

STOICHIOMETRY REVIEW ANSWER KEY.

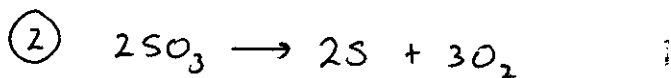
$$1a) \frac{2.6 \text{ mol NH}_3 \mid 6 \text{ mol H}_2\text{O}}{4 \text{ mol NH}_3} = \underline{3.9 \text{ mol H}_2\text{O}}$$

$$b) \frac{0.362 \text{ mol O}_2 \mid 4 \text{ mol NO}}{5 \text{ mol O}_2} = \underline{0.290 \text{ mol NO}}$$

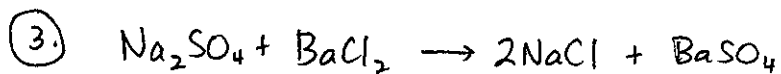
$$c) \frac{54.0 \text{ g NH}_3 \mid 1 \text{ mol NH}_3 \mid 5 \text{ mol O}_2}{17.0 \text{ g NH}_3 \mid 4 \text{ mol NH}_3} = \underline{3.97 \text{ mol O}_2}$$

$$d) \frac{60.0 \text{ g H}_2\text{O} \mid 1 \text{ mol H}_2\text{O} \mid 4 \text{ mol NO}}{18.0 \text{ g H}_2\text{O} \mid 6 \text{ mol H}_2\text{O}} = \underline{2.22 \text{ mol NO}}$$

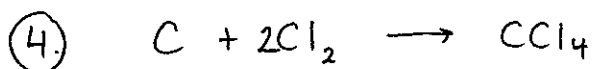
$$e) \frac{8.96 \text{ g NH}_3 \mid 1 \text{ mol NH}_3 \mid 4 \text{ mol NO} \mid 30.0 \text{ g NO}}{17.0 \text{ g NH}_3 \mid 4 \text{ mol NH}_3 \mid 1 \text{ mol NO}} = \underline{15.8 \text{ g NO}}$$



$$\frac{6.0 \text{ mol SO}_3 \mid 2 \text{ mol S} \mid 32.1 \text{ g S}}{2 \text{ mol SO}_3 \mid 1 \text{ mol S}} = \underline{1.9 \times 10^2 \text{ g S}}$$



$$\frac{2.50 \text{ mol Na}_2\text{SO}_4 \mid 2 \text{ mol NaCl} \mid 58.5 \text{ g NaCl}}{1 \text{ mol Na}_2\text{SO}_4 \mid 1 \text{ mol NaCl}} = \underline{293 \text{ g NaCl}}$$



$$\frac{355 \text{ g CCl}_4 \mid 1 \text{ mol CCl}_4 \mid 2 \text{ mol Cl}_2 \mid 71.0 \text{ g Cl}_2}{154.0 \text{ g CCl}_4 \mid 1 \text{ mol CCl}_4 \mid 1 \text{ mol Cl}_2} = \underline{327 \text{ g Cl}_2}$$



$$\frac{9.0\text{g H}_2\text{O} \quad | \quad 1\text{mol H}_2\text{O} \quad | \quad 3\text{mol O}_2 \quad | \quad 32.0\text{g O}_2}{18.0\text{g H}_2\text{O} \quad | \quad 2\text{mol H}_2\text{O} \quad | \quad 1\text{mol O}_2} = \underline{24\text{g O}_2}$$

$\textcircled{6a}$

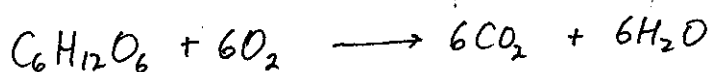
$$\frac{0.316\text{g C}_{14}\text{H}_{10}\text{O}_3\text{S} \quad | \quad 1\text{mol C}_{14}\text{H}_{10}\text{O}_3\text{S} \quad | \quad 14\text{mol CO}_2 \quad | \quad 22.4\text{L CO}_2}{258.1\text{g C}_{14}\text{H}_{10}\text{O}_3\text{S} \quad | \quad 1\text{mol C}_{14}\text{H}_{10}\text{O}_3\text{S} \quad | \quad 1\text{mol CO}_2} = \underline{0.384\text{L CO}_2}$$

$\textcircled{6b}$

$$\frac{16.5\text{L SO}_2 \quad | \quad 1\text{mol SO}_2 \quad | \quad 1\text{mol SO}_2 \quad | \quad 258.1\text{g C}_{14}\text{H}_{10}\text{O}_3\text{S}}{22.4\text{L SO}_2 \quad | \quad 1\text{mol C}_{14}\text{H}_{10}\text{O}_3\text{S} \quad | \quad 1\text{mol C}_{14}\text{H}_{10}\text{O}_3\text{S}} = \underline{190\text{g C}_{14}\text{H}_{10}\text{O}_3\text{S}}$$

$\textcircled{7}$

$$\frac{120\text{g C}_6\text{H}_{12}\text{O}_6 \quad | \quad 1\text{mol C}_6\text{H}_{12}\text{O}_6 \quad | \quad 6\text{mol O}_2 \quad | \quad 22.4\text{L O}_2}{180.0\text{g C}_6\text{H}_{12}\text{O}_6 \quad | \quad 1\text{mol C}_6\text{H}_{12}\text{O}_6 \quad | \quad 1\text{mol O}_2} = \underline{9.0 \times 10^1\text{L O}_2}$$

