

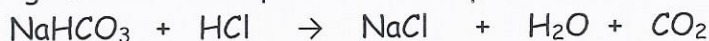
## Stoichiometry Worksheet Week 2

1. If  $2.45 \times 10^{22}$  molecules of oxygen gas are available, how many moles of  $H_2$  would react with it?



$$2.45 \times 10^{22} \text{ molec } O_2 \times \frac{1 \text{ mol } O_2}{(6.02 \times 10^{23}) \text{ molec } O_2} \times \frac{2 \text{ mol } H_2}{1 \text{ mol } O_2} = 8.14 \times 10^{-2} \text{ mol } H_2$$

2. What would the final volume be of water when a 5.5 M solution is needed to react with 12 g of HCl? The equation that represents the reaction follows.



$$12 \text{ g } HCl \times \frac{1 \text{ mol } HCl}{36.46 \text{ g } HCl} \times \frac{1 \text{ mol } H_2O}{1 \text{ mol } HCl} = 0.329127811 \text{ mol} = 5.5 \text{ mol}$$

$$= 0.060 \text{ L}$$

3. Kim uses 50 mL of  $Pb(NO_3)_2$  at a concentration of 4.5 mol/L, what is the mass produced of sodium iodide (NaI)? Using the following equation:



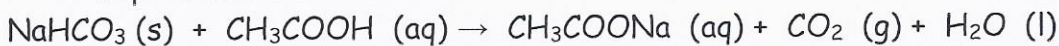
$$0.225 \text{ mol } Pb(NO_3)_2 \times \frac{2 \text{ mol } NaI}{1 \text{ mol } Pb(NO_3)_2} \times \frac{149.98 \text{ g } NaI}{1 \text{ mol } NaI} = 70 \text{ g } NaI$$

$$\frac{4.5 \text{ mol}}{2} \times 0.050 \text{ L}$$

$$= 0.225 \text{ mol}$$

↑  
given

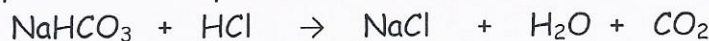
4. 120 mL of  $CH_3COONa$  is used to produce  $H_2O$ . If 9.81g of  $H_2O$  is made, what is the concentration of  $CH_3COONa$  used? The following equation represents the reaction:



$$9.81 \text{ g } H_2O \times \frac{1 \text{ mol } H_2O}{18.02 \text{ g } H_2O} \times \frac{1 \text{ mol } CH_3COONa}{1 \text{ mol } H_2O} = 0.544355117 \text{ mol}$$

$$= \frac{0.544355117 \text{ mol}}{0.12 \text{ L}} = 4.5 \text{ M}$$

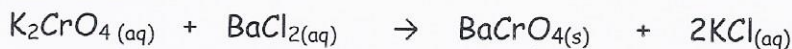
5. How many L of a 7.0M solution of HCl are needed to react with 9.85g of  $H_2O$ ? The equation that represents the reaction follows.



$$9.85 \text{ g } H_2O \times \frac{1 \text{ mol } H_2O}{18.02 \text{ g } H_2O} \times \frac{1 \text{ mol } HCl}{1 \text{ mol } H_2O} = 0.546614872 \text{ mol } HCl = 7.0 \text{ mol}$$

$$= \frac{0.546614872 \text{ mol}}{7.0 \text{ M}} = 0.078 \text{ L}$$

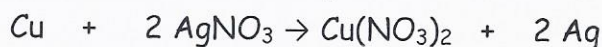
6. 150 mL of  $\text{BaCl}_2$  is used to produce  $\text{BaCrO}_4$ . If 25.0 g of  $\text{BaCrO}_4$  is made, what is the concentration of the  $\text{BaCl}_2$  used? The following equation represents the reaction:



$$25.0 \text{ g } \text{BaCrO}_4 \times \frac{1 \text{ mol } \text{BaCrO}_4}{253.33 \text{ g } \text{BaCrO}_4} \times \frac{1 \text{ mol } \text{BaCl}_2}{1 \text{ mol } \text{BaCrO}_4} = \frac{0.098685509 \text{ mol}}{0.15 \text{ L}}$$

**0.66 mol/L**

7. Use the equation below to answer questions a and b.



- a- If  $4.33 \times 10^7$  molecules of Ag are available, how many moles of silver nitrate  $\text{AgNO}_3$  would react with it?

$$4.33 \times 10^7 \text{ molec Ag} \times \frac{1 \text{ mol Ag}}{6.02 \times 10^{23} \text{ molec Ag}} \times \frac{2 \text{ mol AgNO}_3}{2 \text{ mol Ag}} = 7.19 \times 10^{-17} \text{ mol AgNO}_3$$

- b- If 450.0 g of copper nitrate  $\text{Cu}(\text{NO}_3)_2$  was produced, how many Ag atoms must have reacted with the copper nitrate?

$$450.0 \text{ g } \text{Cu}(\text{NO}_3)_2 \times \frac{1 \text{ mol } \text{Cu}(\text{NO}_3)_2}{187.50 \text{ g } \text{Cu}(\text{NO}_3)_2} \times \frac{2 \text{ mol Ag}}{1 \text{ mol } \text{Cu}(\text{NO}_3)_2} \times \frac{6.02 \times 10^{23} \text{ atoms Ag}}{1 \text{ mol Ag}} = 2.890 \times 10^{24} \text{ Ag atoms}$$

8. Fred neutralizes 250 mL of HCl at a concentration of 4.5 mol/L using  $\text{Ca}(\text{OH})_2$  according to the following equation:



What is the mass of the  $\text{CaCl}_2$  that will be left in the beaker?

$$n = C \times V \quad \frac{4.5 \text{ mol}}{2} \times 0.25 \text{ L} = 1.125 \text{ mol } \leftarrow \text{given}$$

$$1.125 \text{ mol HCl} \times \frac{1 \text{ mol } \text{CaCl}_2}{2 \text{ mol HCl}} \times \frac{110.97 \text{ g } \text{CaCl}_2}{1 \text{ mol } \text{CaCl}_2} = 62 \text{ g } \text{CaCl}_2$$