and can be easily **rolled, drawn, forged** and **welded**. It has high **resistance** to corrosion. The **carbon** content is generally less than 0,1 % and the material must contain not less than 1 % of **slag**.

Cast steel normally contains about 0,5 % of **carbon**, and **is used to replace cast iron** when **castings** of considerable strength are required. **Forged** steel is steel that **has been hammered, drawn**, pressed or **rolled** in the process of manufacturing a particular part.

Ex. 4. Answer the questions to the text:

1. What are the characteristics of engineering materials?
2. What do they depend upon?
3. What is the most common metal?
4. What are the properties of cast iron?
5. What is cast iron obtained from?
6. What is grey cast iron?
7. What is white cast iron?
8. What is steel?
9. How is semisteel made?
10. What can you say about wrought iron?
11. What does cast steel normally contain?
12. What is forged steel?

Ex. 5. Find the correct statements:

1. An engineer must select ... for each machine member.
  - a) a plant;
  - b) a workshop;
  - c) suitable materials.
2. One must know ... of engineering materials.
  - a) the tonnage;
  - b) the structure;
  - c) the characteristics.
3. The characteristics of engineering materials depend upon ... .
  - a) their weight;
  - b) their colour;
  - c) the chemical composition and their physical structure.
4. Steel is a ferrous material with a carbon content from ... .
  - a) 0,2 to 2,0 %;
  - b) 0,3 to 3,0 %;
  - c) 0,1 to 1,0 %.



5. Cast steel normally contains about ... of carbon.
- a) 1,5 %;
  - b) 0,75 %;
  - c) 0,5 %.

Ex. 6. Complete the sentences using the appropriate variants:

white iron casting    free    graphite    iron-carbon alloys    combined
--

- 1. Cast iron is a general term applied to ... .
- 2. Grey cast iron has the carbon present in the ... or ... state.
- 3. White cast iron has most of the carbon in the ... state.
- 4. Malleable cast iron is made by heating ... for a period of several days in air-tight pots filled with an oxide of iron.

Ex. 7 Translate into English:

- 1. Свойства машиностроительных материалов следующие: сопротивление, жесткость, ковкость, прочность, эластичность, усталостная прочность, прочность на сотрясение, на коррозию и т.д.
- 2. Эти свойства зависят от химического состава и физической структуры материала.
- 3. Чугун без добавления сплавов слабый на упругость и на срезающем усилии.
- 4. Серый чугун содержит углерод как в чистом, так и в графитовом состоянии.
- 5. Основными легирующими элементами, используемыми в стали, являются никель, хром, ванадий, молибден и марганец.
- 6. Около 60 % меди используется в электротехнике.
- 7. Латунь, бронза и сплавы меди с никелем – основные медные сплавы.
- 8. Алюминий обычно используется в сплавах с медью, кремнием и магнием.
- 9. Химики создали много синтетических материалов, которые могут быть использованы вместо металлов.
- 10. Нормализация – это форма отжига.
- 11. Закалка – это быстрое охлаждение при погружении в холодную воду.

## Active Vocabulary:

ferrous	–	железный
alloy	–	сплав
steel	–	сталь
molybdenum	–	молибден
manganese	–	марганец
tungsten	–	вольфрам
beryllium	–	бериллий
boron	–	бор
conductivity	–	проводимость
design	–	конструкция
brass	–	латунь
bronze	–	бронза
bakelite	–	бакелит
plexiglass	–	плексиглас
fibres	–	волокно
rubber	–	резина
protective	–	защитный
coatings	–	покров, оболочка
heat-treatment	–	тепловая обработка
cooling	–	охлаждение
arrangement	–	устройство, расположение
annealing	–	отжиг
grain	–	зерно
normalizing	–	нормализация
quenching	–	закалка
immersion	–	погружение
tempering	–	отпуск после закалки, нормализация
to quench	–	закаливать, охлаждать
to restore	–	восстанавливать

Ex. 8. Text B. Read and translate the text:

**Alloy steels** are those in which some alloying element in addition to the carbon is present in some appreciable quantity. The principal alloying elements used in **steel** are nickel, chromium, vanadium, **molybdenum**, **manganese**, and to lesser extent, copper, **tungsten**, **beryllium** and **boron**.

Because of its high electric **conductivity** about 60 % of copper produced is used in electrical work. Three chief groups of copper alloys used in machine design are **brasses** (copper-zinc alloys), **bronzes** (copper-tin alloys), and nickel-copper alloys.

Aluminium is one of the lightest metals used for machine construction. It is commonly used alloyed with copper, silicon or magnesium, the world's lightest structural metal.

Intensive chemical research has created a large number of nonmetallic synthetic materials grouped under the general term of plastics, e.g. **bakelite**, **plexiglass**, textile **fibres**, synthetic **rubber** and several **protective coatings**.

**Heat-treatment** is the process of controlled heating and **cooling** of metals to change their structural **arrangement** and to ensure certain desirable properties.

**Annealing** consists of heating the metal to a temperature slightly above the critical temperature and then **cooling** slowly to produce **grain** structure, reduce the hardness, and increase the ductility.

**Normalizing** is a form of **annealing** in which the material is **cooled** in the air.

**Quenching** or rapid **cooling** from above the critical temperature by **immersion** in cold water or some other **cooling** medium, is a hardening treatment.

**Tempering** consists of reheating the **quenched** metal to **restore** ductility to some extent and reduce the brittleness.

Ex. 9. Answer the questions to the text:

1. What is the most important non-ferrous metal?
2. What is the difference between brass and bronze?
3. What nonmetallic synthetic materials do you know?
4. What is quenching?
5. What is the difference between annealing and normalizing?
6. What is a hardening treatment?

Ex. 10. Combine the parts of the sentences given in columns I and II:

I

1. Heat-treatment
2. Quenching
3. Normalizing
4. Annealing

II

- a. is a form of annealing, in which the material is cooled.
- b. is cooling of metals to change their structural arrangement.
- c. is rapid cooling.
- d. consists of heating the metal to a temperature above the critical temperature.

Ex. 11. Translate the sentences in the Passive Voice with the following verbs. Pay attention to the prepositions:

to speak about – говорить о  
to laugh at – смеяться над  
to follow by – следовать за  
to rely on – полагаться на  
to look after – смотреть за  
to refer to – ссылаться на, следить за  
to take care of – заботиться о  
to take notice of – обращать внимание на  
to work at – работать над

1. The film was much spoken about.
2. He is often laughed at.
3. A criminal was followed by two policemen.
4. He is a reliable person. He is always relied on.
5. The old car was in excellent condition. It was looked after well.
6. This book was often referred to.
7. Old people are taken care of in our country.
8. The design of the house was much worked at.
9. His warning was not taken notice of.
10. The report was followed by a lively discussion.

## UNIT 8. MACHINE-TOOLS

Active Vocabulary:

machine-tools - станки  
electrically driven – с электроприводом  
shape – форма  
workpiece – деталь  
accurate – точный  
development – развитие  
to allow – позволять, разрешать  
interchangeable – взаимозаменяемый  
facility – приспособление  
relative – относительный  
amount – количество  
fluid – жидкость  
to lubricate – смазывать  
spark erosion – электроискровая обработка

discharge – разряд  
by means of – посредством  
beam – луч  
drilling – сверление  
flexible – гибкий  
range – ассортимент, диапазон

Ex. 1. Text A. Read and translate the text:

**Machine-tools** are used to **shape** metals and other materials. The material to be **shaped** is called the **workpiece**. Most **machine-tools** are now **electrically driven**. **Machine-tools** with electrical drive are faster and more **accurate** than hand tools: they were an important element in the **development** of mass-production processes, as they **allowed** individual parts to be made in large numbers so as to be **interchangeable**.

All **machine-tools** have **facilities** for holding both the **workpiece** and the tool, and for accurately controlling the movement of the cutting tool **relative** to the **workpiece**. Most machining operations generate large **amounts** of heat, and use cooling **fluids** (usually a mixture of water and oils) for cooling and **lubrication**.

**Machine-tools** usually work materials mechanically but other machining methods have been developed lately. They include chemical machining, **spark erosion** to machine very hard materials to any shape **by means of** a continuous high-voltage spark (**discharge**) between an electrode and a **workpiece**. Other machining methods include **drilling** using ultrasound, and cutting **by means of** a laser **beam**. Numerical control of **machine-tools** and **flexible** manufacturing systems have made it possible for complete systems of **machine-tools** to be used **flexibly** for the manufacture of a **range** of products.

Ex. 2. Make the summary of the text using following phrases:

1. The text explains ...
2. The main function of machine-tools is ...
3. At present most machine-tools are ...
4. That's why they are ...
5. Besides, all machine-tools have ...
6. Finally, machine-tools usually work ...
7. To sum it up, ....

Ex. 3. Give as more synonyms to the following words as you can:

device, versatile, complex, rapid, purpose, demand, treatment, fabrication, tremendous, selection, advanced, opportunity, suitable, probably.

Ex. 4. State the part of the speech of the following words:

native, material, impurity, undesirable, distribute, involve, absorption, apply, mix, metallurgy, vary, markedly, cutting, internal, permanently.

Ex. 5. Using the suffixes -er, -able, -ly, -ment, -al, -ance, -ion, -ty build the words according to the model:

Model: equip (оборудование) – equipment

1. manufacture (производитель); 2. arrange (расположение); 3. suit (подходящий), 4. resist (сопротивление); 5. friction (фрикционные); 6. moderate (умеренно); 7. chemical (химический); 8. treat (обработка); 9. immerse (погружение); 10. proper (свойство); 11. span (гаечный ключ); 12. eliminate (устранение); 13. product (производство); 14. engine (инженер); 15. develop (развитие); 16. distinct (различие).

Ex. 6. Insert somewhere, anywhere, nowhere or everywhere:

1. I can't find my book ... I have looked all over the house. 2. Johnny lives ... near Chicago. 3. It so happened that he had ... to go to. So last summer he stayed at home in his beloved city for his holidays. 4. Do you live ... near them? 5. Is it ... in Russia? – Yes, it's ... in Russia. 6. Where are you going? – I am not going ... . 7. I put my dictionary ... yesterday and now I can't find it ... . – Of course, that is because you live your books ... . 8. You must go ... next summer. 9. Did you go ... on Sunday? 10. Today is a holiday. The streets are full of people. There are flags, banners and flowers ... .

#### Active Vocabulary:

manufacture – производство

equipment – оборудование

minute – мелкий

jewel – драгоценный камень

aircraft – самолет

spindle – шпиндель

to impart – придавать, сообщать

rotary – вращательный

motion – движение

feed – подача

to rest – отдыхать, покоиться

frame – рама, корпус

cutter – резец, фреза, режущий инструмент  
to rotate – вращать  
lathe – токарный станок  
to perform – исполнять, совершать  
variety – разнообразие, множество  
reaming – развертывание, раззенкование  
tapping – нарезка резьбы метчиком  
to employ – употреблять  
adapter – держатель, соединительная муфта  
drive – привод, передача  
arrangement – устройство, расположение  
gear – шестерня

Word combinations for connected reading:

drilling machine – сверлильный станок  
sensitive drilling machine – сверлильный станок повышенной точности  
upright drilling machine – вертикально-сверлильный станок  
radial drilling machine – радиально-сверлильный станок  
multi-spindle machine – многошпиндельный станок  
milling machine – фрезерный станок  
bench lathe – верстальный станок  
chucking lathe – патронный токарный станок  
screw machine – винторезный станок  
boring mill – расточный станок  
crankshaft lathe – коленчатовальный станок  
wheel lathe – колесотокарный станок  
engine lathe – токарно-винторезный станок

Ex. 7. Text B. Read and translate the text:

The machine-tool is the principal **manufacturing equipment** in a machine shop. It is essential in the **manufacture** of every product from a giant turbine to **minute jewels** for **aircraft** instruments.

One of the simplest tools is the ordinary **drilling machine**. It consists of a **spindle** which **imparts rotary motion** to the drilling tool, mechanism for feeding the tool into the work, a table on which the work **rests**, and a **frame**.

The **drilling machines** (pic. A4.1) or drill presses are grouped into the following four classes: **sensitive**, **upright**, **radial** and **multi-spindle machines**.

A **milling machine** (pic. A4.2) is a machine-tool that removes metal as the work is fed against a **rotating cutter**.

The **lathe** (pic. A4.3) is a machine-tool which can **perform** a wide **variety** of operations. It is primarily used for turning and boring operations. In addition, the **lathe** can be used for **drilling, reaming, tapping** and, by **employing** suitable **adapters**, operations of milling and grinding may be carried out without difficulty.

The **lathe** is the oldest machine-tool, but it is still widely used.

There are many types of **lathes** that differ in their size, design, method of **drive, arrangement** of **gears** and purpose.

According to the character of work **performed**, the design and construction **lathes** are divided into the following types: **bench lathes, chucking lathes** and automatic lathes. There are also **screw machines, boring mills, crankshaft lathes, wheel lathes**, etc.

Ex. 8. Find in the text B English equivalents for the following word combinations:

различаются по размеру;  
операции фрезерования и шлифования;  
расположение шестерен;  
широко используется;  
удаляет металл;  
для подачи инструмента;  
гигантская турбина;  
придает вращательное движение.

Ex. 9. Answer the questions to the text B:

1. What is the machine-tool?
2. Where are machine-tools used?
3. What parts does the ordinary drilling machine consist of?
4. What types of drilling machines do you know?
5. What machine-tool removes metal with a rotating cutter?
6. What operations can the lathe be used for?
7. What are the main types of lathes?
8. What do many types of lathes differ in?

Ex. 10. Complete the sentences choosing appropriate variants from the box:

their size, design, method of drive, arrangement of gears and purpose; the oldest machine-tool; removes metal; drilling, reaming, tapping; sensitive, upright, radial and multi-spindle machines; the lathe; drilling machine
---



1. ... consists of a spindle which imparts rotary motion to the drilling tool, mechanism for feeding the tool into the work, a table on which the work rests, and a frame.

