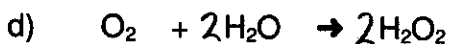


Name: _____

Stoichiometry Review
SCH 4C

1. Balance each of the following equations:



2. Perform each of the requested conversions

a) convert 23.6 g of CO_2 to an amount (in mol) of CO_2

$$23.6 \text{ g CO}_2 \times \frac{1 \text{ mol CO}_2}{44.01 \text{ g CO}_2} = 0.536 \text{ mol CO}_2$$

b) convert 8.7 mol of NaCl to a mass in g of NaCl

$$8.7 \text{ mol NaCl} \times \frac{58.44 \text{ g NaCl}}{1 \text{ mol NaCl}} = 508 \text{ g NaCl}$$

c) convert 1.40 mol of $\text{C}_6\text{H}_{12}\text{O}_6$ to number of molecules

$$1.40 \text{ mol C}_6\text{H}_{12}\text{O}_6 \times \frac{6.022 \times 10^{23} \text{ molec C}_6\text{H}_{12}\text{O}_6}{1 \text{ mol C}_6\text{H}_{12}\text{O}_6} = 8.43 \times 10^{23} \text{ molec C}_6\text{H}_{12}\text{O}_6$$

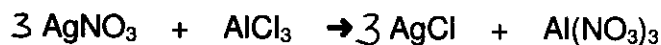
d) convert 1.40 mol of $\text{C}_6\text{H}_{12}\text{O}_6$ to number of hydrogen atoms

$$1.40 \text{ mol C}_6\text{H}_{12}\text{O}_6 \times \frac{6.022 \times 10^{23} \text{ molec C}_6\text{H}_{12}\text{O}_6}{1 \text{ mol C}_6\text{H}_{12}\text{O}_6} \times \frac{12 \text{ H atoms}}{1 \text{ molec C}_6\text{H}_{12}\text{O}_6} = 1.01 \times 10^{25} \text{ atoms}$$

e) convert 2.37×10^{24} molecules of C_2H_6 to a mass in g of C_2H_6

$$2.37 \times 10^{24} \text{ molec C}_2\text{H}_6 \times \frac{1 \text{ mol C}_2\text{H}_6}{6.022 \times 10^{23} \text{ molec C}_2\text{H}_6} \times \frac{30.08 \text{ g C}_2\text{H}_6}{1 \text{ mol C}_2\text{H}_6} = 118 \text{ g C}_2\text{H}_6$$

3. What mass of silver chloride will form if 24.3 g of aluminum chloride is reacted.



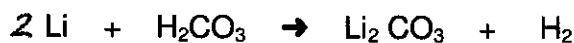
$$24.3 \text{g AlCl}_3 \times \frac{1 \text{ mol AlCl}_3}{133.33 \text{g AlCl}_3} \times \frac{3 \text{ mol AgCl}}{1 \text{ mol AlCl}_3} \times \frac{143.32 \text{g AgCl}}{1 \text{ mol AgCl}} = 78.4 \text{g AgCl}$$

4. What mass of sodium phosphate is required to form 122 g of calcium phosphate



$$122 \text{g Ca}_3(\text{PO}_4)_2 \times \frac{1 \text{ mol Ca}_3(\text{PO}_4)_2}{310.18 \text{g Ca}_3(\text{PO}_4)_2} \times \frac{2 \text{ mol Na}_3\text{PO}_4}{1 \text{ mol Ca}_3(\text{PO}_4)_2} \times \frac{163.94 \text{g Na}_3\text{PO}_4}{1 \text{ mol Na}_3\text{PO}_4} = 128.96 \text{g Na}_3\text{PO}_4$$

5. What amount of lithium carbonate will form from the reaction of 3.42 g of lithium metal



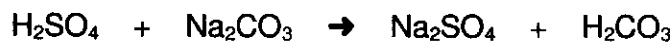
$$3.42 \text{g Li} \times \frac{1 \text{ mol Li}}{6.94 \text{g Li}} \times \frac{1 \text{ mol Li}_2\text{CO}_3}{2 \text{ mol Li}} = 0.246 \text{ mol Li}_2\text{CO}_3$$

6. What mass of uranium hexafluoride will form from the reaction of 25.0 mol of fluoride gas



$$25.0 \text{ mol F}_2 \times \frac{2 \text{ mol UF}_6}{6 \text{ mol F}_2} \times \frac{352.03 \text{g UF}_6}{1 \text{ mol UF}_6} = 2930 \text{g UF}_6$$

