МЕЖГОСУДАРСТВЕННОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ
ВЫСШЕГО ОБРАЗОВАНИЯ
«БЕЛОРУССКО-РОССИЙСКИЙ УНИВЕРСИТЕТ»

Кафедра «Гуманитарные дисциплины»

АНГЛИЙСКИЙ ЯЗЫК

Задания для обучения профессионально ориентированному чтению на английском языке для студентов специальности 1-36 01 06 «Оборудование и технология сварочного производства» очной и заочной форм обучения

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Могилев 2020

УДК 804.0
ББК 812.АНГ
А64

Рекомендовано к изданию
учебно-методическим отделом
Белорусско-Российского университета

Одобрено кафедрой «Гуманитарные дисциплины» «26» мая 2020 г., протокол № 11

Составители: ст. преподаватель Е. С. Вербицкая;
ст. преподаватель Е. В. Грицаева;
ст. преподаватель Г. И. Свидинская
Рецензент Е. Н. Мельникова

Задания для обучения профессионально ориентированному чтению на английском языке предназначены для развития и совершенствования навыков поискового и изучающего чтения, а также для формирования рецептивных и продуктивных лексических навыков у студентов специальности 1-36 01 06 «Оборудование и технология сварочного производства». Задания разработаны на основе аутентичных текстовых материалов.

Учебно-методическое издание

АНГЛИЙСКИЙ ЯЗЫК

Ответственный за выпуск С. Е. Макарова

Корректор Т. А. Рыжикова

Компьютерная верстка Е. В. Ковалевская

Подписано в печать . Формат 60×84/16. Бумага офсетная. Гарнитура Таймс.
Печать трафаретная. Усл. печ. л. . Уч.-изд. л. . Тираж 26 экз. Заказ №

Издатель и полиграфическое исполнение:
Межгосударственное образовательное учреждение высшего образования
«Белорусско-Российский университет».
Свидетельство о государственной регистрации издателя,
изготовителя, распространителя печатных изданий
№ 1/156 от 07.03.2019.
Пр-т Мира, 43, 212022, г. Могилев.

Unit 1. What is Welding?

1. Discussion.

1. What do you know about welding?
2. Could any industry operate without welding nowadays?

2. Study the following words.

1	joining	соединение
2	gross national product	валовой национальный продукт
3	to rank	котироваться; занимать какое-то место
4	to involve	включать в себя; содержать
5	variable	показатель
6	to make a weld	произвести сварку
7	spark	искра
8	virtually	фактически; практически
9	oil drilling rig	нефтебуровая установка
10	vehicle	транспортное средство
11	to warp	деформироваться; коробиться
12	imperfection	дефект; изъян

3. Read the text.

Welding is the most economical and efficient way to join metals permanently. It is the only way of **joining** two or more pieces of metal to make them act as a single piece. Welding is vital to our economy. It is admitted that high percentage of the **gross national product** in any country is related to welding in one way or another. Welding **ranks** high among industrial processes **and involves** more sciences and **variables** than those involved in any other industrial process. There are many ways to **make a weld** and many different kinds of welds. Some processes cause **sparks** and others do not even require extra heat. Welding can be done **virtually** anywhere, outdoors or indoors, underwater and in outer space.

Nearly everything we use in our daily life is welded or made by equipment that is welded. Welders help build metal products from coffeepots to skyscrapers. They help build space vehicles and millions of other products ranging from **oil drilling rigs** to modern **vehicles**. In construction, welders are virtually rebuilding the world, extending subways, building bridges, and helping to improve the environment by building pollution control devices. The use of welding is practically unlimited.

It is not an easy job. The difficulty of it depends on many things, like the type of metal, welding position. Hard metals like titanium and steel tend to **warp** less and are therefore easier to join together. Soft materials like aluminum are easily warped and subject to damage if the surface is not thoroughly cleaned. The welder must take special care to prevent **imperfections** in the weld.

4. Complete the sentences with a proper word/word combination.

joining, gross national product, rank, involve, make a weld, spark, oil drilling rig, vehicle, warp, imperfection

1. A welder must try to … … free of defects.
2. There are few industries, which do not … welding in some part of their process.
3. During welding you should protect yourself from the danger of flying ... .
4. Cracking is an undesirable …, which may be caused by different reasons.
5. The act of bringing two things into contact or fastening them is called … .
6. An … … … is a large structure with facilities to explore, extract, store, and process oil and natural gas.
7. People use different … for transporting people or goods.
8. The total value of goods produced and services provided by a country during one year is called … … … .
9. England … first as a ship - owning nation, then comes the United States.
10. When things become bent or twisted, as a result of the effects of heat or dampness we say that they … .

5. In each line of words (1–4) find the odd one out. Explain your choice:
1. welding, joining, damaging, bonding;
2. imperfection, process, procedure, method;
3. vehicle, motor car, oil drilling rig, automobile;
4. sparks, fire, flame, wind.

6. Answer the following questions:
1. What is the only way of joining two or more pieces of metal to make them act as a single piece?
2. Are there many or few ways to make different kinds of welds?
3. Where can welding be done?
4. What can welders do?
5. Is the use of welding limited or unlimited?
6. What does the difficulty of welding depend on?

Unit 2. From the History of Welding

1. Discussion.

1. What do you know about the history of welding?
2. What early applications of any technique used for joining things do you know?

2. Study the following welding terms.

1	carburization	науглероживание
2	interlaying	чередование слоев
3	hammer forging	ковка молотом
4	cast iron	чугун
5	blacksmith	кузнец
6	joining	соединение
7	riveting	производить клёпку
8	fusion welding	сварка плавлением
9	continuous joint	сплошное соединение
10	oxyacetylene welding	ацетиленокислородная сварка
11	consumable/nonconsumable electrode	плавящийся/ неплавящийся электрод
12	bare/coated electrode	непокрытый/покрытый электрод
13	resistance welding	контактная сварка
14	arc welding	электродуговая сварка
15	butt welding	сварка встык
16	tungsten-inert gas welding (TIG)	дуговая сварка вольфрамовым электродом в среде защитного газа
17	spot and seam joining	точечное и шовное соединение

3. Read the text.

Welding is a technique used for joining metallic parts usually through the **application** of heat. This technique was discovered to manipulate iron into useful shapes. Welded blades were developed in the first millennium AD, and the most famous were produced by Arab armorers at Damascus, Syria. The process of **carburization** of iron to produce hard steel was known at this time, but that steel was very **brittle.** The welding technique, which involved **interlayering** relatively soft iron with **high-carbon material**, followed by **hammer forging**, produced a strong blade.

Later the introduction of **cast iron** restricted welding to the **blacksmith** and the jeweler. Other **joining techniques**, such as fastening by bolts or **rivets**, were widely applied to new products, from bridges and railway engines to kitchen utensils.

