

# Stoichiometry Review Key

$$1a) \frac{2.6 \text{ mol NH}_3}{4 \text{ mol NH}_3} \left| \frac{6 \text{ mol H}_2\text{O}}{4 \text{ mol NH}_3} \right. = \boxed{3.9 \text{ mol H}_2\text{O}}$$

$$b) \frac{0.362 \text{ mol O}_2}{5 \text{ mol O}_2} \left| \frac{4 \text{ mol NO}}{5 \text{ mol O}_2} \right. = \boxed{0.290 \text{ mol NO}}$$

$$c) \frac{54.0 \text{ g NH}_3}{17.0 \text{ g NH}_3} \left| \frac{1 \text{ mol NH}_3}{4 \text{ mol NH}_3} \right| \frac{5 \text{ mol O}_2}{4 \text{ mol NH}_3} = \boxed{3.97 \text{ mol O}_2}$$

$$d) \frac{60.0 \text{ g H}_2\text{O}}{18.0 \text{ g H}_2\text{O}} \left| \frac{1 \text{ mol H}_2\text{O}}{6 \text{ mol H}_2\text{O}} \right| \frac{4 \text{ mol NO}}{6 \text{ mol H}_2\text{O}} = \boxed{2.22 \text{ mol NO}}$$

$$e) \frac{8.96 \text{ g NH}_3}{17.0 \text{ g NH}_3} \left| \frac{1 \text{ mol NH}_3}{4 \text{ mol NH}_3} \right| \frac{4 \text{ mol NO}}{4 \text{ mol NH}_3} \left| \frac{30.0 \text{ g NO}}{1 \text{ mol NO}} \right. = \boxed{15.8 \text{ g NO}}$$



$$\frac{6.0 \text{ mol SO}_3}{2 \text{ mol SO}_3} \left| \frac{2 \text{ mol S}}{2 \text{ mol SO}_3} \right| \frac{32.1 \text{ g S}}{1 \text{ mol S}} = \boxed{1.9 \times 10^2 \text{ g S}}$$



$$\frac{355 \text{ g CCl}_4}{154.0 \text{ g CCl}_4} \left| \frac{1 \text{ mol CCl}_4}{1 \text{ mol CCl}_4} \right| \frac{2 \text{ mol Cl}_2}{1 \text{ mol CCl}_4} \left| \frac{71.0 \text{ g Cl}_2}{1 \text{ mol Cl}_2} \right. = \boxed{327 \text{ g Cl}_2}$$



$$\frac{2.50 \text{ mol Na}_2\text{SO}_4}{1 \text{ mol Na}_2\text{SO}_4} \left| \frac{2 \text{ mol NaCl}}{1 \text{ mol Na}_2\text{SO}_4} \right| \frac{58.5 \text{ g NaCl}}{1 \text{ mol NaCl}} = \boxed{293 \text{ g NaCl}}$$



$$\frac{9.0 \text{ g H}_2\text{O}}{18.0 \text{ g H}_2\text{O}} \left| \frac{1 \text{ mol H}_2\text{O}}{2 \text{ mol H}_2\text{O}} \right| \frac{3 \text{ mol O}_2}{2 \text{ mol H}_2\text{O}} \left| \frac{32.0 \text{ g O}_2}{1 \text{ mol O}_2} \right. = \boxed{24 \text{ g O}_2}$$

$$6. a) \frac{0.316 \text{ g C}_4\text{H}_{10}\text{O}_3\text{S}}{258.1 \text{ g C}_4\text{H}_{10}\text{O}_3\text{S}} \left| \frac{1 \text{ mol C}_4\text{H}_{10}\text{O}_3\text{S}}{1 \text{ mol C}_4\text{H}_{10}\text{O}_3\text{S}} \right| \frac{14 \text{ mol CO}_2}{1 \text{ mol C}_4\text{H}_{10}\text{O}_3\text{S}} \left| \frac{22.4 \text{ L CO}_2}{1 \text{ mol CO}_2} \right. = \boxed{0.384 \text{ L CO}_2}$$

$$b) \frac{16.5 \text{ L SO}_2}{22.4 \text{ L SO}_2} \left| \frac{1 \text{ mol SO}_2}{1 \text{ mol SO}_2} \right| \frac{1 \text{ mol C}_4\text{H}_{10}\text{O}_3\text{S}}{1 \text{ mol SO}_2} \left| \frac{258.1 \text{ g C}_4\text{H}_{10}\text{O}_3\text{S}}{1 \text{ mol}} \right. = \boxed{1.90 \times 10^2 \text{ g C}_4\text{H}_{10}\text{O}_3\text{S}}$$



