


Англійська мова для інженерів з охорони навколишнього середовища

методичні рекомендації до самостійної роботи
здобувачів освіти першого (бакалаврського) рівня вищої
освіти спеціальності 183 (перший курс, перший семестр)

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Укладач

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Це навчально-методичне видання розроблено для студентів-інженерів з охорони навколишнього середовища, які вивчають англійську мову з метою використання її в майбутній професійній діяльності. Це видання сприяє засвоєнню спеціалізованої термінології, що є невід'ємною частиною роботи інженера з охорони навколишнього середовища, допомагаючи студентам вільно користуватися англійською мовою у своїй професійній сфері і є незамінним інструментом для тих, хто прагне оволодіти англійською мовою на високому професійному рівні та підвищити свою конкурентоспроможність на ринку праці в галузі охорони навколишнього середовища.

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ВСТУП

Метою цих методичних вказівок є сприяння формуванню іншомовної професійно орієнтованої комунікативної компетентності у здобувачів освіти першого курсу спеціальності 183 "Технології захисту навколишнього середовища".

Самостійна робота студентів з курсу «Англійська мова для інженерів з охорони навколишнього середовища» спрямована на підготовку до практичних занять, а також розвиток навичок самостійної роботи. Студенти зможуть розробляти власні когнітивні та інформаційні стратегії для самостійного опанування навчального матеріалу.

Підібрані тексти є важливою частиною підготовки майбутніх фахівців з захисту навколишнього середовища. Вони допоможуть студентам опанувати необхідну термінологію і підготуватися до професійного спілкування англійською мовою.

Самостійна робота з англійської мови для студентів технічних спеціальностей є важливою формою самоосвіти. Вона має багатофункціональний характер і сприяє розвитку мовних навичок, необхідних для сучасного фахівця. Така робота допомагає здобувачам формувати навички самостійного здобування знань та інформаційну культуру.

Мета самостійної роботи з курсу «Англійська мова для інженерів з охорони навколишнього середовища» полягає у розвитку лінгвістичних та соціокультурних компетенцій до рівня, що дозволяє ефективно використовувати мову в різних професійних та освітніх ситуаціях.

Завдання самостійної роботи включають вдосконалення професійно орієнтованих мовних навичок.

Зміст самостійної роботи студентів охоплює такі види діяльності:

- переклад професійних текстів;
- пошук додаткової інформації;
- відповіді на питання до текстів;
- виконання лексичних вправ;
- підготовка до модульних контрольних робіт та інших видів контролю.

Самостійна робота з іноземної мови (за професійним спрямуванням) передбачає поглиблене вивчення окремих тем, систематизацію знань, що сприяє розвитку світогляду, навичок роботи з інформаційними ресурсами, а також формує професійну культуру студентів у сфері навколишнього середовища.



1. Understanding the role of environmental engineers

1.1 What is an Environmental Engineer?

An Environmental Engineer is a professional who applies principles of engineering, biology, and chemistry to develop solutions that protect and improve the environment. They work on projects that address issues like water and air pollution, waste management, and environmental sustainability. Their role often involves designing systems for water treatment, developing strategies to reduce industrial pollution, and ensuring that new construction projects comply with environmental regulations. By combining technical expertise with a deep understanding of environmental impacts, environmental engineers play a crucial role in preserving natural resources and promoting public health.

Ex.1. Choose the correct answer.

1. What do environmental engineers do to help the environment?
 - A. They build roads and bridges.
 - B. They develop solutions to protect the environment.
 - C. They study wild animals in nature.
 - D. They design new types of cars.
2. Which of these problems do environmental engineers try to solve?
 - A. Traffic jams in big cities.
 - B. Planting more trees in parks.
 - C. Managing air and water pollution.
 - D. Building new houses and buildings.
3. How do environmental engineers use their knowledge and skills?
 - A. By making computer games about the environment.
 - B. By working with scientists to study climate change.
 - C. By combining technical skills with environmental understanding.
 - D. By creating new laws and policies for the government.
4. What is the main goal of an environmental engineer's work?
 - A. To make a lot of money for their company.
 - B. To invent new types of renewable energy.
 - C. To protect natural resources and public health.
 - D. To monitor wildlife in national parks.
5. What is the most important skill for an environmental engineer?
 - A. Being good at math and science.
 - B. Excellent project management abilities.
 - C. In-depth knowledge of environmental science and policy.
 - D. Proficiency in computer programming.

1.2. Responsibilities of Environmental Engineers

Environmental Engineers have a broad range of responsibilities centered around protecting the environment and human health. They design and implement systems for managing waste, treating water and wastewater, and controlling air pollution. They also assess environmental impact and develop



plans to mitigate the effects of construction and industrial activities. Additionally, environmental engineers ensure compliance with environmental regulations and laws, conduct environmental audits, and may be involved in emergency response planning for environmental hazards. Their work is essential in promoting sustainability and minimizing the negative impacts of human activities on the environment.

Ex.2. Define if the following statements are true or false.

1. Environmental engineers help to manage waste and treat water.
2. Environmental engineers do not work with air pollution control.
3. They create plans to reduce the impact of construction activities.
4. Environmental engineers ignore environmental regulations and laws.
5. Their work is important for promoting sustainability.

1.3. The Importance of Environmental Engineers

Environmental Engineers play a vital role in safeguarding our planet and ensuring a sustainable future. Their work is crucial in addressing some of the most pressing environmental challenges, such as climate change, pollution, and resource depletion. By developing innovative solutions for waste management, pollution control, and renewable energy, environmental engineers help reduce the harmful impact of human activities on the environment. They also ensure that industries and communities comply with environmental regulations, protecting public health and preserving ecosystems. Ultimately, the expertise of environmental engineers is essential in creating a healthier, more sustainable world for future generations.

Ex.3. Can You Fill in the Blanks with the following words: waste, safeguarding, pollution, environmental, renewable

Environmental Engineers play a vital role in _____(1) our planet and ensuring a sustainable future. Their work is crucial in addressing some of the most pressing _____(2) challenges, such as climate change, _____(3), and resource depletion. By developing innovative solutions for _____(4) management, pollution control, and _____(5) energy, environmental engineers help reduce the harmful impact of human activities on the environment

1.4. Joining the Environmental Engineering Field

Joining the Environmental Engineering field offers a unique opportunity to make a positive impact on the world. Aspiring environmental engineers typically start by earning a degree in environmental engineering or a related field, where they gain knowledge in subjects like biology, chemistry, and environmental science, as well as engineering principles. Internships and hands-on projects are important for gaining practical experience and understanding real-world environmental challenges.

This field is ideal for those passionate about solving environmental problems and interested in working on projects that improve public health and protect natural resources. Whether it's designing clean water systems, developing sustainable energy solutions, or creating strategies to combat



pollution, a career in environmental engineering allows you to contribute directly to building a more sustainable future.

Ex.4. Match the words with their definitions

<ol style="list-style-type: none"> 1. public health 2. sustainable 3. knowledge 4. opportunity 5. hands-on project 	<ol style="list-style-type: none"> a. a chance to do something good or important. b. able to be kept going without harming the environment. c. a task where you use your hands to make or create something. d. the health of people in a community or society. e. information and understanding about things.
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1.5. Environmental Challenges and Their Global Impact.

Environmental challenges, such as climate change, pollution, deforestation, and biodiversity loss, pose significant threats to our planet and humanity. Climate change, driven by greenhouse gas emissions, leads to global warming, extreme weather, and rising sea levels, affecting ecosystems and human health. Pollution contaminates air, water, and soil, causing harm to wildlife and increasing health risks for communities. Deforestation contributes to habitat loss and accelerates climate change, while the loss of biodiversity disrupts ecological balance and threatens food security.

The global impact of these challenges is profound, affecting economies, public health, and social stability. Developing nations and vulnerable populations often face the harshest consequences, exacerbating inequality and leading to resource conflicts and migration. Addressing these challenges requires urgent global action, sustainable practices, and a commitment to protecting our environment for future generations.

Ex.5. Answer the following questions.

1. What are some environmental challenges mentioned in the text?
2. How does climate change affect ecosystems and human health?
3. What are the consequences of pollution on air, water, and soil?
4. How does deforestation contribute to habitat loss and climate change?
5. Why is the loss of biodiversity a threat to food security?
6. Who often faces the harshest consequences of environmental challenges?
7. What is needed to address these environmental challenges according to the text?



2. Water Quality and Treatment

2.1. What is Water Quality?

Water quality refers to the condition of water based on its physical, chemical, and biological characteristics. It determines the suitability of water for various uses, such as drinking, agriculture, and recreation. High water quality means the water is clean, safe, and free from pollutants, while poor water quality indicates contamination that can harm ecosystems, human health, and the environment.