Riveting had been shown to have disadvantages, especially for an enclosed container such as a boiler. **Fusion welding** processes made it possible to obtain a **continuous joint** on large steel plates. Gas welding, arc welding, and resistance welding appeared at the end of the 19th century. By 1916 the **oxyacetylene** process was well developed, and the welding techniques employed then are still used. Arc welding, using **a consumable electrode**, was also introduced in this period, but the **bare electrodes** produced brittle welds. The modern electrode, introduced in 1907, consists of a bare wire with a complex **coating** of minerals and metals. Arc welding was not widely used until World War II, when the urgent needs spurred the necessary development work.

Resistance welding, invented in 1877 by Elihu Thomson, was accepted long before **arc welding** for **spot and seam joining** of sheet. **Butt welding** for joining bars and rods was developed during the 1920s. In the 1940s the **tungsten-inert gas process**, using a **nonconsumable** tungsten **electrode** to perform fusion welds, was introduced.

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

использование нагрева, хрупкая сталь, сварочная технология, высокоуглеродистая сталь, кухонная утварь, листовая сталь, крепление болтами, сложное покрытие, острая необходимость, подстегнули необходимые технологические разработки, проволока без покрытия, шов при сварке плавлением.

5. Match the names of welding processes with their definitions.

fusion welding, oxyacetylene welding, resistance welding, arc welding, butt welding, tungsten inert gas welding (TIG), spot welding

1. … uses pressure and heat that is generated in the pieces to be welded by resistance to an electric current.
2. … is a process that uses heat to join or fuse two or more materials by heating them to melting point.
3. … is a type of welding process using an electric arc to create heat to melt and join metals.
4. …, commonly referred to as gas welding, is a process, which relies on combustion of oxygen and acetylene.
5. … is a process, in which the two parts of material are put together parallel along an edge in one line and are joined.
6. … is a type of electric resistance welding used to weld overlapping pieces of metal at a number of small points “spots” by application of pressure and electric current.
7. … is also known as gas tungsten arc welding (GTAW) and an arc welding process using a non-consumable tungsten electrode to make a weld.

6. Say if the following is true or false. Correct the false sentences.

1. Only heat is used for joining metallic parts in welding.
2. The process of carburization of iron is rather new.
3. The blacksmith and the jeweler continue to use welding techniques in their work.
4. Welding is the only technique of joining metallic parts.
5. Riveting is widely used for producing an enclosed container such as a boiler.
6. Fusion welding processes make it possible to obtain a continuous joint on large steel plates
7. The modern electrode consists of a bare electrode without any coating.
8. Arc welding was introduced only after World War II.
9. The tungsten-inert gas process uses a consumable tungsten electrode to perform fusion welds.

7. Answer the following questions:

1. What is welding?
2. How was welding discovered?
3. Who were the first welders?
4. What did the first welding technique for making blades involve?
5. What other joining techniques were applied to such products as bridges and railway engines?
6. Is it efficient to apply riveting for making boilers?
7. What was the quality of the welds produced by the arc welding using bare electrodes like?
8. What does the coating of the modern electrode consist of?
9. Name all the welding techniques mentioned in this text.

Unit 3. What Do Welders Do?

1. Discussion.

1. Is welding an interesting and rewarding career to pursue?
2. What is the primary duty of a welder?

2. Study the following words and terms.

1	unskilled welder	неквалифицированный сварщик
2	assembly line	сборочный конвейер
3	spot welding	точечная сварка
4	welding wire	сварочная проволока
5	settings	параметры настройки
6	stable weld	прочный шов
7	hand weld	сваривать вручную
8	steel beam	стальные балки
9	electric current	электрический ток
10	welding rod	сварочный пруток
11	shielded metal arc welding	дуговая сварка металлическим покрытым электродом
12	submerged arc welding	дуговая сварка под флюсом

3. Read the text.

A welder is a worker who joins metal together, or repairs metal constructions through the use of intense heat and gas. Welders work on all types of industrial, manufacturing, and construction applications; some even work underwater to build and repair different types of subaquatic structures. Due to the almost universal need for their skills, welders are in high demand worldwide.

Unskilled welders work on **assembly lines**, performing repetitive welding tasks. They may employ robots in order to join body panels from a car or truck or perform **spot welding** during the construction of specialized equipment. They may

have little or no knowledge of the properties of metal, or what types of gas, **wires**, and **settings** are used to produce a **stable weld**.

Skilled welders know the welding specifications of many types of metal. They learn advanced welding techniques and may **hand weld** or use robots to weld metal components.

While those who use robots are usually confined to working in a factory, those who weld by hand can work outdoors or indoors. Construction welders join **steel beams** for high-rise structures, skyscrapers, or any other type of building that uses metal. Welders can work on a car racing team, repairing a damaged car or building an entirely new one.

Depending on the project, welders use one of the more than 100 welding methods. In arc welding, workers either weld by hand or machine. It is the most common method of welding in which an arc of **electric current** combines two metal pieces with a special **welding rod**. Oxyacetylene welding, or gas welding use gases and oxygen to produce the heat needed to melt and join pieces of metal. Other types include resistance welding, **shielded metal arc welding, submerged arc welding**, and the more modern laser beam welding processes.

4. Find the English equivalents for the following words and word combinations:
на открытом воздухе, в помещении, строительство, панель кузова, подводные сооружения, лазерная сварка, высотное здание, автомобильная гоночная команда, контактная сварка, быть востребованным, метод сварки.

5. Match the names of welding processes (A) with their definitions (B).

spot welding, shielded metal arc welding, laser beam welding, submerged arc welding

1. … is a process in which a coated welding wire is melted and the molten coating protects the molten metal from the atmosphere.
2. … is a welding process in which the molten weld and the arc zone are protected from atmospheric contamination under a meltable flux.
3. … is a welding technique used to join pieces of metal through the use of a laser beam which is characterized by concentrated heat source, narrow and deep welds, and high welding rates.
4. … is a resistance welding process that is used primarily for welding two or more metal sheets together by applying pressure and heat to some spots.

6. Complete the following sentences with the information from the text.
1. A welder is … . 2. Welders work … . 3. Unskilled welders work on … . 4. Skilled welders know … . 5. Construction welders join … . 6. Welders can work on … . 7. Welders use … . 8. The most common method of welding are … . 9. Welders may specialize in … .

7. Answer the following questions.

1. What does a welder do?
2. Why are welders in high demand?
3. What kind of work do unskilled welders do?
4. What kind of work do skilled welders do?
5. What kind of work do construction welders do?
6. What is the most common method of welding?
7. How many welding processes can you list?
8. What is the difference between arc welding and oxyacetylene welding?
9. Have you already tried to weld metals?

