Stoichiometry Activity Problems

5(22.4) 3(22.4)

1. $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$, if 20 L of oxygen are consumed in the above reaction, how many Liters of carbon dioxide are produced?

V → V

$\frac{X\ L\ CO_2}{3(22.4)L\ CO_2} = \frac{20\ L\ O_2}{5(22.4)L\ O_2}$ | X=12 |

2. $2C + 4H_2O + 5{,}000\ kJ \rightarrow 2CO_2 + 4H_2$, if 2,500 kJ were used in the reaction, how much CO_2 would be produced?

m → E

$\frac{5000\ kJ}{2500\ kJ} = \frac{2\ mol\ CO_2}{X\ mol\ CO_2}$ | 1 mol |

3. What mass of oxygen is required to react with 15 moles of iron?
$4Fe + 3O_2 \rightarrow 2Fe_2O_3$

359.9775

m → g

$\frac{X\ g\ O_2}{15\ mol\ Fe} = \frac{95.994}{4\ mol\ Fe}$ $\frac{4\ mol\ Fe}{3\ mol\ O_2} = \frac{15\ mol\ Fe}{X\ mol\ O_2}$ | X=11.25 |

4. How many moles of sodium hydroxide are required to produce 3 grams of hydrogen?
$6NaOH + 2Al \rightarrow 2Na_3AlO_3 + 3H_2$

m → g

$\frac{6\ mol\ NaOH}{6\ g\ H_2} = \frac{X\ moles\ NaOH}{3\ g\ H_2}$ $18 = 6X$ | X=3 | moles

5. In the following reaction, $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$, how many moles of hydrogen would be required to produce 5 moles of water?

m → m

$\frac{2\ mol\ H_2}{2\ mol\ H_2O} = \frac{X\ mol\ H_2}{5\ mol\ H_2O} = 10 = 2X$ | 5 = X |

6. $4\ FeCr_2O_7 + 8\ K_2CO_3 + O_2 \longrightarrow 2\ Fe_2O_3 + 8\ K_2CrO_4 + 8\ CO_2$
How many grams of $FeCr_2O_7$ are required to produce 44.0 g of CO_2?

g → g

$\frac{X\ g\ FeCr_2O_7}{44.0\ g\ CO_2} = \frac{1087.328\ g\ FeCr_2O_7}{352.072\ g\ CO_2}$ | 135.888 g $FeCr_2O_7$ |

7. How many grams of sulfur are needed to react with 3.5 moles of oxygen?
$S + O_2 \rightarrow SO_2$

g → m

$\frac{g\ S}{3.5\ mol\ O_2} = \frac{32.066}{1\ mol\ O_2} =$ | 112.231 g S |

8. In the decomposition of baking soda, how much energy is required if there are 3 moles of NaOH produced? $NaHCO_3(s) + 1{,}800\ kJ \rightarrow CO_2(g) + NaOH(s)$

m → e

$\frac{1800\ kJ}{1\ mol\ NaOH} = \frac{X\ kJ}{3\ mol\ NaOH} =$ | 5400 kJ |

9. $N_2 + 3H_2 \rightarrow 2NH_3$, what volume of hydrogen is necessary to react with 5 L of nitrogen to produce ammonia?

V → V

$\frac{X\ L\ H_2}{3(22.4)L\ H_2} = \frac{5L\ N_2}{(1)(22.4)}$ | 15L H_2 |

$2\ KMnO_4 + H_2SO_4 \longrightarrow K_2SO_4 + Mn_2O_7 + H_2O$

10. How many grams of Mn_2O_7 can be formed from 390.0 g of $KMnO_4$?

g → g

$\frac{X\ g\ Mn_2O_7}{390\ g\ KMnO_4} = \frac{221.869\ g\ Mn_2O_7}{316.064\ g\ KMnO_4}$ | 273.77 g Mn_2O_7 |

