МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ
Федеральное государственное бюджетное образовательное учреждение высшего образования
«Воронежский государственный технический университет»
Строительно-политехнический колледж

МЕТОДИЧЕСКИЕ УКАЗАНИЯ

ТЕХНОЛОГИЯ МАШИНОСТРОЕНИЯ: ЛИТЕЙНОЕ ПРОИЗВОДСТВО

для практических занятий и организации самостоятельной работы по дисциплинам "Иностранный язык" и "Иностранный язык в профессиональной деятельности"
для студентов специальностей 15.02.08 Технология машиностроения, 15.02.10 Мехатроника и мобильная робототехника

Методические указания обсуждены на заседании методического совета СПК

«18» 02. 2022 года Протокол № 6

Председатель методического совета СПК_____ Сергеева С. И.

Методические указания одобрены на заседании педагогического совета СПК

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Составитель: преп. Н.В. Аленькова

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Методические указания к учебному материалу на английском языке для студентов специальностей 15.02.08 «Технология машиностроения», 15.02.10 «Мехатроника и мобильная робототехника» очной формы обучения / ФГБОУ ВО «Воронежский государственный технический университет»; сост. Н.В. Аленькова, 2022. 24 с.

Методические указания содержат учебные тексты и задания для аудиторной работы. Они предназначены для развития навыков чтения, реферирования и аннотирования литературы по специальности, а также для развития навыков говорения и расширения терминологической лексики. Задания содержат упражнения на усвоение лексических единиц по специальности и развитие навыков говорения.

Предназначены для студентов 3 курса.
Библиогр.: 2 назв.

Рецензент канд. филол. наук, доц. Е.В. Сарафанникова

Ответственный за выпуск директор СПК Дегтев Д.Н.

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UNIT 1

1. Study the following words and word combinations of your active vocabulary:

1. casting – литье; отливка;
2. cast – отливать, лить;
3. mould – литейная форма, форма;
4. green sand mould – литейная форма из сырого песка;
5. pattern – модель;
6. permanent mould – постоянная литейная форма;
7. die castings – отливки в постоянные формы.

2. Find the Russian equivalents to the following words and word combinations:

Расплавленный металл	Castings
Отливки	Molten metal
Модель	Viscosity
Литейная форма	Pattern
Сплавы	Permanent mould
Хрупкий	Die Castings
Литье в постоянные формы	Alloys
Отливки в постоянные формы	Brittle
Вязкость	Mould

3. Read and translate the text:

CASTINGS

For many purposes, the simplest process of producing metal articles is that of casting the molten metal into a suitable mould. The relatively low melting point of aluminium permits the use of a variety of casting processes that are not suitable for metals like iron

and copper. The cheapest type of mould is one made of moist ("green") sand, which is rammed around a wooden or metallic pattern. Where only a limited number of castings are to be made, or where the casting is very large or intricate, sand moulds produce the cheapest castings. If very large numbers of the same casting are to be produced, and if the casting is not too large, a permanent mould (usually iron) may be used, because of the moderate casting temperatures employed, and may produce castings that are both cheaper and metallurgically superior. By rapidly forcing metal under pressure into a suitable permanent mould "die castings" are produced. They have very high surface smoothness and dimensional accuracy. A special type of plaster used for moulds produces castings with surface smoothness and dimensional accuracy comparable with those of die castings, but with somewhat lower mechanical properties.

Of the alloying elements used with aluminium, zinc was the cheapest and was one of the earliest used. It very decidedly increases the strength of aluminium and at least 15 or 20 per cent of it may be added with beneficial results, as far as the strength and ease of casting are concerned. It was soon found, however, that binary aluminium-zinc casting alloys were quite inferior to pure aluminium, from the standpoint of hot shortness and resistance to corrosion as well as specific gravity, and that they had a marked tendency to become brittle with age, so they have not been used extensively for many years. Silicon and iron are the two most common impurities in aluminium, and traditionally both were generally looked upon as undesirable. Iron, indeed, in amounts up to perhaps 1.5 percent or a little more, may improve the tensile strength of some of the alloys, but if there is much more than this the high-melting iron-aluminium constituent increases the viscosity of the alloy at the pouring temperature and also tends to make the castings brittle.