Unit 4. Welding Principles.

1. Discussion.

1. Do you agree that the basic principle of welding is joining materials, usually metals, by using high heat to melt the parts together?

2. Do you know average temperatures, at which welding can be performed?

2. Study the following welding terms.

1	edge	край, острие
2	fuse	расплавлять
3	filler metal	присадочный металл
4	parent (base) metal	основной металл
5	bead	валик; наплавленный металл
6	mild steel	мягкая (малоуглеродистая) сталь
7	flame	пламя
8	torch	горелка
9	MIG-welding	дуговая сварка плавящимся электродом в среде инертного газа
10	compatible	совместимый
11	contaminants	примеси
12	adjustment	регулировка, настройка

3. Read the text.

The most basic principle of the welding process is joining two pieces of metal together or two **edges** of the same piece. This is generally done by heating the metals to be joined until they become liquid or molten and the two edges **fuse** together. Most often, the joining of the two metal edges is accomplished by melting new metal into the joint at the same time. This new metal is called **filler metal**, while the pieces being joined are called the **parent metal**. Together they form a welded "**bead**" of filler and parent metal.

A tremendous amount of localized heat is needed to weld metals together, and heat control is the key to welding properly. Every material has its own specific **melting point**, and you need to heat the material to that point but not beyond it. Aluminum melts at just below 1250° F, and common **mild steel** melts at 2750° F.

The heat required can be achieved in several ways, but it is mostly generated either with a **flame** or with electrical current. The traditional source in welding has been the oxy-acetylene **torch**, while electricity is now used in most of the other methods, such as arc welding, **MIG-welding**, and TIG-welding.

The filler material must be **compatible** with the parent metal, and the weld must be free of outside **contaminants** that weaken the joint. If you weld aluminum, the filler rod must be aluminum, a stainless filler rod is used for welding stainless steel and steel rods are used on steel. In gas welding, the weld cleanliness is controlled by the **adjustment** of the torch flame and the cleanliness of two edges of the parent metal. In electric welding, an inert gas "cloud" is formed around the weld to keep outside oxygen from contaminating it.

4. Find the English equivalents for the following words and word combinations.

жидкий или расплавленный; одновременно; наплавленный валик; основной металл; тепловой контроль; точка плавления; пламенем или электрическим током, дуговая сварка, присадочный металл; примеси, которые ослабляют шов; присадочный пруток; чистота шва; кислород.

5. Fill in the following word and word-combinations into the sentences.

welding process, filler metal, parent metal, melting point, a flame or electric current, compatible, contaminants, adjustment.

1. The heat required can be achieved in several ways, but it is mostly generated with either … .
2. This new metal is called…, while the pieces being joined are called the … .
3. The most basic principle of the … is joining two pieces of metal together or two edges of the same piece.
4. The filler material must be … with the parent metal, and the weld must be free of outside … that weaken the joint.
5. In gas welding, the weld cleanliness is controlled by the … of the torch
6. Every material has its own specific …, and you need to heat the material to that point but not beyond it.

6. Find the word in the text that means the following.

1. the temperature at which a substance melts;
2. a small change;
3. joining metal parts together;
4. the outer or furthest point of something;
5. a stream of hot, burning gas from something on fire;
6. a long thin pole made of wood or metal;
7. a chemical element that is a gas with no smell or color;
8. a strong metal that is a mixture of iron and carbon.

7. Say if the following is true or false. Correct the false sentences.

1. Most often, the joining of the two metal edges is accomplished by melting steel into the joint at the same time.

2. A tremendous amount of localized heat is needed to weld metals together, and heat control is the key to welding properly.
3. Aluminum melts at just below 36° F, and common mild steel melts at 2750° F.
4. The filler material must be compatible with the parent metal, and the weld must be free of outside contaminants that strengthen the joint.
5. In arc welding, an inert gas "cloud" is formed around the weld to keep outside oxygen from contaminating it.
6. The heat required can be achieved in several ways, but it is mostly generated either with a flame or with electrical current.

8. Answer the following questions.
1. What is the most basic principle of the welding process?
2. In what way is the joining of the two metal edges accomplished?
3. A tremendous amount of localized heat is needed to weld metals together, and heat control is the key to proper welding, isn't it?
4. Does every material have its own specific melting point?
5. What is the melting point of aluminum?
6. Is the weld cleanliness controlled by the torch flame only in gas welding?
7. What rod is used for welding stainless steel?
8. Is it important for the filler material to be compatible with the parent metal?
9. How is the weld cleanliness controlled in gas welding?

Unit 5. Welding Processes.

1. Discussion.
1. Ask your partner to list the welding processes he already knows.
2. What processes is your partner most familiar with?

2. Match words in Column A with words in Column B.

	A	B
1	oxy fuel or oxyacetylene welding	плазменная сварка
2	torch welding	дуговая сварка металлическим покрытым электродом
3	arc welding	дуговая сварка вольфрамовым электродом в среде защитного газа
4	gas metal arc welding (GMAW)	газосварка (с нагревом ацетилено-кислородным пламенем)
5	metal inert gas welding (MIG)	электродуговая сварка
6	gas tungsten arc welding (TIG)	дуговая сварка плавящимся электродом в среде инертного газа
7	plasma arc welding	дуговая сварка под флюсом
8	shielded-metal arc welding	дуговая сварка металлическим электродом в среде защитного газа
9	submerged arc welding	газосварка, кислородно-ацетиленовая сварка

3. Read the text.

There are a number of welding processes, from simple **oxy fuel** to more high-tech laser beam welding. Understanding the differences between these welding processes is important for choosing the right one for the job at hand. There exist over 30 types of welding processes depending on the form and thickness of the material to be joined. However, most welding falls into two categories: **arc welding** and **torch welding**.

In arc welding, the materials as well as filler material are melted together using an electrical arc. Common types of arc welding include the following:

- **Gas metal arc welding**
- **Gas tungsten arc welding**
- **Plasma arc welding**
- **Shielded-metal arc welding**
- **Submerged arc welding**

Torch welding, on the other hand, is a process that melts the working material and welding rod using an open flame. The most common application for torch welding is repair and maintenance work. The big advantage to this type of welding is that it allows the user to control the torch and rod at the same time, making it easier to be more precise. The most common type of torch welding is **oxyacetylene welding.**

Of course, there are many more welding methods than these, some of which are quite extreme. For instance, explosions, laser beams, and high-frequency vibrations can also be used to join metals together.