2. The milling machine is a machine-tool that ... as the work is fed against a rotating cutter.

3. ... is used for turning and boring operations.

4. The lathe is still widely used in spite of it is ... .

5. Lathes differ in ... .

6. The lathe can be used for ... .

7. The drilling machines are divided into four classes ... .

Ex. 11. Translate into English:

1. Станок – необходимое в производстве оборудование.

2. Сверлильный станок – простейший станок.

3. Сверлильный станок состоит из шпинделя, механизма по подаче инструмента к детали, стола и рамы.

4. Деталь лежит на столе.

5. Сверло вращается при помощи шпинделя.

6. Фрезерный станок удаляет металл с детали с помощью фрезы.

7. Токарный станок используется для сверления, развертывания и нарезки резьбы метчиком.

8. Фрезерование и шлифование проходят без особых трудностей.

Ex. 12. Give definitions of the following terms:

milling, grinding, machine-tool, lathe, milling machine, reaming, boring, drilling.

Ex. 13. Read the following text. Put the words from the right side in appropriate form if it is necessary:

Metal undergoes a number of processes before it is formed into the required shape: casting, rolling, welding, piercing, trimming, spinning, bending, drawing, etc.

The machines which perform all these kinds of works \_\_\_\_\_ called machine-tools. The most common machine-tool found in almost any workshop is the lathe. The main parts of it are: the headstock, the chuck, the tailstock, the carriage.

The automatic lathe is a \_\_\_\_\_ of the ordinary lathe. Its tools are changed automatically. A worker skilled in the use of a lathe is called a \_\_\_\_\_.

to be

perfect

to turn

There are many other machine-tools that work on plane surfaces, for example, milling machines, planning and shaping machines. \_\_\_\_\_ holes are drilled by a drilling machine or bored by a boring machine or a boring mill. Thread milling machines are used in the \_\_\_\_\_ of different machine elements. Gear cutting machines include gear milling machines. All these machines use cutting tools made of high-speed steel.

circle

to produce

There are three types of lathes produced by our machine-tool \_\_\_\_\_ works: heavy, medium and light types. The type of a lathe depends upon the size of diameter of workpieces.

to manufacture

The most convenient and efficient machine is the model combination lathe for turning, milling, drilling, grinding, slotting, and tool-sharpening jobs. It can be used both in \_\_\_\_\_ and mobile repair shops, on ships, etc.

station

Majority of drilling machines are equipped with mechanisms, permitting not only drilling, countersinking and reaming, but also cutting female threads with the \_\_\_\_\_ of taps.

help

Both universal and special-purpose type radial drills are built.

## UNIT 9. MILLING MACHINES

### Active Vocabulary:

milling – фрезерование, измельчение

to remove – удалять

essential – существенный, неотъемлемый

feature – особенность, характерная черта

spindle – шпиндель

multiple – многочисленный

slot – прорезь, паз, щель

groove – выемка, желобок, паз

casting – отливка, литье

to mount – крепить, держать

knee – колено, подкос

jack – домкрат

screw – винт

saddle – суппорт, опора, скоба

slide – скольжение

guide – приспособление, передаточный рычаг

angle – угол

edge – край, лезвие

axis – ось

Ex. 1. Find the Russian equivalents for the following word combinations:

1. the process of removal metal	a. движение детали
2. a rotating multipoint cutter	b. процесс удаления (снятия) металла
3. relative to the cutting surface	c. могут условно относиться
4. can be conventionally regarded	d. вращение фрезы
5. the rotation of a cutter	e. число оборотов шпинделя в минуту
6. the moment of the work	f. относительно режущей поверхности
7. the number of spindle revolutions per minute	g. вращающаяся многозубая фреза

Ex. 2. Insert may or can modal verbs:

1. I don't think I ... be here by eleven o'clock tomorrow, but I ... be.
2. ... you say what will happen in an hour?
3. ... I take it?
4. Let me look at your exercises. I ... be able to help you.
5. Libraries are quite free, and anyone who likes ... get books there.
6. I ... come and see you tomorrow if I have time.
7. Do you think you ... do that?
8. What time is it? – It ... be about six o'clock, but I am not sure.
9. Only a person who knows the language very well ... answer such a question.

Word combinations for connected reading:

milling machines – фрезерные станки  
 rotating cutters – вращающиеся фрезы  
 power-driven table – столик с механическим приводом  
 multiple-toothed cutters – многозубчатые фрезы  
 gear drive – шестеренчатый привод  
 feed gear-box – зубчатая коробка передач  
 V-guide – V-образная направляющая  
 jack screw – домкратный винт  
 on the top of the knee – на верху кронштейна  
 at right angles – под прямыми углами  
 relative to – относительно  
 is permanently fixed – постоянно закреплен  
 is mounted on an arbor – смонтированный на шпинделе  
 spacing washers and locking nuts – распорные шайбы и зажимные гайки  
 slide and face cutter – боковая и лобовая фреза  
 cutting edges on both slides and on periphery – режущие кромки по бокам и на периферии

in the form of helix about the axis of rotation – в форме спирали по оси вращения

Ex. 3. Read and translate the text:

Milling is the process of removing metal with rotating cutters.

The essential features of most milling machines are a power-driven table on which the work is done and a spindle carrying one or more multiple-toothed cutters, slots or grooves.

The horizontal milling machine consists of a main casting in which the spindle and its gear drive and the gear-box are mounted. On the front of this casting is a vertical V-guide on which the knee is mounted. The knee is raised or lowered by a telescopic jack screw. A saddle slides from front to back on V-guides on the top of the knee. The work table is mounted in V-guides on the saddle. The table is provided with movement in two directions at right angles to each other in the horizontal plane, and with vertical movement relative to the cutter, whose height is permanently fixed.

The cutter is mounted on an arbor and held in the desired position by spacing washers and a locking nut.

The type of a cutter mainly used on the horizontal miller is what is known as a slide and face cutter, that is, a cutter provided with cutting edges on both sides and on periphery. For large flat surfaces, roller milling cutters are used, having cutting edges in the form of helix about the axis of rotation.

Ex. 4. Find in the text English equivalents for the following word combinations:

суппорт скользит;

процесс удаления металла;

характерные черты (особенности);

шпиндель крепится;

постоянно зафиксирована;

поднимается или опускается при помощи домкратного винта;

плоские поверхности;

движение в двух направлениях;

вертикальный V-образный передаточный рычаг;

режущие края;

многозубчатые фрезы.

Ex. 5. Answer the questions to the text:

1. What is milling?
2. What are the essential features of most milling machines?
3. What does the horizontal milling machine consist of?
4. What is there on the front of the casting?
5. What is mounted on the casting?
6. What is knee moved by?
7. How does the work table move?
8. Where is the cutter mounted on?
9. What is known as slide and face cutter?
10. What types of milling machines do you know?
11. What are roller milling cutters used for?

Ex. 6. Find the wrong statements and correct them:

1. Milling is the process of drilling a hole.
2. A spindle carries multiple-toothed cutters, V-guides and slots.
3. The vertical milling machine consists of a casting and feed-gear box.
4. The knee is mounted on the horizontal V-guide.
5. A saddle moves at right angles on the top of the knee.
6. The height of the locking cut is permanently fixed.
7. The cutter used on the horizontal miller is a side and face cutter.

Ex. 7. Complete the statements choosing the appropriate variant:

1. The horizontal milling machine consists of a casting in which ... is mounted and ... .
  - a) locking nut; hole;
  - b) saddle; knee;
  - c) the spindle; feed gear-box.
2. The cutter is mounted on ... .
  - a) arbor;
  - b) surface;
  - c) spindle.
3. The work table is mounted on ... .
  - a) V-guides;
  - b) saddle;
  - c) in two directions.
4. The vertical movement of the table is relative to ... .
  - a) saddle;
  - b) cutter;
  - c) cutting edges.

5. ... have cutting edges in the form of helix about the axis of rotation.
- horizontal millers;
  - face cutters;
  - roller milling cutters.

Ex. 8. Translate into English:

- Фрезерование – это процесс удаления металла с помощью вращающейся фрезы.
- Фреза смонтирована на шпинделе.
- Рабочий стол крепится на суппорте.
- Зубчатая коробка передач и шпиндель – составные части горизонтального фрезерного станка.
- Стол движется в двух направлениях.
- Для плоских поверхностей используются роликовые фрезы.
- Многозубчатые фрезы крепятся на шпинделе.

Ex. 9. Everyday English. On the phone. Complete the conversations with phrases from the box:



I'll give it	to hold	I'm phoning	line's busy	Speaking	Speak to
leave a message	we'll get back to you	This is	phone back later		
I'm afraid	take a message	have extension	putting you through		
	at her desk	take your call			

1. A Hello. Could I _____ Sam Jackson, please?
B _____ Mr Jackson's in a meeting. It won't be over until 3.00.
Can I _____ ?
A Yes, please. Could you ask him to phone me? I think he's got my number, but _____ to you again just in case. It's 743 219186.

<p>2. <b>A</b> Can I _____ 2173, please?  <b>B</b> The _____ at the moment. Would you like _____ ?  <b>A</b> Yes, please.  <i>(Five seconds later.)</i>  <b>B</b> I'm _____ now.  <b>A</b> Thank you.</p>
<p>3. <b>A</b> Could I speak to Alison Short?  <b>B</b> I'm afraid she isn't _____ at the moment. Do you want to hold?  <b>A</b> No, don't worry. I'll _____ .</p>
<p>4. <b>A</b> Can I speak to Terence Cameron, please?  <b>B</b> _____ .  <b>A</b> Ah, Mr Cameron! _____ Holly Lucas. _____ about a letter I got this morning.</p>
<p>5. <b>A</b> Hello. This is Incom International. There's no one here to _____ at the moment. Please _____ and _____ as soon as we can.</p>

## UNIT 10. LATHE

### Active Vocabulary:

lathe – токарный станок

bed – станина станка

headstock – передняя бабка

tailstock – задняя бабка

apron – фартук, основная поворотная доска резцовой каретки

carriage – каретка станка

to traverse – пересекать; поперечина

to clamp – крепить, закреплять

spindle – шпиндель

to maintain – поддерживать, обслуживать, содержать

Word combinations for connected reading:

linear feed motion – прямолинейное движение подачи

feed gearbox – коробка передач

speed gearbox – коробка скоростей

Ex. 1. Read and translate the text:

The **lathe** is the most general and useful of all machine-tools and is used in producing many types of machine parts.

In machining operations on **lathes**, the work is rotated, while the cutting tool has a **linear feed motion**.

Although there are many types of **lathes** employed in industry, they have many units and parts in common. The principle units of an engine **lathe** are the **bed, headstock, tailstock, feed gearbox, apron** and **carriage**. All the principle units of the **lathe** are mounted on the **bed**. The **lathe** has ways along which the **carriage** and **tailstock** traverse. The work is **clamped** and rotated by the **headstock** which contains the **spindle** and **speed gearbox**. In all **lathe** work it is the most important to **clamp** the work and the tool as firmly as possible.

The separate parts and mechanisms of the **lathe** can be **maintained** in proper operating condition only by attentive care.

Ex. 2. Find the Russian equivalents for the following word combinations:

the most useful of all machine-tools	деталь вращается
the work is rotated	содержит шпиндель
in producing parts	содержать в особых условиях
are mounted on the bed	крепятся на станине
is rotated by the headstock	вращается при помощи передней бабки
to maintain in proper condition	в изготовлении деталей
contains spindle	наиболее используемый из станков

Ex. 3. Answer the questions to the text:

1. What machine-tools are the most general?
2. Where is lathe used?
3. What are the main parts of an engine lathe?
4. Where are all the principle units of the lathe mounted?
5. What does the headstock contain?
6. When is the headstock rotated?



Ex. 4. Agree or disagree with the statements using the following phrases:

*I agree.*

*You are right.*

*It's right.*

*As far as I know ...*

*According to the information from  
the text ...*

*I disagree.*

*You are wrong.*

*It's false.*

1. Lathe is used in manufacturing many types of machine-tools.
2. The principle units of an engine lathe are the bed, headstock, speed gearbox, feed gearbox, apron and carriage.
3. The work is rotated by the tailstock.
4. The lathe parts are clamped on the bed.
5. The headstock contains the carriage and feed gearbox.

Ex. 5. Put the verb in brackets into the Past Simple or Past Continuous:

1. The cat (to take) a piece of fish and then (to run) away.
2. He (to read) a newspaper when I (to come) in.
3. Yesterday I (to get) up at eight o'clock.
4. The train (to start) at fifteen minutes to ten.
5. He (to put) on his coat and cap, (to open) the door and (to go) out.
6. At this time yesterday I (to watch) a play by Chekhov at the theatre.
7. He (to come) back to St Petersburg on the 15<sup>th</sup> of January.
8. I (to go) to the institute when I (to see) him.
9. At this time yesterday we (to have) dinner.
10. He (to write) a letter when I (to come) in.
11. He (to make) a report when I (to leave) the meeting.
12. Yesterday he (to write) a letter to his friend.
13. When I (to look) at them, they (to smile) at me.
14. What you (to do) at six o'clock yesterday?
15. I (to go) to bed at half past eleven.
16. Yesterday the lesson (to begin) at nine o'clock.
17. When somebody (to knock) on the door, she (to argue) with her husband.
18. When Pete (to jog) in the park in the morning, he (to lose) his expensive mobile phone.
19. When the police (to take) the thief to the car, I (to go) to the cinema to see the new Tom Cruise film.
20. He (to shave) when he (to hear) her scream.

Ex. 6. Complete the sentences choosing the appropriate variant from the box:

headstock	linear feed motion	rotated
-----------	--------------------	---------

1. The cutting tool has ...
2. In machining operations on lathes the work is ...
3. The work is clamped and rotated by ...
4. The spindle and speed gearbox are the parts of ...