4. Answer the following questions:

1. What is the simplest process of making metal articles for many purposes?
2. What quality of aluminium permits the use of a variety of casting processes that are not suitable for metals like iron and copper?
3. Which is the cheapest type of mould?
4. In what case may a permanent mould be used?
5. In what way die castings are produced?
6. What characteristic features are typical for die castings?
7. What are the two most common impurities in aluminium?

5. Write an annotation to the text "Castings", using the plan on pages 23 – 24 Unit 10.

UNIT 2

1. Study the words:

1. unconventional – нетрадиционный
2. impact molding – ударное прессование; штамповка
3. explosion – взрыв
4. instantaneous – мгновенный
5. ignition – воспламенение
6. spark-plug – свеча зажигания
7. densification – загущение, уплотнение
8. dispensing hopper – дозирующий желоб
9. sealed – герметизированный
10. vent – входное/выходное отверстие

2. Read the text and try to understand its main idea:

RECENT TECHNIQUES

Several new concepts have been developed in recent years in foreign countries. They achieve mold compaction in a variety of

unconventional ways. Impact molding, originated in Switzerland, compacts sand by utilizing either a controlled explosion or the instantaneous release of a compressed air supply.

In the former method, sand is fed under gravity into the flask, which is connected to a chamber containing a mixture of natural gas and air. Ignition of the mixture by means of a spark-plug results in instantaneous application of pressure to the sand.

An air-impulse system developed in West Germany uses compressed air to effect compaction. A large volume of high-pressure air is released instantaneously through a rapid-acting diaphragm valve. In common with the impact molding procedure, no squeezing action on the sand is required. Actually, there is some relationship to the diaphragm concept, in which high-pressure air is released onto a rubber diaphragm on the mold surface.

Another process developed in West Germany is based on the principle that pattern and flask are totally enclosed in a molding chamber, from which air is extracted before sand filling takes place. The pressure drop between the evacuated flask and the sand-dispensing hopper is said to assure even filling without the creation of pockets in the mold. The mold is squeezed while vacuum is maintained.

A Japanese molding sequence is a two-stage method of producing a foundry mold. The portion of the mold closest to the pattern is compacted by applying a flow of compressed air through the molding sand. The mold is squeezed to achieve uniform density and hardness. Compressed air is applied to the molding sand in a sealed flask for a short period and is exhausted through vents in the pattern-plate.

3.Answer the following questions:

2. What method compacts sand by utilizing either a controlled explosion or the instantaneous release of a compressed air supply?

3. Describe the operation of an air-impulse system developed in West Germany.
4. What is the essence of the Japanese molding sequence?

4. Read the text and translate it without a dictionary and get ready to retell it:

METALLURGY

Some metals are mined in the native state. Among these are gold, silver, platinum, mercury, tin and copper. Even in the native metals, however, there is considerable foreign material, such as rock, gravel, sand and other impurities, which require removal.

Most of the metals, however, are found in the earth in oxide form. These oxides which may be mined with commercial profit is called ore. Ores of different metals are put through various refining processes to obtain the pure metal.

The more common impurities in iron ore are silica, titanium, and phosphorus. The ores which contain the smallest amounts of these impurities are the most valuable. Much silica and titanium are undesirable. Phosphorus and sulphur are undesirable too because of their adverse effect on iron and steel.

5. Write an annotation to the text “Recent techniques”, using the plan on pages 23 – 24 Unit 10.

UNIT 3

1. Study the words:

1. bottom (drag) – нижняя полуформа
2. top (cope) – верхняя полуформа
3. intermediate sections (cheeks) - щечки (промежуточные секции)
4. parting line – линия разъема
5. flask – опока
6. sprue – стояк
7. runner – литниковый ход (канал)
8. to conduct – зд. подводить
9. riser – прибыль
10. to shrink – давать усадку
11. to float – всплывать
12. to trim – обрубать

2. Read the text and find information about:

a) the factors which influence the selection of a casting method;
b) the technology of making castings by the method of sand-casting;
c) advantages and disadvantages of a given method of casting

SAND CASTING

Selection of a casting method depends primarily upon:1) quantity of parts, 2)size of the part, 3) tolerances and finish, 4) physical characteristics, 5) part configuration, 6) the metal to cast.

The oldest commercial method of making metal castings consists of forming a cavity in sand and filling the cavity with molten metal. After the metal solidifies, the sand is broken away, and the casting is removed, trimmed, and cleaned. Sand molds are

made in two or more sections: bottom (drag), top (cope) and intermediate sections (cheeks) when required. Joints between sections are the parting lines. The sand is contained in flasks, made of metal or sometimes wood.

