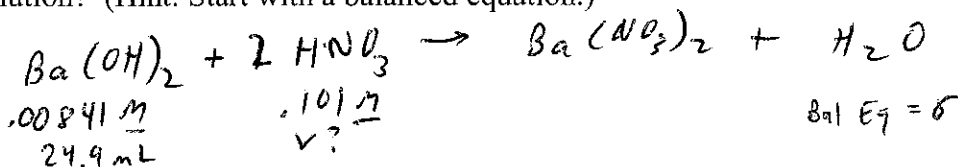


1. Calculate the molarity (M) of a solution made by dissolving 73.4 grams of sodium sulfate in enough water to form 275 milliliters of solution.

$$\text{Na}_2\text{SO}_4 \rightarrow \frac{22.99 \times 2}{32.07} = \frac{16.00 \times 4}{142.05 \text{ g/mol}}$$

$$M = \frac{\text{mol}}{L} = \frac{73.4 \text{ g} \left(\frac{1 \text{ mol}}{142.05 \text{ g}} \right)}{(275 \text{ mL}) \left(\frac{1 \text{ L}}{1000 \text{ mL}} \right)} = 1.88 \text{ M}$$

2. What volume of 0.101 M HNO₃ solution is needed to react with 24.9 mL of 0.00841 M Ba(OH)₂ solution? (Hint: Start with a balanced equation.)



$$24.9 \text{ mL Ba(OH)}_2 \left(\frac{1 \text{ L}}{1000 \text{ mL}} \right) \left(\frac{0.00841 \text{ mol Ba(OH)}_2}{1 \text{ L}} \right) \left(\frac{2 \text{ mol HNO}_3}{1 \text{ mol Ba(OH)}_2} \right) \left(\frac{1 \text{ L}}{0.101 \text{ mol HNO}_3} \right) = 0.0415 \text{ L HNO}_3$$

3. How many liters of a 2.0 % v/v solution could you prepare using 75 liters of ethanol and an unlimited amount of water?

$$75 \text{ L ethanol} \left(\frac{100 \text{ L solution}}{2.0 \text{ L ethanol}} \right) = 3750 \text{ L}$$

3800 L
 ① Ans
 ① SF

4. How many grams of sodium chloride are in 100.0 mL of a 2.50 M NaCl solution?

$$\text{NaCl molar mass } 22.99 + 35.45 = 58.44 \text{ g/mol}$$

$$100.0 \text{ mL} \left(\frac{1 \text{ L}}{1000 \text{ mL}} \right) \left(\frac{2.50 \text{ mol}}{1 \text{ L}} \right) \left(\frac{58.44 \text{ g}}{1 \text{ mol}} \right) = 14.6 \text{ g}$$

32

5. Calculate the mass percent of a solution prepared by adding 75 g of NaOH to 100. g of water.

6

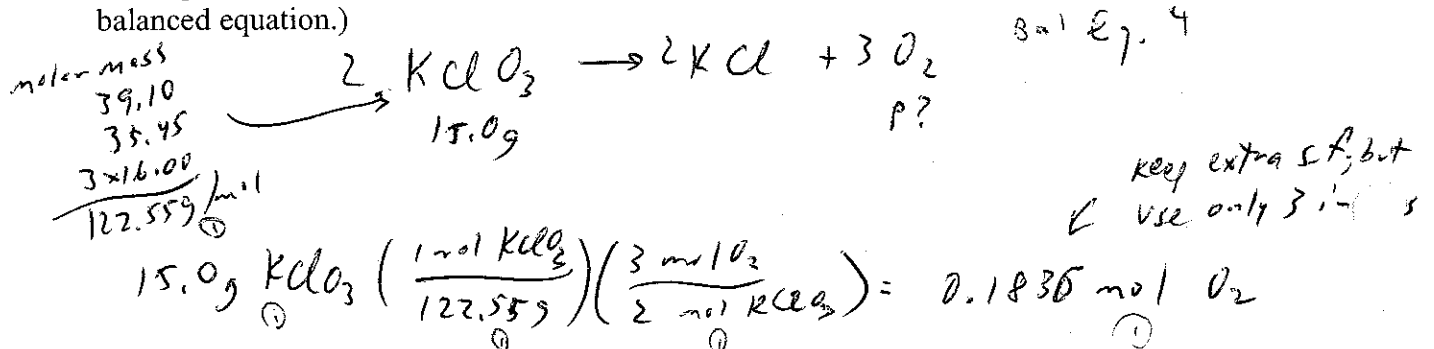
$$\text{Mass Percent} = \frac{\text{Solute}}{\text{Solution}} = \frac{75 \text{ g NaOH}}{(100. \text{ g} + 75 \text{ g}) \text{ solution}} \times 100 = 42.9\%$$

(1) ans
(1) st

6. In the previous problem,
 a. What is the solvent? H_2O 3
 b. What is the solute? NaOH 3

6

7. [15 pts] When heated, potassium chlorate decomposes to form potassium chloride and oxygen gas. What pressure of oxygen would accumulate in a 150.0-mL container by the decomposition of 15.0 grams of potassium chlorate at 22.0°C. (Hint: Start with a balanced equation.)



$$PV = nRT$$

$$T = 22.0 + 273.15 = 295.2 \text{ K}$$

$$P = \frac{nRT}{V} = \frac{(0.1836 \text{ mol})(0.08206 \frac{\text{L atm}}{\text{K mol}})(295.2 \text{ K})}{(150.0 \text{ mL}) \left(\frac{1 \text{ L}}{1000 \text{ mL}} \right)}$$

$$= 29.7 \text{ atm}$$

(1) ans
(1) sig. fig.
(1) unit

8. [10 pts] An unknown gaseous compound has a mass of 2.678 grams in a 2.00-Liter container at STP. What is its molar mass?

8

$$\text{molar mass} = \frac{g}{\text{mol}} = \frac{2.678 \text{ g}}{(2.00 \text{ L}) \left(\frac{1 \text{ mol}}{22.4 \text{ L}} \right)} = 30.0 \text{ g/mol}$$

(1) ans
(1) sig. fig.
(1) units

$$PV = nRT$$

$$P = \frac{nRT}{V} = \frac{1 \text{ mol} \times 0.08206 \text{ L atm / K mol} \times 273 \text{ K}}{22.4 \text{ L}} = 1 \text{ atm}$$