

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ
імені В. Н. КАРАЗІНА

**ІНОЗЕМНА МОВА
ПРОФЕСІЙНО-ДІЛОВОГО СПІЛКУВАННЯ.
АНГЛІЙСЬКА МОВА**

Методичні вказівки
до проведення самостійної роботи
для здобувачів вищої освіти першого (бакалаврського) рівня
за спеціальністю 015 «Професійна освіта (Зварювання)»

Електронний ресурс

Харків –2025

Рецензенти:

Я. М. Бельмаз – доктор педагогічних наук, професор кафедри іноземної філології Комунального закладу «Харківська гуманітарно-педагогічна академія» Харківської обласної ради;

А. В. Богдан – кандидат педагогічних наук, доцент, професор кафедри соціально-гуманітарних дисциплін, працівник ЗСУ Військового інституту танкових військ НТУ «ХП».

*Затверджено до розміщення в мережі Інтернет рішенням Науково-методичної ради
Харківського національного університету імені В. Н. Каразіна
(протокол № 9 від 23 квітня 2025 року)*

I-67 **Іноземна мова професійно-ділового спілкування. Англійська мова :**
Методичні вказівки до проведення самостійної роботи для здобувачів вищої освіти першого (бакалаврського) рівня за спеціальністю 015 «Професійна освіта (Зварювання)» [Електронний ресурс] / укладач І. С. Лученцова. – Харків : ХНУ імені В. Н. Каразіна, 2025. – (PDF 68 с.)

Методичні вказівки для самостійної роботи розроблено згідно з навчальною програмою з англійської мови для професійного спілкування. Завдання методичних вказівок спрямовані на формування у студентів професійно-орієнтованих компетенцій. У методичні вказівки включені автентичні тексти англійською мовою з основної зварювальної тематики, забезпечені вправами і завданнями до них. Дані методичні вказівки розраховані на підготовку здобувачів першого (бакалаврського) рівня вищої освіти 3–4 курсів денної та заочної форми навчання спеціальності «015 Професійна освіта. (Зварювання)».

УДК 811.111(075.5)

ЗМІСТ

Вступ.....	4
Topic 1 What is welding?	5
Topic 2 Metals.....	8
Topic 3. Welding materials and equipment.....	11
Topic 4 Welding Methods.....	14
Topic 5 Welding processes.....	19
Topic 6. Traditional Type of Welding: Gas welding.....	23
Topic 7. Traditional Type of Welding: Arc Welding.....	27
Topic 8. Alternative types of welding.....	30
Topic 9. Safety Precautions to Enforce Today to Ensure Welding Safety...	37
Topic 10. Advanced Welding Machines and Their Applications.....	42
Topic 11. Weld Joints.....	47
Topic 12. IT in Welding and Cutting for the Welding Engineer.....	53
Topic 13. Revision test.....	59
Рекомендована література.....	64
Appendix. Application Definitions.....	65

ВСТУП

Дані методичні вказівки розраховані на підготовку студентів вищих навчальних закладів, що навчаються за спеціальністю «Зварювання», з іноземної (англійської) мови для професійного спілкування. У методичні вказівки включені автентичні тексти англійською мовою з основної зварювальної тематики, забезпечені вправами і завданнями, спрямованими на розвиток навичок читання, реферування і анотування з літератури за фахом, а також навичок ведення бесіди на спеціальні теми. Робота з матеріалом, представленим в метододичних вказівках, допоможе студентам не тільки опанувати англійською технічною термінологією в області зварювання і зварювальних процесів, а й познайомитися з історією і сучасним станом галузі, заглянути в майбутнє технології.

Читання текстів англійською мовою – один із способів вивчення мови. Тексти англійською мовою, якщо вони правильно підібрані, можуть допомогти у вивченні мови. Неправильно і невміло підібрані тексти англійською мовою здатні відбити охоту і бажання вивчати мову у найстійкіших і найзатятіших. Важливо не тільки правильно підібрати тексти, а й правильно з цими текстами працювати. Але читання текстів може бути різним, як за своїми цілями, так і за способами, якими ці цілі досягаються. Найпоширенішими цілями, яких домагається читач текстів англійською мовою, є: поповнення загального або тематичного словникового запасу, навчання і тренування у вимові англійських слів і виразів, закріплення правил англійської граматики шляхом розбору типових прикладів, що трапляються в тексті, та їх багаторазове повторення з метою запам'ятовування і т.д. Хорошим варіантом роботи з текстами англійською мовою є читання невеликих текстів з наведеним перекладом найскладніших слів і виразів. Переклад слів заощадить час на звернення до словника.

Методичні вказівки забезпечені довідковим матеріалом і може використовуватися як для аудиторної, так і для самостійної роботи студентів.

Topic 1. What is welding?

1. Vocabulary

equipment	обладнання
(to) join	з'єднувати
to melt	плавити
oil	нафта
to repair	ремонтувати
mining	гірничча справа виловуток корисних копалин
extraction	вилучення , видобуток
strong bond	міцний зв'язок
to weld	варити
welding	зварювання
welder	зварювальник
alloy	сплав
medical restriction	медичне обмеження
full-time work	повний робочий день
shift work	змінна робота
safety measures	заходи безпеки
(welding) torch	(зварювальний) пальник
to add	додавати
addition	додавання
molten	розплавлений
iron	залізо
steel	стал
shipbuilding plant	суднобудівний завод затока
shipyard	суднобудівна верф
skilled	кваліфікований
arc	дуга
property	властивість
non-ferrous	кольоровий (про метал)

1. Read and translate.

What is welding?

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

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

Nowadays welding is used instead of bolting and riveting in the construction of many types of structures, including bridges, buildings, and ships. It is also a basic

process in the manufacture of machinery and in the motor and aircraft industries. It is necessary almost in all productions where metals are used.

The welding process depends greatly on the properties of the metals, the purpose of their application and the available equipment. Welding processes are classified according to the sources of heat and pressure used: gas welding, arc welding, and resistance welding. Other joining processes are laser welding, and electron-beam welding.

2. Answer the following questions:

1. How can a process of welding be defined?
2. What are the two main groups of processes of welding?
3. How can we join metal parts together?
4. What is welding used for nowadays?
5. Where is welding necessary?
6. What do the welding processes of today include?

3. Find the English equivalents in the text.

1. Сьогодні зварювання використовується замість з'єднання болтами.
2. Зварювальний процес здебільшого залежить від властивостей металу.
3. Вона необхідна майже у всіх виробництвах, де використовується метал.
4. Зварювання нагріванням — найпоширеніший процес зварювання сьогодні.

4. Complete the sentences based on the text:

- 1are laser welding, and electron-beam welding.
- 2in all productions where metals are used.
- 3on the properties of the metals.
- 4or a combination of both.
- 5when the weld is achieved by heat.

5. Fill in the table using the given words:

join, steel, welding engineer, gold, use, weld, metal, developer, electrode, repair, iron, operator, produce, welding instructor, welding machine,

welder, welding robot, extract, melt, gas, form, torch, add, welding station, plastic

<i>Equipment</i>	<i>Activity</i>	<i>Material</i>	<i>Profession</i>

6. Translate the sentences into Ukrainian:

1. Welding can be carried out in dangerous and extreme conditions: at the height or during rain and snow storms.
2. Hard work, interest, valuable experience and absence of medical restrictions will help to achieve considerable success in this area.
3. Most welders work full-time, sometimes in shift work or self-employed; indoors or outdoors.
4. The last Friday of May is the day when welders begin to celebrate their professional holiday.
5. In 1802 a Russian scientist opened the effect of the electric arc which is able to create very high temperatures.
6. A good specialist must know technology in melting metals, metal properties, principles of equipment operation, safety measures and knowledge of physics and chemistry.

7. Fill in the gaps using the words from the box:

concentrate, metals, hard-working, form, masks, holes, demand, medical, ladder, dangerous, eyesight, income

A welder is a worker who joins (1)_____together, or fills and repairs (2)_____on meta constructions. Welders need good (3)_____, manual dexterity and coordination. They should also be able to (4)_____for long periods of time on very detailed work, as well as be in good physical (5)_____. The profession of a welder is considered to be in (6)_____today. There are plenty of opportunities to move up the career (7)_____. If the specialist is (8)_____and constantly improving their skills his (9) grows. But this profession is very (10)_____. To protect face and eyes welders

should always use special (11) _____. To be a welder you must not have (12) _____ restrictions.

Topic 2. Metals

1. Vocabulary

copper	мідь
lead	свинець
ore	руда
precious	дорогоцінний
silver	срібло
mercury	ртуть
amount	кількість
to be rich in	бути багатим (на що-небудь)
advantages and disadvantages	переваги та недоліки
drawback	недолік
resistant	стійкий
rust	іржа, корозія
liquid	рідина
compatible	сумісний
workshop	майстерня
longevity	довговічність
to treat	обробляти
treated	оброблений
treatment	обробка
expensive	дорогий
to possess	володіти
conductivity	провідність
surface	поверхня
solid	твердий
to bend	згинати
shape	форма
size	розмір
pure	чистий
melting point	точка плавлення

1. Read and translate.

Metals

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

The separation between the atoms in metals is small, so most metals are *dense*. The atoms are *arranged* regularly and can slide over each other. That is why metals are *malleable* (can be deformed and bent without fracture) and *ductile* (can be drawn

into wire). Metals vary greatly in their properties. For example, *lead* is soft and can be *bent* by hand, while *iron* can only be worked by *hammering* at red heat.

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

Heat *treatment* such as *quenching*, *tempering*, or *annealing* controls the nature of grains and their size in the metal. Small amounts of other metals (less than 1 per cent) are often added to a pure metal. This is called *alloying* and it changes the grain structure and properties of metals.

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

The ways of working a metal depend on its properties. Many metals can be *melted* and *cast* in *moulds*, but special conditions are required for metals that react with air.

2. Fill in the table using the given words:

Treatment; widely; separation; dense; slide; ductile; regularly; fracture; vary; soft; arrangement; crystal; crystalline; grain; coarse; add; pure; require; long; length; width; wide; cause; pressure; depend; melt; react; condition.

noun	Verb	adjective	adverb

3. Find the English equivalents of the following expressions in the text

1) завдяки своїм властивостям; 2) метали можна згинати, не ламаючи; 3) можна витягати на дріт; 4) сильно відрізнятися; 5) обробляти молотом під час червоного гарту; 6) впорядковане розташування атомів; 7) орієнтація і

розташування атомів; 8) теплова обробка; 9) невеликі кількості; 10) чистий метал; 11) метали схильні до втоми і повзучості; 12) брати до уваги при конструюванні; 13) посудини, що працюють під тиском, для хімічних процесів при високій температурі; 14) метали можна обробляти, використовуючи верстати.

4. Answer the following questions:

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

5. Translate the sentences into English:

1. Метали – хороші провідники тепла, звуку та електрики.
2. Ртуть має рідкий стан (state) за кімнатної температури.
- 3 Метали мають високу точку плавлення.
- 4 Алюміній дешевий, легкий і стійкий до корозії.
5. Золото та срібло - дорогоцінні метали.
6. Які переваги та недоліки у використанні міді?

