Test Your Knowledge of Disinfection

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1. Given the following data, calculate the chlorine demand:

   - Total daily pounds used is 1,350 lbs/day
   - The plant flow is 13.5 mgd
   - The effluent chlorine residual is 2.0 mg/l

   A. 6,305 lbs/day
   B. 1,124 lbs/day
   C. 1,681 lbs/day
   D. 281 lbs/day

2. What chemical is used to identify a chlorine leak?

   A. Fumes from sulfur dioxide
   B. Sodium hydroxide
   C. Fumes from ammonia
   D. Sulfuric acid

3. What does this formula best represent?

   Tank Volume, ft^3 ÷ (Flow, mgd x 92.84 cfm/mgd)

   A. Chlorine residual
   B. Detention time in minutes
   C. Detention time in hours
   D. Tank volume in gallons

4. Given the following data, calculate the required volume of this chlorine contact chamber:

   - Average daily flow is 5.7 mgd
   - Peak flow is 9.9 mgd
   - Required detention time at ADF is 30 min
   - Required detention time at peak flow is 15 min

   A. 13,787 cubic ft
   B. 103,125 gal
   C. 12,367 cubic ft
   D. 118,750 gal

5. Other than sulfur dioxide, which chemical below will result in dechlorination?

   A. Bleach
   B. Ferric chloride
   C. Sodium bisulfite
   D. Sodium hydroxide

6. What is created when chlorine reacts with ammonia in the effluent stream?

   A. Chloramines
   B. Free residual
   C. Dichloramines
   D. Trichloramines

7. Leaking chlorine gas will tend to collect near the ceiling of a closed room. ***True*** or ***False***

8. Match the following emergency repair kits to their respective containers:

Kit A	Tank cars and trucks
Kit B	150 lb cylinders
Kit C	Ton containers

9. What concentration of chlorine can kill in a few short breaths?

   A. 15 ppm
   B. 50 ppm
   C. 100 ppm
   D. 1000 ppm

10. In which position should you rotate a ton container if a leak develops?

    A. With leak at bottom.
    B. With leak at top.
    C. With leak on the side.
    D. It doesn't matter.

Answers on page 66

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Certification Boulevard Answer Key

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1. **B) 1,124 lbs/day**
   Supply - Demand = Residual or
   Demand = Supply - Residual

   - *Supply is given at 1,350 lbs/day*
   - *Residual = 13.5 mgd x 2.0 mg/l x 8.34 lbs/gal = 225.18 lbs/day*
   - *1,350 lbs/day – 225.18 lbs/day = 1,124.82 lbs/day*

2. **C) Fumes from ammonia**
   Only the fumes from ammonia should be used to identify chlorine leaks. Liquid ammonia sprayed directly onto valves and fittings will cause corrosion and pits to develop over time.

3. **B) Detention time in minutes.**
   92.84 cfm per mgd

   1,000,000 gpd ÷ 1,440 min per day
   = 694 gpm per mgd
   694 gpm per mgd ÷ 7.48 gal per cubic foot
   = 92.84 cubic feet per min per mgd

4. **D) 118,750 gallons**
   - *D.T. @ ADF = 5.7 mgd x 92.84 cfm/mgd x 30 min = 15,876 cu.ft. x 7.48 gal/cu.ft. = 118,750 gal*
   - *D.T. @ Peak = 9.9 mgd x 92.84 cfm/mgd x 15 min = 13,787 cu.ft. x 7.48 gal/cu.ft. = 103,125 gal*
   - *ADF using 103,125 gal would only be about 26 min D.T.*
   - *Answer is 118,750 gal volume to meet both flow/time requirements*

5. **C) Sodium Bisulfite**
   Typically, dechlorination is accomplished by adding sulfur dioxide or sulfite salts (i.e., sodium sulfite, sodium bisulfite, or sodium metabisulfite).

6. **A) Chloramines**
   Chloramines are created when chlorine reacts with ammonia. The creation of chloramines is known as monochloramines; the destruction of chloramines is known as dichloramines. After all of the chlorine demand has been satisfied and the breakpoint has been achieved—this is known as trichloramines.

7. **False**
   Because chlorine gas is 2.5 times heavier than air, it will settle in the space. Leak detectors should always be located about 6 to 12 in. from the floor.

8. **Kit A = 150 lb. cylinders**
   Kit B = Ton containers
   Kit C = Tank cars and trucks

9. **D) 1,000 ppm**
   1000 ppm is a deadly concentration in just a few short breaths.

10. **B) With leak at top**
    Because liquid chlorine will convert to gas at a rate of about 457 times, it is important to locate the leak "gas side up." With the leak located at the top of the ton container, the least amount of chlorine will escape.