

Chemistry 101 – Unit 9
Practice Problem Answers

1. 161 grams of Na_2CO_3 are dissolved in enough water to make 4.6 L of solution.

a. What is a solution? **Homogenous Mixture**

b. What is the solute in this example? **Na_2CO_3**

c. What is the solvent in the example? **Water**

d. How many moles of Na_2CO_3 are being dissolved in this example?

$$161 \text{ g Na}_2\text{CO}_3 \times \frac{1 \text{ mole Na}_2\text{CO}_3}{105.99 \text{ g}} = 1.52 \text{ moles}$$

e. What is the molarity (M) of the solution prepared in this example?

$$\frac{1.52 \text{ moles}}{4.62 \text{ L}} = 0.33 \text{ M}$$

f. If 225 mL of this example solution are poured into a flask, how many moles of Na_2CO_3 have been put into the flask?

$$225 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{0.33 \text{ moles}}{1 \text{ L}} = 0.074 \text{ moles}$$

2.

a. How many grams of CaCl_2 must be added to water to make 200. mL of a solution that is 0.875 M CaCl_2 ?

$$\frac{0.875 \text{ mol CaCl}_2}{1 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times 200 \text{ mL} \times \frac{110.98 \text{ g CaCl}_2}{1 \text{ mol}} = 19.4 \text{ g}$$

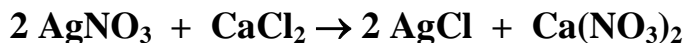
b. What is the solvent in this example? **Water**

c. What is the solute in this example? **CaCl_2**

d. How many moles of CaCl_2 would be in 68.9 mL of the 0.875 M solution?

$$\frac{0.875 \text{ mol CaCl}_2}{1 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times 68.9 \text{ mL} = 0.0603 \text{ moles}$$

3. What volume, in mL, of 0.4050 M calcium chloride reacts completely with 25.00 mL of 0.2800 M silver nitrate?



Given: **25.00 mL of AgNO₃ solution**

Wanted: **# mL 0.4050 M CaCl₂ solution**

Path: mL AgNO₃ → L AgNO₃ → mol AgNO₃ → mol CaCl₂ → L CaCl₂ → mL CaCl₂

Factors: $\frac{1 \text{ L}}{1000 \text{ mL}}$ $\frac{1 \text{ mol CaCl}_2}{2 \text{ mol AgNO}_3}$

$$\frac{0.2800 \text{ Mole AgNO}_3}{1 \text{ L AgNO}_3} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times 25.00 \text{ mL} \times \frac{1 \text{ mole CaCl}_2}{2 \text{ mole AgNO}_3} \times \frac{1 \text{ L}}{0.4050 \text{ mole CaCl}_2} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 8.642 \text{ mL}$$

4. For $2 \text{ AgNO}_3 + \text{ MgBr}_2 \rightarrow 2 \text{ AgBr(s)} + \text{ Mg(NO}_3)_2$

- a. How many grams of AgBr can be prepared when 58.0 mL of 0.264 M AgNO₃ react with excess MgBr₂?

Path: mL AgNO₃ → L AgNO₃ → mol AgNO₃ → mol AgBr → g AgBr

$$\frac{0.264 \text{ mole AgNO}_3}{1 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times 58.0 \text{ mL} \times \frac{2 \text{ mol AgBr}}{2 \text{ mol AgNO}_3} \times \frac{187.8 \text{ g}}{1 \text{ mole AgBr}} = 2.88 \text{ g}$$

- b. How many mL of 0.833 M AgNO₃ are required to react with 73.1 mL of 0.552 M MgBr₂?

Path: mL MgBr₂ → mol MgBr₂ → mol AgNO₃ → mL AgNO₃

$$\frac{0.552 \text{ moles MgBr}_2}{1000 \text{ mL}} \times 73.1 \text{ mL} \times \frac{2 \text{ moles AgNO}_3}{1 \text{ mole MgBr}_2} \times \frac{1000 \text{ mL}}{0.833 \text{ mole AgNO}_3} = 96.9 \text{ mL}$$

- c. If 205 mL of a MgBr_2 solution react completely with 42.95 mL of 0.439 M AgNO_3 solution, what must be the molarity of the MgBr_2 solution?

Given: 205 mL of MgBr_2 solution and 42.95 mL of 0.439M AgNO_3

Wanted: Molarity MgBr_2 solution

Path: mL AgNO_3 sol'n \rightarrow mol AgNO_3 \rightarrow mol MgBr_2 \rightarrow mole/ L MgBr_2

$$\frac{0.439 \text{ moles AgNO}_3}{1000 \text{ mL}} \times 42.95 \text{ mL} \times \frac{1 \text{ mole MgBr}_2}{2 \text{ mole AgNO}_3} \times \frac{1}{205 \text{ mL}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 0.0460 \text{ M}$$