National Council of Examiners for Engineering and Surveying (NCEES) Fundamentals of Engineering (FE) Environmental Practice Exam (Sample)

Study Guide

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Questions

1. Which environmental policy promotes the use of renewable energy sources?

A. Cap-and-trade system

B. Subsidies for fossil fuels

C. Renewable Portfolio Standards

D. Emission reduction agreements

2. What is the measurement of parts per billion (ppb) equivalent to in micrograms per liter?

A. mg/L

B. micro g/L

C. g/L

D. mg/m3

3. What does MCL stand for in the context of drinking water quality?

A. Maximum Contaminant Levels

B. Minimum Contaminant Load

C. Maximum Chemical Limit

D. Measured Concentration Level

4. What is immunotoxicity related to?

A. Toxicity of the heart

B. Toxicity of the kidneys

C. Toxicity of the immune system

D. Toxicity of the liver

5. What is the purpose of using deep bed filters in air pollution control?

A. To cool gases

B. To filter larger particles

C. To efficiently capture smaller particulate matter

D. To enhance combustion efficiency

6. What is the term for the mixture of activated sludge and wastewater in the aeration basin?

A. Mixed liquor

B. Return sludge

C. Primary sludge

D. Settled sludge

7. What is the primary purpose of TLV-TWA?

A. Determining maximum exposure levels for a single incident

B. Calculating average exposure over a short period of time

C. Measuring long-term exposure limits for workers

D. Setting environmental air quality standards

8. What is NOT a characteristic of hazardous waste?

A. Ignitable

B. Corrosive

C. Innocuous

D. Toxic

9. What characterizes an oligotrophic lake?

A. High nutrient levels and high productivity

B. Clear water and low nutrient levels

C. Turbid water and high organic material

D. Low biodiversity and minimal plant life

10. What type of waste is characterized as non-hazardous and compostable?

A. Hazardous waste

B. Industrial waste

C. Municipal solid waste

D. Medical waste

Answers

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

Explanations

1. Which environmental policy promotes the use of renewable energy sources?

A. Cap-and-trade system

B. Subsidies for fossil fuels

C. Renewable Portfolio Standards

D. Emission reduction agreements

The correct answer highlights the role of Renewable Portfolio Standards (RPS) in promoting the use of renewable energy sources. RPS are regulatory mandates that require utilities to obtain a certain percentage of their energy from renewable sources, such as wind, solar, and hydroelectric power. This policy framework incentivizes utility companies to develop and integrate renewable energy projects into their energy mix, fostering investment in cleaner energy technologies and reducing dependency on fossil fuels. By setting specific targets for renewable energy generation, RPS create a market demand for renewable energy, encourage innovation, and ultimately contribute to a more sustainable energy portfolio. This approach not only supports the growth of the renewable energy sector but also helps achieve various environmental goals, such as reducing greenhouse gas emissions and improving air quality. In contrast, the other options focus on different aspects of energy policy that may not directly promote the development of renewable energy. For instance, a cap-and-trade system is primarily aimed at controlling overall emissions by allowing companies to buy and sell emission allowances, but it does not specifically target renewable energy adoption. Similarly, subsidies for fossil fuels encourage the continued use of non-renewable energy sources rather than promoting cleaner alternatives. Emission reduction agreements may set targets for reducing emissions but do not inherently incentivize the transition

2. What is the measurement of parts per billion (ppb) equivalent to in micrograms per liter?

A. mg/L

B. micro g/L

C. g/L

D. mg/m3

Parts per billion (ppb) is a unit of measurement that expresses the concentration of a substance in a solution, typically in water or air. In the context of freshwater systems or environmental analyses, 1 ppb is equivalent to 1 microgram of solute per liter of solution. This conversion stems from the definition of a billion, where one part per billion signifies one part of a substance in one billion parts of the solution. Since a liter of water weighs about a million micrograms, dividing by a factor of one thousand to convert to micrograms gives the equivalence of 1 ppb being 1 microgram per liter (µg/L). The context of the other choices helps reinforce understanding: milligrams per liter (mg/L) would be a larger measurement, where 1 mg/L equals 1,000 ppb. Grams per liter (g/L) is an even larger scale and isn't applicable at the ppb level. Milligrams per cubic meter (mg/m^3) measures concentration in air rather than liquid solutions, making it unrelated to the units for ppb activity in liquid form. Thus, the understanding of units in environmental science focuses significantly on the relationship and conversions among these micro-scale concentrations.

