



# Certification Boulevard

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## Test Your Knowledge of Water Supply & Other Topics

- Which repair kit is designed for use with one-ton chlorine cylinders?
  - "A" kit
  - "B" kit
  - "C" kit
  - "D" kit
- If a gallon of water weighs 8.34 lbs and a cubic foot of water holds 7.48 gallons, how much does a cubic foot of water weigh?
  - 92.8 lbs
  - 56.7 lbs
  - 62.4 lbs
  - 3.14 lbs
- A water flow meter reads 350 gpm for 11.5 hrs/day, 275 gpm for 3.5 hrs/day, and 175 gpm for the remainder of the 24-hour day. What is the total daily flow in mgd?
  - 0.2415 mgd
  - 0.39375 mgd
  - 0.05775 mgd
  - 0.0945 mgd
- What is the flow velocity in a 12-inch pipe compared to the flow velocity in a 24-inch pipe, assuming both pipes are carrying a water flow of 150 gpm?
  - The same
  - Twice the velocity
  - Three times the velocity
  - Four times the velocity
- If a stream of water is moving at 185.68 cubic feet per minute, what is the volume of the stream in mgd?
  - 0.5 mgd
  - 2.0 mgd
  - 0.785 mgd
  - 1.0 mgd
- Given the following data, calculate the approximate horsepower required for this pumping application:
  - Flow is 575 gpm
  - TDH is 200 feet
  - 83-percent pump efficiency
  - 88-percent motor efficiency
  - 29 HP
  - 40 HP
  - 35 HP
  - 47 HP
- Which has a lower pH, sodium hydroxide or aluminum sulfate?
  - Aluminum sulfate
  - Sodium hydroxide
  - They are both the same
- What is the weight relationship of chlorine liquid compared to water?
  - Water weighs more than liquid chlorine.
  - Liquid chlorine weighs 2.5 times more than water.
  - Water weighs 1.5 times more than liquid chlorine.
  - Liquid chlorine weighs 1.5 times more than water.
- Which lab test requires the use of an analytical balance, a drying oven, filter papers, and a desiccator?
  - TSS
  - OUR
  - BOD<sub>5</sub>
  - Settleable solids
- What units are used to measure ultraviolet dosage?
  - millirems/volt
  - mg/l
  - lumens
  - mJ/cm<sup>2</sup>

ANSWERS ON  
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## 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.

## 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. **B. "B" kit**

The "A" is for 150-pound cylinders and the "C" kit is for tank cars and trucks. I don't think that a "D" kit exists.

2. **C. 62.4 lbs**

$$8.34 \text{ lbs/gal} \times 7.48 \text{ gal/ft}^3 = 62.4 \text{ lbs/ft}^3$$

3. **B. 0.39375 mgd**

$$\begin{aligned} & (350 \text{ gpm} \times 11.5 \text{ hrs/day} \times 60 \text{ mins/hr}) + (275 \text{ gpm} \times \\ & 3.5 \text{ hrs/day} \times 60 \text{ mins/day}) + (175 \text{ gpm} \times 9 \text{ hrs/day} \times 60 \\ & \text{mins/hr}) \\ & = 241,500 \text{ gpd} + 57,750 \text{ gpd} + 94,500 \\ & = 393,750 \text{ gpd} \div 1,000,000 \\ & = 0.39375 \text{ mgd} \end{aligned}$$

4. **D. Four times the velocity**

**Cross section of a 12-inch pipe =  $\pi r^2$**

$$3.14 \times (6 \text{ in.} \div 12 \text{ in.})^2 = 0.785 \text{ ft}^2$$

**Cross section of a 24-inch pipe =  $\pi r^2$**

$$3.14 \times (12 \text{ in.} \div 12 \text{ in.})^2 = 3.14 \text{ ft}^2$$

$$= 3.14 \text{ ft}^2 \div 0.785 \text{ ft}^2 = 4.0$$

5. **B. 2.0 mgd**

$$185.68 \text{ cfm/mgd} \times 7.48 \text{ gal/cu.ft.} \times 1,440 \text{ mins/day} = 1,999,996.4 \text{ gpd (or 2.0 mgd)}$$

**Flow Volume Explanation:**

$$1.0 \text{ mgd} = 1,000,000 \text{ gpd} \div 1,440 \text{ mins/day} \div 7.48 \text{ gal/cu.ft.} = 92.84 \text{ cfm/mgd}$$

6. **B. 40 HP**

$$\begin{aligned} \text{Horsepower} &= (\text{gpm} \times \text{TDH, feet} \times 8.34 \text{ lbs/gal}) \div \\ & 33,000 \text{ foot lbs/second} \div \% \text{ pump eff} \div \% \text{ motor eff} \\ &= 575 \text{ gpm} \times 200 \text{ TDH} \times 8.34 \text{ lbs/gal} \div 33,000 \div 0.83 \div \\ & 0.88 \\ &= 39.8 \text{ HP} \end{aligned}$$

7. **A. Aluminum sulfate**

Aluminum sulfate (alum) is an acid with a pH typically below 4.0, and sodium hydroxide (caustic) is an alkaline with a pH typically greater than 12.

8. **D. Liquid chlorine weighs 1.5 times more than water**

Chlorine is a clear, amber-colored liquid about 1.5 times heavier than water. Gaseous chlorine is greenish-yellow and is about 2.5 times heavier than air.

9. **A. TSS**

The equipment required for performing a TSS test includes an analytical balance, drying oven, desiccator, and these additional items:

- Buchner Funnel – A ceramic funnel with a flat or fitted base that provides uniform support and a uniform, filterable surface.
- Glass fiber filter – Glass microfiber filters of adequate size for use with the chosen funnel (a Buchner Funnel with a diameter of 110 mm requires 110-mm filter paper).
- Vacuum filter flask – A glass flask equipped with a side arm for vacuum pump connection and a rubber stopper to provide a seal with the funnel. The flask is used to collect the filtered process water that passes through the filter.
- Vacuum pump – A suitable vacuum is required for filtering process water through the funnel and filter paper.

10. **D. mJ/cm<sup>2</sup>**

UV dose is measured as energy per unit area—in this case, milli-joules per square centimeter. UV Radiation is growing as an important disinfection tool for water systems, and operators should be familiar with UV terminology and operation.