



# Certification Boulevard

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## Test Your Knowledge of Wastewater Disposal

- What typically happens to the ORP of final effluent when the ammonia concentration in the effluent decreases?
  - The ORP value increases.
  - The ORP value decreases.
  - The ORP value remains the same.
  - Ammonia concentration has nothing to do with ORP values.
- What term typically is used to identify toxicity on wastewater effluent discharged to an open body of water?
  - CBOD<sub>5</sub>
  - TOC
  - TTHM
  - WET
- Which chemical typically is used to adjust effluent pH (between 6.0 to 8.5) before being discharged to a surface water outfall?
  - Lime
  - Polymer
  - Sodium Hydroxide
  - Alum
- What typically happens to the chlorine demand of reclaimed water when the nitrate concentration is elevated from 4 mg/L to 8 mg/L?
  - The chlorine demand doubles.
  - The chlorine demand is cut in half.
  - The chlorine demand is fairly unaffected by nitrate concentrations.
  - The chlorine demand is tripled.
- What may be typical permit values for nitrogen and phosphorus in effluent being discharged to open bodies of water in Florida?
  - TN greater than 5 mg/l ... TP less than 2.0 mg/l
  - TN less than 0.1 mg/l ... TP greater than 1.5 mg/l
  - TN greater than 3.0 mg/l ... TP less than 3.0 mg/l
  - TN less than 3.0 mg/l ... TP less than 1.0 mg/l
- Given the following data, what is the annual budget for chlorination of reclaimed water at this plant?
  - Plant flow is 7.5 mgd.
  - Chlorine residual is 2.4 mg/L.
  - Chlorine demand is 6.9 mg/L.
  - Cost of chlorine is \$0.39 per pound.
  - \$50,958 per year
  - \$61,437.54 per year

# Looking for Answers?

## Check the Archives

Are you new to the water and wastewater field? Want to boost your knowledge about topics you'll face each day as a water/wastewater professional?

All past editions of *Certification Boulevard* back through the year 2000 are available on the Florida Water Environment Association's Web site at [www.fwea.org](http://www.fwea.org). Click the "Site Map" button on the home page, then scroll down to the Certification Boulevard Archives, located below the Operations Research Committee.

- \$108,697.20 per year
  - \$82,803.90 per year
- What is the flow entering a reclaimed water storage tank if the tank volume is 0.14 mg and the detention time is 3.5 hours?
    - 583,000 gals per day
    - 1.2 mgd
    - 0.96 mgd
    - 312,500 gals per day
  - What is considered to be a neutral pH?
    - 6.5
    - 14.0
    - 10.0
    - 7.0
  - What is the equivalent in gpm of a pipe that has 1 mgd flowing through it?
    - 694 gpm
    - 1,440 gpm
    - 133,690 gpm
    - 7.48 gpm
  - What is the demand for chlorine if the residual is 1.1 mg/l and the amount of chlorine applied is 7.4 mg/l?
    - 7.3 mg/l
    - 6.5 mg/l
    - 8.5 mg/l
    - 6.3 mg/l

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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](mailto:roy.pelletier@cityoforlando.net), or by mail to:

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# Certification Boulevard Answer Key

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1. **A. The ORP value increases**

Typically, ammonia and ORP values are inversely proportional to each other. When one goes up, the other goes down.

2. **D. WET**

WET stands for Whole Effluent Toxicity.

3. **C. Sodium Hydroxide**

Water that is disinfected with chlorine, and then dechlorinated with sulfur dioxide, may require a chemical to stabilize the pH within the required 6.0 to 8.5 range. A common chemical used for this application is sodium hydroxide ... caustic soda.

4. **C. The chlorine demand is fairly unaffected by nitrate concentrations**

Nitrate ( $\text{NO}_3$ ) values have little to no effect on demand for chlorine in the disinfection process; however, nitrites ( $\text{NO}_2$ ) will consume about five times their weight in chlorine before a residual is detected.

5. **D. TN less than 3.0 mg/l ... TP less than 1.0 mg/l**

Typical AWT standards in Florida, especially for effluents discharged to open water bodies, are something no greater than 3.0 mg/l for Total Nitrogen (TN) and no greater than 1.0 mg/l for Total Phosphorus (TP).

6. **D. \$82,803.90 per year**

**Lbs/day of chlorine used**

$$= \text{flow, mgd} \times (\text{residual, mg/L} + \text{demand, mg/L}) \times 8.34 \text{ lbs/gal}$$

$$= 7.5 \text{ mgd} \times (2.4 \text{ mg/L} + 6.9 \text{ mg/L}) \times 8.34 \text{ lbs/gal}$$

$$= 581.7 \text{ lbs/day}$$

**Cost per day**

$$= \text{lbs/day chlorine} \times \text{cost per pound}$$

$$= 581.7 \text{ lbs/day} \times \$0.39 \text{ per lb}$$

$$= \$226.86 \text{ per day}$$

**Cost per year**

$$= \text{cost per day} \times 365 \text{ days/year}$$

$$= \$226.86 \text{ per day} \times 365 \text{ days/year}$$

$$= \$82,803.90 \text{ per year}$$

7. **C. 0.96 mgd**

**Flow in gpd**

$$= \text{Tank Volume, gals} \times 24 \text{ hrs/day} \div \text{Detention Time, hrs}$$

$$= 140,000 \text{ gals} \times 24 \text{ hrs/day} \div 3.5 \text{ hours}$$

$$= 960,000 \text{ gallons per day}$$

**mgd**

$$= 960,000 \text{ gpd} \div 1,000,000$$

$$= 0.96 \text{ mgd}$$

8. **D. 7.0**

The pH scale is 0 to 14

0 to 6.9 is acidic

7.0 is neutral

7.1 to 14 is basic (alkaline)

9. **A. 694 gpm**

$$1,000,000 \text{ gals per day} \div 1,440 \text{ mins per day}$$

$$= 694 \text{ gals per min per mgd}$$

10. **D. 6.3 mg/l**

The formula for chlorine demand is: chlorine supply minus chlorine residual

**Demand = Supply - Residual**

$$= 7.4 \text{ mg/l} - 1.1 \text{ mg/l}$$

$$= 6.3 \text{ mg/l demand}$$