Molten metal is poured into the sprue, and connecting runners conduct the metal to the casting cavity. Riser cavities in the cope sand over heavy sections of the casting serve as metal reservoirs. They fill with molten metal as the cavity is filled and, as the casting solidifies and shrinks, the risers feed molten metal to the heavy, slowly solidifying sections, thus minimizing porosity in the part. Slag floats to the top of the risers and thus is not incorporated into the casting. Sprue, runner, and risers are trimmed from the casting after it is removed from the sand.

Cores are hard shapes of sand placed in the mold to produce hollow castings. Patterns of wood or metal are used to prepare the mold. Extremely large or heavy castings are made by floor molding. Here, the mold is made in the floor of the foundry using the earth as the flask.

Advantages and disadvantages: Sand casting offers the least expensive method for producing general-purpose castings. Pattern equipment is relatively inexpensive and long lasting. Sand castings are more subject to human control than parts made by other casting processes. More material must be left on a sand casting to permit machining for a finished surface. Thin sections cannot be cast (1/3 in. is generally considered a practical minimum).

3. Speak about the gating system and casting equipment, used in sand casting. Fill the following table:

Part of a gating system		Purpose	
Eng.	Rus.	Eng.	Rus.
1. sprue			
2. runner			

3. riser			
4. flask			
5. parting line			
6. bottom=drag			
7. top=cope			
8. intermediate sections=cheeks			

4. Write an annotation to the text “Sand casting”, using the plan on pages 23 – 24 Unit 10.

UNIT 4

1. Study the words:

1. pig iron – чугун
2. to consume – потреблять
3. raw materials – сырье
4. flux – флюс
5. limestone – известняк
6. combustion – горение
7. tuyere – фурма
8. fire brick – огнеупорный кирпич
9. crucible - тигель
10. slag – шлак
11. cupola – вагранка

2. Read the following text and translate it.

BLAST-FURNACE

The modern blast-furnace constitutes the largest and most complicated type of metallurgical plant. Such a plant is capable of producing more than one thousand tons of pig iron a day. It

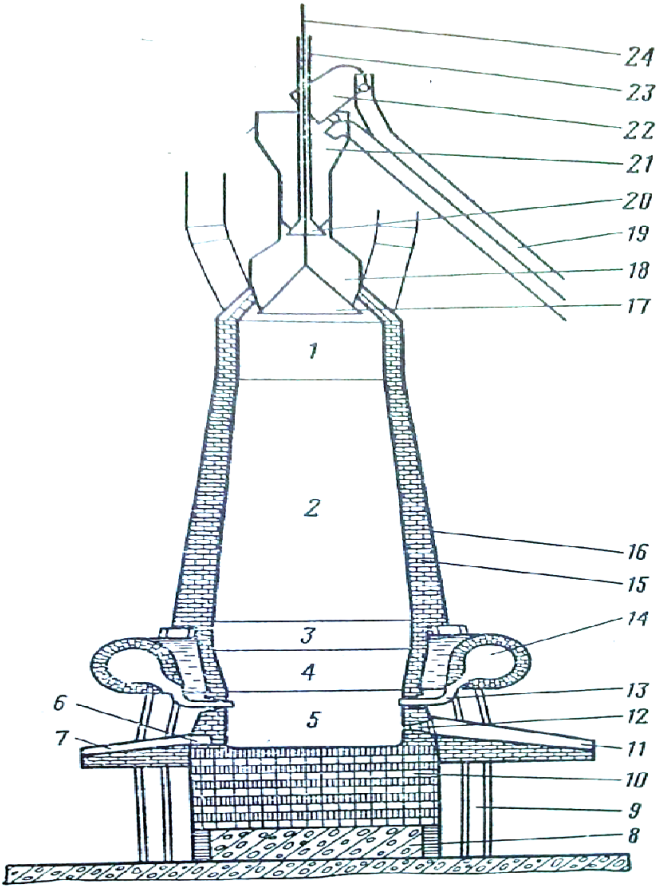

Fig. 1

consumes large quantities of raw materials. The material entering the blast-furnace consists of the iron ore, the flux (limestone), and a fuel.

The blast-furnace derived its name from the fact that the air to support combustion must be forced into it under pressure, because

of the resistance offered by the column of material within the shaft to passage of the combustion gases. The air is usually blown in the bottom through the tuyeres.

