

**ФИЛИАЛ ФЕДЕРАЛЬНОГО ГОСУДАРСТВЕННОГО
АВТОНОМНОГО ОБРАЗОВАТЕЛЬНОГО УЧРЕЖДЕНИЯ
ВЫСШЕГО ОБРАЗОВАНИЯ
НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ
ТЕХНОЛОГИЧЕСКИЙ УНИВЕРСИТЕТ «МИСИС» В
ГОРОДЕ АЛМАЛЫК**

СИНЖАПОВА Р.Р.

АНГЛИЙСКИЙ ЯЗЫК В МЕТАЛЛУРГИИ

Методическое пособие

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Методическое пособие: «Английский язык в металлургии» предназначено для студентов НИТУ МИСИС, обучающихся по направлению 22.03.02 – «Металлургия», а также может быть рекомендовано для самостоятельного изучения. Основная направленность – развитие у студентов навыков говорения и чтения. Методические рекомендации включают тексты для чтения и обсуждения, словари слов, упражнения и задания, направленные на развитие различных навыков английского языка, а также задания по переводу в сфере металлургии.

Данное методическое пособие соответствует рабочей программе курса «Английский язык в металлургии».

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ПРЕДИСЛОВИЕ

В современном мире металлургическая промышленность стремительно развивается и интегрируется в глобальную экономику. Для успешного взаимодействия с международными партнёрами, клиентами и поставщиками, а также для освоения новейших технологий и оборудования, знание английского языка становится неотъемлемой частью профессиональной компетентности специалистов металлургической отрасли.

Данное методическое пособие разработано специально для металлургов, чтобы помочь им освоить английский язык в контексте их профессиональной деятельности. Автор стремится сделать материал максимально прикладным и полезным, фокусируясь на терминологии, ситуациях и задачах, с которыми ежедневно можно столкнуться на производстве.

Методическое пособие состоит из нескольких разделов, каждый из которых охватывает определённую тематическую область. Каждый раздел включает в себя ключевые слова и выражения, используемые в металлургии; задания для закрепления материала, включая диалоги, тексты для чтения и письменные работы; примеры диалогов, которые могут возникнуть на рабочем месте.

Мы надеемся, что это пособие станет надёжным помощником в вашем профессиональном развитии и позволит вам уверенно общаться на английском языке в любой ситуации, связанной с металлургией.

ВВЕДЕНИЕ

Общеизвестно, что английский язык является международным языком. В связи с этим преподавание этого языка имеет особое значение. Поскольку мы живем в динамичном мире, преподаватели должны быть в курсе всех реформ в сфере обучения. Особое внимание сегодня уделяется ESP (английский для специальных целей).

Данное пособие разработано с целью помочь студентам и специалистам в области металлургии овладеть профессиональной лексикой и навыками общения на английском языке, которые необходимы для успешной работы в международной среде.

Металлургическая промышленность является одной из самых технологически развитых и глобализированных отраслей. Современные металлургические предприятия работают в тесном сотрудничестве с зарубежными партнерами, что требует высокого уровня владения английским языком:

- расширить профессиональный словарный запас: Освоить ключевые термины и фразы, используемые в металлургии.

- улучшить навыки чтения и понимания технической литературы: Научиться читать и анализировать научные статьи, технические отчеты и инструкции на английском языке.

- развить умение вести деловую переписку: Изучить структуру и стиль написания писем, электронных сообщений и отчетов.

- практиковаться в устной речи: Участвовать в деловых беседах, презентациях и переговорах на английском языке.

- подготовиться к международным конференциям и выставкам: Научиться представлять свои исследования и проекты на международных площадках.

Пособие состоит из нескольких разделов, каждый из которых посвящен конкретной теме или аспекту металлургической деятельности. В каждом разделе представлены тексты для чтения, упражнения на грамматику и лексику, а также задания для практического применения полученных знаний.

Целью пособия является развитие языковых навыков и критического мышления в сфере металлургии. Пособие составлено текстовым материалом, словарем и упражнениями, а также заданиями на перевод наиболее распространенных разговорных формул, вопросами по изучаемым темам.

Основной задачей пособия является обогащение терминологического словаря студентов, развитие творческих способностей при выполнении различных заданий, расширение навыков устной речи. Упражнения, основанные на чтении и на повторении терминологии в технических текстах, способствуют закреплению полученных знаний в англоязычных текстах, а также способствуют совершенствованию навыков говорения и расширению кругозора студентов.

UNIT 1

The Industry of Uzbekistan

During the years of Independence, the Republic of Uzbekistan firmly consolidated its positions on the world market of mineral- raw materials resources on many directions. The current status of the mineral raw materials basis on strategically important types of metal minerals, oil and gas, mineral fertilizers, underground water, construction materials in general is estimated as satisfactory.

Heavy Industry

The Tashkent Province, in the north-eastern “peninsula” adjacent to the Fergana Valley, accounts for about one-third of the industrial output of Uzbekistan, with agricultural machinery the most important product. Uzbekistan’s most productive heavy industries have been extraction of natural gas and oil; oil refining; mining and mineral processing; machine building, especially equipment for cotton cultivation and the textile industry; coal mining; and the ferrous metallurgy, chemical, and electrical power industries. The chemical manufacturing industry focuses primarily on the production of fertilizer.

Uzbekistan’s most productive heavy industries have been extraction of natural gas and oil; oil refining; mining and mineral processing; machine building, especially equipment for cotton cultivation and the textile industry; coal mining; and the ferrous metallurgy, chemical, and electrical power industries. The chemical manufacturing industry focuses primarily on the production of fertilizer.

Light Industry

The light and textile industry is significant in creating and extending the industrial complex of the country. It has a sufficient raw material base of around 1,000,000 tons annually. More than third of the total number of industrial companies in Uzbekistan are concentrated in the given sector, as well as make up the country’s basic funds and number of personnel engaged, huge share of the foreign trade balance, and currency revenues. Given the specific features of the country with its large farming practice, the diverse

light industry was put in place incorporating production of the cotton-fibre, cotton and silk cloths, raw silk, ambary fibre, hosiery, upper and linen knitted wear, ready-made garments, footwear, and other. The making of carpets, haberdashery, and china-faience ware is considered to be a part of the country's light industry.

Power Industry

Uzbekistan is the largest producer of the electric power energy in Central Asia. It has powerful thermoelectric power stations, which generate almost 90% of electric power in the country.

The Power Industry of Uzbekistan operates in the framework of the State Joint Stock Company "Uzbekenergo", established in the form of open joint stock company including the Coal Industry enterprises since 2001. The company structure includes 53 enterprises and organizations, including 39 open joint-stock companies, 11 unitary enterprises, 2 societies with limited liability and company branch-"Energosotish". At present, all enterprises affiliated the company structure and being the subject for privatization already denationalized except two.

Metallurgical industry

Metallurgical industry is comprised of companies that extract, treat and process raw, ferrous and non-ferrous metals. This sector makes more than 10 percent out of the total of industrial production. There are many predicted reserves of gold, silver, copper, uranium, lead, zinc, tungsten, molybdenum, lithium, aluminium, and other rare metals and minerals in the country. Given that, the share of the metallurgy is expected to further rise in the total amount of industrial production. Products put out by the industry, especially those of non-ferrous and precious metals, are considered to be a rare at the world market, and will serve a good reason to extend their export with a view of enriching the country's revenues.

Chemical Industry

The chemical industry is comprised of companies that make fertilizers, chemical fibres and filaments, synthetic washing tools, varnish and paints, plastic and synthetic pitch, and others.

Machinery Building Industry

The basis of reequipping of all of the sectors of economy – saw the large-scale improvement, as well. The sector, which manufactures machines, used in farming, take the leading role in the sphere. There are more than 300 machine building and metal processing enterprises in the country.

The initial cotton processing and other activities related to it influenced much the development of the sector because it had begun to manufacture the machinery for harvesting, cotton cleaning, and textile industries. Other fields such as aviation, automobile, electronics, and heavy machine building are also developing

Упражнение 1

Ответьте на следующие вопросы:

1. What is the current status of the mineral raw materials basis in Uzbekistan?
2. Which province accounts for about one-third of the industrial output of Uzbekistan?
3. Name three of the most productive heavy industries in Uzbekistan.
4. What is the primary focus of the chemical manufacturing industry in Uzbekistan?
5. How much of the total number of industrial companies in Uzbekistan are concentrated in the light and textile industry?
6. What percentage of electric power in Uzbekistan is generated by thermoelectric power stations?
7. What is the name of the State Joint Stock Company that operates the power industry in Uzbekistan?
8. What percentage of the total industrial production does the metallurgical industry contribute?
9. List three types of products made by the chemical industry in Uzbekistan.
10. How many machine building and metal processing enterprises are there in Uzbekistan?

Упражнение 2

Выберите подходящее слово или фразу из двух вариантов

The of Uzbekistan is the largest producer of electric power energy in Central Asia.

- Power Industry
- Metallurgical Industry

The industry focuses primarily on the production of fertilizer.

- Chemical
- Light

The Tashkent Province accounts for about..... of the industrial output of Uzbekistan.

- one-third
- one-half

The industry is significant in creating and extending the industrial complex of the country.

- Light and Textile
- Machinery Building

The industry is comprised of companies that extract, treat, and process raw, ferrous, and non-ferrous metals.

- Metallurgical
- Chemical

Упражнение 3

Прочитайте утверждения и решите верны они или ложны

1. The Tashkent Province is located in the south-west of Uzbekistan.

2. The chemical manufacturing industry in Uzbekistan mainly produces fertilizers.

3. Uzbekistan's power industry is operated by the State Joint Stock Company “Uzbekenergo”.

4. The light and textile industry in Uzbekistan has a raw material base of around 1,000,000 tons annually.

5. The metallurgical industry contributes more than 10 percent to the total industrial production in Uzbekistan.

UNIT 2

Metallurgical industry

The metallurgical industry can be broadly divided into primary, secondary and miscellaneous metal production operations. Primary refers to the production of metal from ore. Secondary refers to production of alloys from ingots and to recovery of metal from scrap. Miscellaneous metal production includes industries that produce or use metals for final products.