Ex. 7. Translate into English:

1. Токарный станок используют в производстве деталей.
2. Прямолинейное движение подачи режущего инструмента обеспечивает вращение детали.
3. На станине крепятся основные части токарного станка.
4. Деталь вращается при помощи передней бабки.
5. Передняя бабка содержит шпиндель и коробку скоростей.
6. Станина и задняя бабка – это основные части токарного станка.

Ex. 8. Back to history. Read the text and try to understand it without translating:

The lathe is an ancient tool, dating at least to ancient Egypt and known to be used in Assyria and ancient Greece. The lathe was very important to the Industrial Revolution.

The origin of turning dates to around 1300 BCE when the Ancient Egyptians first developed a two-person lathe. One person would turn the wood work piece with a rope while the other used a sharp tool to cut shapes in the wood. Ancient Rome improved the Egyptian design with the addition of a turning bow. In the Middle Ages a pedal replaced hand-operated turning, freeing both the craftsman's hands to hold the woodturning tools. The pedal was usually connected to a pole, often a straight-grained sapling. The system today is called the "spring pole" lathe. Spring pole lathes were in common use into the early 20th century.

An important early lathe in the UK was the horizontal boring machine that was installed in 1772 in the Royal Arsenal in Woolwich. It was horse-powered and allowed for the production of much more accurate and stronger cannon used with success in the American Revolutionary War in the late 18th century. One of the key characteristics of this machine was that the workpiece was turning as opposed to the tool, making it technically a lathe (see attached drawing). Henry Maudslay who later developed many improvements to the lathe worked at the Royal Arsenal from 1783 being exposed to this machine in the Verbruggen workshop.

During the Industrial Revolution, mechanized power generated by water wheels or steam engines was transmitted to the lathe via line shafting, allowing faster and easier work. Metalworking lathes evolved into heavier machines with thicker, more rigid parts. Between the late 19th and mid-20th centuries, individual electric motors at each lathe replaced line shafting as the power source. Beginning in the 1950s, servomechanisms were applied to the control of lathes and other machine tools via numerical control, which often was coupled with computers to yield computerized numerical control (CNC). Today manually controlled and CNC lathes coexist in the manufacturing industries.

Ex. 9. Make up a summary of the text from ex. 8 with the help of the following phrases:

1. This text tells ...
2. The origin of turning dates to ...
3. Later Ancient Rome improved ...
4. Speaking further, in the Middle Ages ...
5. Besides, an important early lathe in the UK was ...
6. Furthermore, one should not forget that Henry Maudslay ...
7. During the Industrial Revolution ...
8. All in all in the early 1950-s ...

## UNIT 11. DRILLING MACHINES

Vocabulary:

hole – отверстие  
to machine – обрабатывать  
to handle – регулировать  
to apply – применять  
to indicate – показывать, указывать  
spindle – шпиндель  
advantage – преимущество  
to possess – владеть, обладать  
value – ценность, значение  
to perform – совершать, выполнять  
tools – инструменты  
gang – набор, комплект  
column – вертикально-сверлильный станок  
feed – подача  
simultaneously – одновременно

Word combinations for connected reading:

drilling machines – сверлильные станки  
machine-parts – детали машин  
for handling the various classes of work – для выполнения различных работ  
upright drilling machine – вертикальный сверлильный станок  
radial drilling machine – радиально-сверлильный станок  
over the work – над деталью  
sensitive drill – быстроходный сверлильный станок с ручной подачей

delicate work – мелкая деталь  
side by side on a common base – рядом на общем основании  
as to speed and feed so that – что касается скорости и подачи так, что  
upon a machine – на станке

Ex. 1. Read and translate the text:

**Drilling machines** which are used mainly for drilling **holes** in **machine parts**, are made in many different types designed **for handling the various classes of work**.

The **upright drilling machines** is the type most commonly used, and the name **applied** to this class **indicates** that the general design of the machine is vertical, and also that the drill **spindle** is in a vertical position.

The **radial drilling machine**. The main **advantage** of a **radial machine** is that the drill can be moved **over the work** to any desired position, so that a large number of **holes** can be drilled in the work without moving it.

The **sensitive drill** is a small machine of light construction, which **possesses** sensitive qualities which are of **value** in drilling holes in **delicate work**.

The multiple-spindle type is built in both vertical and horizontal design.

It can **perform** a number of operations on a component without the necessity of changing **tools**.

**Gang** drills. When a number of single-spindle drilling machines **columns** are placed **side by side on a common base** and have a common work table, the machine is known as a **gang** drill. Each **spindle** is independently controlled **as to speed and feed so that** a number of operations may be **performed** in succession and **simultaneously upon the machine**. In this machine work is moved progressively from one **spindle** to the next.

Ex. 2. Find the Russian equivalents for the following word combinations:

are used mainly; for drilling holes; applied to this class; the general design of the machine; in a vertical position; possesses sensitive qualities; without the necessity of changing tools; is independently controlled; is moved from one spindle to the next.

без необходимости смены инструментов; в вертикальном положении; управляется независимо; движется от одного шпинделя к другому; обладает быстроходными качествами; общее проектирование станка; относящийся к этому классу; в основном используется; для сверления отверстий.

Ex. 3. Answer the questions to the text:

1. What are drilling machines used for?
2. What type of drilling machines is the type most commonly used?
3. What position is the upright drilling machine spindle in?
4. What is the main advantage of a radial drilling machine?
5. What type has both vertical and horizontal design?
6. What drilling machine possesses sensitive qualities?
7. When are gang drills used?

Ex. 4. Find the wrong statements and correct them:

1. The main advantage of a radial machine is that the drill can be moved over the work to the definite position.
2. The multi-spindle type is built only in vertical position.
3. In gang drills each spindle is independently controlled.
4. Drilling machines are used to drill a hole.
5. The radial drilling machine performs a number of operations on a component without the necessity of changing tools.
6. The upright drilling machine indicates the drilled holes in delicate work.
7. The upright drilling machine drills a large number of holes in the work.

Ex. 5. Insert can, may, must or need modal verbs:

1. Peter ... return the book to the library. We all want to read it.
2. Why ... not you understand it? It is so easy.
3. ... we do the exercise at once? – Yes, you ... do it right now.
4. ... you pronounce the word?
5. You ... not have bought this meat: we have everything for dinner.
6. I ... not go out today: it is too cold.
7. ... I take your pen? – Yes, please.
8. We ... not carry the bookcase upstairs: it is too heavy.
9. We ... not carry the bookcase upstairs ourselves: the workers will come and do it.
10. When ... you come to see us? – I ... come only on Sunday.
11. Shall I write a letter to him? – No, you ... not, it is not necessary.
12. ... I offer you something to drink?
13. Everything is clear and you ... not go into detail now.
14. He ... not drink alcohol when he drives.
15. Don't worry! I ... change a light bulb.
16. By the end of the week I ... have finished writing my book.
17. She ... not call the doctor again unless she feels worse.

Ex. 6. Translate into English:

1. Сверлильные станки используются для сверления отверстий в деталях машин.
2. Сверло в радиально-сверлильном станке может двигаться над деталью.

3. Название вертикального сверлильного станка указывает на вертикальное проектирование.
4. Каждый шпиндель управляется независимо от скорости и подачи.
5. Быстроходный сверлильный станок не сложен по строению.
6. Быстроходный сверлильный станок используется, чтобы просверлить отверстия в мелкой детали.
7. Операции на станке выполняются одновременно.
8. Радиально-сверлильный станок может просверлить множество отверстий в детали.

## CONCLUSION

Иностранный язык в системе современного образования занимает особое место в силу своих социальных, познавательных и развивающих функций, является важным средством общения, познания мира и расширения этого мира. Новая социально-экономическая и политическая ситуация обуславливает повышение требований к уровню языковой подготовки обучаемых.

Учебное пособие способствует формированию, развитию и закреплению фонетических, грамматических и лексических умений и навыков в изучении английского языка, подготовке бакалавров к самостоятельной учебной и научно-исследовательской работе на английском языке. Материалы пособия развивают и закрепляют у бакалавров умения и навыки применения разных видов чтения с извлечением информации из научной и научно-популярной литературы.

Лексическая терминология и грамматические понятия, освещенные в учебной книге, в основном соответствуют общепринятой терминологии, нормам и правилам русского и английского языков и отвечают требованиям ФГОС ВПО по дисциплине «Иностранный (английский) язык».

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## THESAURUS

### **A a**

absorption – всасывание, поглощение, абсорбция  
alloy – сплав  
amount – количество, сумма  
apply – применять, относиться  
arbor – вал, ось  
artificial – искусственный

### **B b**

bending – сгибание  
bismuth – висмут  
boring – бурение, сверление  
brass – латунь  
bronze – бронза

### **C c**

carbon – углерод  
carbonate – карбонат  
carriage – каретка  
casting – отливка  
chuck – зажим, патрон, держатель  
clay – глина  
coinage – чеканка  
conduct – проводить  
constituent – составная часть  
convenient – удобный  
core – сердечник, сердцевина  
corrosion – коррозия  
countersinking – зенкование  
current – ток

### **D d**

diameter – диаметр  
distribute – распределять, распространять  
drawing – выдавливание, волочение  
drilling – дробление, шлифовка, измельчение

### **E e**

equip – снаряжать, оборудовать  
explosive – взрывчатое вещество  
extract – удалять, извлекать

### **G g**

gangue – жильная порода  
gear – шестерня  
grinding – дробление, измельчение, шлифовка

### **H h**

headstock – передняя бабка  
helix – спираль, винт  
high-speed – скоростной  
hole – отверстие

### **I i**

involve – включать в себя  
iron – железо

### **L l**

lathe – токарный станок  
lungs – легкие

### **M m**

machine-tool – станок  
magnesium – магний  
manganese – марганец  
manufacture – производить  
melt – плавиться  
metallurgy – металлургия  
mill – станок, фреза  
milling – фрезерование  
mix – смешивать

### **O o**

obtain – получать, добывать  
occur – происходить, залегать  
occurrence – случай; месторождение

ore – руда  
oxide – окись  
oxygen – кислород

### **P p**

perfection – завершение  
phosphorus – фосфор  
piercing – прохождение отверстия  
plane – плоский  
plant – растение  
polarity – полярность  
probably – вероятно  
property – свойство  
pure – чистый, без примеси

### **R r**

reaming – бурение, развертка,  
раззенкование  
reduce – снижать, раскислять,  
прокатывать  
resist – сопротивляться  
rolling – прокатка

### **S s**

sand – песок  
scale – масштаб, объем  
shape – форма  
shaping – придание формы  
silicate – силикат  
silicon – кремний  
slotting – выдалбливание, долбле-  
ние, прорезание (канавок, пазов),  
пробивка отверстий  
smokeless powder – порох  
spinning – выдавливание (на то-  
карно-винторезном станке)  
steel – сталь  
sulphide – сульфид  
sulphur – сера  
surface – поверхность

### **T t**

tailstock – задняя бабка  
tap – метчик для нарезки резьбы  
term – называть  
thread – резьба, нарезка  
treat – обрабатывать, обогащать  
trimming – обрезка, заделка краев,  
отделка  
turner – токарь  
turning – обточка, вращение, точе-  
ние, токарная обработка

### **U u**

undergo – подвергаться, проходить  
через

### **W w**

weapon – оружие  
welding – сварка  
workpiece – деталь



## WRITTEN TESTS

### WRITTEN TEST 1

*Задание 1. Прочитайте текст и письменно ответьте на вопросы, следующие за ним:*

#### ALLOYS

1. Bronze and brass, the first alloys in the history of metallurgy, were probably obtained by man accidentally when melting mixed metal ores. Much later alloys of iron were obtained.

2. Steel was made in small quantities in early times until the mid-19<sup>th</sup> century when it was manufactured on a large scale in the iron and steel industry.

3. The commercial production of pure aluminum in about 1890 began a new range of alloys and among them duralumin, an alloy of about 94 per cent aluminum, with small quantities of copper, manganese, magnesium, and silicon. Most aluminum alloys are both light and strong.

4. Nickel is often mixed with other metals for special purposes: permalloy is a nickel-iron alloy that is magnetically soft. The polarity of its magnetic field can be easily changed and it is used for transformer cores. Monel metals contain about two parts nickel to one part copper, plus other elements. They are stronger than nickel and extremely corrosion-resistant. These properties make them useful in chemical production.

5. Electrum is a natural or artificial alloy of gold and silver containing 15-45 per cent of silver. It was used in ancient world for coinage.

6. Bismuth is frequently used as a part of alloys with low melting-points. Today alloys can be designed for particular applications with certain properties.

- 1) What are the first alloys in the history of metallurgy?
- 2) How were the first alloys obtained?
- 3) What was manufactured on a large scale in the iron and steel industry in the 19<sup>th</sup> century?
- 4) What alloy began a new range of alloys?
- 5) What gives the addition of copper, manganese, magnesium and silicon to aluminum?
- 6) What are the properties of alloys?
- 7) What is electrum?
- 8) What do applications of alloys depend on?

*Задание 2. Письменно переведите 3-й и 4-й абзацы.*

*Задание 3. По суффиксу определите и выпишите: 1) существительные, 2) прилагательные, 3) глаголы, 4) наречия. Все слова переведите письменно:*

Alloy, metallurgy, probably, obtain, polarity, resist, corrosion, artificial, native, material, impurity, removal, undesirable, adverse, require, common, valuable, apply, currently, conduct.

*Задание 4. Переведите письменно следующие предложения, обращая внимание на употребление глагола-сказуемого в страдательном залоге:*

1. Bronze and brass were probably obtained by man accidentally.
2. Steel was made in small quantities in early times.
3. Electrum was used in ancient world for coinage.
4. Bismuth is frequently used as a part of alloys with low melting-points.
5. Today alloys can be designed for particular applications with certain properties.
6. Some metals are mined in native state.
7. Ores of different metals are put through various refining processes to obtain the pure metal.