The term “charge” refers to the materials fed at the top and includes the fuel, the ore and the flux. The blast-furnace is a circular shaft of varying dimensions made of fire brick. The furnace has a cylindrical crucible at its base for the molten products to be collected. The diameter of the shaft is the biggest in the zone of fusion. A typical blast-furnace is shown in fig.1.

Chemical reactions between carbon, oxygen, and iron and its oxides occur within the blast-furnace. As a result of these reactions pig iron and slag are produced.

The cupola is a small blast-furnace used to remelt pig iron for the purpose of making iron castings in the foundry.

3. Look at the picture (Fig. 1) and give the Russian equivalents to the names of the blast-furnace parts:

1. blast-furnace top
2. shaft
3. fumigating chamber
4. shoulders
5. hearth
6. tap hole
7. cast iron channel
8. foundation
9. supporting columns
10. hearth block
11. slag channel
12. slag hole
13. tuyere
14. ring tube
15. blast-furnace lining
16. blast-furnace jacket
17. large cone of charging apparatus
18. funnel

19. skip hoist
20. small cone of charging apparatus
21. cup
22. small cone bar
23. large cone bar

4. Answer the following questions:

1. What is a blast-furnace? 2. What does the term “charge” refer to? 3. What chemical reactions occur in the blast-furnace? 4. How many tons of pig iron does a modern blast-furnace produce? 5. What is a cupola?

5. Write an annotation to the text “Blast-furnace”, using the plan on pages 23 – 24 Unit 10.

UNIT 5

1. Study the words:

1. Bessemer process – Бессемеровский процесс
2. ladle – заливочный ковш, разливочный ковш
3. ingot molds – форма для стального слитка
4. rolling – прокатка
5. forging – ковка
6. melting – плавление
7. high-grade steel – высокосортная сталь
8. open-hearth furnace – мартеновская печь

2. Read the text and get ready to answer the questions after the text.

BESSEMER AND OPEN-HEARTH PROCESSES

In the Bessemer process no fuel is used. The pig iron from the blast-furnace is poured molten into the converter, and a strong

blast of air is sent up through it. The air first oxidizes the silicon and manganese, which, together with some iron oxide, rise to the top and form a slag. The blowing is continued until the carbon content is lowered to about 0.05%. When the blow is completed, the amount of carbon necessary to bring the carbon content to the specified percentage, together with manganese to counteract the influence of sulphur, and silicon to degasify, are added to the molten metal. The finished steel is then poured into a ladle, and hence it is poured into the ingot molds for subsequent rolling or forging.

Bessemer steel is considered to be inferior to steel produced by other methods. It is still used because of low cost of its production. Bessemer steel refined additionally in the open-hearth, or electric furnace, is called duplex steel.

The open-hearth furnace is rectangular and rather low, holding from 15 to 200 tons of metal in a shallow pool. The purpose of this furnace is to convert various types of ferrous material into finished steel of proper composition and quality. The open-hearth process is a very versatile one, for it involves melting, refining and deoxidation.

Electrical furnaces are used in making high-grade steels from cold material; they are also used in additional refining of steel produced by the Bessemer and open-hearth processes. The electric furnace is now capable of making high-grade tool steels equal in quality to the steels produced by crucible process.

3. Answer the questions:

1. What metallurgical processes do you know?
2. What is the Bessemer process?
3. What is the purpose of the open-hearth furnace?
4. What are electric furnaces used for?

4. Translate sentences from Russian into English:

1. Доменная печь является сложной металлургической установкой.
2. Материал, поступающий в доменную печь, состоит из руды, флюсов и топлива.
3. Мартеновская печь вмещает от 15 до 200 тонн металла.
4. Вагранка – маленькая доменная печь, используемая для переплавки доменного чугуна.
5. Электрические печи используются для получения высококачественной стали.

5. Write an annotation to the text “Bessemer and open-hearth processes”, using the plan on pages 23 – 24 Unit 10.

UNIT 6

1. Study the following words and word combinations of your active vocabulary:

1. induction (-arc) furnace – индукционная печь;
2. open-hearth furnace – мартеновская печь;
3. blast-furnace – доменная печь;
4. induction-crucible furnace – индукционно-тигельная печь;
5. electric (-arc) furnace – электрическая печь;

2. Find the Russian equivalents to the following words and word combinations:

Доменная печь Вагранка Электрическая дуга Электрическая печь Индукционная тигельная печь Индукционная печь	Cupola furnace Electric arc Blast furnace Open-hearth furnace Induction (-arc) furnace Induction-crucible furnace

3.Read the text and try to understand it.