The task of the metallurgist is to achieve balance between material properties such as cost, weight, strength, toughness, hardness, corrosion and fatigue resistance, and performance in temperature extremes. To achieve this goal, the operating environment must be carefully considered. In a saltwater environment, ferrous metals and some aluminium alloys corrode quickly. Metals exposed to cold or cryogenic conditions may endure a ductile to brittle transition and lose their toughness, becoming more brittle and prone to cracking. Metals under continual cyclic loading can suffer from metal fatigue. Metals under constant stress at elevated temperatures can creep.

The primary metals industry consists of both ferrous and nonferrous operations. These processes are characterised by emission of large quantities of sulfur oxides and particulate. The major air contaminant from secondary metallurgical process is particulate in the forms of metallic fumes, smoke and dust.

Air pollution is prevented by capturing the smoke, dust, and fumes at the furnace and transporting these contaminants to suitable control devices.

Упражнение 1

Ответьте на следующие вопросы

1. How can the metallurgical industry be divided?
2. What does the term "primary metal production" mean?
3. What does secondary metal production include?

4. What challenges does the metallurgist face?
5. How does salt water affect iron and some aluminum alloys?
6. What happens to metals at low or cryogenic temperatures?
7. What processes can cause metal fatigue?
8. What air pollutants are primarily emitted from primary metallurgy?
9. How is air pollution prevented in metallurgical processes?

Упражнение 2

Переведите данные слова на русский язык и составьте с ними предложения

Metallurgical

Primary

Secondary

Miscellaneous

Alloy

Ingot

Scrap

Toughness

Hardness

Corrosion

Fatigue

Ductile

Brittle

Emission

Particulate

Упражнение 3

Вставьте слова в нужную форму

1. The metallurgical industry __ (can) be divided into primary, secondary, and miscellaneous metal production operations.
2. Primary production __ (refer) to the production of metal from ore.
3. Secondary production __ (refer) to the production of alloys from ingots.

4. The task of the metallurgist __ (be) to achieve balance between material properties.

5. Metals __ (expose) to cold or cryogenic conditions may become more brittle.

6. Metals __ (suffer) from metal fatigue under continual cyclic loading.

7. Air pollution __ (prevent) by capturing smoke, dust, and fumes.

Упражнение 4

Перепишите предложения и вставьте глагол в прошедшее время

1. The metallurgical industry can be divided into primary, secondary, and miscellaneous metal production operations.

2. Primary production refers to the production of metal from ore.

3. Secondary production refers to the production of alloys from ingots.

4. The task of the metallurgist is to achieve balance between material properties.

5. Metals exposed to cold or cryogenic conditions may become more brittle.

6. Metals under continual cyclic loading can suffer from metal fatigue.

7. Air pollution is prevented by capturing smoke, dust, and fumes.

Упражнение 5

Вставьте необходимый предлог

1. The metallurgical industry can be divided ____ primary, secondary, and miscellaneous metal production operations.

2. Primary production refers ____ the production of metal from ore.

3. Secondary production refers ____ the production of alloys from ingots.

4. The task of the metallurgist is to achieve balance ____ material properties.

5. Metals exposed ____ cold or cryogenic conditions may become more brittle.

6. Metals under continual cyclic loading can suffer ____ metal fatigue.

7. Air pollution is prevented ____ capturing smoke, dust, and fumes.

UNIT 3

Famous personalities in the History of Metallurgy

Anosov, Pavel Petrovich (1799 - 1851), a Russian metallurgist. Entered the St.Petersburg Mining Corps of Cadets at the age of 11. Graduated with honours in 1817 and was appointed to a minor post at the Zlatoust Crown Works. Promoted to Supervisor of the Zlatoust Arms Factory in 1819, to its Superintendent in 1824, and its Manager in 1829. From 1831 on, Mining Chief of the Zlatoust Works. From 1847 until his death, Chief of the Altai Works.

Anosov won world renown for his writings on the manufacture of iron and his re-discovery of the secret of damaskene lost in the Middle Ages. He explained the effect of the chemical composition, structure and treatment of steel on its properties. His findings formed the basis for the science of quality steels. Anosov summed up his studies in his now classical treatise, 'On Damaskene' (1841), immediately translated into German and French.

Anosov was the first to use the microscope in studies into the structure of steel (1831), thus laying the foundation for the microscopic analysis of metals.

Anosov was elected a corresponding member of the Kazan University (1844) and an honorary member of the Kharkov University (1846).

Bessemer, Sir Henry (1813 - 1898), a British civil engineer and inventor, elected to the London Royal Society in 1879. Patented over a hundred inventions in various fields of technology. Those most important were the needle die for postal stamps and the word-casting machine in 1838, the sugar cane press in 1849, and the centrifugal pump in 1850. While working on ways and means of improving the quality of a heavy artillery shell in 1854, he felt the need for a better steel-making process. In 1856 he patented a vessel for converting molten pig iron into steel. The process which took place in a vessel was named after him and revolutionized the iron and steel industry. In 1860, he patented a converter in which air is blown through the

bottom and trunnions. He also advanced the idea of rolling steel without having to cast it into ingots.

Huntsman, Benjamin (1704 - 1776), a British metallurgist. Rediscovered around 1740 the crucible process of steel-making known to the ancients in India, Persia, Syria, and elsewhere but later lost to civilization. The crucible process produced strong steel.

Упражнение 1

Заполните пропуски словами из списка:

Anosov entered the St.Petersburg Mining Corps of Cadets at the age of ____.

He graduated with honours in_____.

Anosov was promoted to Supervisor of the Zlatoust Arms Factory in _____.

He became the Mining Chief of the Zlatoust Works from _____.

Anosov's findings formed the basis for the science of _____.

Bessemer patented over a hundred inventions in various fields of _____.

The process which took place in a vessel was named after _____.

Huntsman rediscovered the _____ process of steel-making.

The crucible process produced _____ steel.

Anosov was elected a corresponding member of the _____ University.

Список слов:

11, 1817, 1819, 1831, 1847, quality steels, technology, Bessemer, crucible, strong, Kazan

Упражнение 2

Определите, являются ли следующие утверждения верными (True) или неверными (False):

Anosov was born in 1799.

He graduated from the St.Petersburg Mining Corps of Cadets in 1818.

Anosov became the Manager of the Zlatoust Arms Factory in 1829.
Anosov wrote a treatise called 'On Damaskene' in 1841.
Bessemer was elected to the London Royal Society in 1879.
Bessemer patented the sugar cane press in 1849.
The Bessemer process revolutionized the iron and steel industry.
Huntsman rediscovered the crucible process of steel-making in 1740.

Anosov was elected a corresponding member of the Moscow University in 1844.

Huntsman was a British metallurgist.

Упражнение 3

Переведите следующие предложения на английский язык:

Аносов вошел в Санкт-Петербургский горный корпус кадетов в возрасте 11 лет.

Он окончил учебное заведение с отличием в 1817 году.

Аносов был назначен на должность начальника Златоустовского оружейного завода в 1829 году.

Его исследования стали основой для науки о качественной стали.

Бессемер запатентовал более ста изобретений в различных областях техники.

Процесс, происходящий в сосуде, был назван в его честь.

Хантсман пересоздал древний процесс выплавки стали, известный в Индии, Персии и Сирии.

Крицебельный процесс производил прочную сталь.

Упражнение 5: Резюме

Напишите краткое резюме (3-4 предложения) о каждом из упомянутых металлургов:

Павел Петрович Аносов

Генри Бессемер

Бенджамин Хантсман

UNIT 4

Dmitri Mendeleev. Famous chemist and inventor.

Dmitri Mendeleev (08.02. [O.S. 27.01.] 1834 - 02.02. [O.S. 20.01.] 1907) Russian chemist and inventor. Dmitri Ivanovich Mendeleev was born on 8 February 1834 near Tobolsk. He was a Russian inventor and chemist. The most famous invention of Mendeleev is periodic table of elements.

Mendeleev's parents were Maria Mendeleeva (nee Kornilieva) and Ivan Mendeleev. According to the different sources there were approximately seventeen children in their family. Mendeleev was the youngest child. His father worked as a teacher but he became blind and stopped working. As a result Maria Mendeleeva began to work and re-established the glass factory which belonged to her family. It is also known that Mendeleev's grandfather was a priest of the Russian Orthodox Church. When Mendeleev was 13 he entered the Gymnasium in Tobolsk.

In 1849 his family moved to Saint Petersburg. In 1850 Mendeleev joined The Main Pedagogical Institute. Following the graduation he developed tuberculosis and was forced to relocate to the Crimean Peninsula. Living there, Mendeleev became a science master of the Simferopol gymnasium #1. In 1857 after recovery he arrived in Saint Petersburg.

From 1859 to 1861 Mendeleev worked in Heidelberg and researched the capillarity of liquids. In April 1862 he married Feozva Nikitichna Leshcheva. Two years later Mendeleev became a professor at the Saint Petersburg Technological Institute. In 1865 he became a professor at Saint Petersburg State University. The same year Mendeleev completed his dissertation "On the Combinations of Water with Alcohol". By 1871 Saint Petersburg was known as a center for chemistry research. In 1876 Mendeleev fell in love with Anna Ivanova Popova. In 1881 he made a proposal of marriage to her. The following year Mendeleev married her. The same year he divorced his first wife. Mendeleev had two children from his first

marriage: Olga and Vladimir. His other children from the second marriage were Lyubov, a pair of twins and son Ivan. It should be noted that Lyubov was the wife of Russian poet Alexander Blok.