*Задание 5. Заполните пропуски предлогами **of, with, in, on, for, by**:*

1. Even ... the native metals, there is considerable foreign material.
2. Ore is the oxide which may be mined ... commercial profit.
3. The more common impurities ... iron ore are silica, titanium, and phosphorous.
4. The ores which contain the smallest amounts ... these impurities are the most profitable.
5. Phosphorous and sulphur are undesirable because ... their adverse effect ... iron and steel.

*Задание 6. Определите, является ли глагол “to have” смысловым или вспомогательным. Предложения переведите на русский язык письменно.*

1. Iron was used in the earliest times of which we have any historical records.
2. The lightest metal is lithium, which has the density of 0.534.
3. The machining processes have been greatly developed since the development of the steam engine.

4. The broach has a number of successive teeth of increasing size which cut in a fixed path.
5. Bearing materials must have sufficient strength.

*Задание 7. Определите функцию глагола “to be”. Предложения переведите письменно на русский язык.*

1. The metal is widely distributed in nature in the form of silicates, oxides, and the sulphide.
2. Iron is present in the hemoglobin of the blood and is involved in this condition in the absorption of oxygen in the lungs.
3. The definite chemical compound of the metal in the ore is termed a mineral.
4. The uses to which metals are put are based upon their physical or chemical properties.
5. The solids obtained when two or more metals are mixed in the molten condition and allowed to solidify are called alloys.
6. Alloys may be binary (two-component), ternary (three-component), etc.

*Задание 8. Переведите письменно предложения, обращая внимание на степени сравнения прилагательных.*

1. The heaviest metal is osmium which is closely related to platinum in physical and chemical properties.
2. Screwdrivers are used for most ordinary works such as screwing in and out screws.
3. Hand chiseling can be made easier when mechanized with the aid of a pneumatic hammer.
4. It is one of the most accurate methods.
5. In the design of a modern machine of any type are reflected the latest developments of practically all the other engineering industries.

## WRITTEN TEST 2

*Задание 1. Прочитайте текст и письменно ответьте на вопросы, следующие за ним:*

### OCCURANCE OF METALS

1. Iron was used in the earliest times of which we have any historical records. The art of making weapons from iron was known to the Egyptians and Hindoos.

2. The metal is widely distributed in nature in the form of silicates, oxides, and the sulphide. Iron occurs in plants and animals as a constituent of complex organic compounds. It presents in the hemoglobin of the blood and is involved in this condition in the absorption of oxygen in the lungs.

3. The naturally occurring materials containing compounds of the metals which may be economically extracted are called ores. The definite chemical compound of the metal in the ore is termed a mineral. The name gangue is applied to the constituents of the ore other than the mineral containing the metal to be extracted.

4. Iron is obtained by reducing its ores with carbon. The ores contain, in addition to the oxides and carbonate of the metal, small amounts of combined sulphur, phosphorus, and manganese and are mixed with more or less sand and clay. The metals from lithium down to manganese are obtained by electrolysis of melted compounds that conduct an electric current.

5. The science which treats of the methods used to obtain the metals in free condition from compounds that occur in nature is called metallurgy.

- 1) When was iron first used?
- 2) Where does iron occur?
- 3) What is the function of iron?
- 4) What is termed a mineral?
- 5) How is iron obtained from the ores?
- 6) What is the ore?
- 7) What do iron ores contain?
- 8) What is metallurgy?

**Задание 2.** *Письменно переведите 2-й и 4-й абзацы.*

**Задание 3.** *По суффиксу определите и выпишите: 1) существительные, 2) прилагательные, 3) глаголы, 4) наречия. Все слова переведите письменно:*

Constituent, complex, organic, widely, absorption, small, clay, conduct, electric, current, obtain, occur, nature, naturally, economically, addition, treat, electrolysis, free, artificially.

**Задание 4.** *Переведите письменно следующие предложения, обращая внимание на употребление глагола-сказуемого в страдательном залоге:*

1. The name gangue is applied to the constituents of the ore other than the mineral containing the metal to be extracted.

2. The science which treats of the methods used to obtain the metals in free condition from compounds that occur in nature is called metallurgy.
3. Iron was used in the earliest times of which we have any historical records.
4. The art of making weapons from iron was known to the Egyptians and Hindoos.
5. The metals also vary in hardness, from potassium, which can be molted like wax, to chromium, which will cut glass.
6. Many tools are used by the bench workers.

**Задание 5.** Заполните пропуски предложениями *of, with, in, on, for, by*:

1. The metals resemble one another ... their general chemical behavior ... other substances, but they differ markedly ... activity.
2. All substances offer more or less resistance to the flow ... an electric current through them.
3. ... any given substance, the resistance is determined ... its dimensions and the temperature.
4. The ability ... various metals to form alloys differs greatly.
5. Mechanics ... machine-building enterprises perform many types ... jobs.

**Задание 6.** Определите, является ли глагол **“to have”** смысловым или вспомогательным. Предложения переведите на русский язык письменно.

1. Cap screws have no nuts.
2. Iron was used in the earliest times of which we have any historical records.
3. The machining processes have been greatly developed since the development of the steam engine.
4. The broach has a number of successive teeth of increasing size which cut in a fixed path.
5. Bearing materials must have sufficient strength.

**Задание 7.** Определите функцию глагола **“to be”**. Предложения переведите письменно на русский язык.

1. There are jobs requiring additional operations, such as scraping, grinding, lapping, and finishing when the layers are removed from the detail being produced.
2. With any given substance, the resistance is determined by its dimensions and the temperature.

3. The aim of all operations is to give a piece of metal the required shape, dimensions and surface quality.
4. This operation may be manual or mechanized.
5. Hand chiseling is hard work and takes up much time.
6. This operation is being performed when bench workers receive bent or twisted blanks of metal, the elimination of these defects of the blanks is called straightening.

*Задание 8. Переведите письменно предложения, обращая внимание на степени сравнения прилагательных.*

1. The simplest roller bearing consists of an inner race, and outer race, and a set of rollers without any retainer.
2. The most common machine-tool found in almost any workshop is the lathe.
3. Hand chiseling can be made easier when mechanized with the aid of a pneumatic hammer.
4. It is one of the most accurate methods.
5. In the design of a modern machine of any type are reflected the latest developments of practically all the other engineering industries.

### WRITTEN TEST 3

*Задание 1. Прочитайте текст и письменно ответьте на вопросы, следующие за ним:*

### METALWORKING

1. Metals are the fundamental materials used in the metal working and machine-building industries.
2. Bench work consists of various technological operations, which include marking-out, chiseling, straightening, bending metals, cutting them with the hack saw or shears, filing, drilling, riveting, scraping, lapping, soldering, tinning, etc. The aim of all operations is to give a piece of metal the required shape, dimensions and surface quality. There are jobs requiring additional operations, such as scraping, grinding, lapping and finishing when thin layers of metals are removed from the detail being produced.
3. Mechanics (or bench workers) of machine-building enterprises perform many types of jobs. They make special tools, fixtures and some parts of machines, match one part to another and assemble the whole mechanism. When necessary, they do soldering jobs and machine repair work.

4. The operators fulfill one or several definite operations, while the skilled workers distributed in groups or teams and sometimes concentrated in special shops (depending on the nature of the work) perform mostly manual work, as, for instance, assembling. Groups or teams and special shops usually consist of tool makers, assembly, set-up, repair mechanics and other grades of workers.

5. In any industry possessing machines, mechanisms, fixtures and various devices made of metal, mechanics are absolutely necessary.

- 1) What operations does bench work consist of?
- 2) What is the aim of all operations?
- 3) What jobs require additional operations?
- 4) What do mechanics make and match?
- 5) What work do the operators fulfill?
- 6) What is assembling?
- 7) Where are mechanics needed?

*Задание 2. Письменно переведите 3-й и 4-й абзацы.*

*Задание 3. По суффиксу определите и выпишите: 1) существительные, 2) прилагательные, 3) глаголы, 4) наречия. Все слова переведите письменно:*

Assemble, fundamental, industries, operation, include, aim, surface, quality, additional, layer, match, necessary, fulfill, several, mostly, manual, assembly, various, definite, perform.

*Задание 4. Переведите письменно следующие предложения, обращая внимание на употребление глагола-сказуемого в страдательном залоге:*

1. Chisels are widely used for chipping of layers of metal from the surface of jobs.
2. Bending operations are applied when making many articles from sheet, flat and round steel.
3. Metal can be straightened either mechanically or manually, by using hand hammers.
4. Workpieces are bent to a definite radius or to a rounded up angle.
5. It is performed with a special tool, called a lap.
6. A horizontal milling machine may be used as an example.

*Задание 5. Заполните пропуски предложениями of, with, in, on, for, by:*

1. These cutting tools are used ... precise finish ... flat and curved surfaces ... cases when it is necessary to obtain perfect mating surfaces ... contacting parts.

2. Scrapers are rectangular or triangular steel strips ... cutting edges ... one hand.
3. Spanners are used ... tightening and removing bolts and nuts.
4. Drilling is an operation ... making holes ... a solid piece ... material ... means ... cutting tool known as a drill.
5. ... riveting we understand the operation ... fastening two or more parts ... rivets.

***Задание 6.** Определите, является ли глагол “to have” смысловым или вспомогательным. Предложения переведите на русский язык письменно.*

1. If a hard material is to be cut with a tool having a small lip angle  $\beta$ , the thin edge will be too weak.
2. When a number of single-spindle drilling machines columns are placed side by side on a common base and have common work table, the machine is known as a gang drill.
3. The modern planer with modern electric controls has a high outlet.
4. The planer has a reciprocating table which travels beneath a cross bar on which the tools heads are mounted.
5. The hydraulic motor has a speed variation from zero to maximum speed by an infinite number of steps.

***Задание 7.** Определите функцию глагола “to be”. Предложения переведите письменно на русский язык.*

1. Filing is the process of removing a layer of metal from a workpiece with cutting tool called a file.
2. Rivets are employed for fastening parts, metal plates, bars, which are not to be subjected to disassembly.
3. They have been greatly developed since the development of the steam engine.
4. The sawing of materials is an important operation too.
5. There are many types of clutches.
6. Spur gears are most commonly used to connect parallel shafts and make them rotate in opposite directions.

***Задание 8.** Переведите письменно предложения, обращая внимание на степени сравнения прилагательных.*

1. The shaper the wedge, i.e. the smaller the angle formed by its sides, the less effort is required to feed it into the cut.



2. We can say that the smaller the lip angle  $\beta$ , the more easily the cutter will penetrate into the metal.

3. The greater the lip angle, the greater the force that must be applied to remove the metal.

4. Milling cutters with helical teeth provide much smoother performance.

5. Planers are essentially for machining plane surfaces which are larger than can be cut or reached on the shaper.

## WRITTEN TEST 4

*Задание 1. Прочитайте текст и письменно ответьте на вопросы, следующие за ним:*

### BEARINGS

1. A bearing is a machine part which supports a moving part and confines its motion. That part of a shaft which rotates in a bearing is called a journal. Bearings fall into three general classes: radial bearings, thrust bearings, slipper and guide bearings. Bearings may also be classed as plain or sliding bearings, and ball and roller bearings. A bearing in which the journal is supported by rolling contact, i.e. by rollers or balls, is commonly referred to as antifrictional bearing.

2. Bearing materials must have sufficient strength. They must be good conductors of heat, uniform in structure, resistant to abrasion, and have a low coefficient of friction when dry or slightly greasy. Steel, cast iron and various alloys are commonly used as bearing materials.

3. The simplest roller bearing consists of an inner race, an outer race, and a set of rollers without any retainer. There are many types of ball bearings. These are single-row bearings, radial bearings, angular contact bearings, double-row bearings and self-aligning bearings.

4. Lubrication is necessary to reduce the frictional contact between the rolling members and the rotating cages, to help to dissipate the heat, otherwise the bearing may seize.

- 1) What is bearing?
- 2) What is a journal?
- 3) What classes do bearings fall into?
- 4) Are bearings similar in structure?
- 5) What are properties of a bearing?
- 6) What reduces the frictional contact between the rolling members and the rotating cages?
- 7) Where is lubrication used for?

**Задание 2.** *Письменно переведите 1-й и 4-й абзацы.*

**Задание 3.** *По суффиксу определите и выпишите: 1) существительные, 2) прилагательные, 3) глаголы, 4) наречия. Все слова переведите письменно:*

Confine, rotate, journal, sufficient, conductor, abrasion, retainer, commonly, antifrictional, slightly, various, simplest, coefficient, consist, necessary, reduce, member, tool, essential.

**Задание 4.** *Переведите письменно следующие предложения, обращая внимание на употребление глагола-сказуемого в страдательном залоге:*

1. The drilling machines or drill presses are grouped into the following four classes: sensitive, upright, radial and multi-spindle machines.

2. The lathe can be used for drilling, reaming, tapping and, by employing suitable adapters, operations of milling and grinding may be carried out without difficulty.

3. The machines which perform all these kinds of works are called machine-tools.

4. The rotation of the cutter is called the primary cutting motion while the forward movement of the work is known as the feed motion.

5. The table is provided with movement in two directions at right angles to each other in the horizontal plane, and with vertical movement relative to the cutter, whose height is permanently fixed.

**Задание 5.** *Заполните пропуски предлогами **of, with, in, on, for, by, from**:*

1. The machine-tool is essential ... the manufacture ... every product ... a giant turbine to minute jewels ... aircraft instruments.