ELECTRIC ARC FURNACE

An electric arc furnace (EAF) is a furnace that heats charged material by means of an electric arc. Arc furnaces range in size from small units of approximately one ton capacity (used in foundries for producing cast iron products) up to about 400 ton units used for secondary steelmaking. Arc furnaces used in research laboratories and by dentists may have a capacity of only a few dozen grams. Industrial electric arc furnace temperatures can be up to 1,800 degrees Celsius, while laboratory units can exceed 3000 °C. Arc furnaces differ from induction furnaces in that the charge material is directly exposed to an electric arc, and the current in the furnace terminals passes through the charged material.

An electric arc furnace used for steelmaking consists of a refractory-lined vessel, usually water-cooled in larger sizes, covered with a retractable roof, and through which one or more graphite electrodes enter the furnace. The furnace is primarily split into three sections:

1. the shell, which consists of the sidewalls and lower steel 'bowl';
2. the hearth, which consists of the refractory that lines the lower bowl;
3. the roof, which may be refractory-lined or water-cooled, and can be shaped as a section of a sphere, or as a frustum (conical section). The roof also supports the refractory delta in its centre, through which one or more graphite electrodes enter.

The hearth may be hemispherical in shape, or in an eccentric bottom tapping furnace, the hearth has the shape of a halved egg. In modern melt shops, the furnace is often raised off the ground floor, so that ladles and slag pots can easily be maneuvered under either end of the furnace. Separate from the furnace structure is the electrode support and electrical system, and

the tilting platform on which the furnace rests. Two configurations are possible: the electrode supports and the roof tilt with the furnace, or are fixed to the raised platform.

4. Answer the following questions:

1.What is an electric arc furnace?
2.What size do electric arc furnaces range in?
3. What sections is the furnace primarily split into?
4.In what way do arc furnaces differ from induction furnaces?
5. What does an electric arc furnace used for steelmaking consist of?

5. Translate from Russian into English:

1. Вагранка – это старейший тип печей, используемых в литейном производстве.
2. Вагранка изготовлена из огнеупорных или жестких теплостойких веществ, таких как пожароустойчивая глина, кирпич или блоки.
3. Вагранковые печи имеют в высоту цилиндрическую форму, наиболее часто используются для плавления чугуна и ферросплавов.
4. Электрические печи часто используются в больших стальных литейных и металлургических предприятиях.
5. Металл загружается в печь с добавками, чтобы восстановление шлака происходило легче и тепло для плавления металла производилось с помощью электрической дуги из трех углеродных или гранитовых электродов.
6. Электродуговые печи выложены огнеупорным материалом, который разлагается медленно и удаляется вместе со шлаком.

6. Write an annotation to the text “Electric arc furnace”, using the plan on page 23 – 24 Unit 10.

UNIT 7

1. Study the following words and word combinations:

1. skin depth – глубина обшивки
2. penetrate – проникать
3. conductivity – проводимость
4. stirring - помешивание
5. turbulence – турбулентность, сила.

2. Read the following text and try to understand its main idea:

INDUCTION FURNACE

An induction furnace is an electrical furnace in which the heat is applied by induction heating of a conductive medium (usually a metal) in a crucible placed in a water-cooled alternating current solenoid coil. The advantage of the induction furnace is a clean, energy-efficient and well-controllable melting process compared to most other means of metal melting.

Most modern foundries use this type of furnace and now also more iron foundries are replacing cupolas with induction furnaces to melt cast iron, as the former emits lots of dust and other pollutants. Induction furnace capacities range from less than one kilogram to one hundred tonnes capacity, and are used to melt iron and steel, copper, aluminium, and precious metals. The one major drawback to induction furnace usage in a foundry is the lack of refining capacity; charge materials must be clean of oxidation products and of a known composition, and some alloying elements may be lost due to oxidation (and must be re-added to the melt).

Operating frequencies range from utility frequency (50 or 60 Hz) to 400 kHz or higher, usually depending on the material being melted, the capacity(volume) of the furnace and the melting

speed required. Generally the smaller the volume of the melts the higher the frequency of the furnace used; this is due to the skin depth which is a measure of the distance an alternating current can penetrate beneath the surface of a conductor. For the same conductivity the higher frequencies have a shallow skin depth - that is less penetration into the melt. Lower frequencies can generate stirring or turbulence in the metal.