Mendeleev obtained a lot of awards from different scientific organizations but he resigned from Saint Petersburg University in 1890. Three years later Mendeleev was appointed Director of the Bureau of Weights and Measures. His task was to formulate new standards of vodka. According to the new standards created by Mendeleev all vodka had to be made at forty percent alcohol by volume. He also researched the composition of petroleum and made a contribution to the foundation of the first Russian oil refinery.

In 1906 the Nobel Committee for Chemistry suggested to the Swedish Academy to award the Nobel Prize in Chemistry for 1906 to Mendeleev for his discovery of the periodic system. This proposal was approved. But at the full meeting of the Academy one of the members recommended the candidacy of Henri Moissan. Moreover Svante Arrhenius who had influence on the Academy also advised to reject the candidacy of Mendeleev. The contemporaries state that Arrhenius was against Mendeleev because of his critique of Arrhenius's dissociation theory. As a result the candidacy of Mendeleev was rejected.

Dmitri Mendeleev died of influenza in Saint Petersburg in 1907.

Упражнение 1

Найдите и исправьте ошибки в следующих предложениях:

Mendeleev was born on 8 February 1834 near Tobolsk.

His father worked as a teacher but he become blind and stopped working.

In 1850 Mendeleev joined The Main Pedagogical Institute.

Following the graduation he developed tuberculous and was forced to relocate to the Crimean Peninsula.

In 1865 he became a professor at Saint Petersburg State University.

Mendeleev obtained a lot of awards from different scientific organizations but he resign from Saint Petersburg University in 1890.

In 1906 the Nobel Committee for Chemistry suggest to the Swedish Academy to award the Nobel Prize in Chemistry to Mendeleev.

Упражнение 2

Ответьте на вопросы

Когда и где родился Дмитрий Менделеев?

Сколько детей было в семье Менделеева?

Что стало причиной переезда семьи Менделеева в Санкт-Петербург?

В каком году Менделеев стал профессором Санкт-Петербургского технологического института?

За что предложил наградить Менделеева Нобелевский комитет в 1906 году?

Почему Менделеев не получил Нобелевскую премию?

Упражнение 3

Перепишите следующие предложения в отрицательной форме:

Mendeleev was a Russian chemist and inventor.

His father worked as a teacher.

Mendeleev became a professor at Saint Petersburg State University in 1865.

Mendeleev obtained a lot of awards from different scientific organizations.

The Nobel Committee for Chemistry suggested to the Swedish Academy to award the Nobel Prize in Chemistry to Mendeleev in 1906.

Упражнение 4

Используйте слова в скобках в правильной форме:

Mendeleev was born on 8 February 1834 near Tobolsk (near).

His father worked as a teacher but he (become) blind and stopped working.

In 1850 Mendeleev (join) The Main Pedagogical Institute.

Following the graduation he (develop) tuberculosis and was forced to relocate to the Crimean Peninsula.

In 1865 he (become) a professor at Saint Petersburg State University.

Mendeleev (obtain) a lot of awards from different scientific organizations but he (resign) from Saint Petersburg University in 1890.

In 1906 the Nobel Committee for Chemistry (suggest) to the Swedish Academy to award the Nobel Prize in Chemistry to Mendeleev.

UNIT 5

Periodic table of elements

The periodic table of elements is widely used in the field of Chemistry to look up chemical elements as they are arranged in a manner that displays periodic trends in the chemical properties of the elements. However, the Periodic table generally displays only the symbol of the element and not its entire name.

Most of the symbols are similar to the name of the element but some symbols of elements have Latin roots. An example for this is silver which denoted by Ag from its Latin name “Argentum”. Another such example would be the symbol ‘Fe’ which is used to denote Iron and can be traced to the Latin word for iron, “Ferrum”. It could prove difficult for a beginner in chemistry to learn the names of all the elements in the periodic table because these symbols do not always correspond to the English names of the elements. Therefore, a list of 118 elements and their symbols and atomic numbers is provided below:

118 Elements and Their Symbols and Atomic Numbers

Name of the Element	Symbol of the Element	Atomic Number
Hydrogen	H	1
Helium	He	2
Lithium	Li	3
Beryllium	Be	4
Boron	B	5
Carbon	C	6

<u>Nitrogen</u>	N	7
<u>Oxygen</u>	O	8
<u>Fluorine</u>	F	9
<u>Neon</u>	Ne	10
<u>Sodium</u>	Na	11
<u>Magnesium</u>	Mg	12
<u>Aluminium</u>	Al	13
<u>Silicon</u>	Si	14
<u>Phosphorus</u>	P	15
<u>Sulfur</u>	S	16
<u>Chlorine</u>	Cl	17
<u>Argon</u>	Ar	18
<u>Potassium</u>	K	19
<u>Calcium</u>	Ca	20
<u>Scandium</u>	Sc	21
<u>Titanium</u>	Ti	22
<u>Vanadium</u>	V	23
<u>Chromium</u>	Cr	24
<u>Manganese</u>	Mn	25
<u>Iron</u>	Fe	26

<u>Cobalt</u>	Co	27
<u>Nickel</u>	Ni	28
<u>Copper</u>	Cu	29
<u>Zinc</u>	Zn	30
<u>Gallium</u>	Ga	31
<u>Germanium</u>	Ge	32
<u>Arsenic</u>	As	33
<u>Selenium</u>	Se	34
<u>Bromine</u>	Br	35
<u>Krypton</u>	Kr	36
<u>Rubidium</u>	Rb	37
<u>Strontium</u>	Sr	38
<u>Yttrium</u>	Y	39
<u>Zirconium</u>	Zr	40
<u>Niobium</u>	Nb	41
<u>Molybdenum</u>	Mo	42
<u>Technetium</u>	Tc	43
<u>Ruthenium</u>	Ru	44
<u>Rhodium</u>	Rh	45
<u>Palladium</u>	Pd	46

<u>Silver</u>	Ag	47
<u>Cadmium</u>	Cd	48
<u>Indium</u>	In	49
<u>Tin</u>	Sn	50
<u>Antimony</u>	Sb	51
<u>Tellurium</u>	Te	52
<u>Iodine</u>	I	53
<u>Xenon</u>	Xe	54
<u>Cesium</u>	Cs	55
<u>Barium</u>	Ba	56
<u>Lanthanum</u>	La	57
<u>Cerium</u>	Ce	58
<u>Praseodymium</u>	Pr	59
<u>Neodymium</u>	Nd	60
<u>Promethium</u>	Pm	61
<u>Samarium</u>	Sm	62
<u>Europium</u>	Eu	63
<u>Gadolinium</u>	Gd	64
<u>Terbium</u>	Tb	65
<u>Dysprosium</u>	Dy	66

<u>Holmium</u>	Ho	67
<u>Erbium</u>	Er	68
<u>Thulium</u>	Tm	69
<u>Ytterbium</u>	Yb	70
<u>Lutetium</u>	Lu	71
<u>Hafnium</u>	Hf	72
<u>Tantalum</u>	Ta	73
<u>Tungsten</u>	W	74
<u>Rhenium</u>	Re	75
<u>Osmium</u>	Os	76
<u>Iridium</u>	Ir	77
<u>Platinum</u>	Pt	78
<u>Gold</u>	Au	79
<u>Mercury</u>	Hg	80
<u>Thallium</u>	Tl	81
<u>Lead</u>	Pb	82
<u>Bismuth</u>	Bi	83
<u>Polonium</u>	Po	84
<u>Astatine</u>	At	85
<u>Radon</u>	Rn	86

<u>Francium</u>	Fr	87
<u>Radium</u>	Ra	88
<u>Actinium</u>	Ac	89
<u>Thorium</u>	Th	90
<u>Protactinium</u>	Pa	91
<u>Uranium</u>	U	92
<u>Neptunium</u>	Np	93
<u>Plutonium</u>	Pu	94
<u>Americium</u>	Am	95
<u>Curium</u>	Cm	96
<u>Berkelium</u>	Bk	97
<u>Californium</u>	Cf	98
<u>Einsteinium</u>	Es	99
<u>Fermium</u>	Fm	100
<u>Mendelevium</u>	Md	101
<u>Nobelium</u>	No	102
<u>Lawrencium</u>	Lr	103
<u>Rutherfordium</u>	Rf	104
<u>Dubnium</u>	Db	105
<u>Seaborgium</u>	Sg	106

<u>Bohrium</u>	Bh	107
<u>Hassium</u>	Hs	108
<u>Meitnerium</u>	Mt	109
<u>Darmstadtium</u>	Ds	110
<u>Roentgenium</u>	Rg	111
<u>Copernicium</u>	Cn	112
<u>Nihonium</u>	Nh	113
<u>Flerovium</u>	Fl	114
<u>Moscovium</u>	Mc	115
<u>Livermorium</u>	Lv	116
<u>Tennessine</u>	Ts	117
<u>Oganesson</u>	Og	118

Упражнение 1
Напишите названия следующих элементов на английском языке.

Na
Cl
Fe
Cu
Au
Ag
Hg
Si
C
O

Упражнение 2

Напишите химические символы для следующих элементов.

Aluminum

Sulfur

Potassium

Calcium

Nitrogen

Phosphorus

Iodine

Bromine

Zinc

Magnesium

Упражнение 3

Соедините названия элементов с их химическими символами.

Название элемента	Химический символ
Helium	Ne
Neon	He
Argon	Ar
Krypton	I
Xenon	Xe
Radon	F
Fluorine	Cl
Chlorine	Rn
Bromine	Br
Iodine	Kr

Упражнение 4

Опишите основные свойства следующих элементов на английском языке.