2. One ... the simplest tools is the ordinary drilling machine.

3. Circular holes are drilled ... a drilling machine or bored ... a boring machine or a boring mill.

4. It can be used both ... stationary and mobile repair shops, ... ships, etc.

5. Milling is the process ... removing metal ... feeding the work past a rotating multipoint cutter.

*Задание 6. Определите, является ли глагол “to have” смысловым или вспомогательным. Предложения переведите на русский язык письменно.*

1. In machining operations on lathes, the work is rotated, while the cutting tool has a linear feed motion.
2. The lathe has ways along which the carriage and tail stock traverse.
3. The broach has a number of successive teeth of increasing size which cut in a fixed path.
4. The bench lathe is adapted to small work, having a maximum swing capacity of 9 inches.
5. Bearing materials must have sufficient strength.

*Задание 7. Определите функцию глагола “to be”. Предложения переведите письменно на русский язык.*

1. Cutting tools must be hard.
2. Heat dissipation is another factor in considering the correct speed.
3. All lathes receive their power through the headstock which may be equipped either with a step-cone pulley drive or a geared-head drive.
4. The planer is designed to remove metal by moving the work in a straight line against a stationary single-edged cutting tool.
5. Hand chiseling is hard work and takes up much time.
6. The original field of the automatic screw machine was the making of screws.

*Задание 8. Переведите письменно предложения, обращая внимание на степени сравнения прилагательных.*

1. The lathe is the most general and useful of all machine-tool and is used in producing many types of machine parts.
2. The most convenient and efficient machine is the model combination lathe for turning, milling, drilling, grinding, slotting, and tool-sharpening jobs.
3. The lathe is the oldest machine-tool, but it is still widely used.
4. The most common machine-tool found in almost any workshops is the lathe.
5. In the design of a modern machine of any type are reflected the latest developments of practically all the other engineering industries.

**TEXTS FOR EXTRA-CURRICULUM READING****Text 1. Famous people of science. Dmitry Ivanovich Mendeleev**

Dmitry Ivanovich Mendeleev is a famous Russian chemist. He is the best known for his development of the periodic table of the properties of the chemical elements. This table displays that elements' properties are changed periodically when they are arranged according to atomic weight.

Mendeleev was born in 1834 in Tobolsk, Siberia. He studied chemistry at the University of St. Petersburg, and in 1859 he was sent to study at the University of Heidelberg. Mendeleev returned to St. Petersburg and became Professor of Chemistry at the Technical Institute in 1863. He became Professor of General Chemistry at the University of St. Petersburg in 1866. Mendeleev was a well-known teacher, and, because there was no good textbook in chemistry at that time, he wrote the two-volume "Principles of Chemistry" which became a classic textbook in chemistry.

In this book Mendeleev tried to classify the elements according to their chemical properties. In 1869 he published his first version of his periodic table of elements. In 1871 he published an improved version of the periodic table, in which he left gaps for elements that were not known at that time. His table and theories were proved later when three predicted elements: gallium, germanium, and scandium were discovered.

Mendeleev investigated the chemical theory of solution. He found that the best proportion of alcohol and water in vodka is 40 %. He also investigated the thermal expansion of liquids and the nature of petroleum.

In 1893 he became director of the Bureau of Weights and Measures in St. Petersburg and held this position until his death in 1907.

**Text 2. Famous people of science. Mikhail Vasilyevich Lomonosov**

Mikhail Vasilyevich Lomonosov was a famous Russian writer, chemist, and astronomer who made a lot in literature and science.

Lomonosov was born on November 19, 1711, in Denisovka (now Lomonosov), near Archangelsk, and studied at the University of the Imperial Academy of Sciences in St. Petersburg. After studying in Germany at the Universities of Marburg and Freiberg, Lomonosov returned to St. Petersburg in 1745 to teach chemistry and built a teaching and research laboratory there four years later.

Lomonosov is often called the founder of Russian science. He was an innovator in many fields. As a scientist he rejected the phlogiston theory of matter

commonly accepted at the time and he anticipated the kinetic theory of gases. He regarded heat as a form of motion, suggested the wave theory of light, and stated the idea of conservation of matter. Lomonosov was the first person to record the freezing of mercury and to observe the atmosphere of Venus during a solar transit.

Interested in the development of Russian education, Lomonosov helped to found Moscow State University in 1755, and in the same year wrote a grammar that reformed the Russian literary language by combining Old Church Slavonic with modern language. In 1760 he published the first history of Russia. He also revived the art of Russian mosaic and built a mosaic and coloured-glass factory. Most of his achievements, however, were unknown outside Russia. He died in St. Petersburg on April 15, 1765.

### **Text 3. Famous people of science and engineering. Igor Ivanovich Sikorsky**

Sikorsky Igor Ivanovich was a well-known aircraft engineer and manufacturer.

Sikorsky was born in 1889 in Kiev, in the Ukraine, and got his education at the naval college in St. Petersburg, and later in Kiev and Paris. He was the first to make experiments in helicopter design. In 1913 he designed, built, and flew the first successful aeroplane. Later he built military aircrafts for Russia and France.

In 1919 Sikorsky moved to the United States and later helped to organize an aircraft company that produced a series of multiengine flying boats for commercial service. Sikorsky became an American citizen in 1928. In the late 1930s he returned to developing helicopters and produced the first successful helicopter in the west. Helicopters designed by Sikorsky were used mostly by the US Army Air Forces during World War II. He died in 1972 at the age of 83.

### **Text 4. Famous people of science and engineering. George Stephenson**

George Stephenson was a British inventor and engineer. He is famous for building the first practical railway locomotive.

Stephenson was born in 1781 in Wylam, near Newcastle upon Tyne, Northumberland. During his youth he worked as a fireman and later as an engineer in the coal mines of Newcastle. He invented one of the first miner's safety lamps independently of the British inventor Humphry Davy. Stephenson's early locomotives were used to carry loads in coal mines, and in 1825 he established a factory at Newcastle for their manufacture. In 1825 he designed a locomotive known as the Rocket, which could carry both loads and passengers at a greater speed than any locomotive constructed at that time. The success of the Rocket

was the beginning of the construction of locomotives and the laying of railway lines.

Robert Stephenson, the son of George Stephenson was a British civil engineer. He is mostly well-known for the construction of several notable bridges.

He was born in 1803 in Willington Quay, near Newcastle upon Tyne, and educated in Newcastle and at the University of Edinburgh. In 1829 he assisted his father in constructing a locomotive known as the Rocket, and four years later he was appointed as a construction engineer of the Birmingham and London Railway, completed in 1838. Stephenson built several famous bridges, including the Victoria Bridge in Northumberland, the Britannia Bridge in Wales, two bridges across the Nile in Damietta in Egypt and the Victoria Bridge in Montreal, Canada. Stephenson was a Member of Parliament from 1847 until his death in 1859.

### **Text 5. Famous inventors. Alfred Bernhard Nobel**

Alfred Bernhard Nobel was a famous Swedish chemist and inventor. He was born in Stockholm in 1833. After receiving an education in St. Petersburg, Russia, and then in the United States, where he studied mechanical engineering, he returned to St. Petersburg to work with his father in Russia. They were developing mines, torpedoes, and other explosives.

In a family-owned factory in Heleneborg, Sweden, he developed a safe way to handle nitroglycerine, after a factory explosion in 1864 killed his younger brother and four other people. In 1864 Nobel achieved his goal: he produced what he called dynamite. He later produced one of the first smokeless powders. At the time of his death he controlled factories for the manufacture of explosives in many parts of the world. In his will he wanted that the major portion of his money left became a fund for yearly prizes in his name. The prizes were to be given for merits in physics, chemistry and physiology, literature, and world peace. A prize in economics has been awarded since 1969.

### **Text 6. Famous people of science and technology. James Prescott Joule**

James Prescott Joule, famous British physicist, was born in 1818 in Salford, England.

Joule was one of the most outstanding physicists of his time. He is best known for his research in electricity and thermodynamics. In the course of his investigations of the heat emitted in an electrical circuit, he formulated the law, now known as Joule's law of electric heating. This law states that the amount of heat produced each second in a conductor by electric current is proportional to the resistance of the conductor and to the square of the current. Joule experimentally verified the law of conservation of energy in his study of the conversion of mechanical energy into heat energy.

Joule determined the numerical relation between heat and mechanical energy, or the mechanical equivalent of heat, using many independent methods. The unit of energy, called the joule, is named after him. It is equal to 1 watt-second. Together with the physicist William Thomson (Baron Kelvin), Joule found that the temperature of a gas falls when it expands without doing any work. This phenomenon, which became known as the Joule-Thomson effect, lies in the operation of modern refrigeration and air-conditioning systems.

### **Text 7. Famous people of science and engineering. James Watt**

James Watt was a Scottish inventor and mechanical engineer, known for his improvements of the steam engine.

Watt was born on January 19, 1736, in Greenock, Scotland. He worked as a mathematical-instrument maker from the age of 19 and soon became interested in improving the steam engine which was used at that time to pump out water from mines.

Watt determined the properties of steam, especially the relation of its density to its temperature and pressure, and designed a separate condensing chamber for the steam engine that prevented large losses of steam in the cylinder. Watt's first patent, in 1769, covered this device and other improvements on steam engine.

At that time, Watt was the partner of the inventor John Roebuck, who had financed his researches. In 1775, however, Roebuck's interest was taken over by the manufacturer Matthew Boulton, owner of the Soho Engineering Works at Birmingham, and he and Watt began the manufacture of steam engines. Watt continued his research and patented several other important inventions, including the rotary engine for driving various types of machinery; the double-action engine, in which steam is admitted alternately into both ends of the cylinder; and the steam indicator, which records the steam pressure in the engine. He retired from the firm in 1800 and thereafter devoted himself entirely to research work.

The misconception that Watt was the actual inventor of the steam engine arose from the fundamental nature of his contributions to its development. The centrifugal or flyball governor, which he invented in 1788, and which automatically regulated the speed of an engine, is of particular interest today. It embodies the feedback principle of a servomechanism, linking output to input, which is the basic concept of automation. The watt, the unit of power, was named in his honour. Watt was also a well-known civil engineer. He invented, in 1767, an attachment that adapted telescopes for use in the measurement of distances. Watt died in Heathfield, near Birmingham, in August 1819.

### **Text 8. Famous people of science and engineering. Charles Babbage**

Charles Babbage (1792-1871), British mathematician and inventor, who designed and built mechanical computing machines on principles that anticipated the modern electronic computer. Babbage was born in Teignmouth, Devon and educated at the University of Cambridge. He became a Fellow of the Royal Society in 1816 and was active in founding of the Analytical, the Royal Astronomical, and the Statistical Societies.

In the 1820s Babbage began developing his Difference Engine, a mechanical device that could perform simple mathematical calculations. Although Babbage started to build his machine, he was unable to complete it because of lack of funding. In the 1830s Babbage began developing his Analytical Engine, which was designed to carry out more complicated calculations, but this device was never built, too. Babbage's book, "Economy of Machines and Manufactures" (1832), initiated the field of study known today as operational research.

### **Text 9. Famous inventors. Andrei Dmitrievich Sakharov**

Andrei Dmitrievich Sakharov was a Russian nuclear physicist, anti-Soviet dissident and human rights activist.

He became renowned as the designer of the Soviet Union's Third Idea, a codename for Soviet development of thermonuclear weapons. Sakharov was an advocate of civil liberties and civil reforms in the Soviet Union. He was awarded the Nobel Peace Prize in 1975. The Sakharov Prize, which is awarded annually by the European Parliament for people and organizations dedicated to human rights and freedoms, is named in his honor.

Sakharov was born in Moscow on May 21, 1921.

Sakharov entered Moscow State University in 1938. Following evacuation in 1941 during the Great Patriotic War (World War II), he graduated in Ashgabat, in today's Turkmenistan. He was then assigned laboratory work in Ulyanovsk. He returned to Moscow in 1945 to study at the Theoretical Department of FIAN (the Physical Institute of the Soviet Academy of Sciences). He received his Ph.D. in 1947.

After the end of World War II, he researched cosmic rays. In mid-1948 he participated in the Soviet atomic bomb project under Igor Kurchatov and Igor Tamm. The first Soviet atomic device was tested on August 29, 1949. After moving to Sarov in 1950, Sakharov played a key role in the development of the first megaton-range Soviet hydrogen bomb using a design known as *Sakharov's Third Idea* in Russia and the Teller-Ulam design in the United States. A larger variation of the same design which Sakharov worked on was the 50 Mt Tsar Bomba of October 1961, which was the most powerful nuclear device ever exploded.



Sakharov later wrote: "After more than forty years, we have had no third world war, and the balance of nuclear terror ... may have helped to prevent one. But I am not at all sure of this; back then, in those long-gone years, the question didn't even arise. What most troubles me now is the instability of the balance, the extreme peril of the current situation, the appalling waste of the arms race ... Each of us has a responsibility to think about this in global terms, with tolerance, trust, and candor, free from ideological dogmatism, parochial interests, or national egotism."

### **Text 10. Famous people of science and engineering. Bill Gates**

**William Henry Gates** (born October 28, 1955) is an American business magnate, philanthropist, investor, computer programmer, and inventor. Gates is the former chief executive and chairman of Microsoft, the world's largest personal-computer software company, which he co-founded with Paul Allen.

He is consistently ranked in the Forbes list of the world's wealthiest people and was the wealthiest overall from 1995 to 2009 — excluding 2008, when he was ranked third; in 2011 he was the wealthiest American and the world's second wealthiest person. According to the Bloomberg Billionaires List, Gates is the world's richest person in 2013, a position that he last held on the list in 2007.

During his career at Microsoft, Gates held the positions of CEO and chief software architect, and remains the largest individual shareholder, with 6.4 percent of the common stock. He has also authored and co-authored several books.

Gates is one of the best-known entrepreneurs of the personal computer revolution. Gates has been criticized for his business tactics, which have been considered anti-competitive, an opinion which has in some cases been upheld by judicial courts. In the later stages of his career, Gates has pursued a number of philanthropic endeavors, donating large amounts of money to various charitable organizations and scientific research programs through the Bill & Melinda Gates Foundation, established in 2000.

