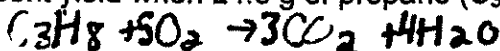1. The burning of 18.0 g of carbon produces 55.0 g of carbon dioxide. Calculate the theoretical and percent yield of the reaction.

$$C + O_2 \rightarrow CO_2$$

$$\dfrac{18.0\,g\,C}{} \left| \dfrac{1\ mol\ C}{12.01\,g\,C} \right| \dfrac{1\ mol\ CO_2}{1\ mol\ C} \left| \dfrac{44.01\,g\,CO_2}{1\ mol\ CO_2} \right. = 65.96\,g\,CO_2$$

$$\dfrac{55.0}{65.96} \times 100 = \boxed{83.4\%}$$

2. Calculate the percent yield when 24.8 g of propane ($C_3H_8$) are burned in air to produce 15.0 g of water vapor.

$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$

$$\dfrac{24.8\,g\,C_3H_8}{} \left| \dfrac{1\ mol\ C_3H_8}{44.09\,g\,C_3H_8} \right| \dfrac{4\ mol\ H_2O}{1\ mol\ C_3H_8} \left| \dfrac{18.01\,g\,H_2O}{1\ mol\ H_2O} \right. = 40.5\,g\,H_2O$$

$$\dfrac{15.0}{40.5} \times 100 = \boxed{37.0\%}$$

3. If 12.5 grams of copper are reacted with an excess of chlorine, then 25.4 grams of copper(II) chloride are obtained. Calculate the theoretical yield and the percent yield.

$$Cu + Cl_2 \rightarrow CuCl_2$$
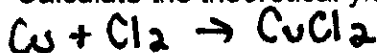
$$\dfrac{12.5\,g\,Cu}{} \left| \dfrac{1\ mol\ Cu}{63.55\,g\,Cu} \right| \dfrac{1\ mol\ CuCl_2}{1\ mol\ Cu} \left| \dfrac{134.45\,g\,CuCl_2}{1\ mol\ CuCl_2} \right. = 26.4\,g\,CuCl_2$$

$$\dfrac{25.4}{26.4} \times 100 = \boxed{96.2\%}$$

4. What is the percent yield if 3.74 grams of copper is produced when 1.87 grams of aluminum is reacted with an excess of copper(II) sulfate?

$$2Al + 3CuSO_4 \rightarrow Al_2(SO_4)_3 + 3Cu$$
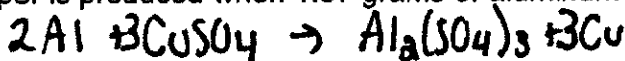
$$\dfrac{1.87\,g\,Al}{} \left| \dfrac{1\ mol\ Al}{26.98\,g\,Al} \right| \dfrac{3\ mol\ Cu}{2\ mol\ Al} \left| \dfrac{63.55\,g\,Cu}{1\ mol\ Cu} \right. = 6.61\,g\,Cu$$

$$\dfrac{3.74}{6.61} \times 100 = \boxed{56.6\%}$$

5. If 6.57 grams of iron are reacted with an excess of hydrochloric acid, then 14.63 grams of iron(II) chloride are obtained. Calculate the theoretical yield and the percent yield.

$$Fe + 2HCl \rightarrow FeCl_2 + H_2$$

$$\dfrac{6.57\,g\,Fe}{} \left| \dfrac{1\ mol\ Fe}{55.85\,g\,Fe} \right| \dfrac{1\ mol\ FeCl_2}{1\ mol\ Fe} \left| \dfrac{126.75\,g\,FeCl_2}{1\ mol\ FeCl_2} \right. = 14.9\,g\,FeCl_2$$

$$\dfrac{14.63}{14.9} \times 100 = \boxed{98.2\%}$$

6. When 84.8 grams of iron(III) oxide reacts with an excess of carbon monoxide, then 57.8 grams of iron along with some carbon dioxide is produced. What is the percent yield of this reaction?

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$
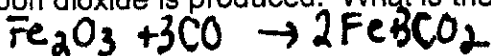
$$\dfrac{84.8\,g\,Fe_2O_3}{} \left| \dfrac{1\ mol\ Fe_2O_3}{159.7\,g\,Fe_2O_3} \right| \dfrac{2\ mol\ Fe}{1\ mol\ Fe_2O_3} \left| \dfrac{55.85\,g\,Fe}{1\ mol\ Fe} \right. = 59.3\,g\,Fe$$

$$\dfrac{57.8}{59.3} \times 100 = \boxed{97.5\%}$$

7. When 50.0 grams of silicon dioxide is heated with an excess of carbon, 32.2 grams of silicon carbide (SiC) along with some carbon monoxide is produced. What is the percent yield of this reaction?

$$SiO_2 + 3C \rightarrow SiC + 2CO$$
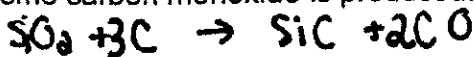
$$\dfrac{50.0\,g\,SiO_2}{} \left| \dfrac{1\ mol\ SiO_2}{60.09\,g\,SiO_2} \right| \dfrac{1\ mol\ SiC}{1\ mol\ SiO_2} \left| \dfrac{40.1\,g\,SiC}{1\ mol\ SiC} \right. = 33.4\,g\,SiC$$

$$\dfrac{32.2}{33.4} \times 100 = \boxed{96.4\%}$$

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