6. Find the odd word:

1. Gold; copper; zinc; lead; steel, silver.
2. To melt; to deform; to bend; to remember; to hammer; to weld.
3. Carbon, selenium, sulphur, phosphorous, sodium.

4. Iron, platina, cobalt, nickel.
5. Copper, titanium, silver, zinc, aluminium.
6. Sodium, potassium, magnesium, helium, beryllium.

Topic 3. Welding materials and equipment.

1. Vocabulary

insulate	ізолювати
flexible	гнучкий
wear resistant	зносостійкий
consume	витрачати, витратити
consumable electrode	електрод, що плавиться
composition	суміш, склад
impurity	домішка
float	плавити на поверхні
eliminate	усувати, запобігати
handle	рукоятка
shield	щиток (зварювальний)
helmet	шолом
coloured	кольоровий

2. Read and translate.

Welding materials and equipment.

1. Welding current is conducted from the source of power to the arc by an insulated copper or aluminum cable. A very flexible cable is used between the electrode holder and the welding machine. This cable is designed for welding service. For grounding the welding circuit, a less flexible, but equally wear resistant cable is used. The size of the cables used in welding depends upon the type of the material to be welded and the distance of the source of power.

2. The electrode is an important component of the electric circuit. We know electrodes to be divided into consumable and non-consumable electrodes. Tungsten and carbon electrodes are non-consumable. In the case of carbon and tungsten arc welding a filler metal may be fed from aside to supply an additional metal to the molten pool. As for the consumable electrodes, they are produced in the form of metal rod or wire, and for this reason provide a filler metal.

3. All the consumable electrodes are divided into bare and coated electrodes. An important advantage of arc welding is in the protection that a special mineral flux composition provides for the molten deposit. It is known that metal electrodes for the covered with flux coatings produce stronger welded joints as compared with those made with bare electrodes.

4. As it was mentioned, the electrodes are held in a special device—an electrode holder. The electrode holder is a clamping device for holding the electrode and is provided with an insulated handle for the operator's hand. It should be mechanically strong, light in weight and hold the electrode firmly in position during welding.

5. We know that the arc is very hot and therefore it throws off both light and heat. To protect the operator's face and eyes from the direct rays of the arc it is necessary to use a face shield or helmet. These shields or helmets are produced of pressed insulating material black in colour. The shield should be light in weight and comfortable to the welder. Shields are provided with special welding coloured lens absorbing the infrared rays, special goggles are used by welder's assistants, foremen, inspectors and others working near the welder.

6. In addition to the equipment and materials described above, there should be available steel brushes for cleaning welds, tools for removing scale and slag from the surface of the weld and other shop equipment. Of course, in any welding shop you may find the equipment for welding inspection.

3. Match the title to each paragraph.

1. Electrode flux coating.
2. Electrode and their types.
3. Cables and their features.
4. Other welding equipment.
5. Protection of welder's face and eyes.
6. Electrode holders.

4 Answer the questions

1. What of electrodes are applied in welding?
2. How is a filler metal provided?

3. What is the difference between the two of cables?
4. What will you say about the electrode holder?
5. How are the welder's face and eyes protected from welding rays?
6. Say a few words about welding helmet.

5. Find the words

Insulateflexiblewearresistantimpurityfloathandlehelmetcoloured

6. Translate the sentences into Ukrainian:

1. When you weld or when you use grinders, sparks and other small pieces of metal fly everywhere.
2. When it comes to welding, every measurement needs to be precise and that requires using different measuring tools: measuring tape, calipers or metal rulers.
3. There are a lot of advanced professional tools on the market, but you can start welding metal by equipping your workshop with some basic items.
4. Without an auto-dimming helmet, you simply can't start welding, so investing in a good quality one is a wise decision.
5. Keep a couple of C Clamps in your workshop, as they are useful in a variety of situations.
6. You can use welding gloves to pick hot metal for a few seconds when needed, but don't make a habit out of this as it will ruin them faster.

7. Fill in the gaps using the words from the box:

proverb, dim, investment, portable, uncomfortable, steel wire brush, reduce, must have, essential, smooth, UV rays, shapes.

1. There are plenty of small and _____ workbenches.
2. Welding on the ground is impractical and _____.
3. For years, welders wanted to be protected from hot sparks, _____ and hot metal.
4. Remember the _____ "measure twice, cut (or weld) once".
5. There are only a couple of _____ welding tools that you'll use regularly.

6. An auto-dimming helmet will _____ the shield only when detecting a bright light.
7. A metal file will allow you to _____ the details.
8. C Clamps come in various _____ and sizes.
9. An auto-dimming helmet will _____ the risk of mistakes.
10. Protective face shield is an absolute _____ in your workshop.
11. A metal file is a great _____, because this tool is effective and cheap.
12. To finish your work, you need a _____.

Topic 4. Welding Methods

1. Vocabulary

adjust	регулювати, пристосовувати
cylinder	балон
dimension	розміри, величина
edge	край, кромка
filler	присадний дріт
manufacturer's specification	специфікація виробника
piece	шматок, частина
prepare	готувати, готувати
proper, correct	правильний, потрібний
to set up	встановлювати
to take precautions	вживати запобіжних заходів
to select	вибирати
to mark	позначати, ставити мітку
necessary	необхідний
to cut	різати
to consider	враховувати, брати до уваги
to clean	очищати
important	важливий
to finish finishing	завершувати, обробляти обробка, оздоблення
according to	відповідно до
activity	діяльність
to put on	одягати
to feel confident	почуватися впевненим

safety	безпека
manual	ручний
perform	виконувати, здійснювати
advanced	просунутий

2. Read and translate.

Welding Methods

There are three basic welding methods: manual, semiautomatic and automatic. Manual welding is the oldest method, and though its proportion of the total welding market diminishes yearly, it is still the most common. Here an operator takes an electrode, clamped in a hand-held electrode holder, and manually guides the electrode along the joint as the weld is made. Usually the electrode is consumable; as the tip is consumed, the operator manually adjusts the position of the electrode to maintain a constant arc length.

Semiautomatic welding is becoming the most popular welding method. The electrode is usually a long length of small-diameter bare wire, usually in coil form, which the welding operator manually positions and advances along the weld joint. The consumable electrode is normally motor-driven at a preselected speed through the nozzle of a hand-held welding gun or torch.

Automatic welding is very similar to semiautomatic welding, except that the electrode is automatically positioned and advanced along the prescribed weld joint. Either the work may advance below the welding head or the mechanized head may move along the weld joint.

3. Decide which statements are true (T) or false (F).

1. Manual welding is the newest method.
2. A welder can use manual position during semiautomatic welding.
3. Semiautomatic welding is the most popular welding method because the weld joint is accurate.
4. Semiautomatic welding is not the most popular welding method.
5. The welding operator manually adjusts the position of the electrode to maintain a constant arc length.

4. Identify which welding method (manual, semiautomatic, automatic) the following description refers to:

- a. the work may advance below the welding head or the mechanized head
- b. the operator manually adjusts the position of the electrode to arc length
- c. the oldest method
- d. the electrode is usually a long length of small-diameter bare wire
- e. the consumable electrode is normally motor-driven at a preselected speed
- f. the electrode is automatically positioned and advanced along the prescribed weld joint.

5. Read and translate.

What is the future of welding technology?

It is important to understand the trends of your sphere if you want to be a good specialist. While most **industries** experience significant swings (for example many professions are still coming to themselves from the latest recession in economics), the **welding** field is comparatively **stable and now even** has enjoyed exciting growth. Welding is one of the careers that is in high demand at all times. Since welders are needed in almost every industry, it gives them the endless opportunities and flexibility to switch industries without changing careers.

When it comes to welding, the salaries vary a lot. It all depends on how skilled you are and how far you are willing to travel. Local jobs typically don't pay much or require a lot of skill. On the other hand, if you are willing to travel, then the salaries are almost too good. And the highest paying welding careers are the following: aerospace welding, underwater welding, military welding, pipeline welding and welding in oil and gas sector.

It is believed that the work of the welders in the future may include programming of machines and demand IT skills. For example, further space exploration will require the use of computer simulation and developing new types of welding. A number of space operations can be performed remotely, using robots and manipulators.

Robotization might change the content of the work and replace the manual welding in many situations. There are several advantages to automating a factory with welding robots such as faster work, no breaks, better weld quality. Also robotization reduce costs and save materials.

Robotic welders have proved themselves in reducing the number of accidents with workers. Now some companies started to switch gradually to robotic welding applications.

The world is changing fast. It is predicted that in the next ten years, we will be seeing more changes in technology than we've seen over the last hundred years. New exotic materials will be introduced in the, and their processing and joining will require completely new technologies. Predominant themes in welding technologies of the nearest future will be the following: robotic welding, Internet of Things (IoT), virtual reality, artificial intelligence and big data.

At the same time, topics connected with welding education and welder's health and safety will be paid a great attention. The safety of welders is naturally a key factor. New safety innovations are developed alongside the welding equipment to ensure that welders can work in hazard-free conditions. By these measures, accidents at work can be reduced and some even avoided.

6. Match the words to make up the expressions:

1. to take	a) dimensions
2. to select	b) welding
3. to mark	c) protective clothes
4. to adjust	d) task
5. to put on	e) confident
6. manufacturer's	f) control
7. to feel	g) electrode
8. to cut	h) a welding machine
9. visual	i) metal
10. to finish	j) specification
11. to weld according to the	k) edges
12. manual	l) precautions

7. Translate the sentences into Ukrainian:

1. The highest paying welding careers are aerospace welding, underwater welding, military welding, pipeline welding and welding in oil and gas sector.
2. Many space operations can be performed remotely, using robots and manipulators.
3. Our nearest future is robotic welding, Internet of Things, virtual reality, artificial intelligence and big data.
4. The processing and joining new exotic materials will require completely new technologies.
5. Your salary depends on how skilled you are and how far you are willing to travel.
6. The main advantages of robotic welding are faster work, no breaks, better quality, reduced costs, reduced accidents and saved materials.

8. Translate the sentences into English:

1. Ручне зварювання вимагає часу, навичок і концентрації; також воно небезпечне.
2. Не так просто вибрати потрібний електрод.
3. Одягніть захисні рукавички, зварювальний шолом і захисний одяг.
4. виміряйте розміри, використовуючи вимірювальну стрічку або цифровий штангенциркуль.
5. Роботи можуть бути корисні, коли доступ до деталі обмежений.
6. Роботизація може замінити людську працю в багатьох ситуаціях.

9. Fill in the gaps using the words from the box:

Caliper, confident, automation, key, breaks, clothes, precautions, prepare, energy, sparks, skilled, helpful

1. The safety of welders is naturally a _____ factor.
2. I must take _____ for my safety at work.
3. The welding process has now reached the age of _____.
4. Unlike laborers, robots don't require _____ and vacations.
5. Flash, fumes, _____ and heat make manual welding a hazardous job.

