

SOLUTION AND DRUG CALCULATIONS

1. 1:100 Solution contains **1 gram** solute and **100 mL** solvent
2. 1:400 solution contains **1 gram** solute and **400 mL** solvent
3. 1:1000 solution contains **1 gram** solute and **1,000 mL** solvent
4. A 10% solution contains **10 grams** solute and **100 mL** solvent
5. A 40% solution contains **40 grams** solute and **100 mL** solvent
6. A 2:600 solution contains **2 grams** solute and **600 mL** solvent
7. The doctor ordered 0.5 ml of a 1:400 solution. How many mg are there in 0.5 ml?

$$1:400 = \frac{1}{400} = .0025 \times 100\% = .25\% \text{ solution}$$

.25% solution = 0.25 grams solvent in 100 mL solution

$$\frac{DH}{VH} = \frac{DD}{VD}$$

$$\frac{.25 \text{ grams}}{100 \text{ mL}} = \frac{\chi}{.5 \text{ mL}}$$

$$\frac{(.25 \text{ grams} \times 0.5 \text{ mL})}{100 \text{ mL}} = \chi = 0.00125 \text{ grams} = 1.25 \text{ mg}$$

$$\# \text{ cc} \times \# \% \times 10 = \# \text{ mg}$$

$$0.5 \text{ cc} \times .25\% \times 10 = \# \text{ mg}$$

$$0.5 \times .25 \times 10 = 1.25 \text{ mg}$$

8. The doctor ordered 250 mg of a 5% solution of lidocaine to be nebulized for a bronchoscopy. How many ml would you draw up?

5% solution = 5 grams solvent in 100 mL solution

$$\frac{5 \text{ grams}}{100 \text{ mL}} = \frac{5,000 \text{ mg}}{100 \text{ mL}}$$

$$\frac{DH}{VH} = \frac{DD}{VD}$$

$$\frac{5,000 \text{ mg}}{100 \text{ mL}} = \frac{250 \text{ mg}}{\chi}$$

$$\frac{100 \text{ mL}}{5,000 \text{ mg}} = \frac{\chi}{250 \text{ mg}}$$

$$\frac{(250 \text{ mg} \times 100 \text{ mL})}{5,000 \text{ mg}} = \chi = 5 \text{ mL}$$

$$\# \text{ cc} \times \# \% \times 10 = \# \text{ mg}$$

$$\# \text{ cc} \times 5\% \times 10 = 250 \text{ mg}$$

$$\# \text{ cc} = \frac{250 \text{ mg}}{5 \times 10} = \frac{250}{50} = 5 \text{ mL}$$

9. The doctor ordered 20 mg of vaponephrine (2.25% solution). How many ml would you draw up?

2.25% solution = 2.25 grams solvent in 100 mL solution

$$\frac{2.25 \text{ grams}}{100 \text{ mL}} = \frac{2,250 \text{ mg}}{100 \text{ mL}}$$

$$\frac{DH}{VH} = \frac{DD}{VD}$$

$$\frac{2,250 \text{ mg}}{100 \text{ mL}} = \frac{20 \text{ mg}}{\chi}$$

$$\frac{100 \text{ mL}}{2,250 \text{ mg}} = \frac{\chi}{20 \text{ mg}}$$

$$\frac{(20 \text{ mg} \times 100 \text{ mL})}{2,250 \text{ mg}} = \chi = 0.89 \text{ mL (0.9 mL - We can't get that precise)}$$

$$\# \text{ cc} \times \# \% \times 10 = \# \text{ mg}$$

$$\# \text{ cc} \times 2.25\% \times 10 = 20 \text{ mg}$$

$$\# \text{ cc} = \frac{20 \text{ mg}}{2.25 \times 10} = \frac{20}{22.5} = 0.89 \text{ mL (0.9 mL)}$$

10. The doctor ordered 5 mg of a 1:100 solution of Isuprel. How many ml would you draw up?

$$1:100 = \frac{1}{100} = .01 \times 100\% = 1\% \text{ solution}$$

1% solution = 1 gram solvent in 100 mL solution

$$1 \text{ gram} / 100 \text{ mL} = 1,000 \text{ mg} / 100 \text{ mL}$$

$$\frac{DH}{VH} = \frac{DD}{VD}$$

$$\frac{1,000 \text{ mg}}{100 \text{ mL}} = \frac{5 \text{ mg}}{\chi}$$

$$\frac{100 \text{ mL}}{1,000 \text{ mg}} = \frac{\chi}{5 \text{ mg}}$$

$$\frac{(100 \text{ mL} \times 5 \text{ mg})}{1,000 \text{ mg}} = \chi = 0.5 \text{ mL}$$

$$\# \text{ cc} \times \# \% \times 10 = \# \text{ mg}$$

$$\# \text{ cc} \times 1\% \times 10 = 5 \text{ mg}$$

$$\# \text{ cc} = \frac{5 \text{ mg}}{1 \times 10} = \frac{5}{10} = 0.5 \text{ mL}$$

11. How else could you express the following drug solutions?

- A. 1:500 **1 gram solvent in 500 mL solution** or **0.2% solution**
- B. 2:100 **2 grams solvent in 100 mL solution** or **2% solution**
- C. 1:200 **1 gram solvent in 200 mL solution** or **0.5% solution**
- D. 4:400 **4 grams solvent in 400 mL solution** or **1% solution**
- E. 3:900 **3 grams solvent in 900 mL solution** or **0.33% solution**