4. Match the names of welding processes (A) with their features (B).

	A	B
1	Oxy Fuel or Oxyacetylene Welding	an electric arc, a metal consumable electrode, externally supplied gas
2	Arc Welding	welding torch, oxygen, acetylene, parent (base) metal, filler metal
3	Gas Metal Arc Welding (GMAW)	electric arc, direct (DC) or alternating (AC) current, filler metal
4	Metal Inert Gas Welding (MIG)	an electric arc, base metal, a non-consumable tungsten electrode, gas shielding
5	Gas Tungsten Arc Welding (TIG)	continuous electrode (the wire), electric arc, a shield of inert gas
6	Plasma Arc Welding	a layer of flux, a continuously fed electrode, a protective gas shield, prevention of sparks
7	Shielded-Metal Arc Welding	heating with a plasma, a high-frequency generator, a non-consumable tungsten electrode
8	Submerged Arc Welding	arc welding process, shielding gas, protected welding area

5. In each line of words (1–4) find the odd one out. Explain your choice:

1. welding processes, filler material, torch welding, driving;
2. repair, maintenance, explosion, welding;
3. torch, vehicle, cylinder. welding setup;
4. gas shield, computer, consumable tungsten electrode, welding area.

6. Work out a dialogue between two students: Student A asks a question; Student B answers it.

	Student A	Student B
1	Ask if there are over 30 types of welding processes.	Answer the question
2	Ask if understanding the differences between welding processes is important.	Answer the question
3	Ask if the choice of the welding process depends on the form and thickness of the material to be joined.	Answer the question
4	Ask if most welding falls into two categories.	Answer the question
5	Ask whether in arc welding, the materials are melted together using an electrical arc.	Answer the question
6	Ask if torch welding is a process that melts the working material and welding rod using an open flame.	Answer the question
7	Ask if the most common application for torch welding is repair and maintenance work.	Answer the question
8	Ask whether oxyacetylene welding allows the welder to control the torch and rod at the same time, making it easier to be more precise.	Answer the question

Unit 6. Oxy-Acetylene Gas Welding.

1. Discussion.

1. What can you say about oxy-acetylene gas welding based on its name?
2. Have you ever seen gas welders working?

2. Study the following welding terms.

1	tank	баллон
2	gas flow	поток газа; течение газа
3	gauge (gage)	измерительный прибор (например, манометр), датчик
4	hose	шланг
5	torch	горелка; сварочная горелка
6	tip	наконечник сварочной горелки
7	spark lighter	искровой зажигатель
8	helmet	защитный шлем, каска сварщика
9	cutting torch	газовый резак
10	welding setup	сварочная установка, сварочный аппарат
11	valve	вентиль
12	filler rod	присадочный пруток (при сварке)
13	molten puddle	сварочная ванна

3. Read the text.

Oxy-Acetylene Gas Welding is perhaps the oldest and most versatile of welding processes. The basic combination in a typical gas-welding package are two high-pressure cylindrical **tanks**, one for oxygen, one for acetylene, a set of **gauges** and regulators to control the **gas flow** out of the tanks, a pair of **hoses**, and a **torch**.

The torch usually comes with a variety of **tips**, a **spark lighter,** and good sets may include a **helmet**, gloves and often a **cutting torch.** The latter is what really makes the oxy-acetylene system so versatile. It is one of the few welding systems that can do cutting as well as welding. This can be invaluable in both repair and fabrication work.

The oxy-acetylene **setup** is still the least expensive welding system. When welding with oxy-acetylene equipment, the basic procedure is to set the proper gas flow to the torch with the regulators, open the **valves** on the torch, light the flame and then adjust the ratio of oxygen to acetylene to achieve the proper flame. Changing tip sizes makes a bigger or smaller flame. A smaller flame is used for thinner metals. The torch is brought down to the work area and the flame is used to heat the two edges to be joined, while your other hand feeds a piece of **filler rod** into the **molten puddle** as you move along the joint. Weld joints can be made with or without a filler rod.

4. Find the word in the text that means the following.

1. a device that produces a hot flame and is used for tasks such as cutting or joining pieces of metal.
2. a large container for holding liquid or gas.
3. a long, flexible pipe made of rubber or plastic.
4. something made of a strong material which you wear to protect your head.
5. an instrument that measures and gives a visual display of the amount, level, or contents of something.
6. metals which, when heated, melt to fill the space between two parts, creating a welded joint.
7. a localized volume of molten metal in a weld prior to its solidification as weld metal.

5. Match the sentence beginnings with the correct endings. Write the sentences down.

1	A typical gas-welding package	a. a variety of tips and a spark lighter.
2	The torch usually has	b. because it can do both cutting and welding
3	The oxy-acetylene setup often contains a cutting torch,	c. consists of two high-pressure cylindrical tanks, a set of gauges to control the gas flow, a pair of hoses, and a torch.
4	The basic procedure is	d. to adjust the ratio of oxygen to acetylene
5	To achieve the proper flame, it is necessary	e. feeds a piece of filler rod into the molten puddle as he moves along the joint.
6	Different tip sizes are used	f. to set the proper gas flow to the torch with the regulators, to open the valves on the torch and to light the flame.
7	The flame is used	g. to make a bigger or smaller flame.

8	The welder	h. to heat the two edges to be joined.

6. Work out a dialogue between two students: Student A asks a question; Student B answers it.

	Student A	Student B
1	Ask what welding process is the oldest and the most versatile.	Answer the question
2	Ask what a typical gas-welding package comprises.	Answer the question
3	Ask what gauges and regulators control.	Answer the question
4	Ask what the torch usually comes with.	Answer the question
5	Ask what the basic procedure is when welding with oxy-acetylene equipment.	Answer the question
6	Ask when a smaller flame is used.	Answer the question
7	Ask what is used to heat the two edges to be joined.	Answer the question
8	Ask whether weld joints can be made with or without a filler rod.	Answer the question

7. Write down tips for a gas-welding apprentice describing an oxy-acetylene setup and the oxy-acetylene gas welding procedure.

Unit 7. Arc Welding

1. Discussion.

1. What does the name of arc welding imply?

2. Does arc welding produce large quantities of light, which is many times the intensity of the sun at noon? How can a welder protect himself from it?

2. Study the following welding terms.

1	power source	источник электропитания
2	ground lead	заземляющий провод
3	electrode lead	вывод электрода
4	electrode holder	электрододержатель
5	to complete the circuit	замыкать цепь
6	moisture	влага
7	flux-coating content	содержание флюсового покрытия
8	chipping hammer	шлакоотбойный молоток

3. Read the text.

Like gas welding, electric arc welding has been around for almost 100 years, and the fact that it is still around today illustrates its continued usefulness. The official acronym for arc welding is SMAW, which stands for Shielded Metal Arc Welding. The basic components of the setup include the machine (the **power source**), a **ground lead** you clamp to the work, an **electrode lead**, which runs from the machine to an **electrode holder**, which is a handle with a clamp that holds consumable electrodes. The electrodes are metal rods covered with a coating.