3. What does MCL stand for in the context of drinking water quality?

A. Maximum Contaminant Levels

B. Minimum Contaminant Load

C. Maximum Chemical Limit

D. Measured Concentration Level

In the context of drinking water quality, MCL stands for Maximum Contaminant Levels. This term is critical because it represents the highest level of a contaminant that is allowed in drinking water under the regulations set by the Environmental Protection Agency (EPA) and other authoritative bodies. MCLs are established to protect public health by ensuring that drinking water remains safe and free from harmful levels of various contaminants. Each substance has a specific MCL based on extensive research that assesses the potential health risks associated with exposure over time. Understanding MCLs is vital for environmental engineers and professionals in the field, as it guides them in assessing water quality, designing treatment systems, and ensuring compliance with safety standards. This provides a framework that not only safeguards human health but also helps in maintaining the overall integrity of water resources.

4. What is immunotoxicity related to?

A. Toxicity of the heart

B. Toxicity of the kidneys

C. Toxicity of the immune system

D. Toxicity of the liver

Immunotoxicity refers specifically to the toxic effects that certain substances can have on the immune system. This can involve a range of adverse effects, including immunosuppression (reducing the immune system's ability to fight against infections and diseases), hypersensitivity reactions (an exaggerated response to allergens), and autoimmunity (where the immune system mistakenly attacks the body's own tissues). Understanding immunotoxicity is important in assessing the safety of various chemicals, medications, and environmental exposures, especially those that could impair the body's natural defense mechanisms. This area of study is critical in immunology and toxicology fields, as it helps to ensure the protection of public health by identifying substances that could pose a risk to immune function.

5. What is the purpose of using deep bed filters in air pollution control?

A. To cool gases

B. To filter larger particles

C. To efficiently capture smaller particulate matter

D. To enhance combustion efficiency

Deep bed filters are designed to efficiently capture smaller particulate matter from gases, making them a critical component in air pollution control systems. The filtering mechanism in deep bed filters relies on a combination of mechanisms, such as interception, inertial impaction, and diffusion, to trap particles as air passes through the filter medium. This is particularly important for removing fine particulate matter that may pose health risks or contribute to environmental pollution. These filters are usually composed of multiple layers of filtration media that create a depth where particles can be trapped at various sizes, enhancing the overall efficiency of air purification. The design allows for a greater surface area and thickness, which significantly improves the filter's ability to capture and retain smaller particles that traditional filtration systems may not effectively remove. Thus, their primary purpose in air pollution control is to mitigate the release of these harmful particulates into the atmosphere, contributing to improved air quality and public health.

6. What is the term for the mixture of activated sludge and wastewater in the aeration basin?

A. Mixed liquor

B. Return sludge

C. Primary sludge

D. Settled sludge

The term for the mixture of activated sludge and wastewater in the aeration basin is known as mixed liquor. In wastewater treatment processes, particularly in activated sludge systems, mixed liquor is a crucial component. It refers to the biological mixture that includes microorganisms, organic matter, and nutrients. In the aeration basin, air is introduced to promote the growth of these microorganisms, which feed on the organic pollutants in the wastewater, thus facilitating the treatment process. The term emphasizes the combined nature of the activated sludge and the incoming wastewater, highlighting the importance of biological activity for effective treatment. Other terms, such as return sludge, which refers to the portion of sludge that is returned to the aeration basin from the secondary clarifier to maintain adequate biomass in the reactor, or primary sludge, which refers to the solids collected from the primary clarifier before biological treatment, do not accurately describe the active mixture occurring in the aeration basin. Settled sludge, on the other hand, relates to the solids that accumulate at the bottom of a clarifier after the biological treatment process, further distinguishing it from the mixed liquor in the aeration stage.

