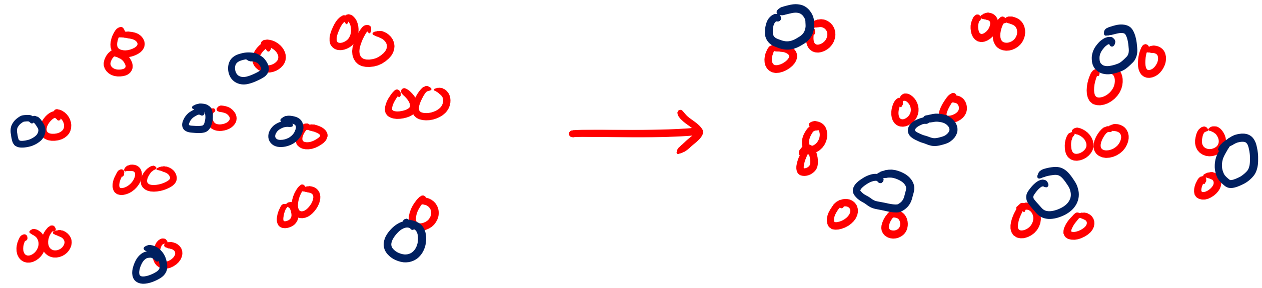
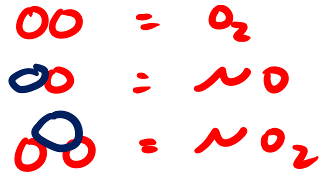
107)





$$\underline{6}NO + \underline{3}O_2 \longrightarrow \underline{6}NO_2$$

* 3 O_2 in excess

$$2NO + O_2 \longrightarrow 2NO_2$$

109) $1.00 \times 10^3 \text{ g } N_2 \; \frac{1 \text{ mole } N_2}{28.02 \text{ g } N_2} = 35.7 \text{ mole } N_2 \quad \frac{}{1}$ 35.7

limits

$5.00 \times 10^2 \text{ g } H_2 \; \frac{1 \text{ mole } H_2}{2.02 \text{ g } H_2} = 248 \text{ mole } H_2 \quad \frac{}{3}$ 82.7

excess

$$35.7 \text{ mole } N_2 \; \frac{2 \text{ mole } NH_3}{1 \text{ mole } N_2} \; \frac{17.04 \text{ g } NH_3}{1 \text{ mole } NH_3} = 1.22 \times 10^3 \text{ g } NH_3$$

$$35.7 \text{ mole } N_2 \; \frac{3 \text{ mole } H_2}{1 \text{ mole } N_2} \; \frac{2.02 \text{ g } H_2}{1 \text{ mole } H_2} = 216 \text{ g } H_2 \text{ reacts}$$

$500. - 216 = 284 \text{ g } H_2$ leftover

111)

$5.00 \times 10^3\ kg\ NH_3 \times \frac{1000\ g}{1\ kg} \times \frac{1\ mole\ NH_3}{17.04\ g\ NH_3} = \frac{2.93 \times 10^5\ mole}{2}$ 1.47×10^5

$5.00 \times 10^3\ kg\ O_2 \times \frac{1000\ g}{1\ kg} \times \frac{1\ mole\ O_2}{32.00\ g\ O_2} = \frac{1.56 \times 10^5\ mole}{3}$ 5.20×10^4

limits

$5.00 \times 10^3\ kg\ CH_4 \times \frac{1000\ g}{1\ kg} \times \frac{1\ mole\ CH_4}{16.05\ g\ CH_4} = \frac{3.11 \times 10^5\ mole}{2}$ 1.55×10^5

$1.56 \times 10^5\ mole\ O_2 \times \frac{2\ mole\ HCN}{3\ mole\ O_2} \times \frac{27.03\ g\ HCN}{1\ mole\ HCN} =$

$2.81 \times 10^6\ g\ HCN$

$1.56 \times 10^5\ mole\ O_2 \times \frac{6\ mole\ H_2O}{3\ mole\ O_2} \times \frac{18.02\ g\ H_2O}{1\ mole\ H_2O} =$

$5.62 \times 10^6\ g\ H_2O$

113) C_2H_6 + Cl_2 $\rightarrow$ C_2H_5Cl + HCl

300. g   650. g   490. g

% yield

* have to figure out limiting reactant and then the expected yield

$$300.\,g\ C_2H_6 \times \frac{1\ mole\ C_2H_6}{30.08\ g\ C_2H_6} = \frac{9.97\ mole\ C_2H_6}{1}$$

$$650.\,g\ Cl_2 \times \frac{1\ mole\ Cl_2}{70.90\ g\ Cl_2} = \frac{9.17\ mole\ Cl_2}{1}$$

limits

$$9.17\ mole\ Cl_2 \times \frac{1\ mole\ C_2H_5Cl}{1\ mole\ Cl_2} \times \frac{64.52\ g\ C_2H_5Cl}{1\ mole\ C_2H_5Cl} = 592\ g\ C_2H_5Cl$$

$$\%\ yield = \frac{experimental}{theoretical} \times 100$$

$$= \frac{490.\ g}{592\ g} \times 100 = 82.8\%$$

11.5)

$$2.80 \text{ metric ton } Cu_3FeS_3 \; \frac{1000 \text{ kg}}{1 \text{ metric ton}} \; \frac{1000 \text{ g}}{1 \text{ kg}}$$

$$\frac{1 \text{ mole } Cu_3FeS_3}{342.71 \text{ g } Cu_3FeS_3} \; \frac{3 \text{ mole } Cu}{1 \text{ mole } Cu_3FeS_3} \; \frac{63.55 \text{ g } Cu}{1 \text{ mole } Cu} =$$

$$1.39 \times 10^6 \text{ g } Cu$$

$$1.39 \times 10^6 \text{ g } Cu \; \frac{86.3 \text{ g } Cu \text{ (experimental)}}{100. \text{ g } Cu \text{ (theoretical)}} = 1.20 \times 10^6 \text{ g } Cu$$

$$1.20 \times 10^6 \text{ g} \; \frac{1 \text{ kg}}{1000 \text{ g}} = 1.20 \times 10^3 \text{ kg}$$

$$1.20 \times 10^3 \text{ kg} \; \frac{1 \text{ metric ton}}{1000 \text{ kg}} = 1.20 \text{ metric ton } Cu$$