Certification Boulevard

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Test Your Knowledge of Disinfection

1. Given the following data, calculate the chlorine demand:
   - Total daily pounds used is 1,400 lbs/day.
   - The plant flow is 13.5 mgd.
   - The effluent chlorine residual is 2.5 mg/l.

   A. 6,305 lbs/day
   B. 1,118 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. 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 minutes.
   - Required detention time at peak flow is 15 minutes.

   A. 13,787 cubic feet
   B. 103,125 gallons
   C. 12,367 cubic feet
   D. 118,750 gallons

4. What does this formula best represent?

$$\frac{\text{Tank Volume, ft}^3}{\text{Flow, mgd x 92.84 cfm/mgd}}$$

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

5. Other than sulfur dioxide, which chemical below will result in dechlorination?
   A. Bleach
   B. Ferric Chloride
   C. Sodium Bisulfite
   D. Sodium Hydroxide

6. Why should liquid chlorine never be trapped between two closed valves?
   A. Liquid chlorine will contract and may implode the pipe.
   B. The gas from liquid chlorine will expand and may explode the pipe.
   C. The pressure will drop too rapidly.
   D. Trapping liquid chlorine is not a problem.

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

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

Kit A	1) Tank cars and trucks
Kit B	2) 150-pound cylinders
Kit C	3) Ton containers

9. What concentration of chlorine can kill in a few short breaths?
   A. 15 ppm B. 50 ppm
   C. 100 ppm D. 1,000 ppm

10. To which position should you rotate a ton container if a leak develops?
    A. With the leak at the bottom.
    B. With the leak at the top.
    C. With the leak on the side.
    D. It doesn't matter.

ANSWERS ON PAGE 58

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 e-mail to roy.pelletier@cityoforlando.net, or by mail to:

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Certification Boulevard Answer Key

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1. **B. 1,118 lbs/day**
   Supply - Demand = Residual ***OR***
   Demand = Supply - Residual
   - *Supply is given at 1,400 lbs/day*
   - *Residual*
     = 13.5 mgd x 2.5 mg/l x 8.34 lbs/gal
     = 281.47 lbs/day
   - *1,400 lbs/day - 281.5 lbs/day*
     = 1,118.5 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.

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

4. **B. Detention time in minutes**

5. **C. Sodium bisulfite**

6. **B. The gas from liquid chlorine will expand and may explode the pipe.**
   The expansion ratio of liquid chlorine to gas is about 457 times. This is why liquid chlorine should never be trapped in a pipeline between two closed valves ... big bang!

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 inches from the floor.

8. Kit A → 3) Ton containers
   Kit B → 2) 150-pound cylinders
   Kit C → 1) Tank cars and trucks

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

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