6. Mark dimensions using a measuring tape or a_____ .
7. Robots can be_____when access to a part is limited or difficult to reach.
8. Put on a welding mask, protective_____and gloves.
9. _____a piece of metal you are going to work with.
10. Putting on protective clothes makes me feel _____
11. Even the most_____welders make mistakes.
12. Welding robotic systems save _____ .

Topic 5. Welding processes

1. Vocabulary

pressure welding	сварка тиском
heat welding	сварка нагріванням
instead (of)	замість, натомість
bolting	з'єднання болтами
riveting	клепання
gas welding	газове зварювання
arc welding	дугове зварювання
resistance welding	контактне зварювання
electron-beam welding	електронно-променеве зварювання
filler	присадний матеріал
rod	пруток, стрижень
joint	з'єднання, стик
flux	флюс
fusible	плавкий
to shield	захищати, екранувати
tip	наконечник
gas-tungsten arc welding	газовольфрамове дугове зварювання
bare	голий
rate	швидкість
gas-metal arc welding	газометалеве дугове зварювання
considerably	значно, суттєво
carbon dioxide	вуглекислий газ
droplet	крапля
weld seam	зварний шов
clamp	затискач, затискати
semi-automatic	напіваавтоматичний
submerge	занурювати

2. Read and translate.

Welding processes

As we have already read at the beginning of this unit, welding is a process when metal parts are joined together by the application of heat, pressure, or a combination of both. The processed of welding can be divided into two main groups: *pressure welding*, when the weld is achieved by pressure and *heat welding*, when the weld is achieved by heat. Heat welding is the most common welding process used today.

Nowadays welding is used *instead of bolting and riveting* in the construction of many types of structures, including bridges, buildings, and ships. It is also a basic process in the manufacture of machinery and in the motor and aircraft industries. It is necessary almost in all productions where metals are used. The welding process depends greatly on the properties of the metals, the *purpose* of their application and the *available* equipment. Welding processes are classified according to the sources of heat and pressure used. The welding processes widely employed today include *gas welding*, *arc welding*, and *resistance welding*. Other joining processes are laser welding, and *electron-beam welding*.

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

Arc Welding. Arc-welding is the most important welding process for joining steels. It requires a continuous supply of either direct or alternating electrical current. This current is used to *create* an electric arc, which generates enough heat to melt metal and create a weld. Arc welding has several advantages over other welding methods. Arc welding is faster because the concentration of heat is high. Also, fluxes are not necessary in certain methods of arc welding. The most widely used arc-

welding processes are shielded metal arc, *gas-tungsten* arc, *gas-metal* arc, and *submerged* arc.

Shielded Metal Arc Welding. In shielded metal-arc welding, a metallic electrode, which conducts electricity, is coated with flux and connected to a source of electric current. The metal to be welded is connected to the other end of the same source of current. An electric arc is formed by touching the *tip* of the electrode to the metal and then drawing it away. The intense heat of the arc melts both parts to be welded and the point of the metal electrode, which supplies filler metal for the weld. This process is used mainly for welding steels. There are also other types of welding.

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

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

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

Resistance Welding. In resistance welding, heat is obtained from the resistance of metal to the flow of an electric current. Electrodes are *clamped* on each

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

3. Match.

1) pressure welding	a) болтове (клепане) з'єднання
2) heat welding	b) залежати від властивостей металів
3) bolting	c) плавний матеріал
4) welding process	d) безперервна подача електричного струму
5) depend on the properties of metals	e) наявне обладнання
6) available equipment	f) зварювання тиском
7) fusible material	g) дефектний зварний шов
8) defective weld	h) процес зварювання
9) alternative electrical current	i) джерело електричного струму
10) electric power source	j) теплова зварка

4. Translate into English:

Вольфрамовий електрод, інертний газ, окислення, високоякісний зварний шов, швидкість зварювання, вуглекислий газ, аргон, гелій, рідкий метал, шар плавкого матеріалу у вигляді гранул, листовий матеріал, напівавтоматичні зварювальні верстати

5. Complete each sentence using the words given below. Each word may be used once. Translate these words and identify which part of speech they are.

Gas, rate, basic, welding, according to, flame, joined by, industries, pressure, metals, heat.

1. Welding is also a ... process in the manufacture of machinery and in the motor and aircraft
2. Welding processes are classified ... the sources of ... and ... used.
3. ... welding is a non-pressure process using heat from a gas
4. However, the ... of welding is considerably slower in gas-tungsten ... than in other processes.

5. Most ... can be ... this process.

6. Answer the following questions.

1. What is a weld?
2. How can the heat be supplied for welding?
3. Is pressure employed in solid-phase processes?
4. What does an arc column consist of?
5. How is heat applied during welding?
6. What is the role of inert atmospheres?
7. What can make a joint brittle while welding?
8. What does the weld metal comprise in arc welding?
9. What is the base metal influenced by?
10. How can residual stress in welded structures be controlled?

Topic 6. Traditional Type of Welding: Gas welding

1. Vocabulary

arc welding	дугове зварювання
gas welding	газозварювання
(to) direct	прямий, направляти
flame	полум'я
(to) overheat	перегрів(ати)
to burn	горіти
consumable/non-	плавиться/неплавкий
consumable	електрод
spool	катушка
tungsten	вольфрам
variety	різноманітність, безліч
fuel	паливо, пальне
oxyacetylene torch	ацетиленокисневий
semiautomatic	напіваавтоматичний
power tool	електроінструмент
precise	точний
precision	точність, чіткість
to feed the wire	подавати дріт
shielding gas	захисний газ
vapor	пар

impact	впливати
noble gas	благородний газ
blend	змішувати(ся)
carbon dioxide	вуглекислий газ
hydrogen	водень
nitrogen	азот
rod	прут
to coat	покривати
coated	покритий

2. Read and translate.

Gas welding

Gas welding is a versatile and widely used joining process. Gas welding is a non-pressure process. Unlike pressure welding, which relies on force to create a bond, gas welding utilizes heat. The heat source is crucial in this method, and they use heat from a gas flame in gas welding. This allows for flexibility and control during the welding operation.

The process involves precise application of the flame. The flame is applied directly to the metal edges to be joined and simultaneously to a filler metal in the form of wire or rod, called the welding rod, which is melted to the joint. This simultaneous application ensures that both the base metal and the filler metal reach the appropriate temperature for fusion. The filler rod adds material to the joint, reinforcing it and ensuring a strong bond.

Gas welding has the advantage of using equipment that is portable and does not require an electric power source. This portability makes it ideal for fieldwork, maintenance repairs, and situations where access to electricity is limited. The simplicity of the equipment also contributes to its ease of use. However, proper preparation is essential for a successful weld. The surface to be welded and the welding wire are coated with flux, a fusible material that shields the metal from air, which would result in a defective weld. The flux acts as a cleaning agent, removing oxides and impurities that can weaken the weld. It also protects the molten metal from atmospheric contamination, ensuring a clean and strong joint. The choice of

flux is crucial and depends on the base metals being joined. Furthermore, the welder must have good control over the flame and the filler rod to produce a quality weld.

3. Put the following words into columns according to the parts of speech.

Equip; welding; directly; advantage; join; simultaneously; joint; advantageous; equipment; fuse; electricity; portable; require; defective requirement; electric; fusible; defect.

Noun	Verb	adjective	Adverb

4. Form antonyms of the following words using prefixes with negative meaning.

Translate the resulting words:

Non-	dis-	un-	im-	ir-	in-
------	------	-----	-----	-----	-----

Possible; pressure; directly; advantage; effective; coated; regular; cover; ferrous.

5. Put the correct prepositions:

1. They use heat ... a gas flame in gas welding.
2. The flame is applied directly ... the metal edges.
3. Welding rod is melted ... the joint.
4. The surface to be welded and the welding wire are coated ... flux.
5. A fusible material shields the metal ... air.
6. Air would result ... a defective weld.

6. Match the beginning and end of the sentences:

1.	Gas welding is ...	a)	... directly to the metal edges.
2.	They use ...	b)	... from air.
3.	The flame is applied ...	c)	... of using portable equipment.
4.	A filler metal is ...	d)	... a non-pressure process.
5.	The welding rod is melted ...	e)	... in the form of wire or rod.
6.	Gas welding has an advantage ...	f)	... heat from a gas flame.
7.	Gas welding does not require ...	g)	... a defective weld.
8.	Flux shields the metal ...	h)	... an electric power source.
9.	Air can result in ...	i)	... to the joint.

7. Match the types of welding to their definitions.

1. gas welding	a) uses a welding power tool and creates an electric arc between an electrode and a base material
2. MIG (GMA) welding	b) has many applications; different electrodes are used; different metals and alloys can be welded
3. MMA welding	c) wire is continuously fed from the spool; it is a semiautomatic
4. TIG welding	d) creates a flame from a burning gas; the torch is moved by hand to control the process
5. arc welding	e) uses a non-consumable tungsten electrode and provides high quality and precision

8. Translate the expressions into English:

1. Портативне обладнання 2. Дефективний шов 3. Низька вартість 4. Інертний газ 5. Кромки металу 6. Створити полум'я 7. Точка зварювання 8. Бажаний ефект 9. Універсальний тип 10. Багато застосувань 11. Докладати безпосередньо 12. Вимагати електрику 13. Одночасно 14. Захищати метал 15. Готовий продукт 16. Різні види 17. Покращувати якість 18. Важлива роль.

9. Fill in the gaps using the words from the box:

temperatures, semi-inert, oxyacetylene, access, rod, colorless, propane, spool, defects, harmful, ___ non-ferrous, noble _____
--

1. Inert Gases are known as _____ gases.
2. Inert Gases are _____, odorless and non-chemically reactive.
3. Gases with low reactivity are known as _____.
4. Shielding is used to protect the metal from the _____ gases in the atmosphere.
5. _____ torch produces a low heat and can be used for small things.
6. You should be careful with _____ torch, it can overheat the area.
7. In MIG welding wire is continuously fed from the _____.
8. One of the great strengths of gas welding is that it can weld _____ and ferrous metals together.
9. You can use gas welding in places that do not have _____ to electricity.

10. Gas welding can't reach the _____ of arc welding.
11. Choosing the wrong shielding gas can result in weld_____.
12. A filler metal may be in the form of a wire or a_____.

Topic 7. Traditional Type of Welding: Arc Welding

1. Vocabulary

(to) supply	забезпечення, забезпечувати, постачати
direct current	постійний струм
alternating	змінний струм
to generate	виробляти, генерувати
enough	достатньо
necessary	необхідний
to conduct	проводити
to draw away	відводити, відсувати
tip	кінчик
several	кілька
voltage	ел. напруга
to fluctuate	коливатися, змінюватися
submerged arc	дугове зварювання під флюсом
arc length	довжина дуги
to charge	заряджати
to separate	відокремлювати(ся)
contamination	забруднення
thick	товстий
circuit	забезпечення, забезпечувати, постачати
earth clamp	постійний струм
holder	змінний струм
continuously	виробляти, генерувати
source	достатньо

2. Read and translate.

Arc Welding

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

Arc welding has several advantages over other welding methods. Arc welding is faster because the concentration of heat is higher. Also, fluxes are not necessary in

certain methods of arc welding. The most widely used arc-welding processes are shielded metal arc, gas-tungsten arc, gas-metal arc, and submerged arc.

