Test Your Knowledge of Emerging Issues and Industrial Applications

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1. Heavy metals are considered a pollutant because of their:

   A. Color
   B. Appearance
   C. Weight
   D. Toxicity

2. In which form are nutrients better utilized by microorganisms in a biological treatment process?

   A. Particulate
   B. Solid
   C. Gaseous
   D. Soluble

3. What is a typical return activated sludge (RAS)-to-Q ratio for an extended aeration activated sludge process?

   A. 10 to 25 percent
   B. 25 to 50 percent
   C. 1 to 2 percent
   D. 75 to 100 percent

4. An industrial facility has a confined space manhole with hazardous gas, and the vapor density of the hazardous gas present is 0.92; where is this gas more likely to be found?

   A. Near the ceiling.
   B. Equally distributed throughout the space.
   C. Near the floor.
   D. At this density, the gas will dissipate immediately.

5. In what section of the 40 Code of Federal Regulations (CFR) will you find general pretreatment regulations?

   A. 408
   B. 403
   C. 406
   D. 412

6. What happens to the activity rate of activated sludge microorganisms as the wastewater temperature increases by 10°C?

   A. It triples.
   B. It doubles.
   C. It remains the same.
   D. It is cut in half.

7. Given the following data, calculate the carbonaceous biochemical oxygen demand (CBOD5) in a sample of industrial wastewater:
   - Sample volume = 2 ml
   - Initial dissolved oxygen = 6.2 mg/L
   - Final dissolved oxygen = 3.9 mg/L

   A. 460 mg/L
   B. 250 mg/L
   C. 345 mg/L
   D. 587 mg/L

8. An industrial waste facility has a total suspended solids (TSS) value of 1,560 mg/L entering its pretreatment process, with a TSS value of 275 mg/L entering the sanitary sewer. Calculate the percent removal of TSS in the pretreatment process.

   A. 29.3 percent
   B. 60.7 percent
   C. 25.5 percent
   D. 82.4 percent

9. What may be the most common factor that a stormwater utility is based on?

   A. Property value
   B. Impervious area
   C. Amount of annual rainfall
   D. Location of a water reclamation facility

10. What does the term aliquot mean?

    A. Composite sample
    B. Grab sample
    C. The total volume of sample.
    D. A portion of a sample.

Answers on page 66

SEND US YOUR QUESTIONS

Readers are welcome to submit questions or exercises on water or wastewater treatment plant operations for publication in Certification Boulevard. Send your question (with the answer) or your exercise (with the solution) by email to roy.pelletier@cityoforlando.net, or by mail to:

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Certification Boulevard Answer Key

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1. **D) Toxicity**
   Heavy metals become toxic when they are not metabolized by the body and accumulate in the soft tissues. Heavy metals may enter the human body through food, water, air, or absorption through the skin when they come in contact with humans in agriculture, and in manufacturing, pharmaceutical, industrial, or residential settings.

2. **D) Soluble**
   Think of solids as "steak" for the bugs; they have to break it down before they can consume it. However, think of soluble as a "milk shake"; it is more readily consumable by the bugs.

3. **D) 75 to 100 percent**
   The typical RAS-to-Q ratio for extended aeration activated sludge is about 75 to 100 percent. Conventional activated sludge RAS is typically between 20 to 50 percent of Q.

4. **A) Near the ceiling.**
   Gasses with a density of less than 1.0 will rise to the top of its space, where gasses with a density greater than 1.0 will settle to the bottom of its space.

5. **B) 403**
   40 CFR Part 403 - General Pretreatment Regulations for Existing and New Sources of Pollution.

6. **B) It doubles.**
   Warmer temperatures will speed up the activity of microorganisms; colder temperatures will slow down the activity of the bugs—much like people!

7. **C) 345 mg/L**
   $CBOD_5$, mg/L
   = (Initial D.O., mg/L - Final D.O., mg/L) ÷ (sample volume, ml ÷ 300 ml)
   = (6.2 - 3.9) ÷ (2 ml ÷ 300 ml)
   = 2.3 ÷ 0.00666666
   = 345 mg/L

8. **D) 82.4 percent**
   Percent TSS Removal
   = (Inlet TSS, mg/L - Outlet TSS, mg/L) ÷ Inlet TSS, mg/L x 100
   = (1,560 mg/L - 275 mg/L) ÷ 1,560 mg/L x 100
   = 1,285 ÷ 1,560 = 0.8237 x 100
   = 82.4 percent

9. **B) Impervious Area**
   Impervious means not permitting penetration or passage; impenetrable. Example: The coat is impervious to rain.

10. **D) A portion of a sample.**
    aliquot:
    1. A sample that is representative of the whole.
    2. A number that will divide another without a remainder; e.g., 2 is an aliquot of 6.