Key

Unit 10 Problems Set 3
Dilutions and % Solutions

1. Compare the moles of solute before a dilution and after a dilution.
   The amount of solute before and after a dilution is equal. Only the amount of solvent changes.
2. You must prepare 300.0 mL of 0.750 M NaBr solution using 2.00 M NaBr stock solution. How many milliliters of stock solution should you use?

   $M_1V_1 = M_2V_2$

   $M_1 = 2.00\ M$ $\quad M_2 = .750\ M$ $\quad V_1 = X$ $\quad V_2 = 300.0\ ml$

   $2.00\ M \cdot V_1 = .750M \cdot 300.0\ ml$

   $V_1 = 113\ ml$

   300 ml Total − 113 ml of 2 M = 187 ml H_2O (1)
3. How many milliliters of stock solution of 2.00 M KNO_3 would you need to prepare 100.0 ml of .20 M KNO_3 solution?

   $M_1V_1 = M_2V_2$

   $.20\ M \cdot 100.0ml = 2.00M \cdot V_2$

   $V_2 = 10\ ml$ (2)

   100 ml total − 10 ml of 2 M = 90 ml H_2O (1)
4. In order to dilute 1.0 L of a 6.00 M solution of NaOH to 0.500 M solution, how much water must you add?

   $M_1V_1 = M_2V_2$

   $6.00\ M \cdot 1.0L = .500M \cdot V_2$

   $V_2 = 12\ L$ solution (solute + solvent) (1)

   How much water?

   $12L - 1.0L = 11\ L$
5. What is the concentration in percent by volume, %(v/v), of 60.0 mL of methanol in a total volume of 500.0 mL.

   $\%\ by\ Vol = \frac{Vol\ solute}{V\ of\ solution} \times 100$ $\quad \frac{60.0ml}{500.0\ ml} \times 100 = 12.0\%$
6. What is the concentration in percent by volume, %(v/v), of 25.0 mL of rubbing alcohol (C_3H_7OH) diluted to a volume of 200.0 mL with water.

   $\%\ by\ Vol = \frac{Vol\ solute}{Vol\ solution} \times 100$ $\quad \frac{25.0ml}{200.0\ ml} \times 100 = 12.5\%$

   $\frac{g}{ml} \times 100 = \%$
7. How many grams of solute are needed to prepare 1.00 L of a 3.00% (m/v) NaCl solution?

   $\%\ by\ mass = \frac{grams\ solute\ (g)}{Volume\ solvent\ (ml)} \times 100$ $\quad 1.00L \times \frac{1000ml}{1L} = 1000ml$ (1000 ml)

   $3.00\% = \frac{X\ g}{1000\ ml} \times 100 \Rightarrow .0300 = \frac{X\ g}{1000ml} \Rightarrow 30.0\ g$
8. How many grams of solute are needed to prepare 2.00 L of 5.00% (m/v) KNO_3 solution?

   $\%\ by\ mass = \frac{grams\ solute\ (g)}{Vol.\ of\ solvent\ ml} \times 100$ $\quad 2.00L \times \frac{1000ml}{1L} = 2000ml$

   $5.00\% = \frac{X\ grams}{2000ml} \times 100 \Rightarrow .0500 = \frac{X\ g}{2000ml} \Rightarrow 100\ g$