12. How many mg are in 4 cc of 20% Mucomyst?

20% solution = 20 grams solvent in 100 mL solution

$$20 \text{ gram} / 100 \text{ mL} = 20,000 \text{ mg} / 100 \text{ mL}$$

$$\frac{DH}{VH} = \frac{DD}{VD}$$

$$\frac{20,000 \text{ mg}}{100 \text{ mL}} = \frac{\chi}{4 \text{ mL}}$$

$$\frac{(4 \text{ mL} \times 20,000 \text{ mg})}{100 \text{ mL}} = \chi = 800 \text{ mg}$$

$$\# \text{ cc} \times \# \% \times 10 = \# \text{ mg}$$

$$4 \text{ cc} \times 20\% \times 10 = \# \text{ mg}$$

$$\# \text{ mg} = 4 \times 20 \times 10 = 800 \text{ mg}$$

13. You are requested to give an aerosol treatment with 10 ml of a 1:200 solution of Isuprel.
How many mg of Isuprel would you be administering to the patient?

$$1:200 = \frac{1}{200} = .005 \times 100\% = 0.5\% \text{ solution}$$

0.5% solution = 0.5 gram solvent in 100 mL solution

$$0.5 \text{ gram} / 100 \text{ mL} = 500 \text{ mg} / 100 \text{ mL}$$

$$\frac{DH}{VH} = \frac{DD}{VD}$$

$$\frac{500 \text{ mg}}{100 \text{ mL}} = \frac{\chi}{10 \text{ mL}}$$

$$\frac{(500 \text{ mg} \times 10 \text{ mL})}{100 \text{ mL}} = \chi = 50 \text{ mg}$$

$$\# \text{ cc} \times \# \% \times 10 = \# \text{ mg}$$

$$10 \text{ mL} \times 0.5\% \times 10 = \# \text{ mg}$$

$$\# \text{ mg} = 10 \times 0.5 \times 10 = 50 \text{ mg}$$

14. You are asked to administer 4 ml of 10% Mucomyst and all that is available is 20% Mucomyst. How much of the 20% solution would you use to give the same dose?

10% solution = 10 grams solvent in 100 mL solution

$$10 \text{ gram} / 100 \text{ mL} = 10,000 \text{ mg} / 100 \text{ mL}$$

$$\frac{DH}{VH} = \frac{DD}{VD}$$

$$\frac{10,000 \text{ mg}}{100 \text{ mL}} = \frac{\chi}{4 \text{ mL}}$$

$$\frac{(10,000 \text{ mg} \times 4 \text{ mL})}{100 \text{ mL}} = \chi = 400 \text{ mg}$$

$$\# \text{ cc} \times \# \% \times 10 = \# \text{ mg}$$

$$\# \text{ mL} \times 20\% \times 10 = 400 \text{ mg}$$

$$\# \text{ mL} = \frac{400 \text{ mg}}{20 \times 10} = \frac{400}{200} = 2 \text{ mL}$$

15. Given 25 ml of a 4% solution, dilute to a concentration of 0.5%

$$C_1 \times V_1 = C_2 \times V_2$$

$$4\% \times 25 \text{ ml} = 0.5\% \times V_2$$

$$V_2 = \frac{(4\% \times 25 \text{ ml})}{0.5\%} = \frac{100 \text{ ml}}{.5} = 200 \text{ ml total volume}$$

175 mL must be added

16. 100 ml of water is added to 350 ml of a 5% solution. Calculate the new concentration

$$C_1 \times V_1 = C_2 \times V_2$$

$$5\% \times 350 \text{ ml} = C_2 \times (350 + 100) \text{ ml}$$

$$C_2 = \frac{(5\% \times 350 \text{ ml})}{450 \text{ ml}} = \frac{1,750 \%}{450} = 3.9\% \text{ solution}$$

17. What volume of saline should be added to 100 ml of a 20% solution to dilute it to a 5% solution?

$$C_1 \times V_1 = C_2 \times V_2$$

$$20\% \times 100 \text{ ml} = 5\% \times V_2$$

$$V_2 = \frac{(20\% \times 100 \text{ ml})}{5\%} = \frac{2,000 \text{ ml}}{5} = 400 \text{ ml total volume}$$

300 mL must be added

18. If 10 ml is added to 6 ml of a 20% solution, what is the solutions final concentration?

$$C_1 \times V_1 = C_2 \times V_2$$

$$20\% \times 6 \text{ ml} = C_2 \times (10 + 6) \text{ ml}$$

$$C_2 = \frac{(20\% \times 6 \text{ ml})}{16 \text{ mL}} = \frac{120\%}{16} = 7.5\%$$

19. Given 40 ml of a 60% solution, dilute to a 35% solution

$$C_1 \times V_1 = C_2 \times V_2$$

$$60\% \times 40 \text{ ml} = 35\% \times V_2$$

$$V_2 = \frac{(60\% \times 40 \text{ ml})}{35\%} = \frac{2400 \text{ ml}}{35} = 68.6 \text{ ml}$$

28.6 mL needs to be added.

20. If 25 ml is added to 10 ml of a 40% solution, what is the solutions final concentration?

$$C_1 \times V_1 = C_2 \times V_2$$

$$40\% \times 10 \text{ ml} = C_2 \times (10 + 25) \text{ ml}$$

$$C_2 = \frac{(40\% \times 10 \text{ ml})}{35 \text{ mL}} = \frac{400\%}{35} = 11.4\%$$