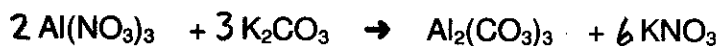
7. What mass of sodium sulphate and what mass of hydrogen carbonate will form from 65.0 g of sodium carbonate



$$65.0 \text{g Na}_2\text{CO}_3 \times \frac{1 \text{ mol Na}_2\text{CO}_3}{105.99 \text{g Na}_2\text{CO}_3} \times \frac{1 \text{ mol Na}_2\text{SO}_4}{1 \text{ mol Na}_2\text{CO}_3} \times \frac{142.05 \text{g Na}_2\text{SO}_4}{1 \text{ mol Na}_2\text{SO}_4} = 87.11 \text{g Na}_2\text{SO}_4$$

$$65.0 \text{g Na}_2\text{CO}_3 \times \frac{1 \text{ mol Na}_2\text{CO}_3}{105.99 \text{g Na}_2\text{CO}_3} \times \frac{1 \text{ mol H}_2\text{CO}_3}{1 \text{ mol Na}_2\text{CO}_3} \times \frac{62.03 \text{g H}_2\text{CO}_3}{1 \text{ mol H}_2\text{CO}_3} = 38.0 \text{g H}_2\text{CO}_3$$

8. What mass of aluminum carbonate will form from the reaction of 32.0 g of aluminum nitrate with 22.0 g of potassium carbonate

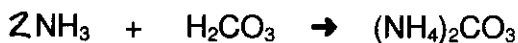


$$32.0 \text{ g Al}(\text{NO}_3)_3 \times \frac{1 \text{ mol Al}(\text{NO}_3)_3}{213.00 \text{ g Al}(\text{NO}_3)_3} \times \frac{1 \text{ mol Al}_2(\text{CO}_3)_3}{2 \text{ mol Al}(\text{NO}_3)_3} \times \frac{233.99 \text{ g Al}_2(\text{CO}_3)_3}{1 \text{ mol Al}_2(\text{CO}_3)_3} = 17.6 \text{ g Al}_2(\text{CO}_3)_3$$

$$22.0 \text{ g K}_2\text{CO}_3 \times \frac{1 \text{ mol K}_2\text{CO}_3}{138.21 \text{ g K}_2\text{CO}_3} \times \frac{1 \text{ mol Al}_2(\text{CO}_3)_3}{3 \text{ mol K}_2\text{CO}_3} \times \frac{233.99 \text{ g Al}_2(\text{CO}_3)_3}{1 \text{ mol Al}_2(\text{CO}_3)_3} = 12.4 \text{ g Al}_2(\text{CO}_3)_3$$

↑
∴ limiting

9. Determine the maximum possible mass of ammonium carbonate can be formed from 15.0 g of ammonia and 25.0 g of hydrogen carbonate



$$15.0 \text{ g NH}_3 \times \frac{1 \text{ mol NH}_3}{17.04 \text{ g NH}_3} \times \frac{1 \text{ mol } (\text{NH}_4)_2\text{CO}_3}{2 \text{ mol NH}_3} \times \frac{96.11 \text{ g } (\text{NH}_4)_2\text{CO}_3}{1 \text{ mol } (\text{NH}_4)_2\text{CO}_3} = 42.3 \text{ g } (\text{NH}_4)_2\text{CO}_3$$

$$25.0 \text{ g H}_2\text{CO}_3 \times \frac{1 \text{ mol H}_2\text{CO}_3}{62.03 \text{ g H}_2\text{CO}_3} \times \frac{1 \text{ mol } (\text{NH}_4)_2\text{CO}_3}{1 \text{ mol H}_2\text{CO}_3} \times \frac{96.11 \text{ g } (\text{NH}_4)_2\text{CO}_3}{1 \text{ mol } (\text{NH}_4)_2\text{CO}_3} = 38.7 \text{ g } (\text{NH}_4)_2\text{CO}_3$$

↑
limiting

10. Determine the concentration of each solution

a) 4.5 mol of NaBr is dissolved in 18 L of solution

$$n = 4.5 \text{ mol} \quad C = \frac{n}{V} \quad C = 0.25 \text{ M}$$
$$C = ?$$
$$V = 18 \text{ L} \quad C = \frac{4.5 \text{ mol}}{18 \text{ L}}$$

b) 42.5 g of K_2CO_3 is dissolved in 15.5 L of solution

$$n = 42.5 \text{ g} \times \frac{1 \text{ mol}}{138.81 \text{ g}} = 0.308 \text{ mol K}_2\text{CO}_3 \quad C = \frac{n}{V} \quad C = 0.0198 \text{ M}$$
$$C = ?$$
$$V = 15.5 \text{ L} \quad C = \frac{0.308}{15.5 \text{ L}}$$

c) 500 mL of 6.0M H_2SO_4 is diluted to 2.5 L

$$C_s = 6.0 \text{ M} \quad C_D = \frac{C_s V_s}{V_D} \quad C_D = 1.2 \text{ M}$$
$$V_s = 500 \text{ mL} \rightarrow 0.500 \text{ L}$$
$$C_D = ?$$
$$V_D = 2.5 \text{ L} \quad C_D = \frac{6.0 \text{ M} \times 0.500 \text{ L}}{2.5 \text{ L}}$$