Shielded Metal Arc Welding

For example, in shielded metal arc welding, a metallic electrode, which conducts electricity, is coated with flux and connected to a source of electric current. The metal to be welded is connected to the other end of the same source of current. An electric arc is formed by touching the tip of the electrode to the metal and then drawing it away. The intense heat of the arc melts edges of both parts to be welded and the point of the metal electrode, which supplies filler metal for the weld. This process is used mainly for welding steels.

3. Match English equivalent with Ukrainian one.

1. joining steels	a) кілька переваг
2. continuous supply	b) джерело струму
3. alternating current	c) плавити кромки
4. to generate heat	d) з'єднання сталей
5. to create a weld	e) широко використовуваний
6. several advantages	f) покривати флюсом
7. widely used	g) безперервна подача
8. source of current	h) створювати шов
9. to coat with flux	i) змінний струм
10. to melt edges	j) виробляти тепло

4. Find English equivalents for the following expressions in the text:

Постійний або змінний струм; певні методи; проводити електрику; приєднувати до джерела; торкатися кінця електрода; дугове зварювання металевим електродом у середовищі захисного газу; дугове зварювання під флюсом; дугове зварювання металевими електродами в захисному середовищі; дугове зварювання вольфрамовими електродами в середовищі захисного газу; подавати наплавочний метал.

5. Choose an appropriate preposition from the brackets:

1. Arc welding is the most important welding process ... joining steels. (to; for; of)
2. Arc welding has several advantages ... other welding methods. (over; above; on)

3. A metallic electrode is coated ... flux. (by; in; with)
4. A metallic electrode is connected to a source of electric current. (in; with; to)
5. An electric arc is formed ... touching the tip of the electrode to the metal and then drawing it away. (by; with; for)
6. The intense heat ... the arc melts edges of both parts to be welded. (of; in; for)

6. Answer the following questions based on the text:

1. What is the purpose of arc welding?
2. What type of electrical current does arc welding require?
3. Why is arc welding faster than other welding methods?
4. Name the four most widely used arc-welding processes.
5. What is the role of the metallic electrode in shielded metal arc welding?

7. Decide whether the following statements are true or false. Correct the false ones.

1. Arc welding requires only direct current.
2. Arc welding generates enough heat to melt metal.
3. Flux is always necessary in arc welding.
4. Shielded metal arc welding is mainly used for welding aluminum.
5. The electrode in shielded metal arc welding is coated with flux.

8. Complete the sentences with words from the text:

1. Arc welding requires a continuous supply of either _____ or _____ electrical current.
2. The heat of the arc melts the edges of both parts to be _____.
3. Arc welding is _____ than other welding methods because the heat concentration is higher.
4. In shielded metal arc welding, the metallic electrode is coated with _____.
5. The electric arc is created by touching the tip of the electrode to the _____ and drawing it away.

9. Match the terms on the left with their correct definitions on the right.

Term	Definition
Arc welding	a welding method that uses an electric arc to generate heat.
Electrode	a metallic rod used to conduct electricity and supply filler metal.
Flux	a substance used to prevent oxidation during welding.
Shielded metal arc welding	a process where an electrode is coated with flux and connected to an electric current.
Filler metal	the metal added to the weld to help join the pieces together.

10. Put the following sentences in the correct order to describe the shielded metal arc welding process:

1. The intense heat of the arc melts the edges of both parts to be welded.
2. An electric arc is formed by touching the electrode tip to the metal and drawing it away.
3. The metal to be welded is connected to the same power source as the electrode.
4. The metallic electrode is coated with flux and connected to a power source.
5. The metal electrode melts and supplies filler metal for the weld.

Topic 8. Alternative types of welding

1. Vocabulary

cold welding	холодне зварювання
friction welding	зварювання тертям
laser beam welding	лазерне зварювання
diffusion welding	дифузійне зварювання
ultrasonic welding	ультразвукове зварювання
explosive welding	зварювання вибухом
to prepare surface	готувати поверхню
axis	вісь
filler metal	присадний матеріал
distortion	спотворення
(dis)similar	(не)схожий
workpiece	виріб
to rotate	обертати
rotation	обертання
cycle	цикл
narrow	вузький

to compare	порівнювати
consumption	споживання
deep	глибокий
to require	вимагати
to apply	наносити
(un)suitable	(не)відповідний
environmentally friendly	екологічно чистий
rapid	швидкий

2. Read and translate.

Alternative types of welding

Cold welding. Cold welding, the joining of materials without the use of heat, can be accomplished simply by pressing them together. Surfaces have to be well prepared, and pressure sufficient to produce 35 to 90 percent deformation at the joint is necessary, depending on the material. Lapped joints in sheets and cold-butt welding of wires constitute the major applications of this technique. Pressure can be applied by punch presses, rolling stands, or pneumatic tooling. Pressures of 1,400,000 to 2,800,000 kilopascals (200,000 to 400,000 pounds per square inch) are needed to produce a joint in aluminum; almost all other metals need higher pressures.

Friction welding. In friction welding two work pieces are brought together under load with one part rapidly revolving. Frictional heat is developed at the interface until the material becomes plastic, at which time the rotation is stopped and the load is increased to consolidate the joint. A strong joint result with the plastic deformation, and in this sense the process may be considered a variation of pressure welding. The process is self-regulating, for, as the temperature at the joint rises, the friction coefficient is reduced and overheating cannot occur. The machines are almost like lathes in appearance. Speed, force, and time are the main variables. The process has been automated for the production of axle casings in the automotive industry.

Laser welding. Laser welding is accomplished when the light energy emitted from a laser source focused upon a workpiece to fuse materials together. The limited availability of lasers of sufficient power for most welding purposes has so far restricted its use in this area. Another difficulty is that the speed and the thickness that can be welded are controlled not so much by power but by the thermal conductivity

of the metals and by the avoidance of metal vaporization at the surface. Particular applications of the process with very thin materials up to 0.5 mm (0.02 inch) have, however, been very successful. The process is useful in the joining of miniaturized electrical circuitry.

Diffusion bonding. This type of bonding relies on the effect of applied pressure at an elevated temperature for an appreciable period of time. Generally, the pressure applied must be less than that necessary to cause 5 percent deformation so that the process can be applied to finished machine parts. The process has been used most extensively in the aerospace industries for joining materials and shapes that otherwise could not be made—for example, multiple-finned channels and honeycomb construction. Steel can be diffusion bonded at above 1,000° C (1,800° F) in a few minutes.

Ultrasonic welding. Ultrasonic joining is achieved by clamping the two pieces to be welded between an anvil and a vibrating probe or sonotrode. The vibration raises the temperature at the interface and produces the weld. The main variables are the clamping force, power input, and welding time. A weld can be made in 0.005 second on thin wires and up to 1 second with material 1.3 mm (0.05 inch) thick. Spot welds and continuous seam welds are made with good reliability. Applications include extensive use on lead bonding to integrated circuitry, transistor canning, and aluminum can bodies.

Explosive welding. Explosive welding takes place when two plates are impacted together under an explosive force at high velocity. The lower plate is laid on a firm surface, such as a heavier steel plate. The upper plate is placed carefully at an angle of approximately 5° to the lower plate with a sheet of explosive material on top. The charge is detonated from the hinge of the two plates, and a weld takes place in microseconds by very rapid plastic deformation of the material at the interface. A completed weld has the appearance of waves at the joint caused by a jetting action of metal between the plates.

3. Fill in the gaps with the type of welding required and translate the sentences given.

1. ... welding is successfully used in manufacture of small elements of electric circuits.
2. Heat is not used in ... welding.
3. ... is widely used in aerospace industries.
4. Vibration is used in ... welding.
5. Plastic deformation is the basic principle in ... welding.
6. ... welding is impossible without pressure and high temperature.
7. In ... welding one of the parts being welded revolves.

4. Match the welding method with its description.

1. Cold welding
2. Friction welding
3. Laser welding
4. Diffusion bonding
5. Ultrasonic welding
6. Explosive welding

- A. Uses a vibrating probe to generate heat and join materials.
- B. Achieved by pressing materials together without heat.
- C. Requires pressure and high temperature for a certain time.
- D. Uses an intense beam of light to melt materials.
- E. Relies on rapid impact and plastic deformation.
- F. Generates heat through friction between rotating parts.

5. Decide whether the following statements are True or False according to the text.

1. Cold welding requires extremely high temperatures.
2. Friction welding prevents overheating due to its self-regulating nature.
3. Laser welding is highly effective for thick materials.
4. Diffusion bonding requires a pressure that deforms materials significantly.
5. Ultrasonic welding is commonly used in the electronics industry.
6. Explosive welding creates joints that resemble waves.

6. Complete the sentences with the correct words from the text.

1. _____ welding does not require heat but relies on high pressure.
2. In _____ welding, one part is rotated rapidly until plastic deformation occurs.
3. The automotive industry uses _____ welding for axle casings.
4. _____ welding is effective for miniaturized electrical circuits.
5. The aerospace industry often applies _____ bonding to complex structures.
6. A sheet of _____ is used to create a bond in explosive welding.

7. Make up the sentences using the given words:

1. Is, surface, preparation, required, minimal.
2. Low, welding, consumption, ultrasonic, has, energy.
3. Short, the, is, cycle, extremely, welding.
4. Possible, welding, dissimilar, of, is, materials.
5. Needed, vacuum, or, is, atmosphere, a, protective.
6. Workpieces, vibrations, are, to, applied, acoustic.

8. Use the words in the box to complete the sentences.

pressure, heat, deformation, interface, friction, laser,
diffusion, vibration, explosion, aerospace

1. Cold welding requires well-prepared surfaces and sufficient _____ to form a bond.
2. In friction welding, _____ is generated between two surfaces until one becomes plastic.
3. Laser welding uses a concentrated beam of _____ to fuse materials.
4. Diffusion bonding relies on applied pressure at an elevated temperature for an extended time to allow atomic _____.
5. Ultrasonic welding depends on _____ to generate heat at the welding point.
6. Explosive welding occurs due to a high-velocity impact caused by an _____.
7. Friction welding prevents overheating because the temperature at the _____ reduces the friction coefficient.

8. The _____ industry extensively uses diffusion bonding for complex material joining.
9. Cold welding requires a high degree of _____ at the joint.
10. A major challenge of laser welding is the metal's thermal conductivity and risk of surface _____.