Stoichiometry Activity Problems 3/21-22

1. $\frac{X\ L\ CO_2}{20\ L\ O_2} = \frac{3(22.4)\ L\ CO_2}{5(22.4)\ L\ O_2}$

$$\frac{20\ L\ O_2 \cdot (3 \cdot 22.4)\ L\ CO_2}{5(22.4)\ L\ O_2} = \frac{5(22.4)\ L\ O_2 \cdot X}{5(22.4)\ L\ O_2}$$

$$\boxed{12\ L\ CO_2 = X}$$

2. $\frac{X\ mol\ CO_2}{2500\ kJ} = \frac{2\ mol\ CO_2}{5000\ kJ}$

$$\frac{5000\ kJ \cdot X}{5000\ kJ} = \frac{2500\ kJ \cdot 2\ mol\ CO_2}{5000\ kJ}$$

$$\boxed{X = 1\ mol\ CO_2}$$

3. $\frac{X\ g\ O_2}{15\ mol\ Fe} = \frac{6(15.999)\ g\ O_2}{4\ mol\ Fe}$

$$\frac{15\ mol\ Fe \cdot 6(15.999)\ g\ O_2}{4\ mol\ Fe} = \frac{4\ mol\ Fe \cdot X\ g\ O_2}{4\ mol\ Fe}$$

$$\boxed{359.9775\ g\ O_2 = X}$$

4. $\frac{X\ mol\ NaOH}{3\ g\ H_2} = \frac{6\ mol\ NaOH}{6.048\ g\ H_2}$

$$\frac{3\ g\ H_2 \cdot 6\ mol\ NaOH}{6.048\ g\ H_2} = \frac{6.048\ g\ H_2 \cdot X}{6.048\ g\ H_2}$$

$$\boxed{2.97\ mol\ NaOH = X}$$

5. $\frac{X \text{ mol } H_2}{5 \text{ mol } H_2O} = \frac{2 \text{ mol } H_2}{2 \text{ mol } H_2O}$

$$\frac{2 \text{ mol } H_2 \cdot 5 \text{ mol } H_2O}{2 \text{ mol } H_2O} = \frac{2 \text{ mol } H_2O \cdot X}{2 \text{ mol } H_2O}$$

$$\boxed{5 \text{ mol } H_2 = X}$$

6. $\frac{X \text{ g } FeCr_2O_7}{44.0 \text{ g } CO_2} = \frac{1087.328 \text{ g } FeCr_2O_7}{352.072 \text{ g } CO_2}$

$8(44.09 \text{ g})$

$$\frac{352.072 \text{ g } CO_2 \cdot X}{352.072 \text{ g } CO_2} = \frac{44.0 \text{ g } CO_2 \cdot 1087.328 \text{ g } FeCr_2O_7}{352.072 \text{ g } CO_2}$$

$$\boxed{X = 135.888 \text{ g } FeCr_2O_7}$$

7. $\frac{X \text{ g } S}{3.5 \text{ mol } O_2} = \frac{32.066 \text{ g } S}{1 \text{ mol } O_2}$

$$X \cdot 1 \text{ mol } O_2 = 32.066 \text{ g } S \cdot 3.5 \text{ mol } O_2$$

$$\boxed{X = 112.231 \text{ g } S}$$

8. $\frac{X \text{ KJ}}{3 \text{ mol NaOH}} = \frac{1800 \text{ KJ}}{1 \text{ mol NaOH}}$

$$X \cdot 1 \text{ mol NaOH} = 3 \text{ mol NaOH} \cdot 1800 \text{ KJ}$$

$$\boxed{X = 5400 \text{ KJ}}$$

9. $\frac{X \text{ L } H_2}{5 \text{ L } N_2} = \frac{3(22.4) \text{ L } H_2}{1(22.4) \text{ L } N_2}$

$$\frac{X \cdot 22.4 \text{ L } N_2}{22.4 \text{ L } N_2} = \frac{3(22.4) \text{ L } H_2 \cdot 5 \text{ L } N_2}{22.4 \text{ L } N_2}$$

$$\boxed{X = 15 \text{ L } H_2}$$