Ex.1. Choose the correct answer.

1. What is water used for according to the passage?
 - A. Drinking, agriculture, and recreation
 - B. Cleaning, cooking, and swimming
 - C. Fishing, boating, and hydropower
 - D. Washing clothes, bathing, and gardening
2. What indicates that water has good quality?
 - A. The presence of pollutants
 - B. Contamination of the water
 - C. Harm to the environment and health
 - D. Suitability for various uses
3. How does the passage describe water with poor quality?
 - A. It is clean and safe to use
 - B. It is free from any pollutants
 - C. It can damage ecosystems and health
 - D. It is suitable for all purposes
4. Which characteristic of water quality is NOT mentioned in the passage?
 - A. Physical
 - B. Chemical
 - C. Biological
 - D. Geographical
5. What is the main purpose of the passage?
 - A. To explain the different types of water
 - B. To discuss the importance of water conservation
 - C. To provide an overview of water quality and its importance
 - D. To highlight the challenges of maintaining water quality

2.2. Common Water Contaminants

- Microorganisms: Bacteria, viruses, and parasites that can cause diseases.
- Nutrients: Excessive nitrogen and phosphorus leading to algae blooms.
- Heavy Metals: Lead, mercury, and arsenic, which are toxic to humans and wildlife.
- Chemicals: Pesticides, herbicides, and industrial chemicals that pollute water.
- Sediments: Soil and organic matter that can cloud water and disrupt



ecosystems.

- Plastics: Microplastics and debris that harm marine life and enter the food chain.

Ex.2. Define if the following statements are true or false.

1. Bacteria and viruses are types of microorganisms that can make people sick.

2. Excessive nitrogen and phosphorus are beneficial for water ecosystems.

3. Lead and mercury are examples of heavy metals that are safe for humans.

4. Pesticides and herbicides are types of chemicals that can pollute water.

5. Sediments can make water clear and help ecosystems.

2.3. Water Treatment Methods

- Filtration: Removes particles and sediments by passing water through filters.

- Chlorination: Disinfects water by killing bacteria, viruses, and other pathogens using chlorine.

- Sedimentation: Allows particles to settle at the bottom of a tank, separating them from the water.

- Coagulation and Flocculation: Chemicals are added to clump together impurities, making them easier to remove.

- Reverse Osmosis: Forces water through a semi-permeable membrane to remove contaminants.

- UV Treatment: Uses ultraviolet light to sterilize water by destroying harmful microorganisms.

- Distillation: Heats water to create steam, leaving contaminants behind, then condenses the steam back into pure water.

Ex.3. Match the words with their Ukrainian equivalent

1. semi-permeable	a. напівпроникний
2. particle	b. частка
3. pure water	c. ультрафіолетове світло
4. chlorine	d. хлор
5. ultraviolet light	e. чиста вода

2.4. Importance of Water Treatment

Water treatment is crucial for ensuring safe, clean water for drinking, agriculture, and industrial use. It removes harmful contaminants like bacteria, chemicals, and heavy metals, protecting public health and preventing waterborne diseases. Additionally, water treatment preserves aquatic ecosystems by reducing pollution and supports sustainable water management, essential for communities' well-being and economic development. Clean water access, enabled by effective treatment, is vital for life and a fundamental human right.



**Ex.4. Can You Fill in the Blanks with the following words:
management, ecosystems, ensuring, access, protecting**

Water treatment is crucial for _____(1) safe, clean water for drinking, agriculture, and industrial use. It removes harmful contaminants like bacteria, chemicals, and heavy metals, _____(2) public health and preventing waterborne diseases. Additionally, water treatment preserves aquatic _____(3) by reducing pollution and supports sustainable water _____(4), essential for communities' well-being and economic development. Clean water _____(5), enabled by effective treatment, is vital for life and a fundamental human right.



3. Water pollution and its sources

3.1. What is Water Pollution?

Water pollution occurs when harmful substances contaminate water bodies such as rivers, lakes, oceans, and groundwater. This contamination can come from industrial discharges, agricultural runoff, untreated sewage, and hazardous waste. Polluted water can harm aquatic life, disrupt ecosystems, and pose serious health risks to humans, including diseases and poisoning. Addressing water pollution involves reducing sources of contaminants, improving waste management, and ensuring effective water treatment.

Ex.1. Answer the following questions

1. What is water pollution?
2. Where can water pollution occur?
3. What are some sources of water contamination mentioned in the text?
4. How can polluted water affect aquatic life?
5. What are the health risks associated with polluted water for humans?
6. How can we address water pollution according to the text?
7. What actions can be taken to reduce sources of contaminants in water?

3.2. Industrial Pollution


Industrial pollution refers to the contamination of air, water, and soil resulting from industrial activities. This pollution includes:

- Chemical Discharges: Toxic substances like heavy metals, acids, and solvents released into water bodies or the atmosphere.
- Particulate Matter: Dust and fine particles emitted from manufacturing processes that can affect air quality and health.
- Waste Products: Solid and liquid waste from industrial processes that may leach harmful chemicals into the environment.
- Greenhouse Gases: Emissions from industries that contribute to climate change, including carbon dioxide and methane.

Industrial pollution poses significant risks to ecosystems, public health, and the environment, making regulation and mitigation crucial for sustainable development.

Ex.2. Choose the correct answer

1. What kind of pollution is caused by industrial activities?
 - A. Air pollution
 - B. Water pollution
 - C. Soil pollution
 - D. All of the above
2. Which of the following is NOT a type of industrial pollution mentioned in the passage?
 - A. Chemical discharges
 - B. Radioactive waste
 - C. Particulate matter
 - D. Greenhouse gases

- 
3. What is the main purpose of regulating industrial pollution?
 - A. To protect the environment
 - B. To increase economic growth
 - C. To create more jobs
 - D. To reduce government spending
 4. Which of these industries is most likely to contribute to greenhouse gas emissions?
 - A. Textile manufacturing
 - B. Pharmaceutical production
 - C. Food processing
 - D. Steel manufacturing
 5. How can industrial pollution negatively impact the ecosystem?
 - A. It can harm plant and animal life
 - B. It can contaminate the water supply
 - C. It can cause climate change
 - D. All of the above.

3.3. Agricultural Runoff

Agricultural runoff is the water that flows from farms into nearby rivers, lakes, and oceans, carrying with it soil, fertilizers, pesticides, and other chemicals. This runoff can lead to:

- Nutrient Pollution: Excess nitrogen and phosphorus cause harmful algal blooms, which deplete oxygen in water and harm aquatic life.
- Chemical Contamination: Pesticides and herbicides in runoff can poison wildlife and contaminate drinking water sources.
- Soil Erosion: Sediments carried by runoff can cloud water, disrupt habitats, and carry additional pollutants.

Managing agricultural runoff through sustainable farming practices and proper waste management is essential to protect water quality and maintain healthy ecosystems.

Ex.3. Define if the following statements are true or false.

1. Agricultural runoff can carry soil and chemicals into rivers and lakes.
2. Nutrient pollution from runoff helps aquatic life by increasing oxygen levels.
3. Pesticides in runoff can make drinking water unsafe.
4. Soil erosion caused by runoff can make water clearer and cleaner.
5. Sustainable farming practices can help manage agricultural runoff.

3.4. Urbanization and Sewage

Urbanization leads to increased sewage production as more people live in concentrated areas. If not properly managed, sewage can cause:

- Water Contamination: Untreated or poorly treated sewage can pollute water bodies with harmful bacteria, viruses, and chemicals, posing health risks.
- Eutrophication: Excess nutrients from sewage can lead to algal blooms, depleting oxygen in water and harming aquatic life.

- Infrastructure Strain: Rapid urban growth can overwhelm sewage systems, leading to leaks, overflows, and environmental degradation.

Effective sewage treatment and infrastructure planning are critical to minimize the environmental impact of urbanization and ensure safe, clean water for communities.

Ex.4. Can You Fill in the Blanks with the following words: sewage, nutrients, degradation, concentrated, pollute

Urbanization leads to increased _____(1) production as more people live in _____(2) areas. If not properly managed, sewage can cause:

Water Contamination: Untreated or poorly treated sewage can _____(3) water bodies with harmful bacteria, viruses, and chemicals, posing health risks.

Eutrophication: Excess _____(4) from sewage can lead to algal blooms, depleting oxygen in water and harming aquatic life.

Infrastructure Strain: Rapid urban growth can overwhelm sewage systems, leading to leaks, overflows, and environmental _____(5).