9. Choose the correct answer for each question.

1. What is the primary mechanism of friction welding?
- a) High temperature melting
 - b) Rapid impact and explosion
 - c) Heat generated by rubbing surfaces together
 - d) Electrical current passing through the materials
2. In which welding method do materials join without melting?
- a) Cold welding
 - b) Laser welding
 - c) Ultrasonic welding
 - d) Friction welding
3. What is the primary advantage of ultrasonic welding?
- a) It creates a strong joint with minimal heat
 - b) It is the fastest welding method available
 - c) It requires no external force
 - d) It is the only method that works on all metals
4. Why is laser welding limited in its applications?
- a) It cannot be automated
 - b) The power of lasers is often insufficient
 - c) It produces weak joints
 - d) It causes significant material loss
5. What is a unique characteristic of explosive welding?
- a) It is used for welding very small electronic components
 - b) It creates a smooth, flat bond

- c) It relies on a chemical reaction for joining
 - d) The final weld has a wave-like structure
6. In diffusion bonding, why must the applied pressure be low?
- a) To avoid melting the materials
 - b) To prevent excessive deformation
 - c) To reduce friction at the interface
 - d) To minimize welding time
7. Which of the following is a key factor in determining the success of cold welding?
- a) The material's ability to conduct electricity
 - b) The purity and preparation of the surfaces
 - c) The rotation speed of the materials
 - d) The presence of a chemical bonding agent
8. What happens during the final stage of friction welding?
- a) The rotation continues as pressure is reduced
 - b) The rotation stops, and pressure is increased
 - c) The materials are allowed to cool naturally without pressure
 - d) An external cooling system is applied

10. Select the best option to complete each sentence.

1. Cold welding requires materials to be ____.
- a) Heated before pressing
 - b) Melted at the joint
 - c) Clean and oxide-free
 - d) Covered in a bonding agent
2. A major limitation of laser welding is ____.
- a) The need for excessive pressure
 - b) The difficulty in controlling heat distribution
 - c) The long welding time required
 - d) Its inability to join thin materials
3. Ultrasonic welding is particularly useful in ____.
- a) Automotive manufacturing

- b) Heavy construction projects
 - c) Joining delicate electronic components
 - d) Shipbuilding
4. Diffusion bonding is widely used in aerospace because ____.
- a) It can join complex shapes without damaging them
 - b) It produces very weak bonds
 - c) It relies on extremely high heat
 - d) It is the cheapest welding method available
5. Explosive welding differs from other methods because ____.
- a) It does not require external pressure
 - b) It creates bonds in a matter of microseconds
 - c) It works only with plastic materials
 - d) It involves heating the materials before impact

Topic 9. Safety Precautions to Enforce Today to Ensure Welding Safety

1. Vocabulary

bum	опік, обпалювати
health problems	проблеми зі здоров'ям
dust	пил
emit	випромінювати, випускати
fume	дим, гар, диміти
illness	захворювання
injury	рана
skin	шкіра
splash	сплеск, бризки
wet	вологий, сирий
hazard	небезпека
slip	ковзання, ковзати
noise	шум
ache	біль
irritation	подразнення
fever	лихоманка, жар
(im)possible	(не)можливий
breath	дихання
unconsciousness	несвідомий стан
cancer	рак
fire extinguisher	вогнегасник
first aid	перша допомога
blood	кров
pay attention	звертати увагу

leak	ВИТІК
to inhale	ВДИХАТИ
treatment	ЛІКУВАННЯ
precautions	ЗАПОБІЖНІ ЗАХОДИ

2. Read and translate.

Safety Precautions to Enforce Today to Ensure Welding Safety

Safety Precautions to Enforce Today to Ensure Welding Safety

Welding is a critical process used in industries such as construction, manufacturing, and automotive repair. However, it comes with significant risks, including burns, electric shock, toxic fume inhalation, and eye damage from intense light. Without proper precautions, these hazards can lead to serious injuries or even fatalities. Therefore, welders and employers must enforce strict safety measures to ensure a secure working environment.

1. Wear Proper Protective Equipment

Personal protective equipment (PPE) is the first defense against welding hazards. Welders must wear flame-resistant clothing to prevent burns, along with welding gloves that provide insulation against heat and electrical shock. A welding helmet with the appropriate shade level protects the eyes from harmful ultraviolet (UV) and infrared (IR) radiation, which can cause "arc eye" or welder's flash. Additionally, safety boots with non-slip soles help prevent accidents caused by falling objects or slippery surfaces. In some cases, a face shield and respirator may be required, particularly when working in confined spaces or with materials that produce hazardous fumes.

2. Ensure Proper Ventilation

Welding produces toxic fumes that contain harmful substances such as manganese, hexavalent chromium, and ozone. Prolonged exposure to these gases can lead to respiratory issues, lung diseases, or even long-term neurological problems. To minimize these risks, welding areas must have effective ventilation systems, including exhaust hoods or portable fume extractors. In poorly ventilated spaces, welders should use respiratory protection, such as an air-purifying respirator or supplied-air respirator, to ensure they do not inhale dangerous fumes.

3. Prevent Fire Hazards

Due to the high temperatures and flying sparks involved in welding, fire safety is a critical concern. Before starting any welding work, the area should be inspected for combustible materials, such as paper, cloth, wood, or flammable liquids. These materials should be removed, covered with fire-resistant blankets, or shielded with fireproof barriers. Employers should ensure that fire extinguishers, fire blankets, and emergency stop buttons are easily accessible. Additionally, workers should be trained in fire prevention techniques and emergency response procedures.

4. Avoid Electric Shock

Electric shock is one of the most severe dangers in welding, often resulting in serious injuries or fatalities. Direct contact with an electrical circuit or faulty equipment can lead to high-voltage shocks or secondary accidents, such as falls from heights. To reduce these risks, welders should inspect their equipment regularly for damaged cables, exposed wires, or loose connections. They should also wear dry, insulated gloves and stand on a dry, non-conductive surface when welding. Proper grounding of equipment is essential to minimize electrical hazards.

5. Follow Proper Training and Procedures

Knowledge and training are key elements in maintaining welding safety. All welders should undergo professional training to understand the risks associated with welding and the correct procedures for using equipment. They must be aware of workplace safety regulations, emergency protocols, and best practices for handling hazardous materials. Regular safety drills, refresher courses, and supervision by experienced welders help reinforce safe working habits.

6. Store and Maintain Equipment Properly

Welding tools and equipment should be stored in a dry, clean area to prevent damage and malfunction. Cables and hoses should be neatly coiled and free from tangles to avoid tripping hazards. Regular maintenance, including checking gas cylinders for leaks, replacing worn-out components, and ensuring proper calibration of machines, is essential for preventing unexpected failures that could lead to accidents.

By enforcing these safety precautions, welders can significantly reduce the risks associated with their work, ensuring both their safety and the safety of those around them. A proactive approach to welding safety not only prevents accidents but also enhances productivity and efficiency in the workplace.

3. Answer the following questions based on the text.

- a) What are some of the main dangers associated with welding
- b) How does proper ventilation help ensure welding safety
- c) Why is it important to check welding equipment before use
- d) What should be done before starting any welding work to prevent fires
- e) How can training contribute to a safer welding environment?

4. Mark the following statements as True (T) or False (F):

- a) Wearing a welding helmet is optional if working in a well-lit environment.
- b) Toxic fumes from welding can cause long-term health problems.
- c) Fire extinguishers should always be within reach in welding areas.
- d) Wet gloves provide better protection against electric shock.
- e) Proper storage of welding equipment helps prevent accidents.

5. Complete the sentences with the correct words from the text:

- a) Welding produces harmful _____ that can damage the respiratory system.
- b) Welders should always stand on a _____, non-conductive surface to avoid electric shock.
- c) Fire-resistant _____ can help protect flammable materials from welding sparks.
- d) Proper _____ helps to remove dangerous fumes from the work area.
- e) Regular _____ ensures that welding tools and equipment function correctly.

6. Match the words on the left with their correct definitions on the right:

Term	Definition
a) Insulation	1) A material that prevents heat or electricity from passing through.

Term	Definition
b) Ventilation	2) The act of training workers to follow safety rules.
c) Hazard	3) The presence of air movement to remove fumes.
d) Fire extinguisher	4) A tool used to put out small fires.
e) Safety training	5) A potential source of danger or harm.

7. Translate the sentences into Ukrainian

- a) Welding produces toxic fumes that can cause serious health problems.
- b) Personal protective equipment helps prevent burns and injuries.
- c) Fire extinguishers must be available in all welding areas.
- d) Electric shock is one of the most dangerous risks in welding.
- e) Proper ventilation reduces the risk of inhaling toxic gases.

8. Translate the sentences into English

- a) Зварники повинні носити захисні рукавиці, шоломи та взуття.
- b) Погана вентиляція може спричинити серйозні проблеми з диханням.
- c) Перед початком роботи слід перевірити обладнання на пошкодження.
- d) Пожежонебезпечні матеріали слід прибрати з робочої зони.
- e) Навчання є важливим для забезпечення безпечного робочого середовища.

9. Fill in the blanks using word below

protective, ventilation, equipment, hazards, extinguisher

- f) Welders must wear _____ clothing to prevent burns.
- g) Good _____ is necessary to remove toxic fumes.
- h) Before starting work, always check the welding _____.
- i) Fire _____ should be available in case of emergency.
- j) Welders should be aware of workplace _____ and follow safety rules.

10. Choose the correct answer

1. What is the main purpose of personal protective equipment?
 - a) To increase welding speed
 - b) To prevent injuries and accidents
 - c) To reduce electricity costs
2. Why is proper ventilation important in welding?

- a) To keep the workshop cool
 - b) To remove toxic fumes and gases
 - c) To improve the quality of the welded metal
3. How can electric shock be prevented?
- a) By touching metal parts with bare hands
 - b) By wearing insulated gloves and standing on a dry surface
 - c) By using water to cool down welding equipment
4. What should be done before welding to reduce fire hazards?
- a) Remove flammable materials and have a fire extinguisher nearby
 - b) Wear wet clothes to prevent burns
 - c) Keep the workshop door closed
5. Why is regular training important for welders?
- a) To ensure they follow the latest safety procedures
 - b) To help them weld faster
 - c) To reduce the need for protective equipment

Topic 10. Advanced Welding Machines and Their Applications

1. Vocabulary.

2.

welding machine	зварювальний апарат
direct/alternating current	постійний/змінний струм
power source	джерело живлення
duty cycle	робочий цикл
voltage	електрична напруга
absorbed current	споживаний струм
overheating	перегрів
adjustment	налаштування, регулювання
remote control	пульт керування
earth (ground) wire	заземлений дріт
arc length	довжина дуги
button	кнопка
capacity	потужність, ємність
confirm	підтверджувати
install	встановлювати
installation	установка
light-emitting diode (LED)	світлодіод
manufacturer's settings	налаштування виробника
overload	перевантаження

plug	вилка, підключати
socket	розетка, роз'єм,
warning	попередження
flow meter	лічильник витрати
mode	режим
specification	технічна характеристика
to prevent	запобігати
short circuit	коротке замикання

3. Read and translate.

Advanced Welding Machines and Their Applications

Welding machines are indispensable tools in modern engineering, enabling the fusion of metal components through heat, pressure, or a combination of both. These machines vary significantly in technology, power source, and application, making them essential in industries such as aerospace, shipbuilding, construction, and heavy machinery manufacturing.

