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**Профессиональная направленность при обучении**

**иностранным языкам**

**Приложение 1.**

**Текст 1. Types of Current**

Current is a flow of electricity through a circuit. Let us consider two types of current: direct and alternating.

A direct current (d.c.) flows through a conducting circuit in one direction only. It flows provided a direct voltage source is applied to the circuit.

An alternating current (a.c.) is a current that changes its direction of flow through a circuit. It flows provided an alternating voltage source is applied to the circuit. Alternating current flows in cycles. The number of cycles per second is called the frequency of the current. In a 60-cycle alternating current circuit the current flows in one direction 60 times and in the other direction 60 times per second.

It is easy to transform a.c. power from one voltage to another by a transformer. Transformers are also used to step down the voltage at the receiving point of the line to the low values that are necessary for use. When necessary a.c. can be changed into d.c. but this is seldom necessary.

Among the most common meters used there are the ohmmeter, the ammeter and the voltmeter. The ohmmeter is used to measure the value of resistance. It consists of a millimeter calibrated to read in ohms, a battery and resistors. The meter is connected in parallel and the circuit is not opened when its resistance is measured. The readings on the scale show the measured value. The ammeter is used to measure the value of current. When the ammeter is used the circuit should be opened at one point and the terminals of the meter should be connected to it. One should take into consideration that the positive terminal of ammeter is connected to the positive terminal of the source; the negative terminal to the negative terminal of the source. The ammeter should be connected in series. The readings on the scale show the measured value.

**Exercise 1. Answer the questions.**

What is current?

What types of current do you know?

How does current flow?

What is direct current? What is alternating current?

What is the frequency of the current?

What are the most common meters?

**Exercise 2. Read the statement. Decide whether that sentence is true or false.**

1. There are three types of current.
2. An alternating current changes its direction of flow through a circuit.
3. A direct current flows through a conducting circuit in many directions.
4. The ammeter is used to measure the value of resistance.
5. . The ohmmeter is used to measure the value of resistance
6. The positive terminal of ammeter is connected to the negative terminal of the source; the negative terminal to the negative terminal of the source.

**Exercise 3. Find the following words and words combinations in the text.**

|  |  |
| --- | --- |
| 1. электричество | 10. число циклов |
| 1. цепь | 11. частота тока |
| 1. измерять | 12. измеритель |
| 1. постоянный ток | 13.параллельно |
| 1. переменный ток | 14.амперметр |
| 1. направление | 15.вольтметр |
| 1. источник напряжения | 16.омметр |
| 1. величина сопротивления | 17.величина тока |
| 1. градуированный | 18.измеряемая величина |

**Exercise 4. Complete the sentences.**

1. Current is …………….
2. The frequency of the current is…………………
3. The ohmmeter consists of ……………………….
4. The ammeter should be connected in………….
5. The ammeter measures………………………..
6. The ohmmeter measures……………………….

**Текст 2. Conductors and Insulators**

Conductorsare materials having a low resistance so that current easily passes through them. The lower the resistance of the material, the more current can pass through it.

Тhe most common conductors are metals. Silver and copper are the best of them. The advantage of copper is that it is much cheaper than silver. Thus copper is widely used to produce wire conductors. One of the common functions of wire conductors is to connect a voltage source to a load resistance. Since copper wire conductors have a very low resistance a minimum voltage drop is produced in them. Thus, all of the applied voltage can produce current in the load resistance. It should be taken into consideration that most materials change the value of resistance when their temperature changes.

Metals increase their resistance when the temperature increases while carbon decreases its resistance when the temperature increases. Thus metals have a positive temperature coefficient of resistance while carbon has a negative temperature coefficient. The smaller is the temperature coefficient or the less the change of resistance with the change of temperature, the more perfect is the resistance material.

Materials having a very high resistance are called insulators. Current passes through insulators with great difficulty. The most common insulators are air, paper, rubber, plastics. Any insulator can conduct current when a high enough voltage is applied to it. Currents of great value must be applied to insulators in order to make them conduct. The higher the resistance of an insulator, the greater the applied voltage must be.

**Exercise 1. Answer the questions.**

What are conductors?

What are insulators?

What are the most common conductors, insulators?

What are the best conductors? How does current pass through insulators?

What is the common function of wire conductors? What do the most materials when their temperature changes?

