

NEHA Wastewater Practice Test (Sample)

Study Guide



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SAMPLE

Questions

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- 1. Which contaminants are targeted in biological treatment processes?**
 - A. Heavy metals and toxins**
 - B. Organic matter and nitrogen compounds**
 - C. Pathogens and fats**
 - D. Chlorinated solvents and pesticides**
- 2. What is the characteristic of the best soil for wastewater absorption?**
 - A. High clay content**
 - B. Good drainage properties**
 - C. Low porosity**
 - D. High sand content**
- 3. According to sedimentation data, which organism has the best removal rate?**
 - A. Viruses**
 - B. Bacteria**
 - C. Cholera vibrio**
 - D. Helminths**
- 4. What type of soil is likely indicated by consistent brown mottling?**
 - A. Well-draining soil**
 - B. Waterlogged soil**
 - C. Highly aerated soil**
 - D. Drought-prone soil**
- 5. During which treatment stage are solids primarily removed?**
 - A. Secondary treatment**
 - B. Tertiary treatment**
 - C. Primary treatment**
 - D. Quaternary treatment**

- 6. Which of the following is NOT a consequence of improper sewage disposal?**
- A. Increased property values**
 - B. Health issues in the population**
 - C. Pollution of surface groundwater**
 - D. Environmental degradation**
- 7. Why are advanced oxidation processes utilized in wastewater treatment?**
- A. To enhance nitrogen removal**
 - B. To treat persistent organic pollutants resistant to conventional methods**
 - C. To improve the taste of treated water**
 - D. To decrease operator workload**
- 8. What is a preferred method for sizing absorption fields in soil analysis?**
- A. Soil density measurement**
 - B. Visual inspection of soil**
 - C. Conducting a percolation test**
 - D. Using soil chemical composition only**
- 9. What are some common methods for sludge disposal?**
- A. Landfilling**
 - B. Incineration**
 - C. Land application as fertilizer**
 - D. All of the above**
- 10. What challenges do wastewater treatment facilities face as a result of climate change?**
- A. Lower runoff rates and drought**
 - B. Increased precipitation and rising temperatures**
 - C. Static water levels**
 - D. Reduced population density in treatment areas**

Answers

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

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Explanations

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1. Which contaminants are targeted in biological treatment processes?

- A. Heavy metals and toxins
- B. Organic matter and nitrogen compounds**
- C. Pathogens and fats
- D. Chlorinated solvents and pesticides

In biological treatment processes, the primary focus is on degrading organic matter and nitrogen compounds. This is because biological treatment relies on microorganisms, such as bacteria and protozoa, which thrive on organic materials as their source of energy. These microorganisms metabolize organic substances, breaking them down into simpler compounds. Additionally, nitrogen compounds, including ammonia and nitrates, are significant contributors to water pollution and can cause harmful environmental effects. Biological treatment processes often incorporate steps like nitrification and denitrification to effectively manage nitrogen levels in wastewater. While the other options mention pollutants that may also require treatment, they are not the primary targets of biological treatment methods. Heavy metals and toxins often necessitate physical or chemical processes for removal due to their non-biodegradable nature. Pathogens may be dealt with in biological processes, but they do not represent the main goal; usually, additional measures are taken to ensure that pathogens are effectively removed. Chlorinated solvents and pesticides tend to require specialized technologies for degradation or removal, as many of these substances are resistant to biological processes. Therefore, the emphasis on organic matter and nitrogen compounds positions them as the correct focus of biological treatment in wastewater management.

2. What is the characteristic of the best soil for wastewater absorption?

- A. High clay content
- B. Good drainage properties**
- C. Low porosity
- D. High sand content

The best soil for wastewater absorption is characterized by good drainage properties. This is essential because effective absorption requires that water from the wastewater can move through the soil and be treated effectively by microbial action. Good drainage ensures that the wastewater does not pool on the surface, which could lead to surface runoff or contamination problems. Soils that exhibit good drainage properties typically have a balance of sand and silt, allowing for adequate pore space to hold water while facilitating its movement downwards through the soil layers. This movement is crucial as it helps distribute the wastewater evenly, promoting the biological processes necessary for treatment and preventing saturation that could hinder these processes. In contrast, soils with high clay content tend to retain water rather than draining it, leading to poor absorption and potential environmental concerns. Similarly, low porosity and high sand content can also create issues. Low porosity may restrict airflow and limit microbial activity vital for breaking down contaminants, while high sand content can lead to rapid drainage that does not allow sufficient time for treatment to occur. Thus, good drainage properties are vital for optimal wastewater absorption and treatment.