One of the most widely used types is the arc welding machine, which generates an electric arc between an electrode and the workpiece. This arc produces intense heat, melting the metal and allowing it to fuse upon cooling. Shielded Metal Arc Welding (SMAW), also known as stick welding, is a robust method suitable for outdoor use due to its flux-coated electrodes that protect the weld from atmospheric contamination.

For more precise and aesthetically refined welds, Gas Metal Arc Welding (GMAW), commonly referred to as MIG welding, employs a continuous wire electrode along with a shielding gas to prevent oxidation. This method is favored in automotive manufacturing due to its efficiency and ease of automation. Similarly, Gas Tungsten Arc Welding (GTAW), or TIG welding, utilizes a non-consumable tungsten electrode, producing high-quality welds with superior control, making it ideal for aerospace applications and delicate materials like aluminum and stainless steel.

Another specialized technique, resistance welding, encompasses spot welding and seam welding, both of which rely on electrical resistance and pressure to join metal sheets. These methods are widely implemented in mass production, particularly in the automotive industry, where precision and speed are critical.

Despite their advantages, welding machines pose safety risks, including exposure to ultraviolet radiation, toxic fumes, and high temperatures. Proper safety measures – such as wearing flame-resistant clothing, insulated gloves, and auto-darkening helmets – are essential. Additionally, adequate ventilation and fume extraction systems must be employed to minimize health hazards.

The advancement of welding technology has led to the development of laser welding and friction stir welding (FSW), which offer enhanced accuracy and minimal material distortion. As automation and robotics continue to evolve, welding machines integrated with AI-driven quality control systems are shaping the future of precision engineering.

4. Match the words with their definitions.

1. Fusion
2. Electrode
3. Oxidation
4. Ventilation
5. Precision
6. Distortion

- a) A process of joining two materials by melting them together.
- b) A metal rod or wire used to conduct electricity in welding.
- c) A chemical reaction where metal reacts with oxygen, causing rust.
- d) The movement of fresh air to remove harmful gases.
- e) The quality of being exact and accurate.
- f) A change in the shape or structure of a material due to heat or pressure.

5. Fill in the blanks using words below.

fusion, electrode, shielding gas, ventilation, resistance, welding helmet

1. In MIG welding, a _____ is used to protect the molten metal from contamination.
2. A tungsten _____ is used in TIG welding to provide precise and clean welds.

3. Proper _____ is necessary in welding workshops to prevent exposure to toxic fumes.

4. Metal _____ occurs when heat is applied and then cooled down.

5. A _____ is essential to protect a welder's eyes and face from sparks and radiation.

6. Decide whether the statements are true or false. If false, correct them.

1. Resistance welding relies on an electric arc to fuse metal. ()

2. TIG welding is known for its high precision and clean welds. ()

3. Shielded Metal Arc Welding (SMAW) is unsuitable for outdoor environments. ()

4. Friction Stir Welding (FSW) uses a rotating tool instead of heat from an electric arc. ()

5. Proper safety equipment is unnecessary when using advanced welding machines. ()

6. SMAW welding is unsuitable for outdoor use.

7. TIG welding is commonly used in automotive manufacturing because it is the fastest method.

8. Resistance welding includes spot welding and seam welding.

9. Exposure to ultraviolet radiation is not a concern in welding.

7. Complete the sentences with the correct words from the text.

1. Arc welding generates an electric _____ between an electrode and the workpiece.

2. MIG welding uses a continuous wire electrode and a _____ gas to prevent oxidation.

3. Resistance welding relies on _____ and _____ to join metal sheets.

4. Proper safety measures include wearing _____-resistant clothing and using _____ gloves.

5. Laser welding and friction stir welding offer high _____ and minimal material _____.

8. Choose the correct answer.

1. What is the primary function of welding machines?
 - a) Cutting metal into precise shapes
 - b) Fusing metal components using heat and pressure
 - c) Polishing metal surfaces
2. Why is SMAW suitable for outdoor welding?
 - a) It uses a shielding gas to prevent oxidation.
 - b) Its flux-coated electrodes protect the weld from contamination.
 - c) It produces the highest quality welds.
3. What makes TIG welding ideal for aerospace applications?
 - a) It is faster than MIG welding.
 - b) It requires less precision than other methods.
 - c) It produces high-quality welds with superior control.
4. Which welding method is widely used in automotive mass production?
 - a) Shielded Metal Arc Welding
 - b) Spot Welding
 - c) Gas Tungsten Arc Welding
5. What is a key benefit of laser welding?
 - a) It is the cheapest welding method.
 - b) It offers high accuracy with minimal material distortion.
 - c) It does not require protective gear.

9. Answer the following questions in your own words.

1. What are the main differences between SMAW, MIG, and TIG welding?
2. Why is resistance welding considered suitable for mass production?
3. How does automation improve welding processes?
4. What safety measures should welders take to minimize health risks?
5. Which welding method do you think is the most advanced, and why?

10. Translate the sentences into English.

1. Я хочу використовувати цей зварювальний апарат. Не могли б Ви пояснити, що означає цей режим?

2. Які характеристики роблять зварювання безпечнішим, швидшим і легшим?

3. Низьке споживання енергії та висока ефективність дуже важливі в зварюванні.

4. До переваг цього зварювального апарата можна віднести малу вагу, маленький розмір, цифровий дисплей і легкий контроль усіх параметрів.

5. Утримування цієї кнопки більше трьох секунд відкриває меню сервісних функцій.

6. Утримування цієї кнопки повертає обрану функцію до налаштувань виробника.

Topic 11. Weld Joints

1. Vocabulary.

across	через, поверх
angle, corner	кут
butt	стик
joint	з'єднання
from side to side	з боку в бік
groove	виїмка, жолоб, паз
lap to overlap	перекриття, внахлест перекривати
plane	площину
pull	тягнути
push	штовхати
spot	точка, пляма,
penetration	проникнення
piece	шматок
sheet	лист, листовий
to fill filler	заповнювати заповнювач
(to) place	місце, поміщати
bead	валик
single	одиначний, окремий
tee	Т-подібний, тавровий
to fasten	прикріплювати,
edge	кромка, край, грань
flat position	нижнє положення
overhead position	стельове положення
air draft	протяг
crack	тріщина
hole	отвір
to prevent	запобігати
nozzle	насадка, наконечник,

2. Read and translate.

WELD JOINTS

The weld joint is where two or more metal parts are joined by welding. Welds can be geometrically prepared in many different ways. The five basic types of weld joints are the butt, corner, tee, lap, and edge. Other variations exist as well — for example, double-V preparation joints are characterized by the two pieces of material, each tapering to a single centre point at one-half their height. Single-U and double-U preparation joints are also fairly common — instead of having straight edges like the single-V and double-V preparation joints, they are curved, forming the shape of a U. Lap joints are also commonly more than two pieces thick — depending on the process used and the thickness of the material, many pieces can be welded together in a lap joint geometry

A butt joint is used to join two members aligned in the same plane. This joint is frequently used in plate, sheet metal, and pipe work. A joint of this type may be either square or grooved.

Corner and tee joints are used to join two members located at right angles to each other. In cross section, the corner joint forms an L-shape, and the tee joint has the shape of the letter T. Various joint designs of both types have uses in many types of metal structures.

A lap joint, as the name implies, is made by lapping one piece of metal over another. This is one of the strongest types of joints available; however, for maximum joint efficiency, you should overlap the metals a minimum of three times the thickness of the thinnest member you are joining. Lap joints are commonly used with torch brazing and spot welding applications.

An edge joint is used to join the edges of two or more members lying in the same plane. In most cases, one of the members is flanged. While this type of joint has some applications in platework, it is more frequently used in sheet metal work. An edge joint should only be used for joining metals 1/4 inch or less in thickness that are not subjected to heavy loads.

Often, particular joint designs are used exclusively or almost exclusively by certain

welding processes. For example, resistance spot welding, laser beam welding, and electron beam welding are most frequently performed on lap joints. However, some welding methods, like shielded metal arc welding, are extremely versatile and can weld virtually any type of joint. Additionally, some processes can be used to make multipass welds, in which one weld is allowed to cool, and then another weld is performed on top of it. This allows for the welding of thick sections arranged in a single-V preparation joint, for example. The type of joint selected for any welding job may materially affect the quality and strength of the weld; the cost of labour and materials; the time and expense involved in preparing, jiggling, and positioning the work; and other factors of like importance.

The selection of the proper joint type depends on a number of factors, such as joint thickness and material, desired physical properties in the finished joint, size of the pieces being welded, accessibility of the joint, fit-up obtainable, available edge preparation equipment, number of pieces to be welded, and specifications of regulatory codes (if applicable).

3. Choose the correct answer.

1. What is the main characteristic of a butt joint?

- a) It forms a T-shape in cross-section.
- b) It joins two members aligned in the same plane.
- c) It is only used in sheet metal work.

2. Which joint type is commonly used with torch brazing and spot welding?

- a) Edge joint
- b) Tee joint
- c) Lap joint

3. What is a key feature of a double-V preparation joint?

- a) It has curved edges forming a U-shape.
- b) It tapers to a single center point at one-half the height.
- c) It overlaps one piece of metal over another.

4. Which joint type should only be used for metals 1/4 inch or less in thickness?

- a) Butt joint
- b) Edge joint
- c) Corner joint

5. Why are multipass welds sometimes used?

- a) To weld thick sections by allowing one weld to cool before adding another.
- b) To make joints more flexible.
- c) To avoid using shielding gas.

4. Complete the sentences with the correct words from the text:

- 1. A _____ joint is used to join two members located at right angles to each other.
- 2. Lap joints are considered strong, but for maximum efficiency, the metals should overlap at least _____ times the thickness of the thinnest member.
- 3. The _____ joint is frequently used in sheet metal work, and one of the members is usually flanged.
- 4. Resistance spot welding, laser beam welding, and electron beam welding are most commonly performed on _____ joints.
- 5. The selection of the proper joint type depends on factors such as joint _____, material properties, and accessibility.

5. Decide whether the statements are true or false. If false, correct them.

- 1. A single-U preparation joint has straight edges like a single-V preparation joint.
- 2. Butt joints are primarily used for welding pipes, plates, and sheet metal.
- 3. An edge joint can be used for any metal thickness and load requirements.
- 4. The type of joint selected for a welding job can affect the strength, cost, and preparation time.
- 5. Shielded metal arc welding is highly limited and can only weld specific types of joints.