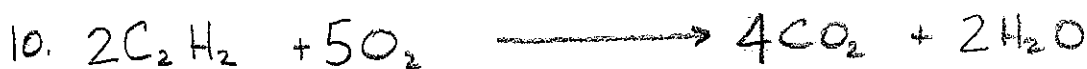
$$\frac{120\text{g C}_6\text{H}_{12}\text{O}_6}{180.0\text{g C}_6\text{H}_{12}\text{O}_6} \times \frac{1\text{mol C}_6\text{H}_{12}\text{O}_6}{1\text{mol C}_6\text{H}_{12}\text{O}_6} \times \frac{6\text{mol O}_2}{1\text{mol C}_6\text{H}_{12}\text{O}_6} \times \frac{22.4\text{L O}_2}{1\text{mol O}_2} = \boxed{9.01 \times 10^1 \text{L O}_2}$$



$$\frac{8.73\text{L H}_2}{22.4\text{L H}_2} \times \frac{1\text{mol H}_2}{2\text{mol H}_2} \times \frac{1\text{mol O}_2}{1\text{mol H}_2} \times \frac{22.4\text{L O}_2}{1\text{mol O}_2} = \boxed{4.37\text{L O}_2}$$



$$\frac{50.0\text{L CO}}{22.4\text{L CO}} \times \frac{1\text{mol CO}}{2\text{mol CO}} \times \frac{1\text{mol CO}_2}{1\text{mol CO}} \times \frac{22.4\text{L CO}_2}{1\text{mol CO}_2} = \boxed{25.0\text{L CO}_2}$$



moles  $\text{CO}_2$  formed:

$$\frac{50.0\text{g O}_2}{32.0\text{g O}_2} \times \frac{1\text{mol O}_2}{5\text{mol O}_2} \times \frac{4\text{mol CO}_2}{1\text{mol O}_2} = 1.25\text{mol CO}_2$$

moles  $\text{CO}_2$  formed:

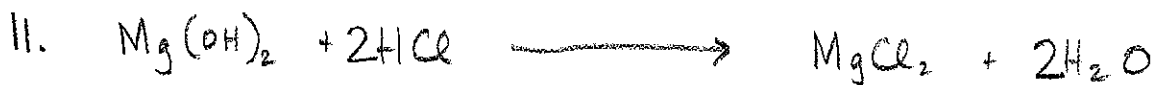
$$\frac{25.0\text{g C}_2\text{H}_2}{26.0\text{g C}_2\text{H}_2} \times \frac{1\text{mol C}_2\text{H}_2}{2\text{mol C}_2\text{H}_2} \times \frac{4\text{mol CO}_2}{1\text{mol C}_2\text{H}_2} = 1.9231\text{mol CO}_2$$

LIMITING REACTANT is  $\text{O}_2$

$$\frac{1.25\text{mol CO}_2}{1\text{mol CO}_2} \times 44.0\text{g CO}_2 = \boxed{55.0\text{g CO}_2 \text{ produced}}$$

$$\frac{50.0\text{g O}_2}{32.0\text{g O}_2} \times \frac{1\text{mol O}_2}{5\text{mol O}_2} \times \frac{2\text{mol C}_2\text{H}_2}{1\text{mol O}_2} \times \frac{26.0\text{g C}_2\text{H}_2}{1\text{mol C}_2\text{H}_2} = 16.25\text{g} = 16.3\text{g C}_2\text{H}_2 \text{ used}$$

$$25.0\text{g C}_2\text{H}_2 (\text{start}) - 16.25\text{g C}_2\text{H}_2 (\text{used}) = \boxed{8.8\text{g C}_2\text{H}_2 \text{ left}}$$



moles  $\text{H}_2\text{O}$  formed:

$$\frac{5.0 \text{ g HCl} \left| \begin{array}{l} 1 \text{ mol HCl} \\ 36.5 \text{ g HCl} \end{array} \right| \begin{array}{l} 2 \text{ mol H}_2\text{O} \\ 2 \text{ mol HCl} \end{array}}{=} = 0.13699 \text{ mol H}_2\text{O}$$

moles  $\text{H}_2\text{O}$  formed:

$$\frac{24.0 \text{ g Mg(OH)}_2 \left| \begin{array}{l} 1 \text{ mol Mg(OH)}_2 \\ 58.3 \text{ g Mg(OH)}_2 \end{array} \right| \begin{array}{l} 2 \text{ mol H}_2\text{O} \\ 1 \text{ mol Mg(OH)}_2 \end{array}}{=} = 0.82333 \text{ mol H}_2\text{O}$$

**HCl is LIMITING REACTANT**

$$\frac{0.13699 \text{ mol H}_2\text{O} \left| \begin{array}{l} 18.0 \text{ g H}_2\text{O} \\ 1 \text{ mol H}_2\text{O} \end{array} \right|}{=} = \boxed{2.47 \text{ g H}_2\text{O formed}}$$

$$\frac{5.0 \text{ g HCl} \left| \begin{array}{l} 1 \text{ mol HCl} \\ 36.5 \text{ g HCl} \end{array} \right| \begin{array}{l} 1 \text{ mol Mg(OH)}_2 \\ 2 \text{ mol HCl} \end{array} \left| \begin{array}{l} 58.3 \text{ g Mg(OH)}_2 \\ 1 \text{ mol Mg(OH)}_2 \end{array} \right|}{=} = 3.99 \text{ g Mg(OH)}_2 \text{ (used)}$$

$$24.0 \text{ g Mg(OH)}_2 \text{ (start)} - 3.99 \text{ g Mg(OH)}_2 \text{ (used)} = \boxed{20.0 \text{ g Mg(OH)}_2 \text{ left}}$$

12. Stoichiometry - comparison of the quantities of materials produced and consumed in a chemical reaction

**Stoichiometric Ratio** - the mole-to-mole ratio of reactants/products in a balanced chemical equation.

**Limiting Reactant** - the reactant that is completely consumed when a reaction is run to completion.