3.5. Plastic Pollution

Plastic pollution refers to the accumulation of plastic objects and particles in the environment, particularly in oceans, rivers, and landfills. This pollution is caused by:

Single-Use Plastics: Items like bags, bottles, and packaging that are used briefly but persist in the environment for hundreds of years.

Microplastics: Tiny plastic particles from degraded products or industrial processes that contaminate water, soil, and air.

Harm to Wildlife: Animals can ingest plastic or become entangled in it, leading to injury, suffocation, or death.

Ecosystem Disruption: Plastic pollution can alter habitats, impact food chains, and introduce toxic chemicals into ecosystems.

Addressing plastic pollution requires reducing plastic use, improving waste management, and promoting recycling to protect the environment and wildlife.

Ex.5. Match the words with their definitions

1. injury	a. a break or change that stops something from working normally.
2. single-use plastics	b. plastic items that people use one time and then throw away.
3. disruption	c. harm or damage to a part of the body.
4. microplastics	d. very small pieces of plastic that can be found in water or soil.
5. waste management	e. the process of collecting and taking care of trash and garbage.

4. Water quality testing and analysis

4.1. Parameters Tested in Water Quality Analysis

Water quality analysis involves testing various parameters to assess the safety and suitability of water for different uses. Key parameters include:

- pH Level: Indicates the acidity or alkalinity of water.
- Dissolved Oxygen: Essential for aquatic life, it shows how much oxygen is available in the water.
- Turbidity: Measures water clarity, indicating the presence of suspended particles.
- Nutrients: Levels of nitrogen and phosphorus, which can cause algae growth.
- Microbial Contaminants: Checks for bacteria, viruses, and other pathogens that can cause disease.
- Chemical Contaminants: Includes testing for heavy metals, pesticides, and other harmful chemicals.

These parameters help determine if water is safe for drinking, recreation, agriculture, and supporting ecosystems.

Ex.1. Choose the correct answer

1. What tells us how acidic or basic the water is?
 - A. Dissolved Oxygen
 - B. Turbidity
 - C. pH Level
 - D. Microbial Contaminants
2. What shows how much oxygen is in the water for living things?
 - A. Nutrients
 - B. Chemical Contaminants
 - C. Dissolved Oxygen
 - D. Turbidity
3. What measures how clear the water is?
 - A. pH Level
 - B. Turbidity
 - C. Microbial Contaminants
 - D. Nutrients
4. What checks for harmful bacteria and viruses in the water?
 - A. Chemical Contaminants
 - B. Microbial Contaminants
 - C. Nutrients
 - D. Turbidity
5. What looks for things like pesticides and heavy metals in the water?
 - A. Microbial Contaminants
 - B. Nutrients
 - C. Chemical Contaminants
 - D. Dissolved Oxygen



4.2. Methods of Water Quality Testing

Physical Testing: Measures physical properties like temperature, turbidity, and color to assess water clarity and quality.

Chemical Testing: Analyzes chemical components such as pH, dissolved oxygen, nitrates, phosphates, and heavy metals to detect pollutants and assess water safety.

Biological Testing: Involves testing for microorganisms, including bacteria, viruses, and algae, to identify biological contaminants that can pose health risks.

Sensor-Based Testing: Uses electronic sensors to monitor water quality in real-time, detecting changes in parameters like pH, conductivity, and dissolved oxygen.

Laboratory Analysis: Samples are collected and sent to laboratories for detailed analysis, including tests for chemical and microbial contaminants that require specialized equipment.

These methods provide a comprehensive understanding of water quality, ensuring it meets safety standards for various uses.

Ex.2. Answer the following questions

1. What physical properties are measured in physical testing to assess water clarity and quality?

2. What chemical components are analyzed in chemical testing to detect pollutants and assess water safety?

3. What microorganisms are tested for in biological testing to identify biological contaminants that can pose health risks?

4. How does sensor-based testing monitor water quality in real-time?

5. What is done with samples collected for laboratory analysis in assessing water quality?


6. What parameters are monitored by electronic sensors in sensor-based testing?

7. Why do these methods provide a comprehensive understanding of water quality?

4.3. Assessing Water Quality Trends

Assessing water quality trends involves monitoring changes in water quality over time to identify patterns and potential issues. Key steps include:

- **Regular Monitoring:** Collecting data on water quality parameters, such as pH, contaminants, and nutrient levels, at consistent intervals.
- **Data Analysis:** Comparing historical and current data to detect trends, such as improvements, declines, or seasonal variations in water quality.
- **Identifying Sources:** Linking changes in water quality to specific activities or events, like industrial discharges, agricultural runoff, or climate changes.
- **Predictive Modeling:** Using data and statistical models to predict future water quality trends and potential risks.

- 
- Reporting and Action: Sharing findings with stakeholders to inform water management decisions and environmental protection efforts.

This approach helps in maintaining water quality, protecting ecosystems, and ensuring the safety of water resources over the long term.

Ex.3. Define if the statement is true or false

1. Monitoring water quality involves checking pH levels regularly.
2. Data analysis helps to find out if water quality is getting better or worse.
3. Changes in water quality are never linked to human activities.
4. Predictive modeling is used to guess future water quality trends.
5. Reporting findings is not important for water management decisions.

5. Common water treatment methods

5.1. Filtration

Filtration is a key water treatment process that removes suspended particles, sediments, and impurities from water. The process involves passing water through a porous material, such as sand, gravel, or specialized membranes, which traps contaminants while allowing clean water to flow through.

Types of Filtration:

- Mechanical Filtration: Physically removes particles based on size using filters like sand or mesh.
- Biological Filtration: Uses beneficial bacteria to break down organic matter and contaminants.
- Activated Carbon Filtration: Removes chemicals, chlorine, and odors by adsorption onto carbon surfaces.
- Reverse Osmosis: Forces water through a semi-permeable membrane to remove dissolved salts and larger molecules.

Filtration is essential for improving water clarity, taste, and safety, making it suitable for drinking, industrial, and agricultural use.

Ex.1. Match the words and word-combinations with their definitions

1. bacteria	a. a thin layer that lets some things pass through but not others.
2. contaminants	b. small pieces of dirt or rock that settle at the bottom of water.
3. reverse osmosis	c. things that make something dirty or unsafe.
4. sediments	d. tiny living things that can be good or bad for health.
5. membrane	e. a process that removes bad stuff from water using pressure.

5.2. Chlorination

Chlorination is a common water treatment method used to disinfect water by adding chlorine or chlorine compounds. This process effectively kills bacteria, viruses, and other harmful microorganisms, making water safe for drinking and other uses.

Key Benefits of Chlorination:

- Disinfection: Eliminates most pathogens that can cause waterborne diseases.
- Residual Protection: Leaves a small amount of chlorine in the water to prevent recontamination as it travels through distribution systems.
- Ease of Use: Simple to implement and widely used in municipal water systems worldwide.

While highly effective, chlorination must be carefully controlled, as excessive chlorine can lead to the formation of harmful byproducts, such as

trihalomethanes (THMs). Regular monitoring ensures safe and effective water disinfection.

Ex.2. Match the words and word-combinations with their Ukrainian equivalents

1. byproducts	a. системи розподілу
2. compounds	b. побічні продукти
3. distribution systems	c. усунути
4. Eliminate	d. впроваджувати
5. implement	e. сполуки

5.3. Coagulation and Flocculation

Coagulation and flocculation are essential processes in water treatment used to remove suspended particles, such as dirt, organic matter, and microorganisms, from water.

Coagulation:

- Process: Coagulation involves adding chemicals, known as coagulants (e.g., aluminum sulfate or ferric chloride), to water. These chemicals neutralize the charges on particles, causing them to clump together.
- Purpose: This initial step is designed to destabilize fine particles, making them easier to aggregate.

Flocculation:

- Process: After coagulation, gentle mixing is applied to encourage the clumped particles to form larger clusters called flocs. This process often involves the addition of flocculants to enhance the formation of flocs.
- Purpose: Flocculation helps form larger, more easily removable particles, which can then be settled out in sedimentation tanks or removed by filtration.

Together, coagulation and flocculation are crucial for improving water clarity and ensuring the effective removal of contaminants, making water safer for consumption and other uses.

Ex.3. Define if the statement is true or false

1. Coagulation uses chemicals to help particles stick together.
2. Flocculation happens before coagulation in water treatment.
3. Flocculants are added to make larger clusters of particles.
4. Coagulation and flocculation are not important for water clarity.
5. The purpose of coagulation is to make fine particles easier to remove.

5.4. Disinfection by Ultraviolet (UV) Light

Ultraviolet (UV) light disinfection is a method used to purify water by exposing it to UV light at specific wavelengths. This process effectively inactivates harmful microorganisms, including bacteria, viruses, and protozoa, by damaging their DNA, preventing them from reproducing and causing infections.