Gates stepped down as chief executive officer of Microsoft in January 2000. He remained as chairman and created the position of chief software architect for himself. In June 2006, Gates announced that he would be transitioning from full-time work at Microsoft to part-time work, and full-time work at the Bill & Melinda Gates Foundation. He gradually transferred his duties to Ray Ozzie, chief software architect, and Craig Mundie, chief research and strategy officer. Gates's last full-time day at Microsoft was June 27, 2008. He stepped down as chairman of Microsoft in February 2014, taking on a new post as technology advisor to support newly appointed CEO Satya Nadella.

## GRAMMAR REFERENCE

Таблица А3.1

## Английские времена группы Indefinite (Simple)

Время	Личные местоимения	Глагольная форма		Случай употребления	
		Вспомогательный глагол	Смысловой глагол		
Present	<b>Действительный залог</b>				
	I, we, you, they	-	I	Действие <b>совершается</b> в настоящем времени <b>регулярно</b> , обычно часто, редко, но <b>не в данный момент</b> . В действительном залоге вопросительные и отрицательные формы образуются с помощью вспомогательного глагола <b>do</b> ( <b>does</b> – 3-е лицо ед. ч.)	
	he, she, it	-	I-s		
	I <u>go</u> . – Я <i>хожу</i> (обычно, часто). He <u>goes</u> . <b>Do I go?</b> <b>Does he go?</b>				
	<b>Страдательный залог</b>				
I	am	III			
Past	he, she, it	is	Действие <b>совершилось в прошлом</b> , обычно с указанием прошедшего времени. В действительном залоге вопросительные и отрицательные формы образуются с помощью вспомогательного глагола <b>did</b>		
	we, you, they	are			
	I <u>am called</u> . – Меня <i>зовут</i> .				
	<b>Действительный залог</b>				
	I, he, she, it, we, you, they	-		II	
Future	I <u>went</u> . – Я <i>ходил</i> (пошел). <b>Did I go?</b> <b>I did not go</b> .				
	<b>Страдательный залог</b>				
	I, he, she, it, we, you, they	was were	III		
	I <u>was called yesterday</u> . – Меня <i>позвали вчера</i> .				
	<b>Действительный залог</b>				
Future	I, we	shall	Когда речь идет о действии (однократном или повторяющемся), которое <b>совершится</b> в будущем (по отношению к моменту речи).		
	he, she, it, you, they	will			
	I <b>shall</b> (I'll) <u>go</u> . – Я <i>пойду, буду ходить</i> . <b>Shall I go?</b> <b>I shall not go</b> .				

Продолжение табл. А3.1

Время Future	Личные местоимения	Глагольная форма		Случаи употребления Используются вспомогательные глаголы <b>shall</b> и <b>will</b>
	<b>Страдательный залог</b>		III	
	I, we he, she, it, you, they	shall be will be		
I <b>shall be called</b> . – <i>Меня позовут.</i>				

Таблица А3.2

Английские времена группы Continuous (Progressive)

Время	Личные местоимения	Глагольная форма		Случаи употребления	
		Вспомогательный глагол	Смысловой глагол		
Present	<b>Действительный залог</b>				
	I he, she, it we, you, they	am is are	V+ing	Действие <b>совершается сейчас</b> , в настоящий момент (или настоящий период времени). А также для обозначения намерения или уверенности в совершении будущего действия (например, пойду сегодня вечером)	
	I <b>am (I'm) going</b> . – <i>Я иду (сейчас)</i> . <b>Am I going?</b> I <b>am not going</b> .				
	<b>Страдательный залог</b>				
I he, she, it we, you, they	am being is being are being	III			
Past	I <b>am being called</b> . – <i>Меня сейчас зовут</i> . <b>Am I being called?</b> I <b>am not being called</b> .				
	<b>Действительный залог</b>				
	I, he, she, it we, you, they	was were	V+ing	<b>Незаконченное</b> длительное действие, которое <b>совершалось</b> в указанный <b>момент в прошлом</b>	
I <b>was going</b> . – <i>Я шел (в то время как)</i> . <b>Was I going?</b> I <b>was not going</b> .					

Продолжение табл. А3.2

Время	Личные местоимения	Глагольная форма		Случай употребления
		Вспомогательный глагол	Смысловый глагол	
Past	I, he, she, it we, you, they	<b>Страдательный залог</b>		(в 8 часов, с 5 до 8 часов, весь день, летом, когда он пришел и т. д.)
		was being	III	
		were being	III	
Future	I, we he, she, it, you, they	Действительный залог		<b>Незаконченное</b> длительное действие, которое <b>будет происходить</b> в указанный <b>момент в будущем</b> (в 10 часов, когда она придет и т. д.)
		shall be	V+ing	
		will be	V+ing	
		<b>I shall (I'll) be going.</b> – Я буду идти (в то время как). <b>Shall I be going? I shall not be going.</b>		
<b>Формы страдательного залога нет</b>				

Таблица А3.3

Английские времена группы Perfect (завершенное)

Время	Личные местоимения	Глагольная форма		Случай употребления
		Вспомогательный глагол	Смысловый глагол	
Present	I, we, you, they he, she, it	<b>Действительный залог</b>		Показывает действие, <b>завершенное</b> к моменту речи. <b>Результат</b> этого действия непременно связан с настоящим
		have	III	
		has	III	
		<b>I have (I've) gone.</b> – Я ушел (уже). <b>Have I gone? I have not gone.</b>		
	I, we, you, they he, she, it	<b>Страдательный залог</b>		
		have been	III	
		has been	III	

Продолжение табл. А3.3

Время	Личные местоимения	Глагольная форма		Случаи употребления	
		Вспомогательный глагол	Смысловый глагол		
Past	I <b>have been called</b> today. – <i>Меня позвали сегодня.</i>				
	<b>Действительный залог</b>				
	I, he, she, it, we, you, they	had	III	Прошедшее действие, <b>закончившееся</b> до указанного момента/к указанному моменту в прошлом (к 5 часам, к субботе, когда он пришел и т. д.)	
	I <b>had</b> (I'd) <b>gone</b> . – <i>Я уже ушел.</i> <b>Had I gone?</b> I <b>had not gone</b> .				
	<b>Страдательный залог</b>				
	I, he, she, it, we, you, they	had been	III		
I <b>had been called</b> when he came. – <i>Меня уже позвали, когда он пришел.</i>					
<b>Действительный залог</b>					
Future	I, we	shall have	III	Будущее действие, которое <b>будет закончено</b> до определенного момента в <b>будущем</b> , на него указывает время или действие, свершившееся раньше будущего	
	he, she, it, you, they	will have			
	I <b>shall have gone</b> . – <i>Я уже иду.</i> <b>Shall I have gone?</b> I <b>shall not have gone</b> .				
	<b>Страдательный залог</b>				
	I, we	shall have been	III		
	he, she, it, you, they	will have been			

## Степени сравнения прилагательных

В английском языке прилагательные имеют три степени сравнения:

- 1) положительная;
- 2) сравнительная;
- 3) превосходная.

Положительная степень сравнения – это простое прилагательное без каких-либо окончаний. Например, *beautiful, pleasant, wild, difficult* и др.

Формы сравнительной и превосходной степени образуются двумя способами:

**Способ 1.** Если прилагательное односложное, форма его сравнительной степени образуется при помощи суффикса *-er*, а форма превосходной степени – при помощи суффикса *-est*. Некоторые двусложные прилагательные, заканчивающиеся на *-y, -er, -ow*, образуют степени сравнения так же.

Таблица А3.4

### Степени сравнения односложных прилагательных

Положительная	Сравнительная	Превосходная
cold (холодный)	colder (холоднее)	the coldest (самый холодный)
big (большой)	bigger (больше)	the biggest (самый большой)
easy (простой)	easier (проще)	the easiest (самый простой)
gay (веселый)	gay <sup>er</sup> (веселее)	the gay <sup>est</sup> (самый веселый)
clear (чистый)	clear <sup>er</sup> (чище)	the clear <sup>est</sup> (самый чистый)

**Способ 2.** От двусложных прилагательных и прилагательных, состоящих из трех или более слогов, сравнительная степень образуется при помощи слова *more (less)*, а превосходная степень – при помощи слова *most (least)*.

Существительное, определяемое прилагательным в превосходной степени, всегда имеет определенный артикль *the*.

Таблица А3.5

### Степени сравнения многосложных прилагательных

Положительная	Сравнительная	Превосходная
useful	more useful	the most useful
beautiful	more beautiful	the most beautiful
comfortable	more comfortable	the most comfortable

Таблица А3.6

Исключения при образовании степеней сравнения прилагательных,  
которые следует запомнить

Положительная	Сравнительная	Превосходная
good (хороший)	better (лучше)	the best (самый лучший)
bad (плохой)	worse (хуже)	the worst (самый плохой)
little (маленький, мало)	less (меньший, меньше)	the least (самый маленький, меньше всего)
much (many) (много)	more (больше)	the most (больше всего)
far (далекий)	farther (дальний по расстоянию)	the farthest (самый дальний по расстоянию)
	further (дальний по порядку)	the furthest (самый дальний по порядку)
old (старый)	older (старший по возрасту)	the oldest (самый старший по возрасту)
	elder (по старшинству в семье)	the eldest (по старшинству в семье)
later (поздний)	later (позже)	the latest (самый поздний)
	latter (последний из двух перечисленных)	the last (последний)

Таблица А3.7

Порядок слов в английском предложении

1 Подлежащее	2 Сказуемое	3 Дополнение			4 Обстоятельство
		косвенное без предлога	прямое	косвенное с предлогом	
		косвенное без предлога	прямое	косвенное с предлогом	-
She Она	likes любит	-	dogs. собак	-	-
They Они	bring приносят	us нам	flowers цветы	-	to the room в комнату
I Я	tell рассказываю	-	this story эту историю	to my sister моей сестре	every day каждый день

## Порядок слов в вопросительном предложении

Тип вопроса	Пример
1. повествовательное предложение	The chief engineer took part in the testing last month.
2. разделительный вопрос	The chief engineer took part in the testing last month, <b>didn't he?</b>
3. вопрос к подлежащему	<b>Who</b> took part in the testing last month?
4. вопрос к определению подлежащего	<b>What</b> engineer took part in the testing last month?
5. общий вопрос	<b>Did</b> the chief engineer take part in the testing last month?
6. альтернативный вопрос	<b>Did</b> the chief engineer take part in the testing <b>or</b> in the party last month?
7. специальный вопрос (к обстоятельству места)	<b>What did</b> the chief engineer take part last month <b>in?</b>
8. специальный вопрос (к обстоятельству времени)	<b>When did</b> the chief engineer take part in the testing?

## Вопросительные слова

**What?** – Что? Какой?

**Who?** – Кто?

**Where?** – Где?

**Where ... from?** – Откуда?

**How?** – Как?

**How much / many?** – Сколько?

**Why?** – Почему?

**When?** – Когда?

Неопределенные местоимения *some* и *any* и их производные

**Some / any** – какой-то, какая-то, какое-то, какие-то, какой-нибудь, какой-либо.

**Somebody / someone** – кто-то (в основном в утвердительных предложениях).

**Something** – что-то (в основном в утвердительных предложениях).

**Somewhere** – где-то (в основном в утвердительных предложениях).

**Anybody / anyone** – кто-нибудь, кто-либо, кто-то (в основном в общих вопросах и отрицаниях).

**Anything** – что-нибудь, что-либо, что-то (в основном в общих вопросах и отрицаниях).

**Anywhere** – где-нибудь, где-либо, где-то (в основном в общих вопросах и отрицаниях).



**Some** и его производные употребляются в *утвердительных предложениях*, а также в *специальных вопросах* и *общих вопросах*, выражающих *просьбу* или *предложение*. Например,

I have **some** books. У меня есть **несколько** книг.  
 There is **something** in the box. В коробке **что-то** есть.  
 Do you have **some** apples? У тебя есть **яблоки**?  
 Where can I buy **some** cheese? Где я могу купить **сыр**?  
 Give me **some** water, please. Дай мне, пожалуйста, **воды**.  
 Would you like **some** coffee, please? Не хотите **кофе**?

**Any** и его производные употребляются в *отрицательных предложениях* и *общих вопросах*. В *утвердительных предложениях* **any** и его производные употребляются в значении **любой**. Например,

I don't have **any** friends, или I have **no** friends. У меня **нет** (**никаких**) друзей.  
 Do you have **any** friends? У вас есть (**какие-нибудь**) предложения?  
 Is there **anything** in the box? **Что-нибудь** есть в коробке?  
 There isn't **anything** on the table, или There is **nothing** on the table. На столе **ничего** нет.

Местоимения, образованные с помощью **-one** и **-body**, употребляются только в отношении *людей*, а местоимения, образованные с помощью **-thing**, употребляются только в отношении *неодушевленных предметов* или *понятий*.

Таблица А3.9

Употребление наречий much, many, (a) little, (a) few

<p><b>much</b> <b>little</b> <b>a little</b></p> <p>употребляется с неисчисляемыми существительными</p>	<p><b>много</b> (в вопросительных предложениях)</p> <p><b>much</b> coffee – много кофе Do you drink <b>much</b> coffee? – Ты пьешь много кофе?</p>	<p><b>мало</b></p> <p><b>little</b> money – мало денег They have <b>little</b> money. They are very poor. – У них мало денег. Они очень бедны.</p>	<p><b>небольшое количество</b></p> <p><b>a little</b> – немного They have <b>a little</b> money, so they aren't poor. – У них есть немного денег. Они не бедные.</p>
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<b>many few a few</b>	<b>много</b>	<b>мало</b>	<b>небольшое количество</b>
употребляется с ис- числяемыми суще- ствительными	<b>many</b> friends – мно- го друзей He has got <b>many</b> friends. – У него много друзей.	<b>few</b> mistakes – мало ошибок She made very <b>few</b> mistakes. – У меня мало друзей, почти нет.	<b>a few</b> – немного I've got <b>a few</b> friends, so I'm not lonely. – У меня есть несколько друзей. Я не оди- нок.
Иногда <b>much</b> употребляется в значении «часто». Do you watch TV <b>much</b> ? No, not <b>much</b> . – Вы часто смотрите телевизор? Нет, не часто.			

