Test Your Knowledge of Wastewater Disposal

Roy Pelletier

1. Which chemical is typically used to adjust effluent pH (between 6.0 to 8.5) before being discharged to a surface water outfall?
   a. Lime
   b. Polymer
   c. Sodium hydroxide
   d. Alum

2. What typically happens to the chlorine demand of reclaimed water when the nitrite concentration is elevated?
   a. The chlorine demand doubles for each pound of nitrite oxidized.
   b. The chlorine demand is cut in half for each pound of nitrite oxidized.
   c. The chlorine demand is unaffected by nitrite concentrations.
   d. The chlorine demand is multiplied by more than 5 for each pound of nitrite oxidized.

3. What is the detention time of a reclaimed water storage tank if the tank volume is 2.5 million gal and the flow entering the tank is 12.5 mgd?
   a. 4.8 hours
   b. 164 hours
   c. 1.3 hours
   d. 3.9 hours

4. What typically happens to the Oxidation-Reduction Potential (ORP) value of reclaimed water when the ammonia concentration increases from 0.5 mg/L to 4 mg/L?
   a. The ORP value increases.
   b. The ORP value decreases.
   c. The ORP value is fairly unaffected by the ammonia level.
   d. Ammonia at any level will cause a typical ORP probe to fail.

5. Given the following data, what is the pressure equivalent expressed in bar delivered by this effluent pump?
   • Pump discharges 575 gpm
   • Total dynamic head (TDH) of 125 ft
   a. 3.68 bar b. 67.11 bar
   c. 14.7 bar d. 2.88 bar

6. Which chemical is more commonly used to dechlorinate effluent following disinfection with chlorine?
   a. H_2SO_4
   b. Sodium hypochlorite
   c. SO_2
   d. FeCL3

7. Given the following data, what is the equivalent percent total solids?
   • 10 ml of sample
   • Tare weight of filter paper is 1.8873 grams
   • Final weight of filter paper after drying is 2.2255 grams
   a. 2.2 percent b. 1.3 percent
   c. 3.4 percent d. 4.3 percent

8. Which formula is used to calculate the circumference of a circular tank?
   a. πr^2 b. πd^2
   c. $0.785\ d^2$ d. πd

9. What is the final effluent total suspended solids (TSS) value if the plant influent TSS is 225 mg/L, and the TSS percent removal is 98.9 percent?
   a. 7.6 mg/L
   b. 2.5 mg/L
   c. 6.7 mg/L
   d. 1.1 mg/L

10. What is the volume of reclaimed water in a 100-ft diameter tank with a water level of 24 ft?
    a. 58,718 gal
    b. 1,409,232 gal
    c. 20,588 gal
    d. 2,380,545 gal

Answers on page 62

LOOKING FOR ANSWERS?
Check the Archives

Are you new to the water and wastewater field? Want to boost your knowledge about topics you'll face each day as a water/wastewater professional?

All past editions of Certification Boulevard through the year 2000 are available on the Florida Water Environment Association's website at www.fwea.org. Click the "Site Map" button on the home page, then scroll down to the Certification Boulevard Archives, located below the Operations Research Committee.

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:

Roy Pelletier
Wastewater Project Consultant
City of Orlando
Public Works Department
Environmental Services
Wastewater Division
5100 L.B. McLeod Road
Orlando, FL 32811
407-716-2971

Certification Boulevard Answer Key

From page 38

1. **C) Sodium hydroxide**
   Of these chemicals, sodium hydroxide is the only one that will consistently increase effluent pH when added.

2. **D) The chlorine demand is multiplied by more than 5 for each pound of nitrite oxidized.**
   Nitrites (NO_2) will consume about five times their weight in chlorine before a residual is detected. However, Nitrate (NO_3) values have little to no effect on demand for chlorine in the disinfection process.

3. **A) 4.8 hours**
   Detention time, hours
   = Tank volume, million gal x 24 hrs/day ÷ flow into tank, mgd
   = 2.5 million gal x 24 hr per day ÷ 12.5 mgd
   = 4.8 hours

4. **B) The ORP value decreases.**
   The ORP and ammonia are inversely proportional to each other. When the ammonia level increases, the ORP value decreases. Conversely, when the ammonia level decreases, the ORP value increases.

5. **A) 3.68 bar**
   125 ft TDH x 0.433 psi per ft of head
   = 54.125 psi ÷ 14.7 psi/bar
   = 3.68 bar

   OR

   125 ft TDH ÷ 2.31 ft of head per psi
   = 54.112 psi ÷ 14.7 psi/bar
   = 3.68 bar

   Notes:
   1) 1.0 bar = 14.7 psi
   2) In this activity, the pump delivery rate has no bearing on the discharge pressure.

6. **C) SO_2**
   SO_2 (Sulfur dioxide) is the only chemical on this list that will effectively dechlorinate chlorinated effluent. Other chemicals used for dechlorination are sodium thiosulfate and sodium bisulfite.

7. **C) 3.4 percent**
   TSS, ppm = weight of suspended solids in grams x (1,000,000 ÷ ml of sample)

   Weight of TSS = Final Wt. - Paper Tare Wt.
   = 2.2255 gm - 1.8873 gm
   = 0.3382 gm

   TSS, ppm
   = 0.3382 gm x (1,000,000 ÷ 10 ml sample)
   = 33,820 mg/L (ppm)

   TS, percent
   = TSS, mg/L ÷ 10,000 mg/L per 1 percent
   = 33,820 mg/L ÷ 10,000 mg/L per 1 percent
   = 3.38 percent

8. **D) πd**
   Circumference is calculated as pi times the diameter, or πd. This is also known as 2πr. Basically, you can take the diameter of any circle and wrap it around the circumference (the outer wall of the circle) 3.14 times. If you have a calculator with a pi button, it typically displays 3.141592653589793.

9. **B) 2.5 mg/L**
   225 mg/L x 0.989 = 222.525 mg/L
   225 mg/L - 222.525 mg/L = Effluent TSS of 2.475 mg/L

   OR

   100 percent - 98.9 percent = 1.1 percent
   225 mg/L x 0.011 = Effluent TSS of 2.475 mg/L

10. **B) 1,409,232 gal**
    Volume per ft = πr^2 x 1 foot x 7.48 gals/ft^3

    3.14 x 50 ft x 50 ft x 1 ft x 7.48 gals/ft^3
    = 58,718 gal per ft

    58,718 gals per ft x 24 ft
    = 1,409,232 gal in 24 ft in a 100-ft diameter tank