**Exercise 2. Read the statement. Decide whether that sentence is true or false.**

1. The best conductors are silver and copper.
2. Copper isn’t used to produce wire conductors.
3. Metals increase the resistance when the temperature increases.
4. Conductors are materials having a low resistance
5. insulators are materials having a low resistance
6. The most common insulators are air, paper, rubber, plastics.
7. Current passes through insulators easily.
8. Current passes through conductor with great easily.
9. Metals have a positive temperature coefficient of resistance while carbon has a negative temperature coefficient.
10. Any insulator can conduct current when a high enough voltage is applied to it.

**Exercise 3. Find the following words and words combinations in the text.**

|  |  |
| --- | --- |
| 1. проводник | 9. активная нагрузка |
| 1. изолятор | 10.коэфициент |
| 1. ток проходит | 1. изменение |
| 1. медь и серебро | 1. углерод |
| 1. сопротивление | 1. принимать во внимание |
| 1. преимущества | 1. увеличивать |
| 1. проволочный проводник | 1. для того, чтобы |
| 1. источник напряжения | 1. увеличивать/ уменьшать |

**Текст 3. Atomic Power Plant**

Atomic power plants are modem installations. They consist of several main units and a great number of auxiliary ones. In a nuclear reactor uranium is utilized as a fuel. During operation process powerful heat and radioactive radiation are produced. The nuclear reactor is cooled by water circulation. Cooling water circulates through a system of tubes, in which the water is heated to a temperature of 250-300°C. In order to prevent boiling of water, it passes into the reactor at a pressure up to 150 atmospheres.

A steam generator includes a series of heat exchangers comprising tubes. The water heated in the reactor is delivered into the heat exchanger tubes. The water to be converted into steam flows outside these tubes. The steam produced is fed into the turbo generator. Besides, an atomic power plant comprises a common turbo generator, a steam condenser with circulating water and a switchboard.

Atomic power plants have their advantages as well as disadvantages. The reactors and steam generators operate in them noiselessly; the atmosphere is not polluted by dust and smoke. As to the fuel consumption, it is of no special importance and there is no problem of fuel transportation.

The disadvantage of power plants utilizing nuclear fuel is their radiation. Radioactive radiation produced in the reactors is dangerous for attending personnel. Therefore, the reactors and steam generators are installed underground. They are also shielded by thick (up to 1.5 m) concrete walls. All their controls are operated by means of automatic devices. These measures serve to protect people from radioactive radiation.

**Exercise 1. Answer the questions.**

What are atomic power plants?

What do atomic power plants consist of?

How does the nuclear reactor cooled by?

What does a steam generator include?

What are advantages and disadvantages of atomic power plants?

**Exercise 2. Read the statement. Decide whether that sentence is true or false.**

1. Atomic power plants are modem installations.
2. The water is heated to a temperature of 250-350°C.
3. During operation process powerful heat and radioactive radiation are produced.
4. Atomic power plants have their advantages but they don’t have disadvantages.
5. The atmosphere is polluted by dust and smoke.
6. The reactors and steam generators are installed underground.

**Exercise 3. Find the following words and words combinations in the text.**

|  |  |
| --- | --- |
| 1. транспортировка | 10.паровой генератор |
| 1. атмосфера | 11. доставляется |
| 1. ядерный реактор | 12.конденсатор |
| 1. топливо | 13.переключатель |
| 1. охлаждение воды | 14.пыль и дым |
| 1. трубы |  |
| 1. циркуляция | 15.радиация. |
| 1. теплообменник | 16.расход топлива |
| 1. защищать людей | 17.автоматические устройства |

**Текст 4. Capacitors**

A capacitor is one of the main elements of a circuit. It is used to store electric energy. A capacitor stores electric energy provided that a voltage source is applied to it. The main parts of a capacitor are metal plates and insulators. The function of insulators is to isolate the metal plates and in this way to prevent a short.

There are two common types of capacitors in use nowadays: a fixed capacitor and a variable one. The plates of a fixed capacitor cannot be moved; for this reason its capacity does not change. The plates of a variable capacitor move; its capacity changes. The greater the distance between the plates, the less is the capacity of a capacitor. Variable capacitors are commonly used by radiomen; their function is to vary the frequency in the circuit. Fixed capacitors are used in telephone and radio work. Fixed capacitors have insulators produced of paper, ceramics and other materials; variable capacitors have air insulators. Paper capacitors are commonly used in radio and electronics; their advantage is their high capacity: it may be higher than1,000 Pico farad.