In use, the welder strikes an arc against the parent metal with the electrode, which **completes the circuit** between the two leads and causes a bright light and concentrated heat. Arc welding uses considerable amperage of electricity to generate the intense arc, which melts the parent metal. The metal core of the electrode melts becoming the filler metal, while the fluxed coating produces a shielding gas around the welding area that protects the parent (base) and filler metal from impurities in the air. Arc welding produces slag as you proceed. This is a thick coating of impurities and deposits left from the rod's coating. This slag must be chipped off with a **chipping hammer**.

There is a wide variety of welding rods (electrodes) available to suit almost any purpose. The rods vary in thickness, according to the thickness of the metal you are welding, and they also differ in **flux-coating content**. There are many special-purpose rods, and different colors may also be added to the fluxes for quick identification. The coatings on arc-welding rods are very susceptible to **moisture** in the air, and must be stored in very dry, secure containers to remain effective.

4. Find the English equivalents for the following words and word combinations:

покрытие; концентрированное тепло; сварочный пруток; дуговая сварка металлическим электродом в среде защитного газа; сварочный аппарат; зона сварки; плавящийся электрод; защитный газ; флюс; прутки, электроды для дуговой сварки; восприимчив к влаге; примесь, загрязняющее вещество.

5. Say if the following is true or false. Correct the false sentences.

1. Electric arc welding has been around for almost 100 years, and the fact that it is still used does not illustrate that it is a very useful method.
2. The electrodes are steel rods having no coating.
3. In use, the welder strikes an arc against the parent metal with the electrode, which completes the circuit between the two leads and causes a bright light and concentrated heat.
4. There are very few metal rods available.
5. The rods do not vary in thickness, and they also have the same flux-coating content.

6. Work out a dialogue between two students: Student A asks a question; Student B answers it.

	Student A	Student B
1	Ask how long arc welding has been around.	Answer the question
2	Ask what SMAW stands for.	Answer the question
3	Ask what basic components the setup includes.	Answer the question
4	Ask how the welder strikes an arc.	Answer the question
5	Ask whether in arc welding, the materials are melted together using an electrical arc.	Answer the question
6	Ask what arc welding uses to generate the intense arc.	Answer the question
7	Ask if the metal core of the electrode melts and becomes the filler metal.	Answer the question
8	Ask whether fluxed coating produces a shielding gas to protect the parent and filler metals from impurities in the air.	Answer the question
9.	Ask why the welder needs a chipping hammer.	Answer the question
10.	Ask if there is a wide variety of electrodes available.	Answer the question
11.	Ask how electrodes vary and differ.	Answer the question
12.	Ask if electrodes are very susceptible to moisture in the air.	Answer the question

7. Answering questions in exercise 6, write down your answers thus making a list of tips describing basic components of an arc welding setup and the arc welding procedure.

Unit 8. Beginning Arc Welding

1. Discussion.

1. Do you think it is an easy thing to start an arc?
2. Do you know what a “stuck rod” is?

2. Study the following welding terms.

1	shielding gas	защитный газ
2	filler metal	присадочный металл
3	flux covering	флюсовое покрытие
4	amperage	сила тока в амперах
5	short circuit	короткое замыкание
6	to conduct electricity	проводить электричество
7	stuck rod	залипший пруток (сварочный)
8	tapping	постукивание
9	rod tip	рабочий конец прутка или электрода
10	red hot	раскалённый докрасна

3. Read the text.

The rod is both the source of filler metal and the **shielding gases**, which are generated when the **flux covering** is vaporized. One end of the rod is bare of any flux covering for about an inch, this is the end you put in the electrode holder.

You need to set the machine for the right **amperage** depending on the thickness of your steel, or perhaps slightly hotter than the instructions recommend. One drawback of the arc-welding process is getting the arc started.

Arc welding is mainly a process of creating a **short circuit** across the rod and the work, and it can only be started by a momentary contact of the two. This short circuit heats the air around the weld and ionizes it to the point where the air **conducts electricity** and continues the arc without actual metal-to-metal contact. The work distance is an important thing. When the arc starts, you must pull the rod back for a second to make a relatively long arc.

If you touch the rod to the surface for more than a second, it may stick, in which case the rod can get **red-hot** for its whole length. The hot rod will stay stuck to your work. An experienced welder will react quickly to a **stuck rod** and will break the connection immediately.

Another method of arc starting favored by some welders is a **"tapping"** style, in which you quickly tap the electrode tip to the work to start the arc.

If you stay in one place too long or with the **rod tip** too close to the work, you will melt a hole in your work. In addition, if you pull the rod back too far, you can lose the arc process and have to restart.

4. Find the English equivalents for the following words and word combinations:

процесс дуговой сварки, не покрыт флюсом примерно на дюйм, кратковременный контакт, относительно длинная дуга, прилипать, постукивать, зажечь дугу, потерять дугу, проплавить дыру, подвести конец электрода слишком близко к месту сварки, отвести пруток слишком далеко назад

5. Learn more facts about arc welding. Fill the missing words into the sentences.

rod, move, gas welding rod-to-work , re-start, bead, welder, speed, slag, stick.

1. The … should be more or less vertical when the arc is struck initially.
2. If the amperage and the … distance are correct, your arc-welding machine will make a steady, crisp noise something like bacon frying.
3. If you have the rod tip too close, it may … to the work.
4. One of the hard parts compared to … … is that in arc welding, the electrode holder must continually be brought closer to the work as the rod is consumed.
5. When the rod gets short, it is best to stop and then … with a new rod.
6. The … is almost as important as the rod-to-work distance.
7. If you … the rod too fast, the resulting bead will be too narrow and you may not get 100% penetration.

8. If you proceed too slowly, the … will be too wide and you may induce excessive heat into the workpiece.

9. The … must keep the rod tip the right distance from the work, the correct travel speed and compensate for the shortening of the rod

10. When you replace a rod, you stop welding and must chip the … away from the place you stopped, before continuing with a new rod.

6. Work out a dialogue between two students: Student A asks a question; Student B answers it.

	Student A	Student B
1	Ask if the rod is both the source of filler metal and the shielding gases.	Answer the question
2	Ask what the amperage, you set, depends on.	Answer the question
3	Ask whether Student B knows about any drawback of the arc-welding process.	Answer the question
4	Ask whether it requires some skills to start the arc.	Answer the question
5	Ask if a short circuit is created across the rod and the work.	Answer the question
6	Ask if the rod-to-work distance is an important thing.	Answer the question
7	Ask when a hot rod will get stuck to your work.	Answer the question
8	Ask how an experienced welder will react to a stuck rod.	Answer the question
9.	Ask when you can melt a hole in your work.	Answer the question

7. Write down instructions for the process of arc welding, specifying what a welder should and should not do to make a good weld.