Sodium (Na)

Chlorine (Cl)

Iron (Fe)

Gold (Au)

Carbon (C)

UNIT 6

Powder Metallurgy

Powder metallurgy is a branch of metallurgy that deals with the production and further processing of powders made of metals, metal alloys, metalloids, metal oxides, and their mixtures with non-metals. Machine parts of various types can be manufactured using the powder metallurgy process. With the help of this process, it is possible to produce parts in their final shape from metal powder. The powders are pressed under high pressure in molds that correspond to the object to be manufactured and sintered at temperatures below the metal melting point.

Powder metallurgy has many advantages over traditional technologies. Any mixture of metals, even scrap metal, can be processed. The materials can be used almost 100%, there is no waste, and the most important advantage of this manufacturing technology is that it can be automated to a large extent.

One of the most significant stages in powder metallurgy is metal powder extraction. It is carried out by: a) mechanical processes-crushing of solid materials and production of metal powder from the melt; b) physical process-metals with low vapor pressure can be made into powder by evaporation followed by condensation. In addition, chemical and electrochemical methods for powder production can also be used.

Упражнение 1 Ответьте на следующие вопросы

What is powder metallurgy?

What types of materials can be used in powder metallurgy?

How are parts produced using the powder metallurgy process?

What are the main advantages of powder metallurgy over traditional technologies?

Describe the process of metal powder extraction.

Упражнение 2

Заполните пропуски словами из текста

Powder metallurgy is a branch of _____ that deals with the production and further processing of powders.

Parts can be produced in their final shape from _____ powder.

The powders are pressed under high pressure in molds that correspond to the _____ to be manufactured.

One of the most significant stages in powder metallurgy is _____ extraction.

Chemical and _____ methods for powder production can also be used.

Упражнение 3

Найдите синонимы для следующих слов (используйте словарь, если необходимо)

Production

Mixture

Manufactured

Advantages

Extraction

Упражнение 4

Переведите следующие предложения на русский язык

Powder metallurgy is a branch of metallurgy that deals with the production and further processing of powders made of metals, metal alloys, metalloids, metal oxides, and their mixtures with non-metals.

The powders are pressed under high pressure in molds that correspond to the object to be manufactured and sintered at temperatures below the metal melting point.

The materials can be used almost 100%, there is no waste, and the most important advantage of this manufacturing technology is that it can be automated to a large extent.

One of the most significant stages in powder metallurgy is metal powder extraction.

Metals with low vapor pressure can be made into powder by evaporation followed by condensation.

Упражнение 5

Определите часть речи для следующих слов

Powder

Metallurgy

Production

Processing

Molds

Упражнение 6

Составьте предложения со следующими словами

Metallurgy

Mixture

Sintering

Automation

Extraction

UNIT 7

Metals

Metals are materials most widely used in industry because of their properties. The study of the production and **properties** of metals is known as **metallurgy**.

The **separation** between the atoms in metals is small, so most metals are **dense**. The atoms are **arranged regularly** and can **slide** over each other. That is why metals are **malleable** (can be deformed and **bent** without **fracture**) and **ductile** (can be **drawn** into **wire**). Metals vary greatly in their properties. For example, **lead** is soft and can be bent by hand, while **iron** can only be worked by hammering at red heat.

The regular arrangement of atoms in metals gives them a crystalline structure. Irregular crystals are called **grains**. The properties of the metals **depend** on the **size, shape**, orientation, and **composition** of these grains. In general, a metal with small grains will be harder and stronger than one with **coarse** grains.

Heat **treatment** such as **quenching, tempering, or annealing** controls the nature of the grains and their size in the metal. Small amounts of other metals (less than

1 per cent) are often added to a pure metal. This is called alloying (легирование) and it changes the grain structure and properties of metals.

All metals can be formed by drawing, **rolling, hammering** and **extrusion**, but some require hot-working. Metals 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.

Упражнение 1

Заполните пропуски

The study of the production and properties of metals is known as _____.

The atoms in metals are arranged _____ and can slide over each other.

Metals are malleable and _____.

Heat treatment such as quenching, tempering, or annealing controls the nature of the _____.

Special conditions are required for metals that _____ with air.

Упражнение 2

Лексические упражнения

Выберите синоним к слову "malleable" (пластичный):

- A) Hard
- B) Brittle
- C) Flexible
- D) Strong

Выберите антоним к слову "ductile" (ковкий):

- A) Brittle
- B) Malleable
- C) Flexible
- D) Strong

Переведите на английский язык:

Легирование: _____

Металлургия: _____

Кристаллическая структура: _____

Металлургический станок: _____

Упражнение 3

Переведите следующие предложения на английский язык:

Металлы широко используются в промышленности из-за их свойств.

Металлы могут быть сформированы путем вытягивания, прокатки,ковки и экструзии.

Инженеры учитывают эффекты металлической усталости и ползучести при проектировании самолетов и газовых турбин.

Сплавление изменяет структуру зерен и свойства металлов.

Некоторые металлы реагируют с воздухом, поэтому для них требуются специальные условия.

UNIT 8

Metals in Perspective

Modern civilization is based on metals and millions of tons are extracted from the surface of the Earth every year. The place of metals in the modern world is supreme in importance. About three-quarters of all known chemical elements are metals. Since the Stone Age, man has found many materials he could work with. However, the materials that helped him most to develop were the metals. In many regions of the Ancient World man used lumps of native metals he could pick from the surface of the ground: gold nuggets, lumps of native copper and silver.

Archaeologists have found evidence of early metal-work dating as far back as 10,000 BC. Such finds were made in the Middle East, where deposits of copper were most plentiful. This does not mean that this metal was easy to find, but that there were more deposits in the Middle East than other parts of the world.

Copper seems to be the first metal which began to oust stone. The need for copper was great indeed. The advantages that copper had over stone as a material for weapons, tools, were obvious. The metal occurred naturally in the pure (free) state and had many good things about it: it could readily be worked to any shape, flattened, pointed and holed. At first, man made it into small things such as arrowheads. Before long, however, man noticed that when hammered copper becomes harder and stronger, but if it is held over a fire - soft, malleable, easy to work. Gold is the most malleable of all the metals. It is much softer than copper and not very strong. But gold has been valued for thousands of years for its beautiful luster and scarcity.

In about 4300 BC in the region of the Caspian Sea man discovered the process of smelting - how to extract the metals from their ores. Two new metals came into use at this time - about 4,000 BC. The first was silver, prized in those days as it is today, for its beauty, and used for ornaments. It was sometimes found 'free', lying around, as was gold, but was mostly smelted from ores. The second

metal was lead, a dull heavy metal, soft and easily shaped into cups and beakers. Lead is never found 'free'; it has always been smelted from ore.

During the next 1,000 years the knowledge of the four metals far known - gold, copper, silver and lead - spread to other lands. Troy (home of Helen), near the Dardanelles, was the chief centre of trade and from there goods were carried by boat into Europe. The River Danube provided a highway deep into the continent, and the traders' boats also took metal goods to all countries around the Mediterranean. Eventually they reached Britain, and the art of smelting and metal working became known in this country. Quite early in the history of metal the process of casting was used to shape metal.

So, during the many centuries of his history man has learnt how to mine, smelt and work many metals. But iron - the chief metal of present times - has given the name of Iron Age to the most significant and productive period in the development of human society.

Упражнение 1

Заполните пропуски

Modern civilization is based on _____ and millions of tons are extracted from the surface of the Earth every year.

About three-quarters of all known chemical elements are _____.

In many regions of the Ancient World, man used lumps of native metals he could pick from the surface of the ground: gold nuggets, lumps of native copper and _____.

Archaeologists have found evidence of early metal-work dating as far back as 10,000 _____.

Copper seems to be the first metal which began to _____ stone.

The metal occurred naturally in the pure (free) state and had many good things about it: it could readily be worked to any _____, flattened, pointed and holed.

Before long, however, man noticed that when hammered copper becomes harder and stronger, but if it is held over a fire - _____, malleable, easy to work.

In about 4300 BC in the region of the _____ Sea man discovered the process of smelting - how to extract the metals from their ores.

The second metal was lead, a dull heavy metal, soft and easily shaped into cups and _____.

The River Danube provided a highway deep into the continent, and the traders' boats also took metal goods to all countries around the _____.

Упражнение 2:

Ответьте на вопросы

What is the foundation of modern civilization according to the text?

How much of all known chemical elements are metals?

What metals did ancient people find on the surface of the ground?

When is the earliest evidence of metalwork found?

Why was copper preferred over stone for making tools and weapons?

What process did man discover around 4300 BC?

What are the two new metals that came into use around 4000 BC?

How did the knowledge of the four metals spread to other lands?

What is the significance of the Iron Age in human history?

What is the most malleable metal mentioned in the text?

Упражнение 3

Найдите антонимы

Hard - _____

Plentiful - _____

Pure - _____

Dull - _____

Soft - _____

Упражнение 4

Определите значение слов

Smelting - _____

Luster - _____

Malleable - _____

Ore - _____

Nuggets - _____

Упражнение 5

Переведите предложения на русский язык

Modern civilization is based on metals.

About three-quarters of all known chemical elements are metals.

Copper seems to be the first metal which began to oust stone.

The metal occurred naturally in the pure (free) state.

In about 4300 BC in the region of the Caspian Sea man discovered the process of smelting.

UNIT 9

The First Non - Ferrous Metals

Non-ferrous metals are the metals not composed of or containing iron. As it has been said before, copper was one of the first metals to be used. In its natural form, copper occurs in the ground as copper ore, a mineral. But this ore contains only 0.5 - 1 per cent of the metal. The rest is rock. The world produces 9.6 million tonnes of copper a year. This means that more than a thousand million tonnes of ore have to be removed from the ground and the pure copper extracted.