Besides, electrolyte capacitors are highly in use. They also have in very high capacity: it varies from 0.5 to 2,000 microfarad. Their disadvantage is that they change their capacity when the temperature changes. They can operate without a change only at temperatures not lower than -40" С. Common troubles in capacitors are an open and a short. A capacitor stops operating and does not store energy in case it has a trouble. A capacitor with a trouble should be substituted by a new one.

**Exercise 1. Answer the questions.**

What is a capacitor?

What are the main parts of a capacitor?

What is the function of insulators?

How many types of capacitor in use today?

What is capacity of a fixed capacitor and a variable one?

Where are capacitors used?

What capacitors are highly in use?

**Exercise 2. Read the statement. Decide whether that sentence is true or false.**

1. The capacitor is used to store electric energy.
2. There are three types of capacitors.
3. The plates of a fixed capacitor move.
4. The plates of a variable capacitor move.
5. The capacity of a fixed capacitor does not change but the capacity of a variable capacitor changes.
6. Fixed capacitors are not used in telephone and radio work.
7. The advantage of paper capacitors is low capacity.
8. The function of Variable capacitor is to vary the frequency in the circuit.
9. The capacity of electrolyte capacitor doesn’t change its capacity when the temperature changes.
10. A capacitor with a trouble should be substituted by a new one.

**Exercise 3. Find the following words and words combinations in the text.**

Конденсатор, главные части, менять частоту в цепи, работать без изменений, прилагать, применять, поломка, хранить электрическую энергию, изолировать, радио и электроника, преимущество, недостаток, предотвратить замыкание.

## Текст 5. 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.

Vocabulary:

property — свойство

metallurgy — металлургия

separation — разделение, отстояние

dense — плотный

arrangement — расположение

regularly — регулярно, правильно

to slide — скользить

malleable — ковкий, податливый, способ­ный деформироваться

bent *pp of* bend — гнуть

to fracture — ломать

ductile — эластичный, ковкий

to draw — волочить, тянуть

wire — проволока

lead — свинец

iron — железо, чугун

grain — зерно

to depend — зависеть

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 (напр. молотом)

extrusion — экструзия

metal fatigue — усталость металла

creep — ползучесть

stress — давление,

failure — повреждение, разрушение

vessel — сосуд, котел, судно

lathe — токарный станок

milling machine — фрезерный станок

shaper — строгальный станок

grinder — шлифовальный станок

to melt — плавить, плавиться расплавить

to cast — отливать, отлить

mould — форма *(для отливки)*

***General understanding:***

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?

**Exercise 1.1. 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

**Exercise 1.2. 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...

***Exercise 1.3.* 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.

## Text 6: «Welding»

Welding is a process when metal parts are joined together by the application of heat, pressure, or a combination of both. The processes of welding can be divided into two main groups:

• pressure welding, when the weld is achieved by pressure and

• heat welding, when the weld is achieved by heat. Heat welding is the most common welding process used today.

Nowadays welding is used instead of bolting and riveting in the construction of many types of structures, including bridges, buildings, and ships. It is also a basic process in the manufacture of machinery and in the motor and aircraft industries. It is necessary almost in all productions where metals are used.

The welding process depends greatly on the properties of the metals, the purpose of their application and the available equipment. Welding processes are classified according to the sources of heat and pressure used.

The welding processes widely employed today include gas welding, arc welding, and resistance welding. Other joining processes are laser welding, and electron-beam welding.

### 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

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 the metal electrode, which supplies filler metal for the weld. This process is used mainly for weld­ing steels.

Vocabulary:

to join — соединять

pressure welding — сварка давлением

heat welding — сварка нагреванием

instead — вместо, взамен

bolting — скрепление болтами

riveting — клепка

basic — основной

to manufacture — изготовлять

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

touching — касание

tip — кончик

**General understanding:**

1. How can a process of welding be defined?

2. What are the two main groups of processes of welding?

3. How can we join metal parts together?

4. What is welding used for nowadays?

5. Where is welding necessary?

6. What do the welding processes of today include?

7. What are the principles of gas welding?

8. What kinds of welding can be used for joining steels?

9. What does arc welding require? 10. What is the difference between the arc welding and shielded-metal welding?

**Exercise 6.1. 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 подача электрического тока
11. Электрическая дуга
12. Источник электрического тока

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