Key Features of UV Disinfection:

- Chemical-Free: UV disinfection does not require the addition of chemicals, making it an environmentally friendly option that doesn't alter the taste or odor of water.
- Effective Against Pathogens: It is highly effective at killing or inactivating a wide range of waterborne pathogens, including those resistant to chemical disinfectants.
- Fast Process: UV treatment works quickly, disinfecting water as it passes through the UV light chamber, making it suitable for both large-scale and point-of-use applications.

Limitations:

- No Residual Effect: Unlike chlorination, UV light does not leave a residual disinfectant in the water, so it must be used in systems where water is immediately consumed or used after treatment.
- Clarity of Water: The effectiveness of UV disinfection can be reduced if the water is cloudy or contains particles that block the light.

UV disinfection is widely used in municipal water treatment plants, industrial processes, and even home water purification systems to ensure safe and clean water.

Ex.4. Choose one correct answer

1. What does UV light do to harmful microorganisms in water?
 - A. It removes them from the water.
 - B. It makes them grow faster.
 - C. It damages their DNA and prevents them from reproducing.
 - D. It changes the taste and odor of the water.
2. Which of the following is not a key benefit of using UV light to disinfect water?
 - A. It is a chemical-free process.
 - B. It works quickly to disinfect water.
 - C. It leaves a residual disinfectant in the water.
 - D. It is effective against a wide range of pathogens.
3. What can reduce the effectiveness of UV disinfection?
 - A. Cloudy or turbid water
 - B. Adding chemicals to the water
 - C. Slow processing speed
 - D. Lack of a residual disinfectant
4. Where is UV disinfection commonly used to purify water?
 - A. Only in homes
 - B. Only in industrial settings
 - C. Only in municipal water treatment plants
 - D. In municipal water treatment plants, industries, and homes
5. How is UV disinfection different from chlorination?
 - A. UV disinfection leaves a residual disinfectant in the water.
 - B. UV disinfection is less effective against pathogens.



C. UV disinfection requires the addition of chemicals.

D. UV disinfection does not change the taste or odor of the water.

5.5. Reverse Osmosis

Reverse osmosis (RO) is a water purification process that removes contaminants by forcing water through a semi-permeable membrane. This membrane allows water molecules to pass through while blocking impurities, such as salts, chemicals, and microorganisms.

How Reverse Osmosis Works:

- **Pressure Application:** Water is pressurized and pushed through the RO membrane, which filters out dissolved solids, bacteria, and other contaminants.
- **Purified Water:** The clean water, known as permeate, passes through the membrane, while the concentrated impurities, known as brine or reject water, are flushed away.

Benefits of Reverse Osmosis:

- **High-Quality Purification:** RO effectively removes a wide range of contaminants, including heavy metals, nitrates, fluoride, and certain microorganisms, making it one of the most thorough filtration methods available.
- **Improves Taste and Safety:** By removing dissolved salts and other impurities, RO improves the taste, odor, and safety of drinking water.

Common Applications:

- **Drinking Water:** Used in household systems to provide clean, safe drinking water.
- **Desalination:** Widely used in desalination plants to convert seawater into potable water.
- **Industrial Uses:** Employed in industries requiring high-purity water, such as pharmaceuticals and electronics manufacturing.

Reverse osmosis is a highly effective and versatile method for producing clean, safe water, making it suitable for a wide range of applications.

Ex.5. Answer the following questions.

1. What is reverse osmosis (RO)?
2. How does pressure play a role in the reverse osmosis process?
3. What happens to the impurities during the reverse osmosis process?
4. What are some benefits of using reverse osmosis for water purification?
5. How does reverse osmosis improve the taste, odor, and safety of drinking water?

6. Types of air pollutants

6.1. Particulate Matter (PM)

Particulate Matter (PM) refers to tiny particles or droplets in the air that can be harmful when inhaled. These particles come in different sizes, with PM10 being particles with a diameter of 10 micrometers or less, and PM2.5 being even smaller, with a diameter of 2.5 micrometers or less.

Sources:

- Natural: Dust, pollen, and sea spray.
- Human-Made: Emissions from vehicles, industrial activities, and burning of fossil fuels.

Health Impact:

- PM can penetrate deep into the lungs and even enter the bloodstream, leading to respiratory and cardiovascular problems.

Environmental Impact:

PM contributes to air pollution, reduces visibility, and can damage ecosystems.

Monitoring and controlling particulate matter is essential for protecting public health and the environment.

Ex.1. Choose one correct option

1. What are tiny things found in the air called?
 - A. Dust
 - B. Pollen
 - C. Particulate Matter
 - D. Sea spray
2. What is the difference between PM10 and PM2.5?
 - A. PM10 is bigger than PM2.5
 - B. PM10 is smaller than PM2.5
 - C. They are the same size
 - D. PM10 is made of different materials than PM2.5
3. Where does Particulate Matter come from?
 - A. Only from nature
 - B. Only from human activities
 - C. Both from nature and human activities
 - D. It comes from burning fossil fuels
4. How can Particulate Matter affect people's health?
 - A. It can make people sick and cause breathing problems
 - B. It can only affect the environment
 - C. It has no effect on people or the environment
 - D. It can make people's eyesight worse
5. Why is it important to monitor and control Particulate Matter?
 - A. To protect the environment only
 - B. To protect people's health only
 - C. To protect the economy only
 - D. To protect both people's health and the environment

6.2. Ground-level Ozone (O₃)

Ground-level ozone (O₃) is a harmful air pollutant formed when sunlight reacts with pollutants like nitrogen oxides (NO_x) and volatile organic compounds (VOCs), which are emitted from vehicles, industrial facilities, and other sources. Unlike the beneficial ozone layer in the upper atmosphere, ground-level ozone is a key component of smog and poses serious health and environmental risks.

Health Effects:

- Irritates the respiratory system, causing coughing, throat irritation, and shortness of breath.
- Can worsen asthma, bronchitis, and other lung diseases.
- Long-term exposure may lead to chronic respiratory conditions.

Environmental Impact:

- Damages crops, forests, and other vegetation.
- Reduces agricultural yields and affects the health of ecosystems.

Controlling emissions of NO_x and VOCs is crucial to reducing ground-level ozone and protecting public health and the environment.

Ex.2. Define if the statement is True or False

1. Ground-level ozone is formed when sunlight reacts with pollutants like nitrogen oxides (NO_x) and volatile organic compounds (VOCs).
2. Ground-level ozone is beneficial for respiratory health and helps prevent lung diseases.
3. Ground-level ozone is formed in the upper atmosphere and is not affected by emissions from vehicles and industrial facilities.
4. Ground-level ozone is the same as the ozone layer in the upper atmosphere, which protects Earth from UV radiation.
5. Ground-level ozone can damage crops and other vegetation.

6.3. Nitrogen Dioxide (NO₂)

Nitrogen dioxide (NO₂) is a reddish-brown gas and a common air pollutant. It is produced from burning fossil fuels in vehicles and industrial processes. NO₂ can contribute to smog and acid rain, and it has harmful effects on health and the environment.

Health Effects:

- Irritates the respiratory system, causing coughing and shortness of breath.
- Long-term exposure can lead to decreased lung function and worsen respiratory diseases like asthma.

Environmental Impact:

- Contributes to the formation of ground-level ozone and particulate matter.
- Can damage vegetation and reduce agricultural yields.

Controlling NO₂ emissions is important for improving air quality and protecting health.

Ex.3. Match the words and word-combinations with their Ukrainian equivalents



1. air pollutant 2. fossil fuels 3. acid rain 4. long-term exposure 5. air quality	А викопне паливо В тривалий вплив С забруднювач повітря D якість повітря Е кислотний дощ
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6.4. Sulfur dioxide (SO₂)

Sulfur dioxide (SO₂) is a colorless gas with a pungent smell, commonly produced from burning fossil fuels like coal and oil, and from industrial processes. It is a major air pollutant and contributes to various environmental and health problems.

Health Effects:

- Irritates the respiratory system, causing coughing, throat irritation, and difficulty breathing.
- Long-term exposure can worsen asthma and other lung conditions, and may reduce lung function.

Environmental Impact:

- Contributes to the formation of acid rain, which can harm aquatic ecosystems, damage vegetation, and erode buildings.
- Can reduce visibility and contribute to the formation of smog.

Reducing SO₂ emissions through cleaner energy sources and pollution control technologies is crucial for improving air quality and protecting both health and the environment.