6. Match the welding joint type with its description:

Joint Type	Description
1. Butt joint	a) One piece of metal overlaps another.
2. Corner joint	b) Joins edges of two or more members in the same plane.
3. Tee joint	c) Forms an L-shape in cross-section.
4. Lap joint	d) Members are aligned in the same plane and can be square or grooved.
5. Edge joint	e) Forms a T-shape in cross-section.

7. Answer the following questions in your own words:

1. Why is the lap joint considered one of the strongest welding joints?
2. What factors should be considered when selecting a welding joint type?
3. How does multipass welding improve the strength of a joint?
4. Why do some joint designs work better with specific welding processes?
5. What are the differences between single-V, double-V, single-U, and

double-U preparation joints?

8. Rewrite the sentences using the given prompts without changing the meaning:

1. An edge joint is mainly used in sheet metal work. (*Rewrite using "primarily"*)
→ _____
2. A lap joint is strong because it overlaps the pieces of metal. (*Rewrite using "due to"*)
→ _____
3. Tee joints form a T-shape in cross-section. (*Rewrite using "which"*)
→ _____
4. Shielded metal arc welding can weld almost any type of joint. (*Rewrite using "able to"*)
→ _____

9. Fill in the blanks with the correct words from the box:

tapering, preparation, multipass, strength, accessibility, overlap, efficiency, regulatory, edges, process

1. The _____ joint should only be used for metals that are not subjected to heavy loads.
2. The double-V preparation joint is characterized by two pieces of metal, each _____ to a center point.
3. To ensure the highest joint _____, materials should be overlapped at least three times their thickness.
4. In some cases, welding requires _____ welds to handle thick sections of metal.
5. The type of joint selected may be influenced by _____ codes that must be followed.

10. Translate into Ukrainian.

1. Зварний шов – це місце, де з'єднуються дві або більше металевих деталей.
2. Існує п'ять основних типів зварних з'єднань: стик, кутове, таврове, внапуск і крайове.
3. Стикове з'єднання використовується для зварювання деталей, розташованих в одній площині.
4. Таврове з'єднання має форму літери "Т" у поперечному перерізі.
5. Лапове з'єднання є одним із найміцніших, оскільки один металевий елемент накладається на інший.
6. Деякі типи зварювання, наприклад точкове або лазерне, найчастіше використовуються для з'єднання внапуск.
7. Крайове з'єднання рекомендується для тонких металів, які не піддаються великим навантаженням.
8. Вибір типу з'єднання впливає на міцність шва, вартість і складність підготовки деталей.
9. Для зварювання товстих деталей можуть застосовувати багат шарові шви.

10. Деякі методи зварювання, наприклад ручне дугове зварювання, підходять для більшості типів з'єднань.

Topic 12. IT in Welding and Cutting for the Welding Engineer

1. Vocabulary.

Welding and cutting processes	Процеси зварювання та різання
Information technology (IT)	Інформаційні технології
Welding engineer	Інженер-зварювальник
Specialized software	Спеціалізоване програмне забезпечення
Efficiency	Ефективність
Precision	Точність
Safety	Безпека
Digital tools	Цифрові інструменти
Weld design	Проектування зварних швів
Robotic welding machine	Роботизований зварювальний апарат
Welding quality	Якість зварювання
CAD (Computer-Aided Design)	САПР (Система автоматизованого проектування)
3D model	3D-модель
Metal structure	Металева конструкція
Welding technique	Зварювальна технологія
Welding defect	Дефект зварювання
Welding simulation software	Програмне забезпечення для симуляції зварювання
Virtual environment	Віртуальне середовище
Material waste	Відходи матеріалу
Online database	Онлайн база даних
Training video	Навчальне відео
Cloud-based system	Хмарна система
Real-time access	Доступ у режимі реального часу
Automated CNC cutting machine	Автоматизований верстат із ЧПУ
CAM (Computer-Aided Manufacturing)	САМ (Система автоматизованого виробництва)
High precision	Висока точність
Cutting process	Процес різання

Error reduction	Зменшення помилок
Environmentally friendly	Екологічно безпечний

2. Read and translate.

IT in Welding and Cutting for the Welding Engineer – PC Programs and the Internet

In modern welding and cutting processes, information technology plays an important role. Welding engineers use specialized PC programs and the internet to improve efficiency, precision, and safety in their work. These digital tools help with designing welds, controlling robotic welding machines, and monitoring welding quality.

One of the most common software types used in welding is CAD (Computer-Aided Design) software. This allows engineers to create detailed 3D models of metal structures before welding. Programs like AutoCAD, SolidWorks, and Inventor help engineers test different welding techniques and predict possible defects before the welding process starts.

Another essential tool is welding simulation software. These programs, such as WeldSim and Simufact Welding, allow engineers to practice and optimize welding parameters in a virtual environment. This reduces material waste and improves weld quality.

The internet is also crucial for welding engineers. They can access online welding databases, watch training videos, and participate in forums where professionals discuss new technologies. Many companies use cloud-based systems to store welding data and ensure that all engineers have real-time access to important project information.

Automated CNC cutting machines also rely on software programs to cut metal with high precision. Engineers program these machines using CAM (Computer-Aided Manufacturing) software, such as Fusion 360 or Mastercam, to ensure accurate and fast cutting processes.

With advancements in IT, welding engineers can work more efficiently, reduce errors, and improve safety. Technology continues to change the welding industry, making processes faster, smarter, and more environmentally friendly.

3. Match each term with the correct definition.

1. Welding engineer
2. CAD software
3. Robotic welding machine
4. Cloud-based system
5. Welding simulation software
6. Material waste
7. CNC cutting machine
8. Virtual environment
9. Real-time access
10. Automated manufacturing

- a). A system that allows users to store and share data over the internet.
- b). A professional who specializes in metal joining technologies.
- c). A digital space where engineers can test welding techniques without using physical materials.
- d). A program used for creating 3D models of structures before welding.
- e). A device that performs welding tasks without direct human control.
- f) Excess materials left after cutting or welding processes.
- g). A system where engineers can access project information instantly.
- h). A machine that follows programmed instructions to cut metal with high precision.
- i). A program that allows users to test and optimize welding parameters in a digital format.
- j). A process where machines handle production tasks with minimal human input.

4. Complete the sentences using the correct words from the word bank.

precision, efficiency, welding quality, database, simulation, environmentally friendly, defects, safety, automation, access

1. Using CAD software improves _____ by allowing engineers to design accurate welding plans.
2. The main goal of welding simulation software is to minimize _____ and optimize welding parameters.
3. Cloud-based systems provide engineers with real-time _____ to important project information.
4. Companies store welding data in a centralized _____ to improve workflow and information management.
5. Robots and CNC machines increase _____ by reducing manual labor and speeding up production.
6. Advanced welding techniques help reduce material waste, making processes more _____.
7. Engineers use virtual _____ to test different welding conditions before applying them in real life.
8. Automated machines improve workplace _____ by minimizing human exposure to hazardous conditions.
9. Poorly planned welds can lead to structural _____, which may compromise safety.
10. Improving _____ in welding ensures strong and durable metal joints.

5. Decide whether the statements are true or false based on the text.

1. CAD software is used only for designing electrical circuits.
2. Welding simulation software helps engineers optimize welding parameters without using real materials.
3. Cloud-based systems allow engineers to access project data from anywhere.
4. CNC cutting machines require manual operation to ensure precision.
5. Online welding databases help engineers learn about the latest industry trends.
6. The main purpose of automation in welding is to increase the amount of manual work.

7. Virtual simulations reduce material waste and improve weld accuracy.
8. Safety is not a major concern when working with welding technologies.
9. CAM software is used for designing welding helmets.
10. Information technology is playing an increasingly important role in modern welding.

6. Answer the following questions in complete sentences.

1. How does CAD software help engineers improve welding processes?
2. Why is welding simulation software important in the industry?
3. What are some benefits of using cloud-based systems in welding?
4. How do CNC cutting machines contribute to precision in metalworking?
5. Why is reducing material waste important in modern welding?
6. How does automation improve efficiency and safety in welding?
7. In what ways can online databases and training videos support welding professionals?
8. What challenges might engineers face when using new welding technologies?
9. How does the integration of IT in welding impact the environment?
10. What do you think the future of welding technology will look like?

7. Complete the sentences using the correct words from the text.

1. _____ software is used to design 3D models of metal structures before welding.
2. Engineers use _____ to practice welding in a virtual environment.
3. _____ systems allow welding engineers to access project data from anywhere.
4. _____ machines are programmed to cut metal with high precision.
5. _____ software helps program automated cutting machines.

8. Rewrite the sentences using different structures while keeping the same meaning.

1. CAD software helps engineers create detailed 3D models.
Engineers use CAD software _____.

2. The internet is essential for welding engineers to learn about new technologies.
Welding engineers need _____.
3. CNC cutting machines work with high precision.
High precision is achieved by _____.
4. Cloud-based systems allow engineers to access welding data anytime.
Engineers can access welding data anytime _____.

9. Translate into English.

1. Інформаційні технології відіграють важливу роль у сучасних процесах зварювання та різання металу.
2. Інженери-зварювальники використовують спеціалізовані комп'ютерні програми для підвищення ефективності та безпеки.
3. Програми САПР дозволяють створювати детальні 3D-моделі металевих конструкцій перед початком зварювання.
4. Таке програмне забезпечення, як AutoCAD і SolidWorks, допомагає передбачити можливі дефекти ще до початку роботи.
5. Імітаційні програми дають змогу інженерам тестувати параметри зварювання у віртуальному середовищі.
6. Використання подібного програмного забезпечення допомагає зменшити кількість відходів матеріалу.
7. Бази даних і навчальні відео в інтернеті допомагають зварювальникам освоювати нові технології.
8. Хмарні системи забезпечують доступ до важливої інформації про проекти в режимі реального часу.
9. Автоматизовані машини з ЧПУ використовують програмне забезпечення для високоточного різання металу.
10. Завдяки сучасним технологіям процеси зварювання стають швидшими, розумнішими та екологічнішими.

Topic 13. Revision test

Part 1. Choose the correct answer – A, B, C, or D.

1. What is welding?

- A) A process of cutting metal using lasers
- B) A technique for joining metals by melting and fusing them
- C) A method of painting metal surfaces
- D) A way to polish and shape metals

2. Which of the following is a non-ferrous metal?

- A) Iron
- B) Steel
- C) Aluminum
- D) Cast iron

3. Which welding method is known for using a continuous wire electrode and shielding gas?

- A) TIG welding
- B) Stick welding
- C) MIG welding
- D) Spot welding

4. In which welding process does a non-consumable tungsten electrode generate heat to melt metal?

- A) Shielded Metal Arc Welding (SMAW)
- B) Gas Tungsten Arc Welding (GTAW) / TIG
- C) Gas Metal Arc Welding (GMAW) / MIG
- D) Oxy-fuel welding

5. Which fuel gas is commonly used in gas welding?

- A) Hydrogen
- B) Argon
- C) Acetylene
- D) Carbon dioxide

6. **What is the primary characteristic of arc welding?**

- A) It uses a high-temperature flame
- B) It relies on an electric arc to generate heat
- C) It only works on aluminum
- D) It does not require any filler material

7. **Which of the following is NOT a welding material?**

- A) Filler metal
- B) Flux
- C) Ceramic coating
- D) Electrode

8. **Which of the following is an alternative welding method?**

- A) Gas welding
- B) Arc welding
- C) Laser welding
- D) Oxy-acetylene welding

9. **Which safety precaution is necessary when welding?**

- A) Wearing cotton gloves
- B) Keeping flammable materials nearby
- C) Using a welding helmet and proper ventilation
- D) Welding without protective clothing

10. **Which advanced welding machine is used in automated welding systems?**

- A) Manual arc welder
- B) Plasma cutting machine
- C) Robotic welding system
- D) Handheld gas torch

Part 2. Complete the sentences using the correct word or phrase.