Таблица А3.10

## Образование числительных

Числительные			
Количественные			Порядковые
1-12	13-19 (суффикс <b>-teen</b> )	20-90 (суффикс <b>-ty</b> )	
1 – one			1 – the first (1 <sup>th</sup> )
2 – two		20 – twenty	2 – the second (2 <sup>nd</sup> )
3 – three	13 – thirteen	30 – thirty	3 – the third (3 <sup>rd</sup> )
4 – four	14 – fourteen	40 – forty	4 – the fourth (4 <sup>th</sup> )
5 – five	15 – fifteen	50 – fifty	5 – the fifth (5 <sup>th</sup> )
6 – six	16 – sixteen	60 – sixty	13 – the thirteenth (13 <sup>th</sup> )
7 – seven	17 – seventeen	70 – seventy	15 – the fifteenth (15 <sup>th</sup> )
8 – eight	18 – eighteen	80 – eighty	20 – the twentieth (20 <sup>th</sup> )
9 – nine	19 – nineteen	90 – ninety	21 – the twenty-first (21 <sup>th</sup> )
10 – ten			30 – the thirtieth (30 <sup>th</sup> )
11 – eleven			40 – the fortieth (40 <sup>th</sup> )
12 – twelve			50 – the fiftieth (50 <sup>th</sup> )
100 – hundred 1000 – thousand 1 000 000 - million 1 000 000 000 - billion			100 – the hundredth (100 <sup>th</sup> )

Оборот **there + to be**

Если мы хотим сказать о наличии (отсутствии) какого-либо предмета или явления, а не о месте, в котором находится последний, то мы используем оборот **there + to be**. Этот оборот переводится словами «есть, имеется, существует». Например,

There are many stories about animals.  
Существует много рассказов о животных.

Если же предложение, которое содержит оборот **there + to be**, заканчивается обстоятельством места или времени, то перевод предложения лучше начинать с этих местоимений. Например,

There are many cars near our house.  
Рядом с нашим домом есть много машин.

Глагол **to be** в этом обороте может функционировать в разных видо-временных формах:

	There is / are
<b>Indefinite</b>	There was / were
	There will be
	There has been / have been
<b>Perfect</b>	There had been
	There will have been

Таблица А3.11

### Основные префиксы (приставки)

Префиксы с отрицательным значением			
<b>un-</b>	<i>не- без (с)- раз (с)-</i>	important – важный limited – ограниченный	<b>un</b> important – неважный <b>un</b> limited – безграничный
<b>im- in- il- ir-</b>	<i>не- без (с)-</i>	accuracy – точность possible – возможный legal – легальный responsible – ответственный	<b>in</b> accuracy - <b>im</b> possible <b>il</b> legal <b>ir</b> responsible
<b>non-</b>	<i>не- без-</i>	conductor - проводник	<b>non</b> -conductor – непроводник (изолятор)
<b>dis-</b>	<i>раз (с)- без (с)- не-</i>	to close - закрыть to connect - соединить	to <b>dis</b> close - раскрыть to <b>dis</b> connect - разъединить
<b>mis-</b>	<i>означает неверно</i>	to understand - понимать	to <b>mis</b> understand – неверно понять

Префиксы с разными значениями			
<b>re-</b>	<i>снова-еще раз-</i>	to write - писать to use - использовать	to <b>rewrite</b> - переписать to <b>reuse</b> - снова использовать
<b>super-</b>	<i>сверх-над-</i>	conductive - проводимый	<b>super</b> conductive - сверхпроводимый
<b>sub-</b>	<i>ниже-под- и др.</i>	way - путь, дорога system - система	<b>sub</b> way - подземная дорога <b>sub</b> system - подсистема
<b>over-</b>	<i>сверх-пере-над-</i>	to load - нагрузить	to <b>over</b> load - перегрузить
<b>semi-</b>	<i>полу-</i>	conductor - проводник	<b>semi</b> conductor - полупроводник
<b>inter-</b>	<i>между-среди-взаимо-</i>	action - действие	<b>inter</b> action - взаимодействие
<b>en-</b>	(для образования глагола)	large - большой	to <b>en</b> large - увеличить
<b>pre-</b>	<i>до-заранее-</i>	to heat - нагреть	to <b>pre</b> heat - предварительно нагреть
<b>post-</b>	<i>после-</i>	war - война	<b>post</b> -war - послевоенный

Таблица А3.12

### Местоимения

Личные		Притяжательные		Возвратно-усилительные
И. п. (кто? что?)	Объектный падеж (кому? кого?)	Простая форма (чей?)	Абсолютная форма (чей?)	
I	мне, меня	my	mine	myself
you	тебе, тебя	your	yours	yourself
he	him ему, его	his	his	himself
she	her ей, ее	her	hers	herself
it	it ему, его, ей, ее	its	its	itself
we	us нам, нас	our	ours	ourselves
you	you вам, вас	your	yours	yourselves
they	them им, их	their	theirs	themselves

Таблица А3.13

## Значения и функции глагола TO BE

Функция	Значение	Пример	Перевод
Смысловый глагол ( <b>be</b> + предлог + существительное)	Быть, находиться	The book <b>is</b> on the table. The problem <b>is</b> of great importance.	Книга <b>находится</b> на столе. Эта проблема <b>имеет</b> огромное значение.
Глагол-связка ( <b>be</b> + существительное или прилагательное)	Самостоятельного значения не имеет	He <b>is</b> a student. The speed of an electric car <b>was</b> not high. The speed of an electric car <b>is</b> about 60 km/h.	Он – студент. Скорость электро-мобиля невысокая. Скорость электро-мобиля – 60 км/ч.
Вспомогательный глагол: Progressive Tense ( <b>be</b> + Participle I), Passive Voice ( <b>be</b> + Participle II)	Самостоятельного значения не имеет	He <b>is writing</b> a new article. The article <b>is written</b> by our professor.	Сейчас он <b>пишет</b> новую статью. Статья <b>написана</b> нашим профессором.
Модальный глагол ( <b>be</b> + инфинитив с частицей <b>to</b> )	Долженствование, необходимость как результат договоренности	He <b>is to</b> come to the lab at 10 o'clock.	Он <b>должен</b> прийти в лабораторию в 10 часов.

Таблица А3.14

## Значение и функции глагола TO HAVE

Функция	Значение	Пример	Перевод
Смысловый глагол ( <b>have</b> + предлог + существительное)	Иметь, владеть, обладать	These laboratories <b>have</b> modern equipment.	Эти лаборатории <b>имеют</b> современное оборудование
Вспомогательный глагол: Perfect Tense ( <b>have</b> + Participle II)	Самостоятельного значения не имеет	These laboratories <b>have</b> bought modern equipment.	Эти лаборатории <b>закупили</b> современное оборудование
Модальный глагол ( <b>have</b> + инфинитив с частицей <b>to</b> )	Необходимость в силу (ввиду) обстоятельств	These laboratories <b>have to</b> buy modern equipment.	Эти лаборатории <b>должны</b> закупить современное оборудование

## МОДАЛЬНЫЕ ГЛАГОЛЫ

### Модальный глагол CAN

**Can** – мочь, уметь, обладать физической или умственной способностью, умением выполнять действие.

Переводится в сочетании с Indefinite Infinitive Active словом «может».

Например, I can swim. – Я могу (умею) плавать.

Сочетание **cannot but + Indefinite Infinitive** переводится «нельзя не», «не могу не».

Например, I cannot but agree with you. Нельзя не согласиться с вами.

Глагол **can** имеет форму прошедшего времени **could** и заменитель **to be able to** – быть в состоянии, который может употребляться во всех временных формах.

Например, He will be able to come in time. – Он сможет приехать вовремя.

### Модальный глагол MAY

**May** имеет следующие значения:

- **разрешение.**

May I ask you a question?

Можно (разрешите) задать вам вопрос?

Глагол **may** имеет форму прошедшего простого времени **might** и заменитель **to be allowed to**, который может употребляться во всех временных формах в этом значении.

Например, He was allowed to stay here. – Ему разрешили остаться.

- **возможность.**

The book may be read in a week.

Эту книгу можно прочесть в течение одной недели.

- **предположение, сомнение, неуверенность.** В этом значении чаще выступает слово **might**, которое выражает большую степень неуверенности.

He might get the tickets for the concert.

Возможно, он купит билеты на концерт.

- **выражение упрека, замечания.** Употребляется только глагол **might**.

You might do it yourself.

Вы могли бы сделать это сами.

## Модальный глагол MUST

**Must** выражает необходимость, моральную обязанность и соответствует в русском языке словам «должен», «нужно», «надо».

Например, I must hurry to catch the last train. – Я должен торопиться, чтобы успеть на последний поезд.

Наряду с глаголом **must** и взамен недостающих форм употребляется глагол **to have** с последующим инфинитивом с частицей **to**.

**Mustn't** означает «нельзя» и употребляется в отрицательном ответе на вопрос «можно?».

В значении вероятности, предположения **must** переводится на русский язык «должно быть», «вероятно».

Например, Having caught her glance, he realized that he must have done a mistake. – По ее взгляду он осознал, что, должно быть, совершил ошибку.

## Модальный глагол OUGHT TO

Модальный глагол **Ought to** имеет значение, схожее с модальным глаголом **Should**, но употребляется значительно реже.

Употребляется:

- для обозначения совета или морального долга или обязательства.

Например, Don't forget about Mick's birthday, you ought to buy him a present. – Не забудь о дне рождения Мика, ты должен купить ему подарок.

- закономерного предположения.

Например, You have made such a long way, you ought to be exhausted. – Вы проделали такой большой путь, должно быть, вы измотаны.

## Модальный глагол SHOULD

Модальный глагол **Should** имеет общее значение необязательной к исполнению рекомендации.

Чаще всего употребляется в советах и инструкциях.

Например, Kevin should invest his money. – Кевину стоит вкладывать свои деньги.

## Модальный глагол WOULD

Модальный глагол **Would** имеет общее значение вежливого побуждения. Используется в вежливых просьбах, вежливом предложении чего-либо.

Например, Would you open the window, please? – Не могли бы Вы открыть окно?

## Модальный глагол NEED

Модальный глагол **Need** имеет значения «требоваться», «нуждаться».

Употребляется только в форме настоящего времени, только в вопросительных или отрицательных предложениях, смысловая нагрузка которых указывает на необходимость совершения какого-либо действия или на его отсутствие.

Например, *Need I wait you now?* – Мне нужно сейчас тебя подождать?

*He need not go there today.* – Ему не нужно сегодня туда идти.

Таблица А3.15

### Список неправильных глаголов

Глагол по-русски Verb in Russian	Неопределенная форма Infinitive (в алфавитном порядке)	Простое прошедшее Past simple	Причастие II Past participle
пребывать, терпеть, соблюдать	abide	abode (abided)	abode (abided)
быть	be	was/were	been
нести, рожать	bear	bore	born
бить	beat	beat	beaten
становиться	become	became	become
начинать	begin	began	begun
гнуть	bend	bent	bent
держаться пари	bet	bet	bet
предлагать цену	bid	bade/bid	bidden/bid
кусаться	bite	bit	bitten
кровоточить	bleed	bled	bled
дуть	blow	blew	blown
ломать	break	broke	broken
приносить	bring	brought	brought
строить	build	built	built
гореть, жечь	burn	burnt (burned)	burnt (burned)
взрываться	burst	burst (burst)	burst (burst)
покупать	buy	bought	bought
бросать, проводить кастинг	cast	cast	cast
ловить	catch	caught	caught



Продолжение табл. А3.15

Глагол по-русски Verb in Russian	Неопределенная форма Infinitive (в алфавитном порядке)	Простое прошедшее Past simple	Причастие II Past participle
выбирать	choose	chose	chosen
приходить	come	came	come
стоять	cost	cost	cost
ползти	creep	crept	crept
резать	cut	cut	cut
(по)смечь	dare	durst (dared)	dared
вести дела	deal	dealt	dealt
копать	dig	dug	dug
делать	do	did	done
рисовать, тянуть	draw	drew	drawn
пить	drink	drank	drunk
водить автомобиль	drive	drove	driven
обитать, останавливаться	dwell	dwelt	dwelt
есть	eat	ate	eaten
падать	fall	fell	fallen
кормить	feed	fed	fed
чувствовать	feel	felt	felt
бороться	fight	fought	fought
находить	find	found	found
сбежать	flee	fled	fled
летать	fly	flew	flown
запрещать	forbid	forbade	forbidden
забывать	forget	forgot	forgotten
простить	forgive	forgave	forgiven
замораживать	freeze	froze	frozen
получать	get	got	got (gotten)
давать	give	gave	given
идти	go	went	gone
точить, молоть	grind	ground	ground
расти	grow	grew	grown

Продолжение табл. А3.15

Глагол по-русски Verb in Russian	Неопределенная форма Infinitive (в алфавитном порядке)	Простое прошедшее Past simple	Причастие II Past participle
висеть	hang	hung	hung
иметь	have / has	had	had
слышать	hear	heard	heard
прятать	hide	hid	hidden
попадать, ударять	hit	hit	hit
держать	hold	held	held
причинять боль	hurt	hurt	hurt
содержать, поддерживать	keep	kept	kept
знать	know	knew	known
класть, стелить	lay	laid	laid
вести, лидировать	lead	led	led
учиться, узнавать	learn	learnt (learned)	learnt (learned)
покидать, оставлять	leave	left	left
давать взаймы	lend	lent	lent
позволять	let	let	let
лежать	lie	lay	lain
зажигать, освещать	light	lit	lit
терять	lose	lost	lost
делать, мастерить	make	made	made
значить	mean	meant	meant
встречать, знакомиться	meet	met	met
косить	mow	mowed	mown
платить	pay	paid	paid
класть, ставить	put	put	put
читать	read	read	read
ездить верхом	ride	rode	ridden
звонить	ring	rang	rung
восходить, подниматься	rise	rose	risen
бежать	run	ran	run