Ex.4. Choose the correct answer

1. What is the primary source of sulfur dioxide (SO₂)?
 - A) Vehicle emissions
 - B) Burning fossil fuels
 - C) Industrial waste
 - D) Agricultural runoff
2. Which health issue is commonly associated with exposure to sulfur dioxide (SO₂)?
 - A) Digestive problems
 - B) Skin irritation
 - C) Respiratory issues
 - D) Hearing loss
3. How does sulfur dioxide (SO₂) contribute to environmental damage?
 - A) It promotes algae growth in water bodies.
 - B) It leads to the formation of acid rain.
 - C) It increases soil fertility.
 - D) It enhances plant photosynthesis.
4. Which of the following is a common method to reduce sulfur dioxide (SO₂) emissions?
 - A) Using cleaner energy sources
 - B) Increasing agricultural runoff

- C) Burning more coal
- D) Reducing vehicle fuel efficiency

5. What is one of the visible effects of high sulfur dioxide (SO₂) levels in the atmosphere?

- A) Improved air clarity
- B) Reduced visibility
- C) Enhanced colors in the sky
- D) Increased sunlight penetration

6.5. Carbon Monoxide (CO)

Carbon monoxide (CO) is a colorless, odorless gas produced by the incomplete combustion of fossil fuels, such as in vehicles, industrial processes, and residential heating systems.

Health Effects:

- Poisoning: Inhalation of CO can prevent oxygen from entering the bloodstream, leading to symptoms like headaches, dizziness, and confusion. High levels can be life-threatening.

Environmental Impact:

- Air Quality: CO can contribute to the formation of ground-level ozone and smog, affecting air quality.

Safety Measures:

- Detection: Installing CO detectors in homes and workplaces can help prevent exposure and ensure safety.

Controlling CO emissions and ensuring proper ventilation can reduce health risks and improve air quality.

Ex.5. Answer the following questions

1. What are the primary sources of carbon monoxide (CO) emissions?
2. How does carbon monoxide (CO) affect human health?
3. What measures can be taken to reduce the risks associated with carbon monoxide (CO)?

6.6. Volatile Organic Compounds (VOCs)

Volatile Organic Compounds (VOCs) are a group of organic chemicals that easily evaporate into the air. They are commonly found in products like paints, solvents, cleaning agents, and fuels.

Health Effects:

- Irritation: VOCs can cause eye, nose, and throat irritation.
- Long-term Exposure: Prolonged exposure may lead to respiratory issues and increase the risk of certain cancers.

Environmental Impact:

- Air Pollution: VOCs contribute to the formation of ground-level ozone and smog, affecting air quality and visibility.

Mitigation:

- Usage: Choosing low-VOC products and ensuring good ventilation can help reduce exposure.

Managing VOCs is important for improving indoor air quality and



protecting health.

Ex.6. Fill in the gaps with the following words: evaporate, commonly, chemicals, fuels, Organic.

Volatile _____ Compounds (VOCs) are a group of _____ organic that easily _____ into the air. They are _____ found in products like paints, solvents, cleaning agents, and _____.

6.7. Lead (Pb)

Lead (Pb) is a heavy metal that can be harmful when it accumulates in the environment or in the human body. It is found in old pipes, lead-based paints, and contaminated soil.

Health Effects:

- Toxicity: Lead exposure can cause severe health problems, including developmental issues in children, decreased IQ, learning disabilities, and behavioral problems. In adults, it can lead to high blood pressure, kidney damage, and reproductive problems.

Environmental Impact:

- Contamination: Lead can contaminate soil and water, affecting plants, animals, and human health. It persists in the environment and can be taken up by crops and wildlife.

Prevention:

- Testing and Remediation: Regular testing of water, soil, and paint in older buildings, and replacing lead pipes and removing lead-based paint, are essential to reduce exposure.

Managing lead exposure is crucial for protecting health, especially in homes and communities with older infrastructure.

Ex.7. Watch the video

<https://www.youtube.com/watch?v=N3rwTK-n-HY>

7. Major sources of air pollution

7.1. Vehicular Emissions

Vehicular emissions are pollutants released into the air from cars, trucks, buses, and other vehicles. These emissions include harmful substances like carbon monoxide (CO), nitrogen oxides (NO_x), particulate matter (PM), and volatile organic compounds (VOCs).

Impact on Health and Environment:

- Air Pollution: Contributes to smog and poor air quality, which can cause respiratory problems, heart disease, and other health issues.
- Climate Change: Emissions of carbon dioxide (CO₂) from vehicles contribute to global warming and climate change.

Mitigation:

- Cleaner Fuels and Technologies: Using electric or hybrid vehicles, improving fuel efficiency, and adopting stricter emission standards can help reduce the impact of vehicular emissions.

Reducing vehicular emissions is essential for improving air quality and protecting public health and the environment.

Ex.1. Fill in the gaps with the following words: matter, compounds, vehicles, harmful, pollutants.

Vehicular emissions are _____ released into the air from cars, trucks, buses, and other _____. These emissions include _____ substances like carbon monoxide (CO), nitrogen oxides (NO_x), particulate _____ (PM), and volatile organic _____ (VOCs).

7.2. Industrial Factories

Industrial factories are significant contributors to air pollution, releasing large amounts of harmful pollutants into the atmosphere during manufacturing processes. Key pollutants include:

- Sulfur Dioxide (SO₂): Produced from burning fossil fuels, it contributes to acid rain and respiratory problems.
- Nitrogen Oxides (NO_x): Emitted from combustion processes, it plays a major role in forming smog and ground-level ozone.
- Particulate Matter (PM): Tiny particles released from factories can penetrate deep into the lungs, causing health issues such as asthma and heart disease.
- Volatile Organic Compounds (VOCs): Emitted from chemical manufacturing, VOCs contribute to air pollution and smog formation.

Controlling emissions through cleaner technologies, filters, and stricter regulations is essential to reduce the air pollution caused by industrial factories.

Ex.2. Choose one correct answer

1. What is one of the main pollutants emitted by industrial factories that contributes to acid rain?

- A) Carbon Monoxide (CO)
- B) Sulfur Dioxide (SO₂)
- C) Methane (CH₄)



D) Hydrogen (H₂)

2. Which pollutant released by industrial factories is primarily responsible for smog and ground-level ozone formation?

A) Carbon Dioxide (CO₂)

B) Nitrogen Oxides (NO_x)

C) Lead (Pb)

D) Water Vapor

3. Which type of pollutant from industrial factories can penetrate deep into the lungs and cause health issues?

A) Sulfur Dioxide (SO₂)

B) Volatile Organic Compounds (VOCs)

C) Particulate Matter (PM)

D) Chlorofluorocarbons (CFCs)

4. What is a key measure to reduce air pollution from industrial factories?

A) Increasing fossil fuel use

B) Implementing cleaner technologies

C) Removing pollution filters

D) Expanding factory operations

5. Which of the following pollutants from industrial factories contributes to the formation of smog?

A) Nitrogen Oxides (NO_x)

B) Helium (He)

C) Argon (Ar)

D) Neon (Ne)

7.3. Power Plants

Power plants, especially those that burn fossil fuels like coal, oil, and natural gas, are major sources of air pollution. They release a variety of harmful pollutants into the atmosphere during the generation of electricity.

Key Pollutants:

- Sulfur Dioxide (SO₂): Contributes to acid rain, which can damage ecosystems, buildings, and human health.
- Nitrogen Oxides (NO_x): Major contributors to smog and ground-level ozone, which can cause respiratory problems.
- Carbon Dioxide (CO₂): A greenhouse gas that significantly contributes to global warming and climate change.
- Mercury and Heavy Metals: Released from burning coal, these pollutants can contaminate water and food sources, posing health risks.

Environmental and Health Impacts:

- Air Quality Degradation: Emissions from power plants reduce air quality, affecting human health, particularly respiratory and cardiovascular systems.
- Climate Change: CO₂ emissions from power plants are a major driver of global climate change.



Reducing emissions from power plants is crucial for improving air quality and combating climate change.

Ex.3. Answer the following questions

1. What are the primary pollutants emitted by power plants that burn fossil fuels, and how do they impact the environment?
2. How do sulfur dioxide (SO₂) emissions from power plants contribute to environmental degradation?
3. What role does carbon dioxide (CO₂) play in climate change, and how are power plants involved?
4. Why are mercury and heavy metals released from power plants a concern for public health?
5. What measures can be taken to reduce air pollution from power plants, and why are they important?

7.4. Deforestation and Agriculture

Deforestation and agriculture are significant sources of air pollution, contributing to environmental degradation and climate change.

Deforestation:

- Carbon Dioxide (CO₂) Emissions: Cutting down trees reduces the planet's capacity to absorb CO₂, a major greenhouse gas. Burning forests releases stored carbon back into the atmosphere, increasing CO₂ levels and contributing to global warming.
- Particulate Matter (PM): Forest fires associated with deforestation release large amounts of particulate matter, which can harm respiratory health.

