



MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Drinking Water and Environmental Health Division

**DRINKING WATER OPERATOR CERTIFICATION
COMPLETE TREATMENT (F-LEVEL) PRACTICE EXAM
ANSWER KEY**

1. C

2. B

Explanation:

Dilution Equation = Concentration 1 × Volume 1 = Concentration 2 × Volume 2

0.01 Normality × 1000mL = 0.1 Normality × V2

$$\frac{0.01\text{N} \times 1000 \text{ mL}}{0.1\text{N}} = V2 \times \frac{0.1\text{N}}{0.1\text{N}}$$

$$\frac{10\text{mL}}{0.1} = V2 = 100 \text{ mL}$$

3. B

4. B

Explanation:

Iron = Fe = 55.85 grams (g); Sulfur = S = 32.06 g; Oxygen = O = 16.00 g

$$(55.85 \text{ g} \times 2) + (32.06 \text{ g} \times 3) + (16.00 \text{ g} \times 12) = 399.88 \text{ g}$$

$$\text{Percent Sulfur} = 96.18 \text{ grams}(\text{Sulfur's Weight}) \div 399.88 \text{ grams}(\text{Total Weight}) \times 100 = 24\%$$

5. D

6. D

Explanation:

$$\frac{750,000 \text{ gal}}{1} \times \frac{8.34 \text{ lbs}}{1 \text{ gal}} = 6,255,000 \text{ lbs}$$

$$\frac{6,255,000 \text{ lbs}}{1,000,000} = 6.255 \text{ M lbs water}$$

Pure Chlorine = 240 lbs of solution \times 0.125 = 30 lbs of pure chlorine

PPM = 30 lbs of pure chlorine \div 6.255 M lbs of water = 4.8 ppm

7. A

8. D

Explanation:

$$\frac{400,000 \text{ gal}}{1} \times \frac{8.34 \text{ lbs}}{1 \text{ gallon}} = 33,360,000 \text{ lbs of water}$$

$$\frac{33,360,000 \text{ lbs}}{1,000,000} = 3.336 \text{ M lbs water}$$

Lbs of Polymer = 3.336 M lbs of water \times 2 ppm = 6.67 lbs of polymer/day

6.67 lbs per day \times 60 days = 400.32 lbs of polymer

9. B

10. B

11. C

12. D

13. D

14.A

Explanation:

Filter Surface Area = Length × Width = 32ft × 32ft = 1024 square feet

$$1024 \text{ square feet} \times 4 \frac{\text{gal}}{\text{min} \times \text{square feet}} = 4096 \text{ gallons/min}$$

$$\frac{4096 \text{ gal}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{24 \text{ hr}}{1 \text{ day}} = 5,898,240 \text{ gallons/day}$$

15.A

16.B

Explanation:

$$\frac{4,000,000 \text{ gal}}{1} \times \frac{8.34 \text{ lbs}}{1 \text{ gallon}} = 33,360,000 \text{ lbs of water}$$

$$\frac{3,336,000 \text{ lbs}}{1,000,000} = 33.36 \text{ M lbs water}$$

Pure Fluoride = 0.23 × 0.791 × 400 lbs of solution = 72.77 lbs of pure fluoride

PPM = 72.77 lbs of pure fluoride ÷ 33.36 M lbs of water = 2.18 ppm of fluoride

17.D

18.C

Explanation:

Volume of rectangular prism = 50ft × 10ft × 150ft = 75,000 cubic feet

$$\frac{75,000 \text{ cubic feet}}{1} \times \frac{7.48 \text{ gal}}{1 \text{ cubic feet}} = 561,000 \text{ gal of water}$$

19.B

20.A

21.C

22.C

23.A

24.B

25.C

Explanation:

$$\frac{16 \text{ hours}}{1} \times \frac{60 \text{ min}}{1 \text{ hour}} = 960 \text{ min}$$

$$\text{Pumping Rate} = \text{volume} / \text{min} = 475,000 \text{ gal} \div 960 \text{ min} = 494.79 \text{ gal/min}$$

26.A

27.D

28.C

29.C

30.D

31.C

Explanation:

$$\text{Product} = \text{pure} \div \text{percent} = 75 \frac{\text{mg}}{\text{L}} \div 0.80(\%) = 93.75 = 94 \text{mg/L}$$

32.C

33.C

34.C

Explanation:

$$\text{Volume of rectangular prism} = 50\text{ft} \times 70\text{ft} \times 80\text{ft} = 280,000 \text{ cubic feet}$$

$$\frac{280,000 \text{ cubic feet}}{1} \times \frac{7.48 \text{ gal}}{1 \text{ cubic feet}} = 2,094,400 \text{ gal of water}$$

$$2,094,400 \text{ gal of water} \div 250 \frac{\text{gal}}{\text{min}} = 8377.6 \text{ min}$$

$$\frac{8,377.6 \text{ min}}{1} \times \frac{1 \text{ hr}}{60 \text{ min}} = 140 \text{ hr}$$

35.D

Explanation:

$$\frac{12.7 \text{ M gal}}{1} \times \frac{8.34 \text{ lbs}}{1 \text{ gal}} = 105.918 \text{ M lbs of water}$$

Pounds of Alum = 8.25ppm of dry alum \div 105.918 M lbs of water = 873.84 lbs of alum

Liquid Alum = 873.84 lbs of dry alum \div 0.48(% as equivalent) = 1820 lbs of liquid alum

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