Unit 9. MIG (Wire-Feed) Welding

1. Discussion.

1. Do you remember what MIG stands for?
2. What are the basic elements of the MIG welding setup?

2. Study the following welding terms.

1	power supply	источник питания
2	ground wire	заземляющий провод
3	gun	сварочная горелка
4	trigger	пусковое устройство
5	to consume	расходовать
6	spattering, spatter	брызги (например, при сварке)
7	feed rate	скорость подачи

3. Read the text.

MIG welding has become one of the most popular. The initials stand for Metal Inert Gas, but is also listed in technical descriptions as GMAW, for Gas Metal Arc Welding. The basic elements of the welding setup include a **power supply** (machine), a **torch** with a large-diameter cable, a **ground wire** with clamp, and a cylinder of compressed shielding gas. Inside the machine, there is a roll of relatively thin wire and a system to feed this wire. In practice, you weld almost like in arc welding, but the electrode (wire) is constantly fed to the **gun** and **consumed** at the weld. When you pull the **trigger** of the MIG gun, you start the supply of amperage, the feeding of the wire electrode, and the flow of shielding gas. The gas comes out of the tip all around the electrode, and preserves the integrity of the weld as the flux coating does on arc rods.

The advantages of the MIG system include a much cleaner weld than gas or arc, good versatility in materials, and no electrode to replace. The welder does not have to remove slag. **Spattering** is very little compared to arc welding.

The welding can proceed a lot faster than with other methods because the **wire feed rate** is automatic. Control is easy because you can set the amperage on the machine and also adjust the speed of the wire coming out of the gun. Various diameter steel wires are available to weld material from the thinnest sheet metal to 1/4-inch, as well as aluminum wires to weld aluminum. The weld from a MIG gun is much cleaner than in arc welding in terms of spatter, and there is no **slag** to chip off.

4. Find the English equivalents for the following words and word combinations:

кабель большого диаметра, сварочная горелка (два термина), сжатый защитный газ, заземляющий провод (два термина), сварочный аппарат (сварочная установка), рулон тонкой проволоки, подача проволочного электрода, поток защитного газа, прутки для электродуговой сварки, флюсовое покрытие, стальная проволока различного диаметра, регулировать скорость.

5. Learn more facts about MIG welding. Fill the missing words into the sentences.

gun, shielding gas, amperages, trigger, wire feeding mechanism, cable, flux-coated wire, clean-looking welds, ship decks, outdoor welding, general rule.

1. The basic components of the MIG equipment consist of the welding machine, and a … … … that holds a large roll of wire, a cylinder of … … , a simple torch or … and a ground … .
2. In operation, the welder brings the torch down to the work until the bare wire electrode is touching the work and pulls the … .
3. There are three basic types of small MIG machines: those that use plain wire with shielding gas, those that use … … … and no gas, and combination machines that can run either plain or fluxed wire.

4. The gas-shielded MIG welding is the preferred method for indoor welding where … are desired.
5. For … (such as farm equipment repair) the fluxed-wire machine is better, because shielding gas is disturbed by air currents.
6. Larger MIG machines are used in industrial welding processes where high … and large diameter welding wire are used.
7. They weld large plates, such as on … , with very large wire diameter and high amperages.
8. This is just a … … that the wire speed and welding travel speed affect the current used.

6. Answer the following questions.

1. What are the basic elements of the MIG welding setup?
2. What is there inside the MIG welding machine?
3. What are the advantages of the MIG welding system?
4. Why can MIG welding proceed a lot faster?
5. Spattering is very little compared to arc welding processes, isn't it?
6. Is the weld performed with a MIG gun much cleaner than during arc-welding in terms of spatter?
7. Is it necessary to chip off slag as it is done during arc welding?

Unit 10. The Shielding Gas.

1. Discussion.

1. Do you know the function of shielding gas in welding?
2. What gases can be used to protect weld area?

2. Match words in Column A with words in Column B.

	A	B
1	plain	не содержащий добавок; чистый
2	penetration	проплавление; глубина проплавления
3	overhead welding	потолочная сварка; сварка в верхнем положении
4	out-of-position welding	сварка в неудобном положении
5	pipe welding	сварка труб

3. Read the text.

The shielding gas used with MIG machines can be $C0_2$, Argon, or a mixture of the two, depending on the materials you are welding. The basic gas used most often is $C0_2$, because it is the least expensive. **Plain** CO_2 will not usually result in as clean a weld as with other gases, but it is used often because it is the least expensive shielding gas for welding steel. It will weld very fast, with good **penetration.**

Argon is a versatile inert shielding gas that is often used by itself, or in combination with other gases to produce certain weld characteristics. For instance,

welding of non-ferrous materials like aluminum is usually done with pure argon. It makes for good penetration and a concentrated arc.

To weld ferrous materials, argon is usually mixed with another gas. A mixture of 75% argon and 25% CO_2 has become pretty much the standard for welding mild steel with MIG machines with wire diameters of .035-inch or less. This mixture, often abbreviated as C-25, is more expensive than the plain CO_2 but produces much less spatter and better looking welds. It is what we would recommend for most of your welding needs. If you were doing a lot of thicker materials, **overhead** or other **out-of-position welding** and **pipe welding**, you might use a 50 % - 50 % mix of argon and CO_2.

For welding of non-ferrous materials, either argon or mixtures of argon and helium are used in various combinations, which provide higher heat to a MIG arc. Usually, the thicker the material to be welded, the higher the percentage of helium, and the HE-75 gas, which is 25% argon and 75% helium is typically used in industry to weld thick aluminum.

4. In each line of words (1–4) find the odd one out. Explain your choice:
1. low-voltage, gas flame, direct current, AC current;
2. oxygen, acetylene, hydrogen, non-ferrous metal;
3. fusion, filler material, characteristics, heat-affected;
4. out-of-position welding, overhead welding, hard-to-access welding, oxy-fuel cutting.

5. Answer the following questions.
1. What is the least expensive gas used in welding?
2. Is argon a versatile inert shielding gas that is often used by itself, or is it used in combination with other gases to produce certain weld characteristics?
3. What gas is mixed with another gas to weld ferrous materials?
4. What mixtures are used for welding non-ferrous materials?
5. Is welding of non-ferrous materials like aluminum usually done with pure argon or oxygen?
6. What gas is typically used in industry to weld thick aluminum?