Most copper is extracted from a compound of iron, sulphur, and copper called sulphide ore. Hot air is blown into a furnace to separate the copper from the iron and sulphur. The iron and sulphur react with the oxygen to form iron oxide and sulphur dioxide, leaving molten copper metal. This copper, known as blister copper, is about 98 per cent pure. A process called electrolysis is needed to separate the remaining impurities. During this process a slab of blister copper is suspended in a solution of copper sulphate and sulphuric acid, where it acts as a positive electrode (anode). When electricity is passed through the solution, the copper in the anode is dissolved. The pure copper collects at the negative electrode (cathode) and the impurities fall below.

Copper is a good conductor of heat and electricity. We use it to make cooling utensils and all sorts of pipes for carrying hot water, both in homes and in industry. We also use it to make different kinds of electrical devices, such as lightning conductors and the electric coils in motors. Copper does not rust easily, so it lasts a very long time.

Such metals as lead and tin were widely known in Roman times. Lead is a soft malleable, ductile, bluish-white, dense metallic element, extracted chiefly from galena and used in containers and pipes for corrosives, in solder and type metal, bullets, radiation shielding, paints and anti-knock compounds.

Some Roman aqueducts still stand today because they were lined with lead and lead does not rust. Many thousands of tonnes were used in a single aqueduct. So much lead was used in water-supply systems that eventually the Romans suffered some lead-poisoning.

Tin was the fifth metal discovered by man. It is a malleable, silvery metallic element obtained chiefly from cassiterite. It is used to coat other metals to prevent corrosion, and forms part of numerous alloys such as soft solder, pewter, type metal and bronze. For example, pewter, an alloy of lead and tin, was widely used in Roman times to make cups and dishes.

Упражнение 1

Переведите следующие слова и фразы на английский язык:

Нелегированные металлы
Медная руда
Сульфидная руда
Blister copper
Электролиз
Хороший проводник тепла и электричества
Мягкий, пластичный, голубовато-белый, плотный
металлический элемент
Облицовка акведука
Предотвращает коррозию
Алюминий

Упражнение 2

Используйте следующие слова и фразы в предложениях:

Non-ferrous metals
Copper ore
Sulphide ore
Blister copper
Electrolysis
Good conductor of heat and electricity
Soft, malleable, bluish-white, dense metallic element

Lined with lead
Prevent corrosion
Alloy

Упражнение 3

Выберите правильное слово из предложенных вариантов, чтобы завершить предложение:

Copper is a (good / bad) conductor of heat and electricity.

Lead is a (soft / hard) malleable, bluish-white, dense metallic element.

The process of removing impurities from copper is called (electrolysis / smelting).

Tin is used to (coat / paint) other metals to prevent corrosion.

Blister copper is about (98 / 50) percent pure.

UNIT 10

Aluminium

Non-Ferrous Metals include: Aluminum Pure aluminum is a silvery-white metal with many desirable characteristics. It is light, nontoxic (as the metal), nonmagnetic and non-sparking. It is easily formed, machined, and cast. Pure aluminum is soft and lacks strength, but alloys with small amounts of copper, magnesium, silicon, manganese, and other elements have very useful properties. Aluminum is an abundant element in the earth's crust, but it is not found free in nature. The Bayer process is used to refine aluminum from bauxite, an aluminum ore. Because of aluminum's mechanical and physical properties, it is an extremely convenient and widely used metal.

Упражнение 1

Выберите правильную форму глагола:

Pure aluminum (is/are) a silvery-white metal.

It (is/are) light, nontoxic, nonmagnetic, and non-sparking.

It (is/are) easily formed, machined, and cast.

Pure aluminum (is/are) soft and lacks strength.

Alloys with small amounts of copper, magnesium, silicon, manganese, and other elements (have/has) very useful properties.

Aluminum (is/are) an abundant element in the earth's crust.

Упражнение 2

Перепишите предложения, используя синонимы или другие слова:

Pure aluminum is a silvery-white metal.

It is light, nontoxic, nonmagnetic, and non-sparking.

Pure aluminum is soft and lacks strength.

The Bayer process is used to refine aluminum from bauxite.

Aluminum is an extremely convenient and widely used metal.

Упражнение 3

Напишите короткое эссе (5-7 предложений) о важности алюминия в современной промышленности, используя информацию из текста.

Упражнение 4

Создайте диалог между двумя людьми, обсуждающими свойства и применение алюминия.

Пример:

A: Did you know that pure aluminum is a silvery-white metal?

B: Yes, I did. It's also light and nontoxic, right?

A: Exactly. And it's nonmagnetic and non-sparking too.

B: That's really useful for many applications. But isn't pure aluminum too soft for most uses?

A: Yes, that's true. But when it's alloyed with other elements like copper, magnesium, and silicon, it becomes much stronger.

B: I see. How is aluminum refined from its ore?

A: The Bayer process is used to refine aluminum from bauxite. It's quite an interesting process!

UNIT 11

Steel

The most important metal in industry is iron and its alloy- steel. Steel is an alloy of iron and carbon. It is strong and stiff, but corrodes easily through rusting,

although stainless and other special steels resist corrosion. The amount of carbon in a steel influences its properties considerably. Steels of low carbon content (mild steels) are quite ductile and are used in the manufacture of sheet iron, wire, and pipes.

Medium-carbon steels containing from 0.2 to 0.4 per cent carbon are tougher and stronger and are used as structural steels. Both mild and medium-carbon steels are suitable for forging and welding. High-carbon steels contain from 0.4 to 1.5 per cent carbon, are hard and brittle and are used in cutting tools, surgical instruments, razor blades and springs.

Tool steel, also called silver steel, contains about 1 per cent carbon and is strengthened and toughened by quenching and tempering.

The inclusion of other elements affects the properties of the steel. Manganese gives extra strength and toughness. Steel containing 4 per cent silicon is used for transformer cores or electromagnets because it has large grains acting like small magnets.

The addition of chromium gives extra strength and corrosion resistance, so we can get rust-proof steels. Heating in the presence of carbon or nitrogen-rich materials is used to form a hard surface on steel (case-hardening). High-speed steels, which are extremely important in machine-tools, contain chromium and tungsten plus smaller amounts of vanadium, molybdenum and other metals.

Упражнение 1

Заполните пропуски подходящими словами из текста:

Steel is an alloy of iron and _____.

Steels of low carbon content are quite _____ and are used in the manufacture of sheet iron, wire, and pipes.

Medium-carbon steels containing from 0.2 to 0.4 per cent carbon are _____ and stronger and are used as structural steels.

High-carbon steels contain from 0.4 to 1.5 per cent carbon, are hard and _____.

Tool steel, also called _____ steel, contains about 1 per cent carbon.

The inclusion of other elements affects the _____ of the steel.

Manganese gives extra _____ and toughness.

The addition of chromium gives extra _____ and corrosion resistance.

Heating in the presence of carbon or nitrogen-rich materials is used to form a hard surface on steel (_____).

High-speed steels, which are extremely important in machine-tools, contain chromium and _____ plus smaller amounts of vanadium, molybdenum and other metals.

Упражнение 2

Переведите следующие слова и фразы с английского на русский:

alloy

carbon

ductile

structural steels

forging and welding

brittle

tool steel

quenching and tempering

manganese

corrosion resistance

UNIT 12

Copper

Copper provides a diverse range of properties: good thermal and electrical conductivity, corrosion resistance, ease of forming, ease of joining, and colour. However, copper and its alloys have relatively low strength at elevated temperatures. Some copper alloys are also susceptible to stress-corrosion cracking unless they are stress relieved. Next to silver, copper is the next best electrical conductor. It is a yellowish red metal that polishes to a bright metallic luster. It is tough, ductile and malleable. Copper has an unpleasant taste and a peculiar smell. Copper is resistant to corrosion in most atmospheres including marine and industrial environments. It is corroded by oxidizing acids, halogens, sulphides and ammonia based solutions. Copper and its alloys – the brasses and bronzes – are available in rod, plate, strip, sheet, tube shapes, forgings, wire, and castings.

Упражнение 1: Заполните пропуски

Copper provides a diverse _____ of properties.

Copper has good thermal and _____ conductivity.

Copper is resistant to _____ in most atmospheres.

Copper is corroded by _____ acids, halogens, sulphides and ammonia based solutions.

Copper and its alloys are available in rod, plate, strip, _____, tube shapes, forgings, wire, and castings.

Упражнение 2

Выберите правильное слово

Copper is (resistant / susceptible) to corrosion in most atmospheres.

Copper and its alloys have (high / low) strength at elevated temperatures.

Copper is (polished / polished to) a bright metallic luster.

Copper is (tough / soft) and malleable.

Copper has an (unpleasant / pleasant) taste and a peculiar smell.

Упражнение 3

Переведите предложения на английский язык

Медь обладает разнообразием свойств.

Медь имеет хорошую теплопроводность и электропроводность.

Медь легко формируется и соединяется.

Медь и её сплавы доступны в виде стержней, пластин, лент, листов, труб, ковок, проволоки и отливок.

Медь корродирует при воздействии окисляющих кислот, галогенов, сульфидов и аммиачных растворов.

Упражнение 4

Ответьте на вопросы

What are the main properties of copper mentioned in the text?

How does copper behave at high temperatures?

What are some of the forms in which copper and its alloys are available?

What substances can corrode copper?

What is the color of copper?

Упражнение 5

Найдите синонимы для следующих слов

Diverse

Conductivity

Resistance

Susceptible

Peculiar

Упражнение 6: Напишите предложения, используя следующие слова

Thermal

Corrosion

Ductile

Alloy
Luster

Упражнение 7

Перепишите предложения, заменив выделенные слова синонимами

Copper provides a diverse range of properties.

Copper and its alloys have relatively low strength at elevated temperatures.

Copper is resistant to corrosion in most atmospheres.

Copper has an unpleasant taste and a peculiar smell.

Copper and its alloys are available in rod, plate, strip, sheet, tube shapes, forgings, wire, and castings.

