Certification Boulevard

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Test Your Knowledge of Wastewater Disposal

1. Which chemical is typically used to raise effluent pH (between 6.0 and 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 ORP value of reclaimed water when the nitrate concentration increases from 3 mg/L to 7 mg/L?
   a. The ORP value increases.
   b. The ORP value decreases.
   c. The ORP value is fairly unaffected by that level adjustment of nitrates.
   d. Nitrates at any level will cause a typical ORP probe to fail.

3. 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 fairly unaffected by nitrite concentrations.
   d. The chlorine demand is multiplied by more than five for each pound of nitrite oxidized.

4. What may be typical permit values for nitrogen and phosphorus in effluent being discharged to open bodies of water in Florida?
   a. TN greater than 5 mg/l …TP less than 2.0 mg/l
   b. TN less than 0.1 mg/l…TP greater than 1.5 mg/l
   c. TN about 3.0 mg/l…TP about 3.0 mg/l
   d. TN less than 3.0 mg/l…TP less than 1.0 mg/l

5. What typically happens to the ORP value of reclaimed water when the ammonia concentration increases from 1 mg/L to 5 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.

6. What is considered to be a basic pH?
   a. 6.5
   b. 0.0
   c. 10.0
   d. 7.0

7. Which chemical is more commonly used to dechlorinate chlorinated effluent?
   a. Sodium hypochlorite
   b. Bleach
   c. Sulfur dioxide
   d. Ferric chloride

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

9. Which formula is used to calculate the circumference of a circular tank?
   a. $\pi r2$
   b. $\pi d2$
   c. $0.785d2$
   d. πd

10. What is the volume of reclaimed water in 14 inches of a storage tank with a diameter of 75 feet?
    a. 33,029 gallons
    b. 3,752 gallons
    c. 20,588 gallons
    d. 38,545 gallons

ANSWERS ON PAGE ??

January Formula Correction...

EDITOR'S NOTE: Because of a typographical error, the formula in Question 7 of the January edition of "Certification Boulevard" contained an error. The formula used the incorrect fraction "1/2" instead of the correct fraction "1/3." Our apologies to Roy Pelletier and our readers. The correct question is:

7. What does the following formula represent? $1/3\pi r^2$ x depth, ft. x 7.48 gals/ft^3
   a. Volume of a cone in ft^3
   b. Volume of a circular tank in gallons
   c. Volume of a sphere in gallons
   d. Volume of a cone in gallons

The correct answer is "d." The formula to calculate the volume in gallons of a cone is $1/3\pi r^2$ x cone depth, ft. x 7.48 gals/ft^3.

A Look Back at November...

James Shoemaker, a senior chemist with the Orlando Utilities Commission, spotted an important flaw in the answer to Question 4 in our November edition of "Certification Boulevard." The backwash cycle time necessary to calculate the total daily backwash volume in a water filtration process was not listed among the data to perform the calculation. He pointed out that since the cycle time wasn't given, the answer to the question was true only if the cycle time is one minute twice a day.

Here is a revised Question 4, which includes the cycle time needed for the calculation and asks for both a volume and rate in the answer:

4. Given the following data, what is the total daily backwash volume, and percent of inflow, in this water filtration process?
   Filter Data:
   · Hydraulic inflow = 1,500 gpm
   · Operational loading rate = 3 gpm/ft^2
   · Backwash rate = 10 gpm/ft^2
   · Backwash cycles per day = 2
   · Backwash cycle time = 30 minutes per cycle
   a. 150,000 gpd and 13.9% of Q
   b. 300,000 gpd and 7.2% of Q
   c. 1,800 gpd and 1.1% of Q
   d. 300,000 gpd and 13.9% of Q

My thanks to James Shoemaker for pointing out the missing cycle time in the original question, and also to Gary Revoir of Reiss Environmental for helping me create the new question. Here are the calculations and the correct solution (answer "d"):

Q to filter, gpd
= 1,500 gpm x 1,440 min/day
= 2,160,000 gpd
Filter surface area, ft^2
= 1,500 gpm divided by 3 gpm/ft^2
= 500 ft^2
Filter backwash volume, gpd
= 500 ft^2 x 10 gpm/ft^2 x 2 cycles per day x 30 mins per cycle
= 300,000 gpd
Filter backwash rate, % of Q
= 300,000 gpd backwash divided by 2,160,000 gpd inflow
= 0.13888 x 100
= 13.9% of Q

Certification Boulevard Answer Key

From page ??

1. c. Sodium hydroxide

   Of these chemicals, sodium hydroxide is the only one that will consistently increase effluent pH when added.

2. c. The ORP value is fairly unaffected by that level adjustment of nitrates

3. d. The chlorine demand is multiplied by more than five 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 affect on demand for chlorine in the disinfection process.

4. d. TN less than 3.0 mg/l … TP less than 1.0 mg/l

   Typical AWT standards in Florida, especially for effluents discharged to open water bodies, is something no greater than 3.0 mg/l for total nitrogen (TN), and no greater than 1.0 mg/l for total phosphorus (TP).

5. b. The ORP value decreases.

   ORP and ammonia are inversely proportional to each other. When the ammonia level increases, the ORP value decreases. Conversely, when the ammonia level drops, the ORP value increases.

6. c. 10.0

   The pH scale is 0 to 14
   0 to 6.9 is acidic
   7.0 is neutral
   7.1 to 14 is basic (alkaline). So, from the list of possible answers, 10.0 is the only basic pH.

7. c. Sulfur dioxide

   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.

8. 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, %
   = TSS, mg/L ÷ 10,000 mg/L per 1%
   = 33,820 mg/L ÷ 10,000 mg/L per 1%
   = 3.38%

9. d. πd

   Circumference is calculated as pi times the diameter … or πd. 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 3.14159265359 …

10. d. 38,545 gallons

    Volume per foot
    = π r^2 x 1 foot x 7.48 gals/ft^3
    = 3.14 x 37.5 ft x 37.5 ft x 1 ft x 7.48 gals/ft^3
    = 33,029 gallons per foot
    = 14 inches ÷ 12 inches per foot
    = 1.167 feet
    = 33,029 gals per foot x 1.167 feet
    = 38,544.8 gallons in 14 inches in a 75-foot diameter tank