Unit 11. TIG (Heli-Arc) Welding

1. Discussion.
1. What does TIG welding stand for?
2. What group of metals does tungsten belong to?

2. Match words in Column A with words in Column B.

	A	B
1	tungsten electrode	с ручной подачей
2	amperage control pedal	валик; наплавленный металл
3	compressed shielding gas	педаль управления силой тока
4	hand-fed	загрязнение
5	weld puddle/pool	разнородные металлы
6	bead	вольфрамовый электрод
7	contamination	труднодоступные места
8	flying sparks	сжатый защитный газ
9	hard-to-access areas	сварочная ванна
10	dissimilar metals	разлетающиеся искры

3. Read the text.

The letters stand TIG for Tungsten Inert Gas, but many welders call it Air- or Water-Cooled TIG Torch heli-arc welding, though this is a trade name established by the Linde Corporation many years ago. The name refers to the fact that back then, helium was used as the shielding gas for the process, though today argon is the most commonly used gas for TIG welding. The process can also be seen abbreviated as GTAW, for Gas Tungsten Arc Welding.

The basic components of the TIG process include a welding machine, a torch with a **tungsten electrode**, a ground cable, a foot-operated **amperage control pedal** and a tank of **compressed shielding gas** such as argon. The electrode is not consumed, and filler rod is separately **hand-fed** into the **weld puddle** when needed.

The welder turns on the machine, brings the torch close to the work and depresses the foot pedal to start the arc. Current flows through the tungsten to the workpiece, creates an intense heat that melts the parent metal. The tungsten electrode has a very high melting point and is not consumed. What differs the heli-arc from other processes is the higher welder skill required and the quality of the finished weld.

TIG welding produces the cleanest **beads** with virtually no **contamination**. For this reason, it is the method of choice for such critical applications as race cars, aircraft, and nuclear reactor welding. The TIG welds are strong and corrosion-resistant, making it popular for welding of surgical, medical and food-service equipment. There is little smoke produced during TIG welding and no **flying sparks**, so the welder can more critically observe the welding action.

Its ability to handle all kinds of metals of various thicknesses and to reach into **hard-to-access areas** has made the heli-arc method particularly useful in race-car and other critical applications. It can weld **dissimilar metals** and join metals of different thicknesses. It has been said that a skilled TIG welder could join a razor blade to a railroad track, though there is not much call for that.

4. Find the English equivalents for the following words and word combinations:

торговая марка, зажечь дугу, заземляющий провод, высокая температура плавления, плавит основной металл, электрод не расходуется, качество готового шва, используется в качестве защитного газа, коррозионностойкий, оборудование для общественного питания, требуется более высокий уровень квалификации сварщика.

5. Learn more facts about TIG welding. Fill the missing words into the sentences.

foot-pedal-controlled, tungsten, dissimilar metals, welder, water-circulating system, non-ferrous materials, oxy-acetylene welding, thickness

1. The torch for TIG welding is smaller and lighter than most other welding torches, allowing for greater comfort for the … when welding for long periods.
2. For production welding, most TIG machines are equipped with a … … to keep the torch cool.
3. TIG welding has a number of benefits such as high-quality welds on thin materials and the ability to weld beautifully on … … like aluminum, even cast aluminum.
4. TIG welding is mostly like … … welding and if you have already learned well how to weld with a gas torch, you will learn to TIG weld faster.
5. … is somewhat expensive, but can be made to last a long time.
6. The TIG welder has to operate a … … … or hand-controlled amperage device.
7. TIG welding is very versatile in handling different thicknesses of metals and joining … … .
8. The rate at which you travel will depend on the … of the material you are working on and the amperage.

6. Complete the following sentences.

1. The basic components of the TIG process include:

a) a power supply, a torch, a ground wire, a cylinder of compressed shielding gas and a roll of relatively thin wire inside the machine;

b) a welding machine, a torch with a tungsten electrode, a ground cable, an amperage control pedal and a tank of compressed shielding gas;

c) two high-pressure cylindrical tanks, one for oxygen, one for acetylene, a set of gauges and regulators, a pair of hoses, and a torch.

2. In TIG welding the electrode:

a) is consumed.
b) is not consumed.
c) is not needed.

3. What differs the heli-arc from other processes is

a) poor quality of the finished weld.
b) high quality of the finished weld.
c) anyone can perform it as no skills are required.

4. TIG welding produces:

a) very contaminated beads.
b) beads that need a lot of cleaning.
c) the cleanest beads with virtually no contamination;

5. TIG welding makes it possible to handle
a) various thicknesses and to reach into hard-to-access areas.
b) only very thin materials.
c) overhead areas.

6. This process can weld
a) similar metals.
b) dissimilar metals.
c) plastic materials.

7. Answer the following questions:

1. What are the basic components of the TIG welding process?
2. Is the electrode consumed in TIG welding?
3. What does TIG welding produce?
4 What differs the heli-arc from other processes?
5 What are the benefits of TIG welding?
6 What can a skilled TIG welder join?

Unit 12. Safety Issues.

1. Discussion.

1. What health hazards associated with welding do you know?
2. Why is it important to follow precautions properly to reduce the risks of injury while welding?

2. Study the following welding terms.

1	precautions	меры предосторожности
2	protection	защита
3	risks of injury	риск получения травмы
4	exposure to heat	воздействие тепла
5	inflammation	воспаление
6	cornea and retina	роговица и сетчатка
7	goggles	очки для сварки
8	particulate matter	твердые частицы
9	fumes	пары
10	explosion risk	риск взрыва

3. Read the text.

Welding, without the proper **precautions**, can be a dangerous and unhealthy practice. However, with the use of new technology and **proper protection**, the **risks of injury** and death associated with welding can be greatly reduced.

Because many common welding procedures involve an open electric arc or flame, the risk of **burns** is significant. To prevent them, welders wear protective clothing, heavy leather gloves and long sleeve jackets to avoid **exposure** to extreme heat and flames. Additionally, the brightness of the weld area leads to a condition called arc eye in which ultraviolet light causes **the inflammation** of the **cornea** and can burn the **retinas** of the eyes. **Goggles** and helmets with dark face plates are worn to prevent this exposure.

Welders are also often exposed to dangerous gases and **particulate matter.** Processes like arc welding and shielded metal arc welding produce smoke containing particles of various types of oxides. The size of the particles influences the toxicity of the **fumes**, with smaller particles presenting a greater danger. Additionally, many processes produce various gases, most commonly carbon dioxide and ozone, and fumes that can be dangerous if ventilation is inadequate. Furthermore, because the use of compressed gases and flames in many welding processes pose an **explosion and fire risk**, some precautions include limiting the amount of oxygen in the air and keeping **combustible materials** away from the workplace.

4. Find the English equivalents for the following words and word combinations:
надлежащие меры предосторожности, яркость зоны сварки, может быть значительно уменьшено, травма глаза излучением электрической дуги, предотвратить это воздействие, часто подвергаются, количество кислорода в воздухе, углекислый газ, дуговая сварка металлическим покрытым электродом, представлять большую опасность, частицы различных оксидов, создают риск пожара, куртки с длинным рукавом.