Agriculture:

- Methane (CH₄): Livestock such as cows produce methane, a potent greenhouse gas that traps heat in the atmosphere. Rice paddies also emit methane during the growing process.
- Ammonia (NH₃): Fertilizers and animal waste release ammonia, which contributes to air pollution and the formation of fine particulate matter.
- Nitrous Oxide (N₂O): Fertilizer use releases nitrous oxide, a greenhouse gas that contributes to global warming and depletes the ozone layer.

Environmental and Health Impacts:

- Air Quality: Emissions from deforestation and agriculture degrade air quality, leading to respiratory issues and other health problems.
- Climate Change: Greenhouse gases released from these activities significantly contribute to global warming.

Reducing deforestation, adopting sustainable farming practices, and managing agricultural emissions are crucial for improving air quality and protecting the environment.

Ex.4. Match the words and word-combinations with their Ukrainian equivalents

1. deforestation	a. глобальне потепління
2. emission	b. добриво



3. fertilizer	с. вирубка лісів
4. greenhouse gas	d. викид
5. global warming	е. парниковий газ

7.5. Residential Heating and Cooking

Residential heating and cooking, especially when using solid fuels like wood, coal, or biomass, are major sources of air pollution. These activities release harmful pollutants directly into the air.

Key Pollutants:

- Particulate Matter (PM): Tiny particles released during burning can penetrate deep into the lungs, causing respiratory and cardiovascular problems.
- Carbon Monoxide (CO): A colorless, odorless gas that can be deadly in high concentrations, causing headaches, dizziness, and even death with prolonged exposure.
- Volatile Organic Compounds (VOCs) and Nitrogen Oxides (NO_x): These pollutants contribute to indoor air pollution and can lead to smog formation outdoors.

Switching to cleaner fuels, improving ventilation, and using energy-efficient appliances can help reduce the air pollution caused by residential heating and cooking.

Ex.5. Match the words and word-combinations with their definitions


1. solid fuels	a. using little electricity, gas, etc.
2. dizziness	b. a substance used for fuel, such as coal or wood, rather than oil or gas
3. energy-efficient	c. a temporary feeling that your sense of balance is not good and that you may fall down
4. cardiovascular	d. relating to the heart and blood vessels
5. outdoors	e. not in a building

7.6. Waste Burning

Burning waste, including household garbage, agricultural residues, and industrial waste, is a significant source of air pollution. This practice releases a wide range of harmful pollutants into the atmosphere.

Key Pollutants:

- Particulate Matter (PM): Tiny particles released during burning can cause respiratory and cardiovascular problems.
- Dioxins and Furans: Highly toxic chemicals formed during the burning of plastics and other materials, which can cause cancer and other serious health effects.
- Carbon Monoxide (CO): A poisonous gas that can affect the body's ability to carry oxygen, leading to headaches, dizziness, and in severe cases, death.

- 
- Volatile Organic Compounds (VOCs): Contribute to smog formation and can cause eye, nose, and throat irritation.

Proper waste management, recycling, and banning open waste burning are essential measures to reduce air pollution from this source.

Ex. 6. Define five key words of this text.

8. Air pollution control technologies

8.1. Air Filters

Air filters are devices used to remove pollutants from the air, improving indoor and outdoor air quality. They work by trapping particles such as dust, pollen, smoke, and harmful pollutants like particulate matter (PM).

Types of Air Filters:

- HEPA Filters: High-Efficiency Particulate Air filters capture up to 99.97% of tiny particles, making them highly effective for home and industrial use.
- Carbon Filters: Use activated carbon to remove odors, gases, and volatile organic compounds (VOCs).
- Electrostatic Filters: Use an electric charge to attract and trap particles.

Benefits:

- Improved Air Quality: Reduces allergens, dust, and pollutants, enhancing health and comfort.
- Health Protection: Helps prevent respiratory issues by filtering out harmful particles.

Air filters are essential for maintaining clean air in homes, workplaces, and industrial settings.

Ex.1. Choose one correct answer.

1. What is the primary function of air filters?
 - A) To cool the air
 - B) To remove pollutants from the air
 - C) To increase air humidity
 - D) To add fragrances to the air
2. Which type of air filter is known for capturing up to 99.97% of tiny particles?
 - A) Carbon Filters
 - B) HEPA Filters
 - C) Electrostatic Filters
 - D) Foam Filters
3. Which air filter type uses activated carbon to remove odors and gases?
 - A) HEPA Filters
 - B) Carbon Filters
 - C) Electrostatic Filters
 - D) UV Filters
4. How do electrostatic filters work?
 - A) By using a chemical reaction to trap particles
 - B) By using water to wash away pollutants
 - C) By using an electric charge to attract and trap particles
 - D) By heating the air to kill germs
5. What is one of the main health benefits of using air filters?
 - A) Increasing room temperature
 - B) Preventing respiratory issues by filtering harmful particles
 - C) Reducing noise levels



D) Lowering electricity bills

8.2. Catalytic Converters

Catalytic converters are devices installed in vehicle exhaust systems to reduce harmful emissions. They work by converting toxic gases from engine exhaust, such as carbon monoxide (CO), nitrogen oxides (NO_x), and hydrocarbons, into less harmful substances like carbon dioxide (CO₂), nitrogen, and water vapor.

How They Work:

- Catalytic Reaction: The converter uses catalysts, usually platinum, palladium, and rhodium, to trigger chemical reactions that neutralize pollutants.
- Reduction and Oxidation: These processes break down harmful gases into safer emissions.

Catalytic converters are essential for reducing vehicle emissions and protecting the environment.

Ex.2. Watch the video about catalytic converters

<https://www.youtube.com/watch?v=PG7NI-bAt-8>

8.3. Smokestack Scrubbers

Smokestack scrubbers are pollution control devices installed in industrial smokestacks to remove harmful pollutants from exhaust gases before they are released into the atmosphere. They are commonly used in power plants, factories, and other industrial facilities.

How They Work:

- Wet Scrubbers: Use a liquid (usually water) to wash out pollutants like sulfur dioxide (SO₂) and particulate matter (PM) from the exhaust.
- Dry Scrubbers: Use dry materials like lime or activated carbon to neutralize and capture pollutants.

Smokestack scrubbers are crucial for minimizing industrial air pollution and safeguarding the environment.

Ex.3. Fill in the gaps with the following words: plants, remove, industrial, before, pollution.

Smokestack scrubbers are _____ control devices installed in industrial smokestacks to _____ harmful pollutants from exhaust gases _____ they are released into the atmosphere. They are commonly used in power _____, factories, and other _____ facilities.

8.4. Solar and Wind Energy

Solar and wind energy are renewable energy sources that harness natural resources to generate electricity without emitting harmful pollutants.

Solar Energy:

How It Works: Solar panels capture sunlight and convert it into electricity using photovoltaic (PV) cells.

Benefits: Reduces reliance on fossil fuels, decreases greenhouse gas emissions, and lowers electricity costs over time.

Wind Energy:



How It Works: Wind turbines use the wind’s kinetic energy to spin blades connected to a generator, producing electricity.

Benefits: Clean, abundant, and sustainable, wind energy reduces carbon emissions and helps combat climate change.

Ex.4. Match the words and word-combinations with their Ukrainian equivalents

1. Solar	a. Турбіна
2. Harmful	b. Шкідливий
3. Turbine	c. Витрати
4. Costs	d. Відновлювальний
5. Renewable	e. Сонячний

8.5. Public Transportation

Public transportation refers to shared travel services like buses, trains, trams, and subways that are available to the public. It offers an efficient and eco-friendly way to move large numbers of people within cities and regions.

Benefits:

- Reduces Air Pollution: Fewer individual cars on the road mean lower emissions of pollutants like carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter (PM).
- Decreases Traffic Congestion: Efficient public transport reduces the number of vehicles, leading to smoother traffic flow and less time spent in traffic jams.
- Promotes Energy Efficiency: Public transport vehicles can carry many passengers at once, making them more fuel-efficient per person compared to private cars.

Ex.5. Answer the following questions

1. How does public transportation help reduce air pollution?
2. What are the benefits of using public transportation in terms of traffic congestion?
3. In what ways does public transportation promote energy efficiency?
4. What role does public transportation play in sustainable urban development?
5. Why is public transportation considered an environmentally friendly option?


8.6. Recycling and Waste Management

Recycling and waste management involve processes that reduce, reuse, and properly dispose of waste to minimize environmental impact.

