$\%(m/v) = \frac{g\ solute}{mL\ solution} \times 100\%$

$\%(v/v) = \frac{mL\ solute}{mL\ solution} \times 100\%$

Name: KEY

Date: _____

Chemistry

Concentration of Solutions WS 2 (% Concentrations)

I. *Perform the following concentration calculations, showing all work and circling your answer:*

1. What is the concentration in % (m/v) of a solution with 75 g K_2SO_4 dissolved in 1500 mL of solvent?

$\%(m/v) = \frac{75\ g\ K_2SO_4}{1500\ mL} \times 100\% =$ **5.0% K_2SO_4**

2. How many grams of NaCl are required to make 2.5 L (convert to mL) of 0.90% (m/v) saline solution?

$\%(m/v) = \frac{g\ solute}{mL\ solution} \times 100\%$ $\quad g\ solute = \frac{\%(m/v) \times mL\ solution}{100\%} = \frac{0.90\%(m/v) \times 2500\ mL}{100\%} =$ **22.5 g NaCl**

3. How much pure isopropyl alcohol is dissolved in 450. mL of 70% (v/v) solution purchased at a pharmacy?

$\%(v/v) = \frac{mL\ solute}{mL\ solution} \times 100\%$ $\quad mL\ solute = \frac{\%(v/v) \times mL\ solution}{100\%} = \frac{70\%(v/v) \times 450.\ mL}{100\%} =$ **315 mL isopropyl alcohol**

4. If you buy a 250 mL bottle of 3.0% (m/v) hydrogen peroxide (H_2O_2), how many grams of H_2O_2 have you purchased?

$g\ solute = \frac{\%(m/v) \times mL\ solution}{100\%} = \frac{3.0\%(m/v)\ H_2O_2 \times 250\ mL}{100\%} =$ **7.5 g H_2O_2**

(see #2)

5. How much water is required to prepare a 5.0% (m/v) solution using 20.0 g KCl?

$\%(m/v) = \frac{g\ solute}{mL\ solution} \times 100\%$ $\quad mL\ solution = \frac{g\ solute}{\%(m/v)} \times 100\% = \frac{20.0\ g\ KCl}{5.0\%(m/v)} \times 100\% =$ **400 mL water**

6. How many grams of solute are required to make 500. mL of 0.30% (m/v) $MgSO_4$?

$$g\ solute = \frac{\%(m/v) \times mL\ solution}{100\%} = \frac{0.30\%(m/v) \times 500.\ mL}{100\%} = 30.\ g\ MgSO_4$$

(from #2)

7. What is the concentration in % (m/v) of 55.5 g $Sr(NO_3)_2$ dissolved in 225 mL H_2O?

$$\%(m/v) = \frac{g\ solute}{mL\ solution} \times 100\% = \frac{55.5\ g\ Sr(NO_3)_2}{225\ mL} \times 100\% = 24.7\%\ Sr(NO_3)_2$$

8. 425 mL of KOH solution is prepared by dissolving 32.0 g of solute. What is its concentration in % (m/v)? What is its molarity?

part 1: $\%(m/v) = \frac{g\ solute}{mL\ solution} \times 100\% = \frac{32.0\ g\ KOH}{425\ mL} \times 100\% = 7.53\%(m/v)\ KOH$

part 2: $32.0\ g\ KOH \left| \frac{1\ mol\ KOH}{56.106\ g\ KOH} \right. = 0.570\ mol\ KOH \qquad M = \frac{n}{V} = \frac{0.570\ mol}{0.425\ L} = 1.34\ M\ KOH$

9. What is the concentration in % (m/v) of a 0.33 M H_3PO_4 solution? *(hint: determine the mass of solute first by letting V = 1 L and solving for n)*

$M = \frac{n}{V} \qquad n = M \times V = 0.33\ M\ H_3PO_4 \times 1\ L = 0.33\ mol\ H_3PO_4 \left| \frac{97.995\ g\ H_3PO_4}{1\ mol\ H_3PO_4} \right. = 32.338\ g\ H_3PO_4$

$$\%(m/v) = \frac{g\ solute}{mL\ solution} \times 100\% = \frac{32.338\ g\ H_3PO_4}{1000\ mL} \times 100\% = 3.2\%(m/v)\ H_3PO_4$$

10. What is the concentration in % (m/v) of 750 mL of a 3.5 M H_2SO_4 solution?

Same as #9, except $V = 750\ mL = 0.75\ L$

$$n = M \times V = (3.5\ M\ H_2SO_4)(0.75\ L) = 2.6\ mol\ H_2SO_4 \left| \frac{98.078\ g\ H_2SO_4}{1\ mol\ H_2SO_4} \right. = 257.456\ g\ H_2SO_4$$

$$\%(m/v) = \frac{g\ solute}{mL\ solution} \times 100\% = \frac{257.456\ g\ H_2SO_4}{750\ mL} \times 100\% = 34\%(m/v)\ H_2SO_4$$