A preheated 1-tonne furnace melting iron can melt cold charge to tapping readiness within an hour. Power supplies range from 10kw to 15000 kw, with melt sizes of 20 kg to 30000 kg of metal respectively.

An operating induction furnace usually emits a hum or whine (due to magnetostriction), the pitch of which can be used by operators to identify whether the furnace is operating correctly, or at what power level.

3. Answer the following questions:

1. What is an induction furnace?
2. What is the advantage of the induction furnace?
3. What is the one major drawback of such a furnace?
4. What are the operating frequencies of the induction furnaces?
5. What are the power supplies and the weight of metal for such a furnace?

4. Write an annotation to the text “Induction furnace”, using the plan on page 23 – 24 Unit 10.

UNIT 8

1. Study the following words and word combinations:

1. molding – формовка
2. pattern – модель

3. mould – мульда, форма
4. sand moulding – литье в песчаные формы
5. injection molding – литье под давлением
6. extrusion molding – прессование
7. transfer mold - компрессионно-литьевая пресс-форма

2. Find the English equivalents to the following Russian words and word combinations.

прессование	injection molding
литье под давлением	extrusion molding
ротационное литье	blow molding
сырье	rotational molding
ударное прессование	raw material

3. Read and translate the following text:

MOLDING (PROCESS)

Molding or moulding is the process of manufacturing by shaping pliable raw material using a rigid frame or model called a pattern. A mold or mould is a hollowed-out block that is filled with a liquid like plastic, glass, metal, or ceramic raw materials. The liquid hardens or sets inside the mold, adopting its shape. A mold is the opposite of a cast. The manufacturer who makes the molds is called the moldmaker. A release agent is typically used to make removal of the hardened/set substance from the mold easier.

The terminology can depend on the application. Sand casting involves both a "pattern" (which is the positive-image model of the desired part) and a "mold" (which is the negative-image hole made by packing sand around the pattern).

Types of molding include: compaction plus sintering, injection molding, reaction injection molding, compression molding, transfer molding, extrusion molding, blow molding, rotational molding, thermoforming, vacuum forming, a simplified

version of thermoforming, laminating, expandable bead molding, foam molding, rotomolding, vacuum plug assist molding, pressure plug assist molding, matched mold.

The common types of molds are:

1. Green sand

These molds are made of wet sands that are used to make the mold's shape. The name comes from the fact that wet sands are used in the molding process.

2. Cold box

Uses organic and inorganic binders that strengthen the mold by chemically adhering to the sand. This type of mold gets its name from not being baked in an oven like other sand mold types. This type of mold is more accurate dimensionally than green-sand molds but are more expensive.

3. No bake molds

No bake molding is a type of molding used for the casting of molten metals. Like sand casting it is an expendable mold that is made up of sand. The primary difference is that it keeps its form from having a liquid resin mixed with the sand at room temperature to help keep its form. Because no heat is involved it is called a cold-setting process. This type of molding also produces a better surface finish than other types of sand molds, and due to the binder does not need to be baked in an oven. Common flask materials that are used are wood, metal, or plastic. Common metals cast into no bake molds are brass, ferric, and aluminium alloys.

4. Answer the questions:

1.What is molding?
2. What is a mold?
3. How is the manufacturer who makes the molds called?
4. What is a release agent typically used for?
5. What does sand casting involve?
6. Enumerate the types of molding.
7. What are the common types of molds?

5**.** Translate from Russian into English:

1. Литье под давлением занимает одно из ведущих мест в литейном производстве.
2. Ещё один способ литья металлов — по выплавляемой модели — применяется в случаях изготовления деталей высокой точности.
3. Центробежный метод литья (центробежное литьё) используется при получении отливок, имеющих форму тел вращения.
4. Центробежное литье — это способ получения отливок в металлических формах.
5. Литьё в оболочковые формы — способ получения фасонных отливок из металлических сплавов в формах, состоящих из смеси песчаных зёрен (обычно кварцевых) и синтетического порошка.

UNIT 9

1. Read the following text and translate it:

MOLDING SAND

Molding sand, also known as foundry sand, is sand that when moistened or oiled tends to pack well and hold its shape. It is used in the process of sand casting.