Key Components:

- Recycling: Converts waste materials like paper, plastic, glass, and metal into new products, conserving natural resources and reducing pollution.
- Waste Management: Involves collection, transportation, treatment, and disposal of waste, ensuring that it is handled in an environmentally responsible way.

Benefits:

- 
- Reduces Landfill Use: Recycling and proper waste management decrease the amount of waste sent to landfills, preventing soil and water contamination.
 - Conserves Resources: Recycling saves raw materials and energy, reducing the need for new resource extraction.
 - Lowers Greenhouse Gas Emissions: Proper waste management helps reduce emissions from waste decomposition and incineration.

Effective recycling and waste management are crucial for protecting the environment and promoting sustainable living.

Ex. 6. Watch the video about recycling and waste management

https://www.youtube.com/watch?v=7_vvVLofjow



9. Types of waste and their classification

Waste can be classified into various types based on its source, composition, and disposal methods. Understanding these classifications helps in managing and recycling waste effectively.

1. Municipal Solid Waste (MSW):

Includes everyday household items like food scraps, packaging, paper, and plastics.

Commonly managed through recycling, composting, incineration, or landfills.

2. Hazardous Waste:

Contains toxic, flammable, corrosive, or reactive substances like chemicals, batteries, and medical waste.

Requires special handling and disposal to prevent environmental and health risks.

3. Liquid Waste

Liquid waste refers to any waste material in liquid form that is discarded or needs treatment. It comes from various sources, including households, industries, and agriculture, and requires proper handling to prevent environmental contamination.

4. Biodegradable Waste:

Biodegradable waste consists of organic materials that can be broken down naturally by microorganisms, such as bacteria and fungi. This type of waste is typically generated from households, agriculture, and food industries.

5. Electronic Waste (E-waste):

Consists of discarded electronic devices like computers, phones, and appliances.

Needs special recycling processes to recover valuable materials and prevent toxic substances from polluting.

Proper classification and management of these waste types are essential for environmental protection and resource conservation.

Ex.1. Choose the correct answer

1. What type of waste includes everyday household items like food scraps, packaging, paper, and plastics?

- A) Hazardous Waste
- B) Liquid Waste
- C) Municipal Solid Waste (MSW)
- D) Electronic Waste (E-waste)

2. Which type of waste requires special handling and disposal to prevent environmental and health risks?

- A) Municipal Solid Waste
- B) Hazardous Waste
- C) Biodegradable Waste
- D) Liquid Waste



3. What is the main characteristic of biodegradable waste?
 - A) It contains metals and plastics.
 - B) It consists of organic materials that decompose naturally.
 - C) It is highly flammable.
 - D) It consists of electronic devices.
4. What is the primary concern with liquid waste?
 - A) It is non-recyclable.
 - B) It requires landfills for disposal.
 - C) It can cause environmental contamination if not properly handled.
 - D) It contains hazardous chemicals only.
5. Which type of waste includes items like computers, phones, and appliances?
 - A) Municipal Solid Waste
 - B) Biodegradable Waste
 - C) Electronic Waste (E-waste)
 - D) Hazardous Waste
6. How is municipal solid waste commonly managed?
 - A) Chemical treatment
 - B) Recycling, composting, incineration, or landfills
 - C) Burial underground
 - D) Ocean dumping
7. Which type of waste typically contains toxic, flammable, or reactive substances?
 - A) Liquid Waste
 - B) Biodegradable Waste
 - C) Hazardous Waste
 - D) Municipal Solid Waste
8. What is a key characteristic of electronic waste?
 - A) It decomposes naturally.
 - B) It consists of organic materials.
 - C) It needs special recycling processes to recover valuable materials.
 - D) It is always non-hazardous.
9. Which type of waste is generated from sources like households, industries, and agriculture?
 - A) Hazardous Waste
 - B) Liquid Waste
 - C) Municipal Solid Waste
 - D) Biodegradable Waste
10. Why is it important to classify and manage different types of waste properly?
 - A) To increase landfill use
 - B) To prevent resource conservation



- C) To protect the environment and conserve resources
- D) To reduce waste production



10. Waste disposal methods and their impact

Proper waste disposal is crucial for managing the increasing amounts of waste generated worldwide. Various disposal methods are used, each with its own environmental and health impacts.

1. Landfills:

Description: Landfills are sites where waste is buried under layers of soil. This is one of the most common waste disposal methods.

Impact: Landfills can release methane, a potent greenhouse gas, and leachate, a toxic liquid that can contaminate groundwater. They also occupy large areas of land, contributing to habitat destruction.

2. Incineration:

Description: Incineration involves burning waste at high temperatures to reduce its volume and mass. This method is often used for hazardous and medical waste.

Impact: While incineration reduces waste volume significantly, it releases harmful pollutants, such as dioxins and carbon dioxide, contributing to air pollution and climate change.

3. Recycling:

Description: Recycling involves converting waste materials into new products, reducing the need for raw materials. Commonly recycled items include paper, glass, metals, and plastics.

Impact: Recycling conserves resources, reduces energy consumption, and lowers greenhouse gas emissions. However, not all materials can be efficiently recycled, and improper sorting can lead to contamination.

4. Composting:

Description: Composting is the natural decomposition of organic waste, such as food scraps and garden waste, into nutrient-rich soil.

Impact: Composting reduces landfill use, lowers methane emissions, and enriches soil, promoting sustainable agriculture. However, it is only suitable for biodegradable waste.

5. Waste-to-Energy (WTE):

Description: WTE is a waste disposal method that converts non-recyclable waste materials into usable forms of energy, such as electricity, heat, or fuel, through processes like combustion, gasification, and pyrolysis. WTE plants serve as an alternative to landfills by reducing the volume of waste and generating energy simultaneously.

Impact: WTE can reduce the volume of waste by up to 90%, significantly decreasing the need for landfills. Converts waste into a valuable source of renewable energy, helping to power homes and businesses. By diverting waste from landfills, WTE plants help reduce methane emissions, a potent greenhouse gas.

Ex. 1. Watch the video about Recycling

https://www.youtube.com/watch?v=6jQ7y_qQYUA



Keys

1.1.ex.1. 1. B 2. C 3. C 4. C 5. C

1.2. ex.2

1. True - Environmental engineers design and implement systems for managing waste and treating water.

2. False - The text states that environmental engineers control air pollution.

3. True - They develop plans to mitigate the effects of construction activities.

4. False - Environmental engineers ensure compliance with environmental regulations and laws.

5. True - Their work is essential in promoting sustainability.

1.3. ex.3. 1. safeguarding, 2. environmental, 3. pollution, 4. waste, 5. renewable

1.4. ex.4. 1. d, 2. b, 3. e, 4. a, 5. C

1.5.ex.5.

1. Climate change, pollution, deforestation, and biodiversity loss are mentioned as environmental challenges.

2. Climate change leads to global warming, extreme weather, and rising sea levels, affecting ecosystems and human health.

3. Pollution contaminates air, water, and soil, causing harm to wildlife and increasing health risks for communities.

4. Deforestation contributes to habitat loss and accelerates climate change.

5. The loss of biodiversity disrupts ecological balance and threatens food security.

6. Developing nations and vulnerable populations often face the harshest consequences of environmental challenges.

7. Urgent global action, sustainable practices, and a commitment to protecting the environment for future generations are needed to address these challenges.

2.1.ex.1. 1. A 2. D 3. C 4. D 5. C

2.2.ex.2

1. True - Bacteria and viruses are mentioned as microorganisms that can cause diseases.

2. False - Excessive nitrogen and phosphorus lead to algae blooms, which are harmful.

3. False - Lead and mercury are toxic to humans and wildlife.

4. True - Pesticides and herbicides are listed as chemicals that pollute water.

5. False - Sediments can cloud water and disrupt ecosystems.

2.3. ex.3. 1. A 2. B 3. E 4. D 5. C

2.4.ex.4. 1.ensuring 2.protecting 3.ecosystems 4.management 5.access

3.1.ex.1



1. Water pollution occurs when harmful substances contaminate water bodies.
2. Water pollution can occur in rivers, lakes, oceans, and groundwater.
3. Sources of water contamination include industrial discharges, agricultural runoff, untreated sewage, and hazardous waste.
4. Polluted water can harm aquatic life by disrupting ecosystems.
5. Health risks for humans from polluted water include diseases and poisoning.
6. Addressing water pollution involves reducing sources of contaminants, improving waste management, and ensuring effective water treatment.
7. To reduce sources of contaminants in water, actions such as proper waste management and effective water treatment should be implemented.

