MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Drinking Water and Environmental Health Division

DRINKING WATER OPERATOR CERTIFICATION
LIMITED TREATMENT (D-LEVEL) PRACTICE EXAM
ANSWER KEY

1. B
2. A
3. D
4. D
5. A
6. B

Explanation:

$$\frac{4.1 \text{ M } \cancel{\text{gal}}}{1} \times \frac{8.34 \text{ lbs}}{1 \cancel{\text{gal}}} = 34.194 \text{ M lbs of water}$$

$$\text{Converted percent} = 11.5\% \div 100 = 0.115$$

$$34.194 \text{ M lbs of water} \times 0.7 \text{ ppm} = \text{X lbs of pure chlorine} = 23.94 \text{ lbs of pure chlorine}$$

$$\frac{23.94 \text{ lbs of chlorine}}{0.115 \text{ converted percent}} = 208.17 \text{ lbs of bleach}$$

$$\frac{208.17 \text{ lbs of bleach}}{1} \times \frac{1 \text{ gal of bleach}}{10.2 \text{ lbs}} = 20.41 \text{ gallons of bleach}$$

7. A

Explanation:

$\text{Total dose} = \text{Demand} + \text{Residual} = 0.45 \text{ ppm} + 1.1 \text{ ppm} = 1.55 \text{ ppm as dose}$

$$\frac{1125 \text{ gal}}{1 \text{ min}} \times \frac{8.34 \text{ lbs}}{1 \text{ gal}} \times \frac{60 \text{ min}}{1 \text{hr}} \times \frac{24 \text{ hr}}{1 \text{ day}} = 13{,}510{,}800 \text{ lbs}$$

$$\frac{13{,}510{,}800 \text{ lbs}}{1{,}000{,}000} = 13.512 \text{ M lbs of water}$$

$13.512 \text{ M Lbs of water} \times 1.55 \text{ ppm} = \text{X lbs of pure chlorine} = 20.94 \text{ lbs of pure chlorine}$

$\text{Convert percent} - 5.25\% \div 100 = 0.0525$

$$\frac{20.94 \text{ lbs of chlorine}}{0.0525 \text{ converted percent}} = 398.86 \text{ lbs of bleach}$$

$$398.86 \frac{\text{lbs of bleach}}{1} \times \frac{1 \text{ gal of bleach}}{8.8 \text{ lbs}} = 45.34 \text{ gallons of bleach}$$

8. B

9. A

Explanation:

$\text{Fluoride Applied} = \text{Fluoride Desired} - \text{Natural Occuring} = 1.0 \text{ ppm} - 0.3 \text{ ppm} = 0.7 \text{ Fluoride Dose}$

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

$8.34 \text{ M lbs of water} \times 0.7 \text{ ppm} = \text{X lbs of pure fluorine} = 5.84 \text{ lbs of pure fluorine}$

$\text{Convert percent} - 19.8\% \div 100 = 0.198$

$$\frac{8.54 \text{ lbs of fluorine}}{0.198 \text{ converted percent}} = 29.49 \text{ lbs of hydrofluorosilicic acid}$$

10. A

11. D

Explanation:

$$\frac{11.2\ \cancel{\text{grains}}}{1} \times \frac{17.12\ \text{ppm of hardness}}{1\ \cancel{\text{grain}}} = 191.74\ \text{ppm of hardness}$$

$$\frac{1.2\ \text{M}\ \cancel{\text{gal}}}{1} \times \frac{8.34\ \text{lbs}}{1\ \cancel{\text{gal}}} = 10.008\ \text{M lbs of water}$$

$$10.008\ \text{M lbs of water} \times 191.74\ \text{ppm} = \text{X lbs of hardness} = 1918.93\ \text{lbs of hardness}$$

$$1918.93\ \text{lbs of hardness} \times 7\ \text{days} = 13{,}432.51\ \text{lbs of hardness per week}$$

12. C

Explanation:

$$18.7\ \text{grains of raw water} - 7.2\ \text{grains of finished water} = 11.5\ \text{grains removed per gallon}$$

$$275{,}000\ \text{grain capacity} \div 11.5\ \text{grains per gallon} = 23{,}913.04\ \text{gallons}$$

13. D

Explanation:

Total Head = Suction Lift + Pumping Head

$$25\ \text{ft suction head} + 145\ \text{ft pumping head} = 170\ \text{ft of total head}$$

14. C

15. A

16. B

Explanation:

