Certification Boulevard

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SPECIAL EDITION for Water Operators

Thanks to Joe Gonzalez, water treatment operator for the city of Ocala, for providing this month's questions and answers for Certification Boulevard—Roy.

1. Some areas in the U.S. have concentrations of fluoride as high as 30 mg/L. Which of these would not be used in defluoridation?
   A. Zirconyl acid
   B. Activated alumina
   C. Bone char
   D. Alum

2. How many lbs of sodium hypochlorite containing 12 percent available chlorine by weight would be needed to provide 25 lbs of chlorine?
   A. 208 lbs B. 312.5 lbs
   C. 2.5 lbs D. 50 lbs

3. Apparent color in an unfiltered sample of water is usually caused by which of these?
   A. Lead & copper
   B. Iron & manganese
   C. Calcium & magnesium
   D. Chlorides & fluoride

4. What is the chemical term used to prevent the precipitation of metallic cations such as copper?
   A. Chelation
   B. Sequestration
   C. Ion exchange
   D. Greensand process

5. A reverse osmosis plant has a given feed flow of 1.47 MGD and a product flow of 1.03 MGD; calculate the percent recovery of the membrane unit.
   A. 60 percent B. 65 percent
   C. 70 percent D. 80 percent

6. Organic contaminants contain carbon and include all of these except:
   A. Nitrates B. THMs
   C. Pesticides D. Herbicides

7. Which of the following is considered a chemical property rather than a physical property?
   A. Color B. Hardness
   C. Odor D. Turbidity

8. Which of these chemicals is not used as an oxidant in the destruction of taste and odor compounds?
   A. Sodium Hydroxide (NaOH)
   B. Ozone (O^3)
   C. Potassium Permanganate ($KMnO^4$)
   D. Chlorine Dioxide (ClO^2)

9. In a conventional water treatment process, which two water quality parameters are not influenced significantly by plant treatment processes?
   A. Chlorides & sulfates
   B. Iron & manganese
   C. Coliforms & turbidity
   D. TDS & pH

10. Which chemical used in water treatment may have the least impact on alkalinity?
    A. Chlorine B. Alum
    C. Lime D. Fluoride

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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. **A. Zirconyl acid**
   Zirconyl acid is a reagent used to measure fluoride concentration in a given sample.

2. **A. 208 lbs**
   25 (lbs/Cl_2) divided by 0.12 (purity %) = 208 lbs Cl_2

3. **B. Iron & manganese**
   Iron and manganese, as well as humus, peat, plankton, aqueous weeds, and industrial waste, are the main causes of apparent color in raw water. SMCL for color is 15 CU.

4. **A. Chelation**
   Chelation is the chemical complexing (forming or joining together) of metallic cations, such as copper, with certain organic compounds such as EDTA.

5. **C. 70 percent**
   Recovery %
   = Product Flow ÷ Feed Flow x 100%
   = 1.03 MGD ÷ 1.47 MGD x 100
   = 70%

6. **A. Nitrates**
   NITRATE is an inorganic contaminant. PMCL= 10 mg/L.

7. **B. Hardness**
   Hardness consists of calcium and magnesium ions (minerals from the earth's crust), and is responsible for the chemical makeup as well as the amount of water that may be recovered. Color, odor, and turbidity affect the sight, taste, and smell of raw water.

8. **A. Sodium hydroxide (NaOH)**
   Sodium hydroxide is a reductant, the opposite of oxidation, which is the addition of O_2 and the removal of hydrogen, or the removal of electrons from an element or compound.

9. **A. Chlorides & sulfates**
   Chlorides and sulfates are not influenced significantly by plant treatment processes. All other issues are more or less under the control of the operator.

10. **D. Fluoride**
    In natural and treated waters, alkalinity is the result of bicarbonates, carbonates, and hydroxides of the metals of calcium, magnesium, and sodium. Lime and caustic increase pH, while alum lowers pH, which alters the amount of hydroxyl ions. Fluoride ions do not affect alkalinity.