UNIT 13

Iron

Iron is a chemical element with the symbol Fe (from Latin: ferrum) and atomic number 26. It is the most common element (by mass) forming the planet Earth as a whole, forming much of Earth's outer and inner core. It is the fourth most common element in the Earth's crust. Iron's very common presence in rocky planets like Earth is due to its abundant production as a result of fusion in high-mass stars. Like other group 8 elements, iron exists in a wide range of oxidation states, -2 to $+8$, although $+2$ and $+3$ are the most common. Iron metal has been used since ancient times, though lower-melting copper alloys were used first in history. Pure iron is soft (softer than aluminium), but is unobtainable by smelting. The material is significantly hardened and strengthened by impurities from the smelting process, such as carbon. A certain proportion of carbon (between 0.2 % and 2.1 %) produces steel, which may be up to 1000 times harder than pure iron. Crude iron metal is produced in blast furnaces, where ore is reduced by coke to cast iron, which has a high carbon content. Further refinement with oxygen reduces the carbon content to the correct proportion to make steel. Steels and low carbon iron alloys with other metals (alloy steels) are by far the most common metals in industrial use, due to their great range of desirable properties. Iron chemical compounds, which include ferrous and ferric compounds, have many uses. Iron oxide mixed with aluminium powder can be ignited to create a thermite reaction, used in welding and purifying ores. It forms binary compounds with the halogens and the chalcogens. Iron is the most widely used of all the metals, accounting for 95 % of worldwide metal production. Its low cost and high strength make it indispensable in engineering applications such as the construction of machinery and machine tools, automobiles, the hulls of large ships, and structural components for buildings. Since pure iron is quite soft, it is most commonly used in the form of steel.

Упражнение 1

Выберите правильное слово

Iron is a chemical element with the symbol (Fe / Cu) and atomic number 26.

It is the most common element (by volume / by mass) forming the planet Earth as a whole.

Iron's very common presence in rocky planets like Earth is due to its abundant production as a result of (fusion / fission) in high-mass stars.

Pure iron is soft (softer than / harder than) aluminium.

A certain proportion of carbon (between 0.2% and 2.1%) produces (copper / steel), which may be up to 1000 times harder than pure iron.

Crude iron metal is produced in (blast / electric) furnaces, where ore is reduced by coke to cast iron, which has a high carbon content.

Steels and low carbon iron alloys with other metals (alloy steels) are by far the most common metals in industrial use, due to their great range of desirable (properties / colors).

Iron oxide mixed with aluminum powder can be ignited to create a (thermite / nuclear) reaction, used in welding and purifying ores.

Iron is the most widely used of all the metals, accounting for 95% of worldwide metal (consumption / production).

Its low cost and high strength make it indispensable in engineering applications such as the construction of machinery and machine tools, (automobiles / bicycles), the hulls of large ships, and structural components for buildings.

Упражнение 2

Ответьте на следующие вопросы

What is the symbol for iron?

What is the atomic number of iron?

Where is iron most commonly found on Earth?

Why is iron so common in rocky planets like Earth?

What happens to iron when it is mixed with carbon?

How is crude iron metal produced?

What is the main difference between cast iron and steel?
What are some common uses of iron and its alloys?
What is a thermite reaction, and what is it used for?
Why is iron so important in engineering applications?

Упражнение 3

Переведите предложения на русский язык

Iron is a chemical element with the symbol Fe and atomic number 26.

It is the most common element (by mass) forming the planet Earth as a whole.

Iron's very common presence in rocky planets like Earth is due to its abundant production as a result of fusion in high-mass stars.

Pure iron is soft (softer than aluminium), but is unobtainable by smelting.

A certain proportion of carbon (between 0.2% and 2.1%) produces steel, which may be up to 1000 times harder than pure iron.

Crude iron metal is produced in blast furnaces, where ore is reduced by coke to cast iron, which has a high carbon content.

Steels and low carbon iron alloys with other metals (alloy steels) are by far the most common metals in industrial use, due to their great range of desirable properties.

Iron oxide mixed with aluminum powder can be ignited to create a thermite reaction, used in welding and purifying ores.

Iron is the most widely used of all the metals, accounting for 95% of worldwide metal production.

Its low cost and high strength make it indispensable in engineering applications such as the construction of machinery and machine tools, automobiles, the hulls of large ships, and structural components for buildings.

Упражнение 4

Найдите синонимы

Common — (frequent / rare)

Soft — (hard / flexible)

Abundant — (scarce / plentiful)
Production — (manufacture / consumption)
Desirable — (undesirable / attractive)
Indispensable — (optional / essential)
Construction — (destruction / building)
Structural — (functional / architectural)
Strength — (weakness / power)
Applications — (uses / theories)

UNIT 14

Ferrous metals

Commercially available iron is classified based on purity and the abundance of additives. Pig iron has 3.5–5 % carbon and contains varying amounts of contaminants such as sulfur, silicon and phosphorus. Pig iron is not a saleable product, but rather an intermediate step in the production of cast iron and steel from iron ore. Cast iron contains 2–4 % carbon, 1–6 % silicon, and small amounts of manganese. Contaminants present in pig iron that negatively affect material properties, such as sulfur and phosphorus, have been reduced to an acceptable level. It has a melting point in the range of 1420–1470 K. Its mechanical properties vary greatly, dependent upon the form carbon takes in the alloy. “White” cast irons contain their carbon in the form of cementite, or iron carbide. This hard, brittle compound dominates the mechanical properties of white cast irons, rendering them hard, but unresistant to shock. The broken surface of a white cast iron is full of fine facets of the broken carbide, a very pale, silvery, shiny material, hence the appellation. Wrought iron contains less than 0.25 % carbon. It is a tough, malleable product, but not as fusible as pig iron. Wrought iron is characterized by the presence of fine fibers of slag entrapped in the metal. Wrought iron is more corrosion resistant than steel. It has been almost completely replaced by mild steel for traditional “wrought iron” products and blacksmithing.

Упражнение 1

Выберите правильное слово

Commercially available iron is classified based on (purity / color) and the abundance of additives.

Pig iron has 3.5–5% (carbon / silicon) and contains varying amounts of contaminants such as sulfur, silicon, and phosphorus.

Pig iron is not a saleable product, but rather an intermediate step in the production of (cast iron / bronze) and steel from iron ore.

Cast iron contains 2–4% carbon, 1–6% (silicon / sulfur), and small amounts of manganese.

Contaminants present in pig iron that negatively affect material properties, such as sulfur and phosphorus, have been reduced to an (acceptable / unacceptable) level.

It has a melting point in the range of 1420–1470 (Celsius / Kelvin).

Its mechanical properties vary greatly, dependent upon the form (carbon / silicon) takes in the alloy.

“White” cast irons contain their carbon in the form of cementite, or (iron carbide / iron oxide).

This hard, brittle compound dominates the mechanical properties of white cast irons, rendering them hard, but unresistant to (heat / shock).

The broken surface of a white cast iron is full of fine facets of the broken carbide, a very pale, silvery, shiny material, hence the (appellation / composition).

Wrought iron contains less than 0.25% (carbon / silicon).

It is a tough, malleable product, but not as (fusible / malleable) as pig iron.

Wrought iron is characterized by the presence of fine fibers of (slag / carbon) entrapped in the metal.

Wrought iron is more (corrosion / heat) resistant than steel.

It has been almost completely replaced by mild steel for traditional “wrought iron” products and (blacksmithing / welding).

Упражнение 2

Ответьте на вопросы

How is commercially available iron classified?

What is the carbon content of pig iron?

What is pig iron used for?

What are the main components of cast iron?

How are contaminants in pig iron reduced?

What is the melting point range of cast iron?

How do the mechanical properties of cast iron vary?

What is the form of carbon in white cast iron?
What are the characteristics of white cast iron?
What is the carbon content of wrought iron?
What are the properties of wrought iron?
What characterizes wrought iron?
How does wrought iron compare to steel in terms of corrosion resistance?
What has largely replaced wrought iron in traditional products?

Упражнение 3

Переведите предложения

Commercially available iron is classified based on purity and the abundance of additives.

Pig iron has 3.5–5% carbon and contains varying amounts of contaminants such as sulfur, silicon, and phosphorus.

Pig iron is not a saleable product, but rather an intermediate step in the production of cast iron and steel from iron ore.

Cast iron contains 2–4% carbon, 1–6% silicon, and small amounts of manganese.

Contaminants present in pig iron that negatively affect material properties, such as sulfur and phosphorus, have been reduced to an acceptable level.

It has a melting point in the range of 1420–1470 K.

Its mechanical properties vary greatly, dependent upon the form carbon takes in the alloy.

“White” cast irons contain their carbon in the form of cementite, or iron carbide.

This hard, brittle compound dominates the mechanical properties of white cast irons, rendering them hard, but unresistant to shock.

The broken surface of a white cast iron is full of fine facets of the broken carbide, a very pale, silvery, shiny material, hence the appellation.

Wrought iron contains less than 0.25% carbon.

It is a tough, malleable product, but not as fusible as pig iron.

Wrought iron is characterized by the presence of fine fibers of slag entrapped in the metal.

Wrought iron is more corrosion resistant than steel.

It has been almost completely replaced by mild steel for traditional “wrought iron” products and blacksmithing.

Упражнение 4

Найдите синонимы

Commercially — (industrially / privately)

Purity — (cleanliness / contamination)

Additives — (ingredients / contaminants)

Contaminants — (impurities / additives)

Intermediate — (middle / final)

Properties — (characteristics / features)

Melting — (boiling / freezing)

Form — (shape / type)

Hard — (soft / brittle)

Brittle — (flexible / fragile)

Facets — (sides / surfaces)

Tough — (delicate / strong)

Malleable — (brittle / pliable)

Fusible — (meltable / solid)

Characterized — (defined / described)

Task 2. Read the second part of the text about ferrous metals paying attention to the metallurgical terms. Explain the italicized phrases.