1.8 ppm of iron (raw water) − 0.3 ppm of iron (finished water) = 1.5 ppm of iron removed

$$\frac{3300\ \cancel{\text{gal}}}{1\ \cancel{\text{min}}} \times \frac{8.34\ \text{lbs}}{1\ \cancel{\text{gal}}} \times \frac{60\ \cancel{\text{min}}}{1\cancel{\text{hr}}} \times \frac{24\ \cancel{\text{hr}}}{1\ \text{day}} = 39{,}631{,}680\ \text{lbs}$$

$$\frac{39{,}631{,}680\ \text{lbs}}{1{,}000{,}000} = 39.632\ \text{M lbs of water}$$

39.632 M lbs of water × 1.5 ppm of iron = X lbs of iron = 59.45 lbs of iron removed per day

59.45 lbs of iron × 3 days = 178.35 lbs of iron removed

17. D

18. D

19. C

20. C

21. D

Explanation:

4.0 ppm of phosphate × 1.4 ppm of iron = 5.6 ppm of phosphate feed

$$\frac{925\ \cancel{\text{gal}}}{1\ \cancel{\text{min}}} \times \frac{8.34\ \text{lbs}}{1\ \cancel{\text{gal}}} \times \frac{60\ \cancel{\text{min}}}{1\cancel{\text{hr}}} \times \frac{24\ \cancel{\text{hr}}}{1\ \text{day}} = 11{,}108{,}880\ \text{lbs of water}$$

$$\frac{11{,}108{,}880\ \text{lbs}}{1{,}000{,}000} = 11.109\ \text{M lbs of water}$$

11.109 M lbs of water × 5.6 ppm of phosphate = X lbs of phopshate
= 62.21 lbs of phosphate per day

22. C

23. C

24. D

Explanation:

$$\frac{5750\ \cancel{\text{gal}}}{1\ \cancel{\text{min}}} \times \frac{60\ \cancel{\text{min}}}{1\cancel{\text{hr}}} \times \frac{24\ \cancel{\text{hr}}}{1\ \text{day}} = 8{,}280{,}000 \text{ gallons per day}$$

$$\frac{8{,}280{,}000\ \text{gal}}{1{,}000{,}000} = 8.28 \text{ M gallons per day}$$

25. A

Explanation:

$$\text{Brake Horse Power (BHP)} = \frac{\text{gallons per minute (gpm)} \times \text{ total dynamic head (TDH)}}{3960 \times \text{Motor Efficiency (E\%)}}$$

$$11.65 \text{ BHP} = \frac{310 \text{ gpm} \times 105 \text{ TDH}}{3960 \times \text{E\%}}$$

$$\text{E\%} \times 11.65 \text{ BHP} = \frac{310 \text{ gpm} \times 105 \text{ TDH}}{3960 \times \cancel{\text{E\%}}} \times \cancel{\text{E\%}}$$

$$\text{E\%} \times 11.65 \text{ BHP} = \frac{310 \text{ gpm} \times 105 \text{ TDH}}{3960} = \frac{32550}{3960} = 8.22$$

$$\text{E\%} \times \frac{\cancel{11.65 \text{ BHP}}}{\cancel{11.65 \text{ BHP}}} = \frac{8.22}{11.65} = 0.71 \times 100 = 71\% \text{ efficiency}$$

26. C

27. C

28. D

29. A

30. B

31. D

32. D

33. B

34. B

Explanation:

$11 \text{ lbs of calcium hypochlorite} \times 0.65\% \text{ of pure chlorine} = 7.15 \text{ lbs of pure chlorine}$

$\text{Total height} = 975 \text{ ft} - 150 \text{ ft} = 825 \text{ ft of water depth}$

$$\frac{18 \text{ ~~inches~~}}{1} \times \frac{1 \text{ foot}}{12 \text{ ~~inches~~}} = 1.5 \text{ ft in diameter}$$

$\text{Volume} = 0.785 \times \text{diameter} \times \text{diameter} \times \text{height}$

$\text{Volume} = 0.785 \times 1.5 \text{ ft} \times 1.5 \text{ ft} \times 825 \text{ ft} = 1457.16 \text{ cubic ft}$

$$\frac{1457.16 \text{ ~~cubic ft~~}}{1} \times \frac{7.48 \text{ ~~gal~~}}{1 \text{ ~~cubic ft~~}} \times \frac{8.34 \text{ lbs}}{1 \text{ ~~gal~~}} = 90{,}902 \text{ lbs of water}$$

$$\frac{90{,}902 \text{ lbs}}{1{,}000{,}000} = 0.091 \text{ M lbs of water}$$

$$\text{ppm of chlorine} = \frac{7.15 \text{ lbs of pure chlorine}}{0.091 \text{ M lbs of water}} = 78.57 \text{ ppm of chlorine}$$

35. B

If you need this information in an alternate format, contact EGLE-Accessibility@Michigan.gov or call 800-662-9278.