Nutrient Removal Quiz

1. Which of the following nitrogen compounds are not typically found in influent wastewater?

a. Ammonia

b. Nitrite

c. Organic Nitrogen

d. TKN

1. A conventional activated sludge treatment process is not designed to remove ammonia. The influent TKN is 30 mg/L and the final effluent TKN is 21 mg/L. where did the 9 mg/L of TKN end up?

a. Released to the atmosphere

b. Converted to ammonia

c. Precipitated with alum

d. Incorporated to biomass

1. After biological treatment is complete, most of the remaining phosphorus will be present as

a. Orthophosphate

b. Polyphosphate

c. Organic phosphate

d. Biomass

1. If ferrous ions (Fe+2) are combined with phosphate ions (PO4-3), the chemical formula for the remaining compound would be  
   a. Fe2PO4

b. Fe3(PO4)2

c. FePO4

d. Fe6 (PO4)2

1. Nitrification is a three-step process involving two groups of bacteria

a. True

b. False

6. Nitrifying bacteria convert ammonia to nitrate under

a. Anaerobic conditions

b. Anoxic conditions

c. Aerobic conditions

d. Reducing conditions

7. An RBC process consists of four wheels operated in series/ where in the process is nitrification

most likely to take place?

a. First wheel

b. Second wheel

c. Third wheel

d. Fourth wheel

8. An activated sludge process with an SRT of six days receives an abnormally high ammonia load.

The blowers are unable to deliver enough air and the DO concentration in the basins drops to

1mg/L. which of the following may occur next?

a. Nitrifying bacteria will die

b. Effluent ammonia will decrease

c. Average floc size will increase

d. Chlorine consumption will increase

9. An activated sludge facility operates with a 25-day SRT in the winter. As soon as the water

temperature drops below 16oC, the SVI increases and foam accumulates on the activated sludge

basins. The final effluent contains less than 1 mg/L NH3-N. The operator in charge begins to

chlorinate the RAS to control filaments and improve settling. After 3 days, the effluent NH3-N

concentration increases to 22 mg/L. What must have happened?

a. SRT was not long enough to support nitrification

b. Improper lab sample results

c. Chlorine concentration in the RAS too high

d. Oxygen levels were depleted by chlorine addition

10. It is known that 7.14 mg of alkalinity (as CaCO3) is consumed in the nitrification reaction per mg

of ammonia oxidized and that a minimum of 50 mg/L of residual alkalinity is required to maintain

optimum pH range. Given the following data, calculate the amount of alkalinity required and

amount to be added to maintain optimum pH.

Given: Influent ammonia concentration: 26 mg/L

Influent alkalinity: 120 mg/L

Flow: 1.3 mgd

a. 136 mg/L required, 173 lbs./day to be added

b. 193 mg/L required, 1051 lbs./day to be added

c. 236 mg/L required, 1258 lbs./day to be added

d. 356 mg/L required, 3859 lbs./day to be added

Key

1. B

2. D

3. A

4. A

5. B

6. C

7. D

8. D

9. C

10. C

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Given: Influent ammonia concentration: 26 mg/L

Influent alkalinity: 120 mg/L

Flow: 1.3 mgd

*Step 1.* Calculate the amount of alkalinity required:

26 mg/L NH4 x 7. 14 mg CaCO3 required per mg NH4 oxidized = 185.64 mg/L CaCO3 or 186 mg/L

186 mg/L CaCO3  required + 50 mg/L or residual needed to maintain pH = **236 mg/L** required

*Step 2.* Calculate the amount of alkalinity to be added

236 mg/L alkalinity required – 120 mg/L available in influent = 116 mg/L CaCO3 to be added

1.3 mgd x 116 mg/L CaCO3 x 8.34 = **1258 lbs./day** CaCO3 to be added