Mild steel corrodes more readily than wrought iron, but is cheaper and more widely available. Alloy steels contain varying amounts of carbon as well as other metals, such as chromium, vanadium, molybdenum, nickel, tungsten, etc. Their alloy content raises their cost, and so they are usually only employed for specialist uses. One common alloy steel, though, is stainless steel. Recent developments in ferrous metallurgy have produced a growing range of microalloyed steels, also termed 24 'HSLA' or high-strength, low

alloy steels, containing tiny additions to produce high strengths and often spectacular toughness at minimal cost. Apart from traditional applications, iron is also used for protection from ionizing radiation. Although it is lighter than another traditional protection material, lead, it is much stronger mechanically. The main disadvantage of iron and steel is that pure iron, and most of its alloys, suffer badly from rust if not protected in some way. Painting, galvanization, passivation, plastic coating and bluing are all used to protect iron from rust by excluding water and oxygen or by cathodic protection¹. (Source: engineershandbook.com/Materials/ferrous.htm)

Words to remember

Mild steel – мягкая малоуглеродистая сталь, свариваемая сталь

Alloy steel – легированная сталь

Lead – свинец

Rust – ржавчина

Galvanization – оцинковывание

Passivation – пассивация, поверхностная протравка, декапировка

Plastic coating – пластиковое покрытие

Bluing – воронение

Task 3. Discuss the questions

A. What are the different types of steel?

B. What does “HSLA” stand for?

C. What is the main disadvantage of iron?

Unit 15

Basic Metallurgy of Cast Iron

The term ‘cast iron’, like the term ‘steel’, identifies a large family of ferrous alloys. Cast irons primarily are alloys of iron that contain more than 2% carbon and form from 1 to 3% silicon. Wide variations in properties can be achieved by varying the balance between carbon and silicon, by alloying with various metallic or nonmetallic elements, and by varying melting, casting and heat treating practices.

Cast irons, as the name implies, are intended to be cast to shape rather than formed in the solid state. Cast irons have low melting temperatures, are very fluid when molten, do not form undesirable surface films when poured, and undergo slight to moderate shrinkage during solidification and cooling. However, cast irons have relatively low impact resistance and ductility, which may limit their use.

Mechanical properties of cast irons - especially strength, ductility, and modulus of elasticity - depend strongly on structure and distribution of microstructural constituents. Physical properties such as thermal conductivity and damping capacity are also strongly influenced by microstructure.

The four basic types of cast iron are white iron, gray iron, ductile iron and malleable iron. White iron and gray iron derive their names from the appearances of their respective fracture surfaces: white iron exhibits a white, crystalline fracture surface, and gray iron exhibits a gray fracture surface with exceedingly tiny facets. Ductile iron derives its name from the fact that, in the as-cast form, it exhibits measurable ductility. By contrast, neither white nor gray iron exhibits significant ductility in a standard tensile test. Malleable iron is cast as white iron, then “malleablized” - that is, heat treated to impart ductility to an otherwise exceedingly brittle material.

Besides the four basic types, there are other specific forms of cast iron to which special names have been applied. Chilled iron is

white iron that has been produced by cooling very rapidly through the solidification temperature range. An area of the casting that solidifies at a rate intermediate between those of chilled iron and gray iron, and which exhibits microstructural and fracture-surface features of both types, is known as mottled iron. Compacted graphite cast iron (also known as vermicular iron) has a structure intermediate between those of gray iron and ductile iron.

Упражнение 1

Выберите правильное слово

Commercially available iron is classified based on (purity / color) and the abundance of additives.

Pig iron has 3.5–5% (carbon / silicon) and contains varying amounts of contaminants such as sulfur, silicon, and phosphorus.

Pig iron is not a saleable product, but rather an intermediate step in the production of (cast iron / bronze) and steel from iron ore.

Cast iron contains 2–4% carbon, 1–6% (silicon / sulfur), and small amounts of manganese.

Contaminants present in pig iron that negatively affect material properties, such as sulfur and phosphorus, have been reduced to an (acceptable / unacceptable) level.

It has a melting point in the range of 1420–1470 (Celsius / Kelvin).

Its mechanical properties vary greatly, dependent upon the form (carbon / silicon) takes in the alloy.

“White” cast irons contain their carbon in the form of cementite, or (iron carbide / iron oxide).

This hard, brittle compound dominates the mechanical properties of white cast irons, rendering them hard, but unresistant to (heat / shock).

The broken surface of a white cast iron is full of fine facets of the broken carbide, a very pale, silvery, shiny material, hence the (appellation / composition).

Wrought iron contains less than 0.25% (carbon / silicon).

It is a tough, malleable product, but not as (fusible / malleable) as pig iron.

Wrought iron is characterized by the presence of fine fibers of (slag / carbon) entrapped in the metal.

Wrought iron is more (corrosion / heat) resistant than steel.

It has been almost completely replaced by mild steel for traditional “wrought iron” products and (blacksmithing / welding).

Упражнение 2

Ответьте на вопросы

How is commercially available iron classified?

What is the carbon content of pig iron?

What is pig iron used for?

What are the main components of cast iron?

How are contaminants in pig iron reduced?

What is the melting point range of cast iron?

How do the mechanical properties of cast iron vary?

What is the form of carbon in white cast iron?

What are the characteristics of white cast iron?

What is the carbon content of wrought iron?

What are the properties of wrought iron?

What characterizes wrought iron?

How does wrought iron compare to steel in terms of corrosion resistance?

What has largely replaced wrought iron in traditional products?

Упражнение 3

Переведите предложения

Commercially available iron is classified based on purity and the abundance of additives.

Pig iron has 3.5–5% carbon and contains varying amounts of contaminants such as sulfur, silicon, and phosphorus.

Pig iron is not a saleable product, but rather an intermediate step in the production of cast iron and steel from iron ore.

Cast iron contains 2–4% carbon, 1–6% silicon, and small amounts of manganese.

“White” cast irons contain their carbon in the form of cementite, or iron carbide.

This hard, brittle compound dominates the mechanical properties of white cast irons, rendering them hard, but unresistant to shock.

The broken surface of a white cast iron is full of fine facets of the broken carbide, a very pale, silvery, shiny material, hence the appellation.

Wrought iron contains less than 0.25% carbon.

It is a tough, malleable product, but not as fusible as pig iron.

Wrought iron is characterized by the presence of fine fibers of slag entrapped in the metal.

Wrought iron is more corrosion resistant than steel.

It has been almost completely replaced by mild steel for traditional “wrought iron” products and blacksmithing.

Упражнение 4

Найдите синонимы

Commercially — (industrially / privately)

Purity — (cleanliness / contamination)

Additives — (ingredients / contaminants)

Contaminants — (impurities / additives)

Intermediate — (middle / final)

Properties — (characteristics / features)

Melting — (boiling / freezing)

Form — (shape / type)

Hard — (soft / brittle)

Brittle — (flexible / fragile)

Facets — (sides / surfaces)

Tough — (delicate / strong)

Malleable — (brittle / pliable)

Fusible — (meltable / solid)

Characterized — (defined / described)

Упражнение 5

Заполните пропуски

The term 'cast iron', like the term 'steel', identifies a large family of _____ alloys.

Cast irons primarily are alloys of iron that contain more than 2% _____ and form from 1 to 3% _____.

Wide variations in properties can be achieved by varying the balance between carbon and silicon, by alloying with various _____ or nonmetallic elements, and by varying melting, casting and heat treating practices.

Cast irons, as the name implies, are intended to be cast to shape rather than _____ in the solid state.

Cast irons have low melting temperatures, are very _____ when molten, do not form undesirable surface films when poured, and undergo slight to moderate _____ during solidification and cooling.

However, cast irons have relatively low impact resistance and _____, which may limit their use.

Mechanical properties of cast irons - especially strength, ductility, and modulus of elasticity - depend strongly on _____ and distribution of microstructural constituents.

Physical properties such as thermal conductivity and damping capacity are also strongly influenced by _____.

The four basic types of cast iron are white iron, gray iron, ductile iron and _____ iron.

White iron and gray iron derive their names from the appearances of their respective _____ surfaces: white iron exhibits a white, crystalline fracture surface, and gray iron exhibits a gray fracture surface with exceedingly tiny facets.

UNIT 16

Precious Metals

Why are some metals so much more valuable than others? Gold, silver and platinum have been highly valued for centuries because of their scarcity, beauty and high qualities. The result of the rush for these metals was death, blood and tragedy.

When Christopher Columbus discovered the Americas in 1492, Spanish expeditions soon followed, and though they are much criticised for their cruelty, greed and treachery, the military achievements of the 'Conquistadores' were remarkable. First they conquered Mexico and took away its valuable treasures. Seeking more land and wealth they invaded Peru, home of the Incas. Here they murdered the king and stole his vast hoard of gold - probably the greatest in the world. The natives were enslaved and set to work to win more gold. Later the Spanish conquered Chile and Bolivia, both of these countries being rich in precious metals, particularly silver.

To the metallurgists, the most exciting discovery made by the Spaniards was the finding of platinum in the silver mines of Mexico. At that time the new metal was regarded as more of a nuisance than of value. It could not be melted by any known method, though it was possible to make a very realistic imitation gold from it. Later it joined the group of precious metals and is now used for jewellery and in industry. Its high melting point makes it suitable for electrical contacts where the heat of sparks would melt other metals. In the chemical industries its resistance to corrosion is of great value.

Gold is the most malleable of all the metals. It can be hammered into sheets so thin that 250 of them would equal the thickness of a sheet of paper. It is also the most ductile metal. One gram of gold can be drawn into a wire 1.8 miles in length.

Gold is the least chemically active of all metals and does not combine with oxygen to form rust. This ability to resist corrosion makes it very durable, i.e. it may last for centuries. Pure gold is too soft to be used in jewelry so it is usually alloyed with other metals.