11. The most common types of weld joints are butt, corner, lap, edge, and _____.

12. _____ is a computer program used by welding engineers to design 3D models of welded structures.
13. In MIG welding, the shielding gas protects the molten metal from _____.
14. The _____ electrode in TIG welding does not melt but generates heat to fuse the metal.
15. _____ welding is commonly used in the automotive industry for joining thin metal sheets with heat and pressure.

Part 3. Mark the sentences as True (T) or False (F).

16. Gas welding is mainly used for welding thick structural steel. ()
17. Plasma arc cutting is an example of an alternative welding technique. ()
18. A butt joint is when two metal pieces are placed side by side and welded along the edge. ()
19. Welding without proper safety measures can expose workers to harmful UV radiation and toxic fumes. ()
20. Cloud-based systems are used in welding to store and manage welding data. ()

Part 4. Match the words with their definitions.

21. **TIG welding**
22. **Flux**
23. **Weld bead**
24. **Fusion welding**
25. **Plasma cutting**
26. **Welding helmet**
27. **Lap joint**
28. **Shielding gas**

- A) A welding technique that uses a tungsten electrode and shielding gas.
- B) A chemical substance used to prevent oxidation during welding.
- C) The result of a completed weld pass on a workpiece.
- D) A welding process that melts base metals together to create a bond.
- E) A process that uses a superheated ionized gas to cut metal.
- F) Personal protective equipment that protects the welder's eyes and face.

- G) A type of weld joint where one piece of metal overlaps another.
- H) A gas used in MIG and TIG welding to protect the weld from contamination.

Part 5. Answer in complete sentences.

29. What is the difference between MIG and TIG welding?
30. Why is preheating sometimes necessary before welding?
31. How does IT help welding engineers improve their work?
32. What are some common welding defects, and how can they be prevented?
33. What are the advantages of using robotic welding systems in manufacturing?

Part 6. Fill in the missing words using the correct term.

34. A _____ joint is created when two pieces of metal are joined at a 90-degree angle.
35. The _____ process requires the use of an electric arc and a coated electrode that provides shielding gas.
36. One of the most common safety hazards in welding is exposure to _____, which can cause lung damage.
37. _____ welding is widely used in the aerospace and automotive industries due to its precision and clean welds.
38. Welding engineers use _____ software to create and test welding plans before starting actual work.

Part 7. Read the descriptions and write the correct welding method.

39. This method uses a high-energy beam of concentrated light to melt and join metals: _____.
40. This welding process does not require filler material and is commonly used for resistance welding: _____.
41. In this process, a wire electrode is continuously fed through a nozzle, and shielding gas protects the weld from contamination: _____.

42. This welding type involves applying heat and pressure using a rotating tool to create a solid-state weld: _____.

43. A type of arc welding that uses a coated electrode, also known as stick welding: _____.

Part 8. Write an essay (120–150 words). Choose one topic.

44. "Welding automation will replace manual welding in the future."

45. "Safety in welding is more important than speed and efficiency."

46. "IT plays a key role in improving welding quality and precision."

Рекомендована література

Основна

1. Mol H., Collie J. Business Update 1. Course Book with audio CDs., Garnet Education., 2012., 206 pp.
2. Mol H., Collie J. Business Update 1. Workbook with audio CDs., Garnet Education., 2012., 177 pp.
3. Mol H., Collie J. Business Update 2. Course Book with audio CDs., Garnet Education., 2013., 176 pp.
4. Mol H., Collie J. Business Update 2. Workbook with audio CDs., Garnet Education., 2014., 206 pp.
5. Gore S. and Smith D. Oxford Business English. English for Socializing. Oxford University Press, 2007, 68 pp.

Додаткова

1. Англійська мова у зварювальному виробництві. Методичні вказівки до практичних занять для студентів денної форми навчання напряму підготовки 131 «Технології та устаткування зварювання» / Укл. Сікалюк А.І., Пермінова В.А. – Чернігів: ЧНТУ, 2017. – 56 с.
2. Klingensmith, S., J. N. DuPont and A. R. Marder, Welding Journal, 84 (2005) 77s-85s.
3. Welding Handbook Vol. 2 Library of Congress number 90-085465 copyright 1991 by American Welding Society.
4. Welding handbook Volume 2, eighth edition. Library of Congress number: 90-085465 copyright 1991 by American Welding Society Occupation Exposure Limits, HSE Books.
5. ASM International (2003). Trends in Welding Research. Materials Park, Ohio: ASM International. - ISBN 0871707802
6. Assessment of Exposure to Fume from Welding and Allied Processes, HSE Books, 1990.
7. Blunt, Jane and Nigel C. Balchin (2002). Health and Safety in Welding and Allied Processes. Cambridge: Woodhead. - ISBN 1855735385
8. Brightmore A. D., Bernasek M. Moving Weld Management from the Desk to the Desktop Using "expert" software packages, computers can make life easier for the welding engineer. - <http://www.cspec.com/csp-paper.html>.
9. Cary, Howard B. and Scott C. Helzer (2005). Modern Welding Technology. Upper Saddle River, New Jersey: Pearson Education. - ISBN 0131130295

Посилання на інформаційні ресурси в Інтернеті, відео-лекції, інше методичне забезпечення

1. Національна бібліотека України ім. В.І.Вернадського URL: <http://www.nbuv.gov.ua/>
2. Бібліотечно-інформаційний ресурс (книжковий фонд, періодика, фонди на електронних носіях тощо) бібліотеки УІПА. URL: <http://library.uipa.edu.ua/>
3. Canadian Welding Association. - <http://www.cwa-acs.or>

Appendix Application Definitions

English	Українська
AC welding	зварювання змінним струмом
active flux	активний флюс
adhesive bonding	адгезійне з'єднання
air-acetylene welding	зварювання повітря-ацетиленом
alloy steel	легована сталь
alternating current (AC)	змінний струм
arc blow	відхилення дуги
arc cutting	дугове різання
arc length	довжина дуги
arc stability	стабільність дуги
arc voltage	напруга дуги
automatic welding	автоматичне зварювання
back weld	зворотний шов
backing strip	підкладна пластина
base material	основний матеріал
bead welding	наплавлення валика
bend test	випробування на згин
bevel angle	кут скосу
bonding strength	міцність з'єднання
burn-through	прожог
carbon arc welding	вугільно-дугове зварювання
chipping hammer	молоток для видалення шлаку
cold welding	холодне зварювання
complete joint penetration (CJP)	повний провар шва
concave weld	увігнутий шов
constant current (CC)	постійний струм
contact tip	контактний наконечник
continuous weld	суцільний шов
corner joint	кутове з'єднання
crater	кратер (в кінці зварного шва)
cutting torch	різаки (пальник для різання)
defect-free weld	бездефектний шов
deposit rate	швидкість наплавлення

English	Українська
direct current (DC)	постійний струм
distortion control	контроль деформацій
double-welded joint	двостороннє зварне з'єднання
ductile fracture	пластичне руйнування
duty cycle	робочий цикл
electrode diameter	діаметр електрода
electrode holder	тримач електрода
excessive penetration	надмірний провар
fabrication	виготовлення металоконструкцій
fillet joint	кутовий шов
flash welding	зварювання оплавленням
flux-cored wire	порошковий дріт
forge welding	ковальське зварювання
fusion face	поверхня розплавлення
gas diffusion	дифузія газу
gas lens	газова лінза
gas shielded arc welding	дугове зварювання в захисному газі
groove angle	кут розкриття шва
groove weld	стиковий шов
heat input	внесення тепла
heat treatment	термічна обробка
hydrogen embrittlement	водневе окрихчення
inert gas	інертний газ
interpass temperature	температура між проходами
joint preparation	підготовка з'єднання
keyhole welding	зварювання з утворенням ключового отвору
lack of fusion	непровар
laser beam welding (LBW)	лазерне зварювання
longitudinal weld	поздовжній шов
mechanical properties	механічні властивості
metal transfer	перенесення металу
microcracking	мікротріщини
multi-pass welding	багатошарове зварювання
nozzle	сопло

English	Українська
overhead welding	зварювання у стельовому положенні
partial joint penetration (PJP)	частковий провар шва
passivation	пасивація
plasma arc welding	плазмове зварювання
porosity	пористість шва
post-weld heat treatment (PWHT)	термічна обробка після зварювання
preheating	підігрів перед зварюванням
residual stresses	залишкові напруження
root pass	кореневий шов
root opening	зазор кореня шва
shielding gas flow rate	витрата захисного газу
slag inclusion	включення шлаку
splatter	розбризування металу
stress relief heat treatment	термообробка для зняття напружень
submerged arc welding (SAW)	зварювання під флюсом
tack weld	прихватка
throat thickness	товщина горловини шва
toe of weld	п'ятка шва
torch angle	кут нахилу пальника
transverse weld	поперечний шов
ultrasonic testing (UT)	ультразвуковий контроль
underbead cracking	тріщини під швом
welding fumes	зварювальні дими
welding parameters	параметри зварювання
welding penetration	глибина провару
welding power source	зварювальне джерело живлення
welding procedure specification (WPS)	специфікація зварювального процесу
welding torch	зварювальний пальник
wire feed speed	швидкість подачі дроту
workpiece clamp	затиск деталі

Електронне навчальне видання комбінованого використання
Можна використовувати в локальному та мережному режимі

Лученцова Ірина Сергіївна

ІНОЗЕМНА МОВА ПРОФЕСІЙНО-ДІЛОВОГО СПІЛКУВАННЯ. АНГЛІЙСЬКА МОВА

Методичні вказівки
до проведення самостійної роботи
для здобувачів вищої освіти першого (бакалаврського) рівня
за спеціальністю 015 «Професійна освіта (Зварювання)»

В авторській редакції

Підписано до розміщення 23.04.2025. Гарнітура Times New Roman.
Ум. друк. арк. 4,4. Обсяг 0,966 Мб. Зам. № 161/25.

Харківський національний університет імені В. Н. Каразіна,
61022, м. Харків, майдан Свободи, 4.
Свідоцтво суб'єкта видавничої справи ДК № 3367 від 13.01.2009
Видавництво ХНУ імені В. Н. Каразіна