5. Say if the following statements are true or false. Correct the false sentences.
1. Without observing the proper precautions, welding can be a dangerous and healthy practice.
2. Welders do not wear any protective clothing, heavy leather gloves and long sleeve jackets as there is no exposure to extreme heat.
3. Goggles and helmets with dark face plates are worn to prevent exposure to the brightness of the weld area.
4. Welders are also often exposed to dangerous gases and particulate matter**.**
5. Additionally, many processes produce various gases, most commonly argon and ozone, and fumes that can be dangerous.
6. With the use of new technology and proper protection, the risks of injury and death associated with welding can be greatly reduced.

6. Answer the following questions:
1. Can welding be a dangerous and unhealthy?
2. What measures of precaution must the welders observe?
3. What harm can be done to a human body with welding?
4. What do processes like arc welding and shielded metal arc welding produce?
5. Does the size of the particles influence the toxicity of the fumes?

6. Why do some precautions include limiting the amount of oxygen in the air and keeping combustible materials away from the workplace?

Welding Terms Glossary

Alternating Current (AC) – Electric current that reverses direction periodically, usually many times per second.
Arc Welding – A group of welding processes that produces coalescence of metals by heating them with an arc, with or without the application of pressure and with or without the use of filler metal.
Arc Welding Electrode – A part of the welding system through which current is conducted that ends at the arc.
Base Metal (material) – The metal (material) to be welded.
Butt Joint – A joint between two members lying in the same plane.
Complete Joint Penetration – Joint penetration in which the weld metal is fused to the base metal throughout its total thickness.
Covered Electrode – An electrode used in shielded metal-arc welding, consisting of a metal-wire core with a flux covering.
Cylinder – A portable container used for transportation and storage of a compressed gas.
Direct Current – Electric current that flows in one direction.
Flux – Material used to prevent, or facilitate removal of oxides and other undesirable surface substances.
Fusion – The melting together of filler metal and base metal (substrate), or of base metal only, which results in coalescence.
Gas Metal Arc Welding (GMAW) – An arc welding process where the arc is between a continuous filler metal electrode and the weld pool. Shielding from an externally supplied gas source is required.
Gas Tungsten Arc Welding (GTAW) – An arc welding process where the arc is between a tungsten electrode (non-consumable) and the weld pool. The process is used with an externally supplied shielding gas.
Gas Welding – Welding with the heat from an oxy-fuel flame, with or without the addition of filler metal or pressure.
Heat-Affected Zone – That section of the base metal, generally adjacent to the weld zone, whose mechanical properties or microstructure, have been altered by the heat of welding.
Incomplete Joint Penetration – A condition in a groove weld where weld metal does not extend through the joint thickness.
Inert Gas – A gas that normally does not combine chemically with the base metal or filler metal.
Joint – The junction of members or the edges of members that are to be joined or have been joined.
Shielded Metal Arc Welding (SMAW) – A process that welds by heat from an electric arc, between a flux-covered metal electrode and the work. Shielding comes from the decomposition of the electrode covering.

Shielding Gas – Protective gas used to prevent atmospheric contamination.
Spatter – Metal particles expelled during welding that do not form a part of the weld.
Submerged Arc Welding – A process that welds with the heat produced by an electric arc between a bare metal electrode and the work. A blanket of granular fusible flux shields the arc.
Weldability – The capacity of a material to be welded under the fabrication conditions imposed into a specific, suitably designed structure and to perform satisfactorily in the intended service.
Weld Bead – The metal deposited in the joint by the process and filler wire used.
Welding Leads – The work piece lead and electrode lead of an arc welding circuit.
Welding Wire – A form of welding filler metal, normally packaged as coils or spools, that may or may not conduct electrical current depending upon the welding process used.
Weld Pool/Puddle – The localized volume of molten metal in a weld prior to its solidification as weld metal.
Wire Feed Speed – The rate at which wire is consumed in welding.
Work Lead – The electric conductor between the source of arc welding current and the work.

Vocabulary

amperage – ток в амперах
arc – (электрическая) дуга

bead – валик; металл, наплавленный за один проход; узкий шов; кромка
bond – соединение; связь; соединять

circuit – цепь
    short-circuit – короткое замыкание; цепь короткого замыкания
coating – покрытие
    flux coating – шлакообразующее покрытие
combustion – горение; сгорание
consumable – плавящий (об электроде)
contaminant – загрязняющее вещество, примесь
cycle – цикл

deposition – наплавка; покрытие
deposit – слой осажденного металла; наплавленный металл

electrode – электрод
    bare wire electrode – голый электрод; электрод без покрытия
    consumable electrode – плавящий электрод
    stick electrode – электрод для ручной (дуговой) сварки

filler (metal) – присадочный металл; наполнитель
flame – пламя
flammable – воспламеняемый; огнеопасный
fuse – плавить; сплавлять
fusion – плавление; сплавление

gas – газ
shielding gas – защитный газ
gauge – измерительный прибор; датчик
gun – сварочная горелка; сварочный пистолет

holder
rod holder – держатель; электрододержатель
hose – шланг

impurities – примеси

joint – соединение; сварное соединение; стык; шов

lead – провод; кабель
electrode lead – провод, идущий к электроду
ground lead – обратный провод, провод заземления
work lead – провод, идущий к свариваемому изделию
lighter – устройство для зажигания; запал

metal – металл
base, parent metal – основной металл, перешедший в шов

pass – проход; валик; узкий шов
penetration – проникание; глубина проникания; проплавление; провар
puddle – сварочная ванна

red-hot – нагретый докрасна
rod – пруток; присадочный пруток; электродный стержень
filler rod – присадочный пруток
seam – шов; стык; спай; место соединения
setup – устройство; установка; регулировка; наладка
spatter, spattering – брызги, разбрызгивание
strike – зажигать (возбуждать) дугу
supply – подача; подвод
power supply – электропитание; электроподача

tack – прихваточный шов; прихват
tap – лёгкий удар, постукивать
tip – наконечник
torch – (сварочная) горелка
cutting torch – газовый резак
trigger – пусковое устройство
welder – сварочная машина; сварщик
welding – сварка
butt welding – сварка встык
forge welding – кузнечная сварка
Gas Metal Arc Welding, or MIG welding (Metal Inert Gas) – дуговая сварка металлическим (плавящимся) электродом в среде защитного газа

Gas Tungsten Arc Welding, or TIG welding (Tungsten Inert Gas) – дуговая сварка вольфрамовым электродом в среде защитного газа

out-of-position welding – сварка в неудобном положении

shielded metal arc welding (SMAW) – дуговая сварка металлическим (плавящимся) покрытым электродом

stick welding – сварка металлическим (плавящимся) электродом

tack welding – сварка прихваточным швом; прихватка

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