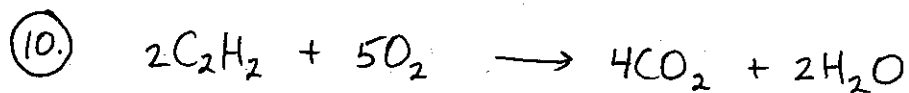


$\textcircled{8}$

$$\frac{8.73\text{L H}_2 \quad | \quad 1\text{mol H}_2 \quad | \quad 1\text{mol O}_2 \quad | \quad 22.4\text{L O}_2}{22.4\text{L H}_2 \quad | \quad 2\text{mol H}_2 \quad | \quad 1\text{mol O}_2} = \underline{4.37\text{L O}_2}$$

$\textcircled{9}$

$$\frac{50.0\text{L CO} \quad | \quad 1\text{mol CO} \quad | \quad 1\text{mol CO}_2 \quad | \quad 22.4\text{L CO}_2}{22.4\text{L CO} \quad | \quad 2\text{mol CO} \quad | \quad 1\text{mol CO}_2} = \underline{25.0\text{L CO}_2}$$



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

$$\text{moles CO}_2 = \frac{25.0\text{g C}_2\text{H}_2}{26.0\text{g C}_2\text{H}_2} \times \frac{1\text{ mol}}{2\text{ mol C}_2\text{H}_2} \times \frac{4\text{ mol CO}_2}{1\text{ mol CO}_2} = 1.92\text{ mol CO}_2$$

The limiting reactant is O₂ as it produces the least amount of CO₂.

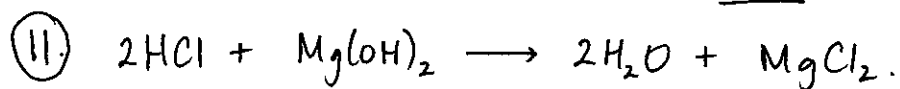
$$\text{mass CO}_2 \text{ produced} = \frac{1.25\text{ mol CO}_2}{1\text{ mol CO}_2} \times \frac{44.0\text{g CO}_2}{1\text{ mol CO}_2} = \underline{55.0\text{g CO}_2 \text{ produced}}$$

The reactant in excess is C₂H₂ and the amount of it consumed is

$$\frac{1.25\text{ mol CO}_2}{4\text{ mol CO}_2} \times \frac{2\text{ mol C}_2\text{H}_2}{1\text{ mol C}_2\text{H}_2} \times \frac{26.0\text{g C}_2\text{H}_2}{1\text{ mol C}_2\text{H}_2} = \underline{16.3\text{g C}_2\text{H}_2 \text{ used in rxn}}$$

The amount of C₂H₂ left over is

$$25.0\text{g} - 16.3\text{g} = \underline{8.7\text{g}}$$



$$\text{moles H}_2\text{O} = \frac{5.0\text{g HCl}}{36.5\text{g HCl}} \times \frac{1\text{ mol HCl}}{2\text{ mol HCl}} \times \frac{2\text{ mol H}_2\text{O}}{1\text{ mol H}_2\text{O}} = 0.137\text{ mol (only 2 s.f. to work with)}$$

$$\text{moles H}_2\text{O} = \frac{24.0\text{g Mg(OH)}_2}{58.3\text{g Mg(OH)}_2} \times \frac{1\text{ mol Mg(OH)}_2}{1\text{ mol Mg(OH)}_2} \times \frac{2\text{ mol H}_2\text{O}}{1\text{ mol H}_2\text{O}} = 0.823\text{ mol}$$

The limiting reactant is HCl as it produces the least amount of H₂O.

$$\text{mass H}_2\text{O produced} = \frac{0.137\text{ mol H}_2\text{O}}{1\text{ mol H}_2\text{O}} \times \frac{18.0\text{g H}_2\text{O}}{1\text{ mol H}_2\text{O}} = \underline{2.5\text{g H}_2\text{O}}$$

The reactant in excess is ~~C₂H₂~~ ^{Mg(OH)₂} and the amount consumed is

$$\frac{0.137 \text{ mol H}_2\text{O}}{2 \text{ mol H}_2\text{O}} \left| \frac{1 \text{ mol Mg(OH)}_2}{1 \text{ mol Mg(OH)}_2} \right| \frac{58.3 \text{ g Mg(OH)}_2}{1 \text{ mol Mg(OH)}_2} = \underline{4.0 \text{ g Mg(OH)}_2 \text{ used.}}$$

The amount of Mg(OH)_2 left over is

$$24.0 \text{ g} - 4.0 \text{ g} = \underline{\underline{20.0 \text{ g}}}$$

⑫ **Stoichiometry**: The method to calculate the quantities of chemicals in a chemical reaction.

Stoichiometric Ratio: The mole ratio of two substances in a chemical reaction.

Limiting Reagent (Reactant): The reactant that runs out first in a reaction thereby limiting the amount of products formed.