3.2.ex.2. 1. D 2. B 3. A 4. D 5. D

3.3. ex.3

1. True - The text states that agricultural runoff carries soil, fertilizers, pesticides, and other chemicals into nearby water bodies.
2. False - The text states that nutrient pollution depletes oxygen in water and harms aquatic life.
3. True - The text mentions that pesticides in runoff can contaminate drinking water sources.
4. False - The text states that soil erosion can cloud water and disrupt habitats.
5. True - The text mentions that managing agricultural runoff through sustainable farming practices is essential to protect water quality.

3.4.ex.4. 1. sewage, 2. concentrated, 3. pollute 4. nutrients 5. degradation

3.5.ex.5. 1. C 2. B 3. A 4. D 5. E

4.1.ex.1. 1. C 2. C 3. B 4. B 5. C

4.2.ex.2

1. Physical testing measures temperature, turbidity, and color.
2. Chemical testing analyzes pH, dissolved oxygen, nitrates, phosphates, and heavy metals.
3. Biological testing involves testing for bacteria, viruses, and algae.
4. Sensor-based testing uses electronic sensors to monitor changes in parameters like pH, conductivity, and dissolved oxygen.
5. Samples collected for laboratory analysis are sent to laboratories for detailed analysis of chemical and microbial contaminants.
6. Electronic sensors in sensor-based testing monitor parameters like pH, conductivity, and dissolved oxygen.
7. These methods provide a comprehensive understanding of water quality to ensure it meets safety standards for various uses.

4.3.ex.3

1. True - The text mentions collecting data on water quality parameters, such as pH, at consistent intervals.
2. True - The text states that data analysis is used to detect trends, such



as improvements or declines in water quality.

3. False - The text says changes in water quality can be linked to activities like industrial discharges and agricultural runoff.

4. True - The text mentions using data and statistical models to predict future water quality trends.

5. False - The text states that sharing findings with stakeholders is important for informing water management decisions.

5.1.ex.1. 1. D 2. C 3. E 4. B 5. A

5.2.ex.2 1. B 2. E 3. A 4. C 5. D

5.3.ex.3

1. True - Coagulation involves adding chemicals to help particles clump together.

2. False - Flocculation happens after coagulation, not before.

3. True - Flocculants are added during flocculation to help form larger clusters.

4. False - Coagulation and flocculation are crucial for improving water clarity.

5. True - The purpose of coagulation is to destabilize fine particles, making them easier to aggregate.

5.4.ex.4. 1. C 2. C 3. A 4. D 5. D

5.5.ex.5

1. Reverse osmosis (RO) is a water purification process that removes contaminants by forcing water through a semi-permeable membrane.

2. Pressure is applied to push water through the RO membrane, filtering out dissolved solids, bacteria, and other contaminants.

3. The clean water, known as permeate, passes through the membrane, while the concentrated impurities, known as brine or reject water, are flushed away.

4. Some benefits of using reverse osmosis include high-quality purification and the removal of heavy metals, nitrates, fluoride, and certain microorganisms.

5. Reverse osmosis improves the taste, odor, and safety of drinking water by removing dissolved salts and impurities.

6. Common applications of reverse osmosis include household systems for drinking water, desalination plants, and industrial uses in pharmaceuticals and electronics manufacturing.

7. Reverse osmosis is considered highly effective for producing clean, safe water due to its thorough filtration capabilities and versatility.

6.1.ex.1. 1. C 2. A 3. C 4. A 5. D

6.2.ex.2

1. True

2. False (Ground-level ozone is harmful to respiratory health.)

3. False (Ground-level ozone forms at ground level due to reactions with emissions from vehicles and industrial facilities.)



4. False (Ground-level ozone is harmful air pollution, while the ozone layer in the upper atmosphere protects Earth from UV radiation.)

5. True

6.3.ex.3. 1C 2A 3E 4B 5D

6.4.ex.4. 1 B 2C 3B 4A 5B

6.5.ex.5

1. The primary sources of carbon monoxide emissions include incomplete combustion of fossil fuels in vehicles, industrial processes, and residential heating systems.

2. Carbon monoxide can prevent oxygen from entering the bloodstream, leading to symptoms such as headaches, dizziness, and confusion. At high levels, CO exposure can cause more severe health issues, including loss of consciousness and death.

3. To reduce risks associated with carbon monoxide, it is important to install CO detectors in homes and workplaces, ensure proper ventilation in areas where combustion occurs, and regularly maintain and check heating systems and vehicles for proper combustion.

7.1.ex.1. pollutants, vehicles, harmful, matter, compounds.

7.2.ex.2. 1 B), 2 B), 3 C), 4 B), 5 A)

7.3.ex.3

1. The primary pollutants emitted by power plants that burn fossil fuels include sulfur dioxide (SO₂), nitrogen oxides (NO_x), carbon dioxide (CO₂), and mercury and heavy metals. SO₂ contributes to acid rain, which damages ecosystems and buildings, and impacts human health. NO_x contributes to smog and ground-level ozone, causing respiratory problems. CO₂ is a significant greenhouse gas driving global warming and climate change. Mercury and heavy metals contaminate water and food sources, posing serious health risks.

2. Sulfur dioxide (SO₂) emissions from power plants contribute to environmental degradation by forming acid rain, which can harm ecosystems, damage buildings and infrastructure, and negatively impact human health. Acid rain can lead to the acidification of lakes and rivers, harming aquatic life and reducing biodiversity.

3. Carbon dioxide (CO₂) plays a major role in climate change as it is a potent greenhouse gas that traps heat in the Earth's atmosphere, leading to global warming. Power plants, especially those that burn fossil fuels, are significant sources of CO₂ emissions, contributing to the increase in atmospheric CO₂ levels and driving climate change.

4. Mercury and heavy metals released from power plants are a concern for public health because they can contaminate water and food sources. When ingested or inhaled, these toxic substances can cause serious health problems, including neurological damage, developmental issues in children, and other chronic health conditions.

5. Measures to reduce air pollution from power plants include



transitioning to cleaner energy sources like wind, solar, and hydroelectric power, which do not produce harmful emissions. Additionally, installing emission control technologies like scrubbers and filters can reduce the release of pollutants such as SO₂, NO_x, and mercury. These measures are important for improving air quality, protecting public health, and combating climate change by reducing the amount of greenhouse gases and other harmful pollutants in the atmosphere.

7.4.ex.4. 1c 2d 3b e 5a

7.5.ex.5. 1b 2c 3a 4d 5e

7.6.ex.6. Possible answers: garbage, waste, pollutants, reduce, atmosphere.

8.1.ex.1. 1 B) 2 B) 3 B) 4 C) 5 B)

8.4.ex.4. 1e 2b 3a 4c 5d

8.5.ex.5 Possible answers:

1. Public transportation helps reduce air pollution by lowering the number of individual cars on the road, which decreases the emissions of harmful pollutants like carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter (PM). Buses, trains, and trams can carry many passengers at once, making them more efficient in terms of emissions per person compared to private vehicles.

2. Public transportation reduces traffic congestion by decreasing the number of cars on the road. With fewer vehicles, traffic flows more smoothly, leading to shorter travel times and less time spent in traffic jams. This also improves the overall efficiency of urban transportation networks.

3. Public transportation promotes energy efficiency because buses, trains, and other forms of mass transit can carry many passengers at once, reducing the amount of fuel used per person compared to individual car travel. This collective mode of transport conserves energy and reduces overall fuel consumption.

4. Public transportation plays a key role in sustainable urban development by providing an efficient, eco-friendly travel option that reduces the need for personal vehicle use. It supports lower emissions, lessens urban sprawl, and encourages compact city planning, which helps preserve green spaces and reduces environmental impact.

5. Public transportation is considered environmentally friendly because it reduces the number of private vehicles on the road, leading to lower emissions of greenhouse gases and pollutants. It conserves energy, decreases the carbon footprint, and helps protect the environment by promoting cleaner, more efficient travel options for the public.

9.ex.1. 1 C, 2 B, 3B, 4C, 5C, 6 B, 7C, 8C, 9B, 10C



Список використаної літератури

1. Малишев В., Кущевська Н., Брускова Д. Professional English/ Education and Ecology, Bio- and Nanotechnologies. Київ : Університет “Україна”, 2016. 244 с.
2. Mishchenko K. O., Minina N. S., Beketov O. M. English for Ecologists : tutorial. Kharkiv : O.M.Beketov NUUE, 2019. 123 p.
3. Evans V., Dooley J., Rodgers K.. Career Paths: Environmental Engineering. ExpressPublishing, 2015. 120 p.



Навчально-методичне видання

Кочергіна Світлана Станіславівна

Англійська мова для інженерів з охорони навколишнього середовища

**методичні рекомендації до самостійної роботи
здобувачів освіти першого (бакалаврського) рівня вищої освіти
спеціальності 183 (перший курс, перший семестр)**

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