Certification Boulevard

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Test Your Knowledge of Water/Wastewater Treatment

1. Which of the following is considered to be the least harmful bacteria?
   a. Typhoid b. Fecal coliform
   c. Cholera d. Streptococcus

2. What does the term "aliquot" mean?
   a. Composite sample
   b. Grab sample
   c. The total volume of sample
   d. A portion of a sample

3. What happens to the alkalinity in wastewater during the denitrification process?
   a. It increases
   b. It decreases
   c. It does not change
   d. It stabilizes at 200 mg/l

4. What happens to the activity rate of activated sludge microorganisms when the temperature increases?
   a. It decreases
   b. It increases
   c. It remains the same

5. Which component in the chlorination process is responsible for creating a vacuum condition, which draws the chlorine gas through the chlorinator, and then mixes the gas into a solution?
   a. Pressure regulator
   b. Vacuum regulator
   c. Gas rotometer
   d. Gas injector

6. If your plant has a flow rate of 1.25 mgd, a chlorine demand of 7.5 mg/l, and you maintain a chlorine residual of 1.5 mg/l, how many lbs/day of chlorine will be used?
   a. 93.8 lbs/day b. 78.2 lbs/day
   c. 62.6 lbs/day d. 52.1 lbs/day

7. What is the system called that requires proper documentation associated with the person who collects the samples, the person who receives the samples in the lab, and the lab technician who performs the tests?
   a. Sample performance
   b. Chain of custody
   c. Mapping
   d. Sample journal

8. Which chemical is used to identify a chlorine leak?
   a. Bleach b. Ammonia
   c. Sodium d. Nitrate

9. When using the proper chemical to identify a chlorine leak, what color will the cloud of smoke be?
   a. Green b. Black
   c. Yellow d. White

10. What is the term when ammonia-N and organic-N are added together?
    a. TN b. SON
    c. NO_3 d. TKN
    e. NO_2 f. NO_x

ANSWERS ON PAGE 70

SEND US YOUR QUESTIONS FOR CERTIFICATION BOULEVARD

Do you have a question or an exercise you would like to feature in "Certification Boulevard?" We'll be glad to publish it. Just send your question (with the answer) or your exercise (with the solution) to:

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There is no limit to the number of questions or exercises you may submit. Please include your name, city, and organization or company so we can give you credit.

Certification Boulevard Answer Key

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1. **b. Fecal coliform**
   Feedback: None of these things sound good to me! Fecal coliform, however, is considered the least harmful because it is not pathogenic. Fecal coliform is an indicator of pathogenic organisms. It is easier to analyze and more difficult to kill. That's what makes it a good indicator to determine the presence or absence of pathogenic organisms.

2. **d. A portion of a sample**
   ***Feedback**: One of the definitions of aliquot is a "little amount." Basically, an aliquot is a little amount of a larger sample.*

3. **a. It increases**
   Feedback: Alkalinity is replenished (increased) during denitrification at about one-half the rate at which it is lost during nitrification. Nitrification consumes alkalinity at the rate of about 7.2 lbs of alkalinity for every pound of ammonia-nitrogen that is converted to nitrate. Then, denitrification puts alkalinity back into the water at the rate of about 3.6 lbs of alkalinity for each pound of nitrate that is used as a source of oxygen.

4. **b. It increases**
   ***Feedback**: Microorganisms will increase their rate of activity as the temperature of the water increases (to a degree, so to speak). Basically, for every 10°C increase in water temperature, the microorganism activity rate doubles; however, there is an upper limit to increasing temperatures, and eventually the bugs' activity rate will drop off as water temperature is above their acceptable threshold.*

5. **d. Gas injector**
   ***Feedback**: An injector creates a vacuum condition as the water flows through a restricted throat. This vacuum action draws the gas through the chlorinator, into the injector, and into solution as it mixes with the water.*

6. **a. 93.8 lbs/day**
   Lbs/day of chlorine used
   = flow, mgd x concentration, ppm x 8.34 lbs/gal
   = 1.25 mgd x (7.5 mg/l + 1.5 mg/l) x 8.34 lbs/gal
   = 93.82 lbs/day chlorine

7. **b. Chain of custody**
   ***Feedback**: The chain of custody is an extremely important protocol designed to identify the paper trail of sample procurement, delivery, analyses and task documentation. The chain of custody is basically a legal record to indicate sample and analyses documentation.*

8. **b. Ammonia**
   ***Feedback**: Fumes from a squeeze bottle of an aqueous solution of ammonia, with the bottle no more than about half full, will create a cloud of "smoke … it's not really smoke" when it contacts chlorine. Do not apply liquid ammonia directly on chlorine pipes, joints, valves, or any other component in the chlorination network. Liquid ammonia will corrode chlorine components and create leaks in the near future.*

9. **d. White**
   ***Feedback**: As discussed, the color of the cloud, which is actually the dust in the air, created by the ammonia fumes is white. The white color is created as the ammonia reacts with the chlorine and creates ammonium hydrochloride. About one-half of the ammonia is converted to chloramines, and the other half is converted to ammonium hydrochloride. Since chloramines can create toxic conditions and can cause breathing problems for many people, it is best to "spray" the least amount of ammonia fumes into the air as possible.*

10. **d. TKN**
    ***Feedback**: TKN … Total Kjeldahl Nitrogen … is the combination of ammonia-nitrogen and organic-nitrogen. Typically, the majority of TKN of domestic raw wastewater is in the ammonia form.*