3. According to sedimentation data, which organism has the best removal rate?

- A. Viruses**
- B. Bacteria**
- C. Cholera vibrio**
- D. Helminths**

Cholera vibrio, as a type of bacteria, typically has a higher removal rate during the sedimentation process compared to viruses, other types of bacteria, and helminths. The removal rate during sedimentation is influenced by factors such as size, density, and the ability to aggregate. Cholera vibrio cells are relatively larger and denser compared to many viruses, which may remain suspended in the water column much longer due to their small size. This means that viruses can take considerably longer to settle out of a solution. Other types of bacteria may also have different settling characteristics, but cholera vibrio's size and behavior during sedimentation lend to better removal rates. Helminths are larger organisms, but they typically have complex life cycles and are often not as effectively removed through sedimentation as cholera vibrio, which settles out more readily from water due to its biological and ecological properties. Therefore, cholera vibrio stands out as the organism with the best removal rate when considering sedimentation data.

4. What type of soil is likely indicated by consistent brown mottling?

- A. Well-draining soil**
- B. Waterlogged soil**
- C. Highly aerated soil**
- D. Drought-prone soil**

Consistent brown mottling in soil typically indicates waterlogged conditions. This mottling occurs due to the periodic saturation of the soil, which leads to the alternating presence of oxidized and reduced iron compounds. In waterlogged soils, iron ions can be reduced in an anaerobic environment, leading to the formation of gray or bluish colors when saturated. Once the soil partially dries out, oxidation occurs, resulting in the characteristic brown mottles. This pattern is a visual cue that the soil has experienced fluctuations in moisture levels, consistent with water drainage issues. Other soil types, such as well-draining, highly aerated, or drought-prone soils, do not typically present with such mottling. Well-draining soils usually appear uniform without the distinct color variations caused by saturation. Highly aerated soils benefit from good oxygen levels and drainage, preventing the anaerobic conditions that lead to mottling. Drought-prone soils are more likely to exhibit signs of desiccation and cracking rather than the color variations associated with fluctuating water levels. Thus, consistent brown mottling is a clear indicator of waterlogged soil conditions.

5. During which treatment stage are solids primarily removed?

- A. Secondary treatment**
- B. Tertiary treatment**
- C. Primary treatment**
- D. Quaternary treatment**

The correct choice indicates that solids are primarily removed during the primary treatment stage of wastewater treatment. This initial phase is crucial for reducing the overall solid content in the wastewater before it undergoes further treatment processes. Primary treatment primarily involves physical processes such as sedimentation, where larger solids settle at the bottom of settling tanks, forming sludge. Additionally, some floating materials, like oils and grease, are skimmed off the surface. This stage effectively removes a significant portion of suspended solids and organic matter, thereby reducing the load on subsequent treatment stages, which focus more on biological and chemical remediation. Understanding the role of primary treatment in solid removal is essential, as it lays the groundwork for the efficiency and effectiveness of the entire wastewater treatment process.

6. Which of the following is NOT a consequence of improper sewage disposal?

- A. Increased property values**
- B. Health issues in the population**
- C. Pollution of surface groundwater**
- D. Environmental degradation**

Increased property values are indeed not a consequence of improper sewage disposal. Typically, improper sewage disposal leads to adverse effects on the surrounding environment and public health. When sewage is not managed properly, it can lead to significant health issues in the population, as untreated waste can contaminate drinking water sources and create conditions conducive to disease. Additionally, improper disposal can result in the pollution of surface and groundwater, harming aquatic ecosystems and compromising water quality for human use. Moreover, environmental degradation is a common outcome of poor sewage practices, as this can disrupt local ecosystems, harm wildlife, and lead to a loss of biodiversity. The consequences of improper sewage management usually include a decline in property values due to health risks and environmental issues, rather than an increase in property values, which would generally require effective land management and sanitation services.