Green sand is an aggregate of sand, bentonite clay, pulverized coal and water. Its principal use is in making molds for metal casting. The largest portion of the aggregate is always sand, which can be either silica or olivine. There are many recipes for the proportion of clay, but they all strike different balances between moldability, surface finish, and ability of the hot molten metal to degas. The coal, typically referred to in foundries as sea-coal, which is present at a ratio of less than 5%, partially combusts in the

presence of the molten metal leading to offgassing of organic vapors.

Sand casting is one of the earliest forms of casting practiced due to the simplicity of materials involved. It still remains one of the cheapest ways to cast metals because of that same simplicity. Other methods of casting, such as those using shell molds boast higher quality of surface finish, but higher cost.

Green sand (and other casting sands) is usually housed in what casters refer to as flasks which are nothing other than boxes without a bottom or lid. The box is split into two halves which are stacked together in use. The halves are referred to as the top (cope) and bottom (drag) flask respectively.

Green sand is not green in color, but "green" in the sense that it is used in a wet state (akin to green wood). According to the Cast Metals Federation website, an alternative casting method is to heat-dry the molded sand before pouring the molten metal. This dry sand casting process results in a more rigid mold better suited to heavier castings.

2. Answer the questions:

1. What is molding sand?
2. What is green sand?
3. Where is green sand mainly used?
4. What is sand casting?
5. Why does sand casting still remain one of the cheapest ways to cast metals?
6. What advantages and disadvantages do other methods of casting such as those using shell molds have?

3. Fill in the gaps with a proper variant:

1. Green sand is an aggregate of sand, bentonite clay, pulverized coal and…
a)gas

b)oil
c)water

2. The largest portion of the aggregate is always…which can be either silica or olivine.
a) sand
b) clay
c) ore

3. Sand casting is one of the earliest forms of casting practiced due to the… of materials involved.
a) complexity
b) simplicity
c) cheapness

4. Green sand is not green in color, but "green" in the sense that it is used in a … state:
a)dry
b)semidry
c)wet

5. The coal, typically referred to in foundries as sea-coal, which is present at a ratio of less than 5%, … combusts in the presence of the molten metal.
a) completely
b) partially
c) instantaneously

4. Read and translate the following text in the written form, using a dictionary:

OPEN HEARTH FURNACE

Open hearth furnaces are one of a number of kinds of furnace where excess carbon and other impurities are burnt out of

the pig iron to produce steel. Since steel is difficult to manufacture due to its high melting point, normal fuels and furnaces were insufficient and the open hearth furnace was developed to overcome this difficulty. Most open hearth furnaces were closed by the early 1990s, not least because of their fuel inefficiency, being replaced by the basic oxygen furnace or electric arc furnace.

Technically perhaps, the first primitive open hearth furnace was the Catalan forge, invented in Spain in the eighth century, but it is usual to confine the term to certain nineteenth century and later steelmaking processes, thus excluding bloomeries (including the Catalan forge), finery forges, and puddling furnaces from its application.

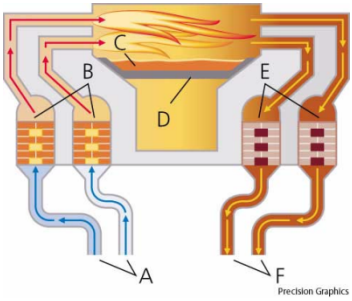

Fig. 2

A. gas and air enter B. pre-heated
B. chamber C. molten pig iron
C. D. hearth E. heating chamber (cold)
D. F. gas and air exit.

UNIT 10

HOW TO WRITE AN ANNOTATION

CONTENTS	**PHRASES**
Introduction:	
Title	*The title of the text is "...".*
Source	*The text is taken from a book "..."*

Author	*The text is written by .../The author of the text is ...*
Main body:	
Main idea	*The main idea of the text under review is…/… is the main idea./The text is about .../The text deals with a problem of ...*
Logical parts	*The text can be divided into ... logical parts./The text contains ... logical parts.*
Description of the first logical part	*The first logical part is about ... . It tells us that ... .*
Description of the second part	*The second logical part deals with ... It describes ... .*
Description of the third logical part	*The third logical part gives information about ... .*
Description of the fourth logical part	*The fourth logical part contains information about ... . It contains figures/ tables/ diagrams.*
Ending:	
Conclusion	*To sum everything up, I can say that ... .*
Attitude to the text	*I like this text, because it is very informative, important and useful for my future professional activity.* *I dislike this text, because it is very boring and unnecessary for my future professional activity.*

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