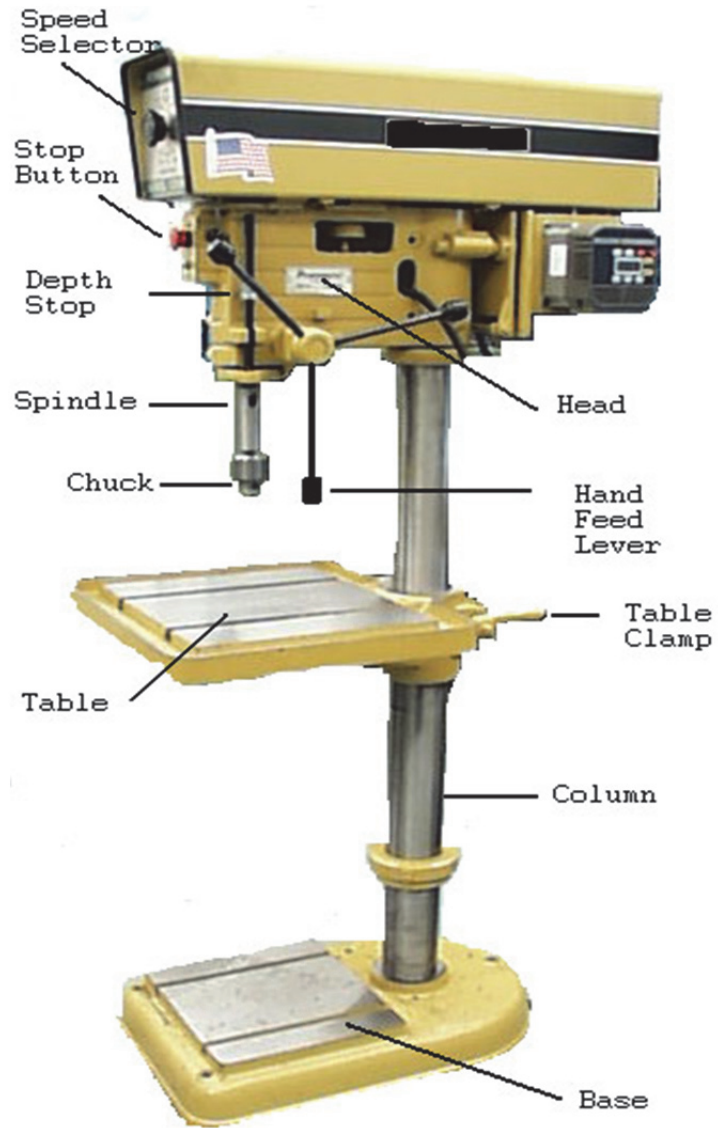
Продолжение табл. А3.15

Глагол по-русски Verb in Russian	Неопределенная форма Infinitive (в алфавитном порядке)	Простое прошедшее Past simple	Причастие II Past participle
сказать	say	said	said
видеть	see	saw	seen
искать	seek	sought	sought
продавать	sell	sold	sold
посылать	send	sent	sent
сажать, устанавливать	set	set	set
шить	sew	sewed	sewn (sewed)
трясти	shake	shook	shaken
проливать	shed	shed	shed
светить, сиять	shine	shone	shone
стрелять	shoot	shot	shot
показывать	show	showed	shown
сжиматься	shrink	shrank	shrunk
закрывать, затворять	shut	shut	shut
петь	sing	sang	sung
погружаться, опускаться	sink	sank	sunk
сидеть	sit	sat	sat
спать	sleep	slept	slept
скользить	slide	slid	slid
пахнуть, нюхать	smell	smelt	smelt
разбить, сразить	smite	smote	smitten
говорить	speak	spoke	spoken
мчаться	speed	sped (speeded)	sped (speeded)
читать по буквам	spell	spelt (spelled)	spelt (spelled)
тратить, проводить	spend	spent	spent
разлить	spill	spilt (spilled)	spilt (spilled)
крутить, прясть	spin	spun	spun
плевать	spit	spat	spat
разделять, раскалывать	split	split	split

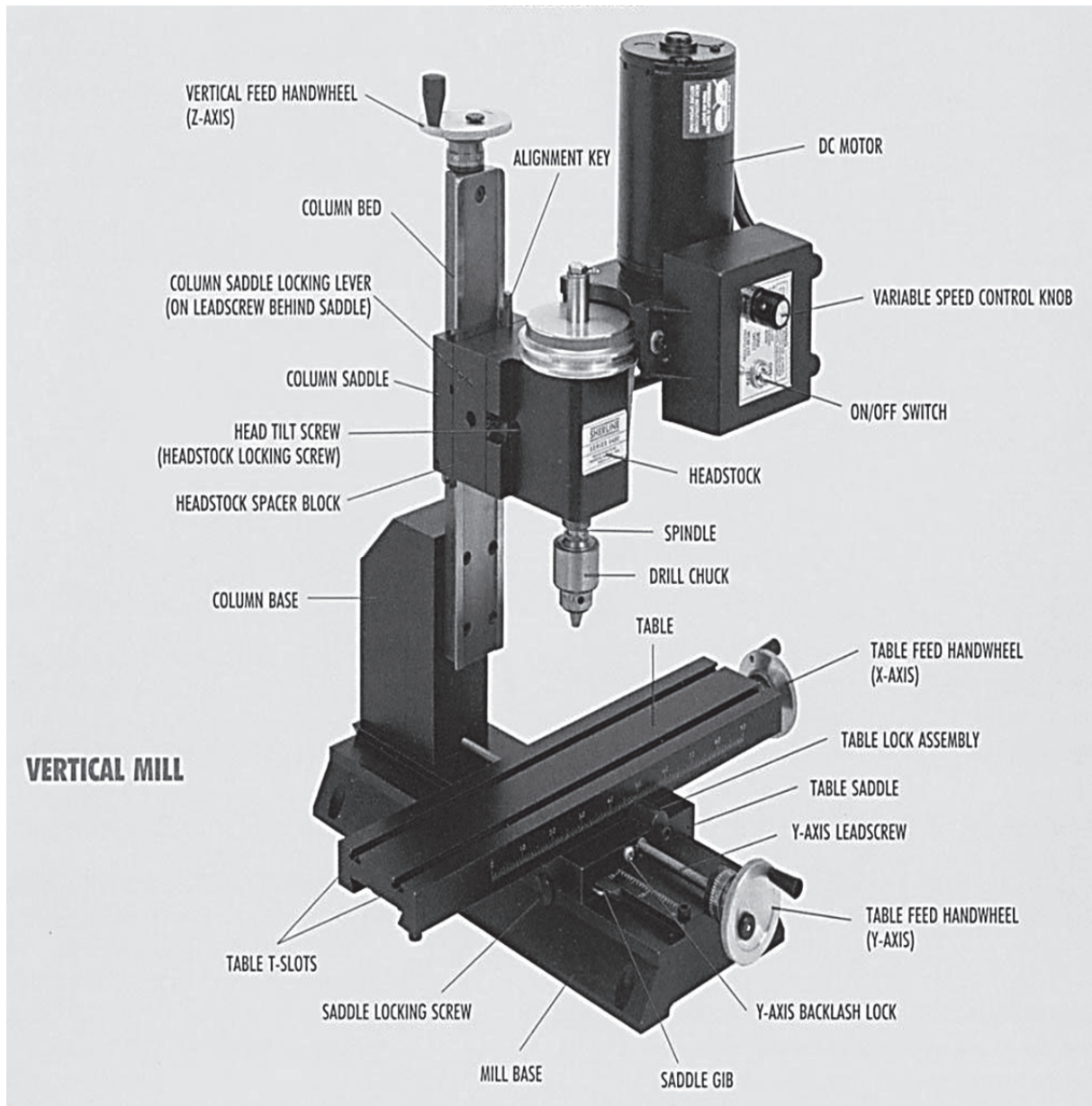
## Окончание табл. А3.15

Глагол по-русски Verb in Russian	Неопределенная форма Infinitive (в алфавитном порядке)	Простое прошедшее Past simple	Причастие II Past participle
портить	spoil	spoilt (spoiled)	spoilt (spoiled)
развернуть, распространять	spread	spread	spread
прыгать, скакать	spring	sprang	sprung
стоять	stand	stood	stood
воровать	steal	stole	stolen
втыкать, прилепить	stick	stuck	stuck
жалить	sting	stung	stung
вонять	stink	stank	stunk
бастовать, ударять	strike	struck	struck
нанизать, натянуть	string	strung	strung
клясться, ругаться	swear	swore	sworn
подметать	sweep	swept	swept
плавать	swim	swam	swum
качать	swing	swung	swung
брать	take	took	taken
обучать	teach	taught	taught
рвать	tear	tore	torn
рассказывать	tell	told	told
думать	think	thought	thought
бросать	throw	threw	thrown
толкнуть, сунуть	thrust	thrust	thrust
понимать	understand	understood	understood
опрокинуть, расстроиться	upset	upset	upset
будить	wake	woke	woken
носить, одевать	wear	wore	worn
ткать	weave	wove	woven
плакать, запотевать	weep	wept	wept
побеждать	win	won	won
заводить часы, наматывать	wind	wound	wound
писать	write	wrote	written

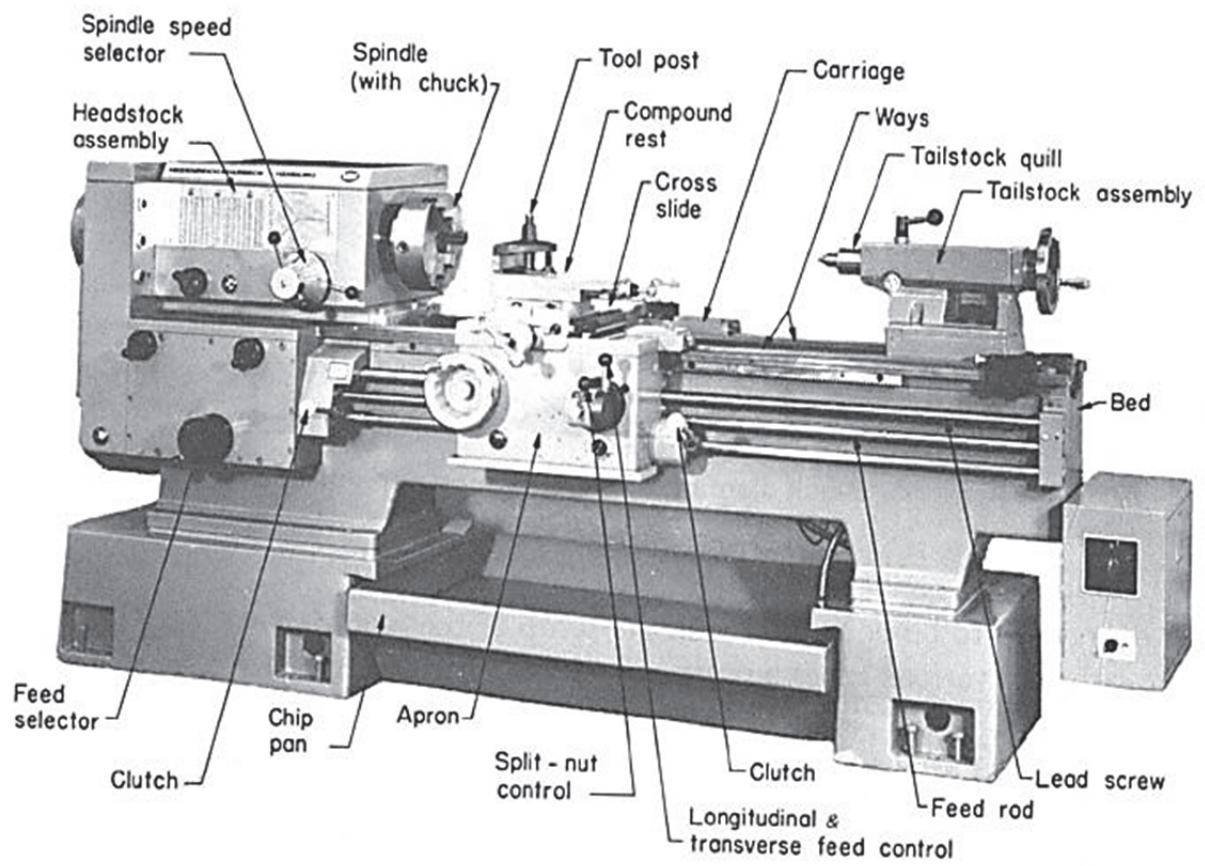
MACHINE'S SCHEME PICTURES



Pic. A4.1. Drilling machine



Pic. A4.2. Milling machine



Pic. A4.3. Lathe

*Учебное издание*

**Маркова Юлия Вячеславовна**

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И ОБОРУДОВАНИЯ**

Учебное пособие

Научный редактор – кандидат культурологии,  
доцент О. В. Кохан

Редактор Е. В. Безолукова

Подписано в печать 12.02.2015.

Формат 60 × 84 1/16. Бумага 80 г/м<sup>2</sup>. Ризограф EZ570E.  
Усл. печ. л. 6,27. Уч.-изд. л. 6,00. Тираж 60 экз. Заказ 26798.

Редакционно-издательский отдел  
Федерального государственного бюджетного образовательного  
учреждения высшего профессионального образования  
«Комсомольский-на-Амуре государственный технический университет»  
681013, г. Комсомольск-на-Амуре, пр. Ленина, 27.

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