7. Why are advanced oxidation processes utilized in wastewater treatment?

- A. To enhance nitrogen removal**
- B. To treat persistent organic pollutants resistant to conventional methods**
- C. To improve the taste of treated water**
- D. To decrease operator workload**

Advanced oxidation processes (AOPs) are employed in wastewater treatment primarily to address the challenge of persistent organic pollutants that are resistant to conventional treatment methods. These pollutants often do not break down easily through standard biological processes or conventional chemical treatments, leading to the need for more aggressive methods to achieve effective degradation. AOPs utilize powerful oxidants, often facilitated by ultraviolet light, ozone, or hydrogen peroxide, to generate hydroxyl radicals. These radicals are highly reactive and can effectively oxidize and break down a wide range of organic contaminants that are resistant to degradation by other means. This capability makes AOPs particularly valuable in treating wastewater that contains specific toxic or recalcitrant compounds, as they can significantly reduce pollutant concentrations and contribute to overall water quality improvement. The other options do not accurately reflect the primary function of advanced oxidation processes. While nitrogen removal is important, it is typically achieved through biological methods like nitrification and denitrification, rather than AOPs. Improving the taste of treated water is generally not a direct goal of AOPs, as taste is more closely related to the presence of certain ions and substances rather than recalcitrant organic compounds. Additionally, while AOPs can contribute to a more efficient treatment process, they

8. What is a preferred method for sizing absorption fields in soil analysis?

- A. Soil density measurement**
- B. Visual inspection of soil**
- C. Conducting a percolation test**
- D. Using soil chemical composition only**

Conducting a percolation test is a widely recognized and preferred method for sizing absorption fields because it directly measures the rate at which water moves through the soil. This test is crucial for understanding the soil's ability to absorb effluent from a septic system, which influences the design and size of the absorption area required. Percolation tests involve digging test holes and observing how quickly water drains away in the soil. The results provide valuable data on soil permeability, which is essential for determining the appropriate size for the absorption field to ensure effective wastewater treatment and prevent potential failures or environmental contamination. Other methods, such as soil density measurement, visual inspection, and using soil chemical composition alone, do not provide a comprehensive understanding of how the soil will behave under real-world conditions involving effluent absorption and filtration. Soil density may indicate compaction but does not directly correlate with percolation rates. Visual inspection can identify some soil characteristics, but it lacks the quantitative data needed for accurate sizing. Relying solely on soil chemical composition does not account for physical properties necessary for wastewater absorption, making the percolation test the most reliable method in this context.

9. What are some common methods for sludge disposal?

- A. Landfilling
- B. Incineration
- C. Land application as fertilizer
- D. All of the above**

All of the mentioned methods—landfilling, incineration, and land application as fertilizer—are common techniques for sludge disposal, making the comprehensive option correct. Landfilling involves the disposal of sludge in a landfill, where it is buried and isolated from the environment. This method is straightforward but requires careful management to prevent groundwater contamination. Incineration is another method employed to reduce the volume of sludge significantly and eliminate pathogens present in it. The process involves burning the sludge at high temperatures, which transforms it into ash, flue gases, and heat. This method is efficient for volume reduction and can also harness energy from the combustion process when designed as a waste-to-energy facility. Land application as fertilizer utilizes the nutrient content of treated sludge, which can enrich soil and support agricultural practices. However, this method requires careful regulation to ensure that the application does not pose risks to human health or the environment. Since all of these disposal techniques play significant roles in managing wastewater sludge, recognizing their applicability in different contexts is essential for effective wastewater management practices.

10. What challenges do wastewater treatment facilities face as a result of climate change?

- A. Lower runoff rates and drought
- B. Increased precipitation and rising temperatures**
- C. Static water levels
- D. Reduced population density in treatment areas

Wastewater treatment facilities encounter several challenges due to climate change, and increased precipitation and rising temperatures play a significant role in these challenges. As temperatures rise, the water bodies that treatment facilities rely on can experience changes in temperature, which can affect the efficiency of processes such as biological treatment. Warmer water can lead to increased nutrient loading and algae growth, which can complicate treatment processes. Additionally, increased precipitation can lead to more frequent and intense storm events, causing flooding and overwhelming wastewater systems. These events can exceed the capacity of treatment facilities, leading to untreated wastewater being released into the environment, which poses significant public health risks and can result in environmental harm. Together, the combination of increased precipitation and rising temperatures necessitates adaptations and improvements in wastewater treatment infrastructure to maintain effective operations and protect water quality.