7. What is the primary purpose of TLV-TWA?

A. Determining maximum exposure levels for a single incident

B. Calculating average exposure over a short period of time

C. Measuring long-term exposure limits for workers

D. Setting environmental air quality standards

The primary purpose of TLV-TWA, or Threshold Limit Value - Time-Weighted Average, is to set a guideline for measuring long-term exposure limits for workers to various airborne contaminants. TLV-TWA is specifically designed to protect workers from the cumulative effects of hazardous substances in the workplace over an 8-hour workday or 40-hour workweek. This value represents the maximum average concentration of a chemical to which a worker can be exposed continuously during that time period without expecting adverse effects on health. It accounts for variations in exposure during the workday and establishes a reasonable average threshold that should not be exceeded to maintain worker safety and health over time. Other options consider different types of exposure metrics, such as maximum exposure for single incidents or shorter-term averages, but these do not align with the specific purpose of TLV-TWA, which is focused on long-term exposure assessments. Setting environmental air quality standards also relates to broader public health implications and regulatory frameworks rather than specific occupational safety limits.

8. What is NOT a characteristic of hazardous waste?

A. Ignitable

B. Corrosive

C. Innocuous

D. Toxic

A characteristic of hazardous waste is that it poses potential dangers to human health or the environment. The properties that define hazardous waste typically include ignitable, corrosive, toxic, and reactive traits. These characteristics represent various ways in which waste can be harmful: - **Ignitable waste can easily catch fire and sustain combustion. - **Corrosive waste** can corrode materials or living tissue, posing risks of chemical burns or damage. - **Toxic waste** can cause harmful effects upon exposure or ingestion, either acutely or chronically. In contrast, the term "innocuous" refers to something that is harmless or does not pose any risk. Thus, classifying waste as innocuous would mean it does not meet the criteria for hazardous waste, which inherently includes potential risks and dangers. This distinction makes "innocuous" the correct choice as it is not a characteristic of hazardous waste.**

9. What characterizes an oligotrophic lake?

A. High nutrient levels and high productivity

B. Clear water and low nutrient levels

C. Turbid water and high organic material

D. Low biodiversity and minimal plant life

An oligotrophic lake is characterized by clear water and low nutrient levels. This type of lake typically has a low concentration of nutrients such as nitrogen and phosphorus, which limits the growth of algae and other aquatic plants. As a consequence, these lakes often have excellent water clarity, allowing sunlight to penetrate deeply. This supports the presence of certain types of fish and other aquatic life that thrive in these conditions. The low nutrient availability results in lower primary productivity, which maintains the clear water quality. Oligotrophic lakes are often found in regions where geological and climatic conditions contribute to their nutrient-poor status, such as in mountainous or less populated areas.

10. What type of waste is characterized as non-hazardous and compostable?

A. Hazardous waste

B. Industrial waste

C. Municipal solid waste

D. Medical waste

Municipal solid waste is a category of waste that typically includes everyday items discarded by the public, such as food scraps, yard waste, paper products, and other organic material. One of the defining features of municipal solid waste is that a significant portion of it is non-hazardous and readily compostable, particularly the organic components. Composting is an environmentally friendly method to recycle organic matter, improve soil health, and reduce landfill waste. In contrast, hazardous waste contains dangerous substances that can pose a risk to human health and the environment. Industrial waste can vary widely, and although it can sometimes be inert, it may also contain hazardous materials. Medical waste includes any waste generated in healthcare settings and often contains hazardous biological materials, making it distinct from non-hazardous organic waste.