11. Determine the mass of sodium sulphate (Na_2SO_4) that is required to make 5.0 L of 2.0 M solution.

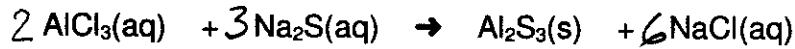
$$n = ? \quad n = CV \quad 10.0 \text{ mol} \times \frac{142.05 \text{ g}}{1 \text{ mol}} = 1420 \text{ g}$$
$$C = 2.0 \text{ M} \quad n = 2.0 \text{ mol/L} \times 5.0 \text{ L}$$
$$V = 5.0 \text{ L} \quad n = 10.0 \text{ mol}$$

12. Determine the mass of aluminum carbonate ($\text{Al}_2(\text{CO}_3)_3$) is required to make 250 mL of 0.0001 M solution

$$n = ? \quad n = CV$$
$$C = 0.0001 \text{ M} \quad n = 0.0001 \text{ mol/L} \times 0.250 \text{ L}$$
$$V = 250 \text{ mL} \rightarrow 0.250 \text{ L} \quad n = 0.000025 \text{ mol}$$

$$0.000025 \text{ mol} \times \frac{233.99 \text{ g}}{1 \text{ mol}} = 0.00585 \text{ g}$$

13. Determine the maximum mass of aluminum sulphide that can be obtained from mixing 300 mL of 0.5 M aluminum chloride and 400 mL of 0.5 M sodium sulphide. Which of these two reactants is the limiting reagent.



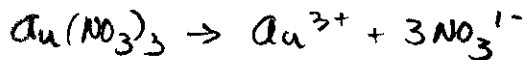
$n = ?$	$n = CV$	$n = ?$	$n = CV$
$C = 0.5 \text{ M}$	$n = 0.5 \text{ mol/L} \times 0.300 \text{ L}$	$C = 0.5 \text{ M}$	$n = 0.5 \text{ mol/L} \times 0.400 \text{ L}$
$V = 300 \text{ mL}$ $\hookrightarrow 0.300 \text{ L}$	$n = 0.15 \text{ mol AlCl}_3$	$V = 400 \text{ mL}$ $\hookrightarrow 0.400 \text{ L}$	$n = 0.20 \text{ mol Na}_2\text{S}$

$$0.15 \text{ mol AlCl}_3 \times \frac{1 \text{ mol Al}_2\text{S}_3}{2 \text{ mol AlCl}_3} \times \frac{150.17 \text{ g Al}_2\text{S}_3}{1 \text{ mol Al}_2\text{S}_3} = 11.3 \text{ g Al}_2\text{S}_3$$

$$0.20 \text{ mol Na}_2\text{S} \times \frac{1 \text{ mol Al}_2\text{S}_3}{3 \text{ mol Na}_2\text{S}} \times \frac{150.17 \text{ g Al}_2\text{S}_3}{1 \text{ mol Al}_2\text{S}_3} = 10.0 \text{ g Al}_2\text{S}_3$$

\therefore limiting

14. What is the concentration in p.p.m. of gold ^{ion}metal in a 0.0001 M gold(III) nitrate solution ($\text{Au}(\text{NO}_3)_3$)?



$$\frac{0.0001 \text{ mol Au}(\text{NO}_3)_3}{1 \text{ L}} \times \frac{1 \text{ mol Au}^{3+}}{1 \text{ mol Au}(\text{NO}_3)_3} \times \frac{196.97 \text{ g Au}^{3+}}{1 \text{ mol Au}^{3+}} \times \frac{1000 \text{ mg}}{1 \text{ g}} = \frac{19.7 \text{ mg Au}^{3+}}{1 \text{ L}} \rightarrow 19.7 \text{ p.p.m.}$$

15. What is the concentration in p.p.m. of sodium ion in a solution that is made by dissolving 0.002 g of sodium carbonate (Na_2CO_3) in 750 mL of solution?



$$0.002 \text{ g Na}_2\text{CO}_3 \times \frac{1 \text{ mol Na}_2\text{CO}_3}{105.99 \text{ g Na}_2\text{CO}_3} \times \frac{2 \text{ mol Na}^{1+}}{1 \text{ mol Na}_2\text{CO}_3} \times \frac{22.99 \text{ g Na}^{1+}}{1 \text{ mol Na}^{1+}} \times \frac{1000 \text{ mg}}{1 \text{ g}} = 0.868 \text{ mg Na}^{1+}$$

$$750 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} = 0.750 \text{ L}$$

$$\frac{0.868 \text{ mg Na}^{1+}}{0.750 \text{ L}} = 1.16 \text{ p.p.m. Na}^{1+}$$