The proportion of gold in an alloy is measured in karats. Pure gold is 24 karats. A 14 karat gold ring is an alloy of about 58% of gold and small percentages of copper and silver.

Silver is similar to gold in many ways. Like gold, it is very malleable and ductile and so it is also used for jewelry. Silver differs from gold in that it is more reactive and tarnished when exposed to the traces of sulfur in the air. (Silver sulfide, a black deposit, forms on its surface). Pure silver is too soft and so it is usually alloyed with copper to increase its hardness and durability. Sterling silver is 92.5 percent silver and 7.5 percent copper. Silver is used for coins and for photographic film because certain compounds of silver, such as silver bromide, reflect light. Silver is the best conductor of electricity known.

Упражнение 1

Вопросы для понимания текста:

Why are gold, silver, and platinum considered precious metals?

What significant event in history led to the discovery of precious metals in the Americas?

What did the Conquistadores do in Mexico and Peru?

How did the Spaniards use the native people after conquering their lands?

What was the most exciting discovery made by the Spaniards in the silver mines of Mexico?

What are the unique properties of platinum that make it valuable in industry?

Describe the malleability and ductility of gold.

Why is pure gold not used in jewelry?

What is the difference between gold and silver in terms of their reactivity?

What is sterling silver, and what is it used for?

Упражнение 2

Сопоставьте слова с их определениями:

Scarcity

Treachery
Hoard
Metallurgists
Malleable
Ductile
Karat
Tarnish
Alloy
Corrosion

- a) A large collection or stock of something.
- b) The quality of being easily shaped or molded.
- c) The ability to be drawn out into a wire.
- d) A measure of the purity of gold.
- e) The process of a metal becoming discolored or corroded.
- f) A mixture of two or more metals.
- g) The gradual destruction of material, especially metals, by chemical reactions with the environment.
- h) The state of being rare or in short supply.
- i) Betrayal of trust or confidence.
- j) Experts in the science and technology of metals.

Упражнение 3

Sentence Completion

Заполните пропуски словами из текста:

Gold, silver, and platinum have been highly valued for centuries because of their _____, beauty, and high qualities.

The military achievements of the 'Conquistadores' were _____.

The natives were enslaved and set to work to win more _____.

Platinum is now used for _____ and in industry.

Gold is the most _____ of all the metals.

One gram of gold can be drawn into a wire _____ miles in length.

Pure gold is too _____ to be used in jewelry.
Silver is the best conductor of _____ known.
Sterling silver is 92.5 percent _____ and 7.5 percent copper.

Silver sulfide, a black deposit, forms on its surface when silver is exposed to _____ in the air.

Упражнение 4

Исправьте грамматические ошибки в следующих предложениях:

Gold, silver and platinum has been highly valued for centuries.
The military achievements of the ‘Conquistadores’ was remarkable.

They conquered Mexico and took away its valuable treasures.

The natives was enslaved and set to work to win more gold.

Platinum is now used for jewellery and in the industry.

Gold is the less chemically active of all metals.

One gram of gold can be draw into a wire 1.8 miles in length.

Pure gold is to soft to be used in jewelry.

Silver is more reactive then gold.

Silver is the best conductor of the electricity known.

Упражнение 5

Напишите короткий абзац о том, как золото и серебро используются в современной промышленности, используя информацию из текста

UNIT 17

The role of metallurgy in today's society

We live in a material world. Today, it is the role of the materials engineer to study, develop, design and operate processes that transform raw materials into useful engineering products intended to improve the quality of our lives.

The industrial revolution thrust metals into the forefront of technology, and they have become the very foundation of our modern society. One cannot envision a life in which electronics, transportation systems, buildings and machines are not part of our daily lives.

Metallurgy is the part of materials science and materials engineering that studies the physical and chemical behavior of metallic elements, their intermetallic compounds and their alloys. Metallurgy is also the technology of metals: The way in which science is applied to the production of metals and the engineering of metal components for use in consumer products and manufactured goods. The production of component parts made from metals is traditionally divided into several categories.

Mineral processing: Involves gathering mineral products from the Earth's crust.

Extractive metallurgy: The study and application of the processes used in the separation and concentration of raw materials. Techniques include chemical processing to convert minerals from inorganic compounds to useful metals and other materials.

Physical metallurgy: Links the structure of materials (primarily metals) with their properties. Concepts such as alloy design and microstructural engineering help link processing and thermodynamics to the structure and properties of metals. Through these efforts, goods and services are produced.

Metallurgical engineers are involved in all aspects of the modern world and strive to meet the needs of modern society in an environmentally responsible way by designing processes and

products that minimize waste, maximize energy efficiency, increase performance and facilitate recycling.

Упражнение 1

Прочитайте текст и ответьте на вопросы:

Какую роль играют материалы инженеры в современном обществе?

Что стало основой нашей современной цивилизации после промышленной революции?

Определите, что изучает металлургия.

Назовите три основные категории производства металлических компонентов.

Какие задачи ставят перед собой металлургические инженеры?

Упражнение 2

Заполните пропуски словами из текста:

Today, it is the role of the _____ engineer to study, develop, design and operate processes that transform raw materials into useful engineering products.

The industrial revolution thrust _____ into the forefront of technology.

Metallurgy is the part of materials science and materials engineering that studies the physical and chemical behavior of _____ elements, their intermetallic compounds and their alloys.

The production of component parts made from metals is traditionally divided into several _____.

Metallurgical engineers are involved in all aspects of the modern world and strive to meet the needs of modern society in an environmentally _____ way.

Упражнение 3

Найдите синонимы и антонимы для следующих слов:

Role — синоним: _____, антоним: _____

Transform — синоним: _____, антоним: _____

Foundation — синоним: _____, антоним: _____
Production — синоним: _____, антоним: _____
Recycling — синоним: _____, антоним: _____

Упражнение 4

Перестройте предложения, сохраняя их смысл:

Today, it is the role of the materials engineer to study, develop, design and operate processes.

Materials engineers are responsible for studying, developing, designing, and operating processes today.

The industrial revolution thrust metals into the forefront of technology.

Metals were brought to the forefront of technology by the industrial revolution.

Metallurgy is the part of materials science and materials engineering that studies the physical and chemical behavior of metallic elements.

The study of the physical and chemical behavior of metallic elements is part of materials science and materials engineering known as metallurgy.

The production of component parts made from metals is traditionally divided into several categories.

Traditionally, the production of metal component parts is divided into several categories.

Metallurgical engineers are involved in all aspects of the modern world.

All aspects of the modern world involve metallurgical engineers.

Упражнение 5

Выберите правильное слово для заполнения пропусков:

The role of the materials engineer is to (study/learn) and (develop/create) new materials.

The industrial revolution (thrust/pushed) metals into the forefront of technology.

Metallurgy is the part of materials science that (studies/examines) the physical and chemical behavior of metallic elements.

The production of component parts made from metals is traditionally (divided/split) into several categories.

Metallurgical engineers strive to meet the needs of modern society in an (environmentally/responsibly) responsible way.

Упражнение 6

Напишите короткий абзац о на английском языке о том, как металлургия влияет на вашу повседневную жизнь. Используйте слова и фразы из текста.

UNIT 18

My speciality

► Centuries ago there were only a few jobs: people were farmers, bakers, butchers or salesman. Today there are thousands of different kinds of jobs, and new ones are constantly appearing.

► May be some professions have their other advantages, for example, if you work in a bank, you can choose have a good journey in other countries.

► And the problem of choosing the future profession has always been very important and difficult matter because it determines our future life in many ways. It is one of the most important decisions for every person, and law.

It is rather small building, but very comfortable. Students say that our building is the best and it is quite easy to find different classes

► As for subjects – we have ten. They are: English practice, grammar and phonetics, Russian, Survival Science, Pedagogic science, Medicine, History, Chemistry, Physical Education and others.

► I find my subjects quite amazing because they help me to understand the way of teaching other people and to learn some more information, I have never known before

► **So, I that I have made the right choice!**

When choosing a future career, we should consider different factors. In my opinion, money is the most important factors when you make a choice.

There are highly-paid jobs and low-paid jobs. For example, a businessman, a president or a film star are highly-paid jobs. A worker, a doctor or an engineer are low-paid jobs. I think everybody wants to earn as much money as possible. Training, promotional prospects and conditions should be also taken into account.

On the other hand, it's good when you get satisfaction from your job. It's very important to choose a profession that suits to your

interests. In my opinion, a job should be interesting and socially important. Some jobs are considered to be suitable for men and others for women. For example, the profession of secretary or nurse is more suitable for women. A pilot or seaman is more likely the jobs for men. You should also decide whether you want to work indoors or outdoors.

To make the right choice, you should take into account your traits of character. It goes without saying that to become a good doctor you must be patient, caring and kind. Teacher's work requires love for children, profound knowledge of subjects, and the ability to explain. A secretary must be efficient and careful in order to do her work quickly and accurately. People need to be friendly and persuasive, to get people buy their products.

There are many people who influence us in choosing our occupation. Parents and friends play a very important role in choosing our future profession. Some people want to continue the tradition of their family, such as woodcraft, embroidery, etc.

Task. Discussion.

1. What is your future profession?
2. Why did you choose this job?
3. What are the advantages of your speciality?
4. Does your profession have any difficulties?

THE LIST OF USED LITERATURE:

1. Алёхина М.С. Английский язык для металлургов. Москва - Издательство "Русский язык", 2001 г., - 207 с.
2. Чистякова М.А. English for metallurgists. Екатеринбург, 2016 г., - 26 с.
3. <https://byjus.com/chemistry/118-elements-their-symbols-atomic-numbers/>
4. <https://www.homeenglish.ru/ArticlesMendeleev.htm>
5. <https://www.industrialheating.com/blogs/14-industrial-heating-experts-speak-blog/post/91351-the-role-of-metallurgy-in-todays-society>

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