Stoichiometry Problems

1. Upon the addition of heat to an unknown amount of $KClO_3$, 0.96 g of oxygen was liberated, with KCl being the other product. How much $KClO_3$ was present? $2\,KClO_3 \rightarrow 2\,KCl + 3O_2$

$\frac{1\text{ mole } O_2}{32\text{ g}} = \frac{0.96\text{ g}}{x\text{ moles}}$ 2.5 g

$0.030\text{ mole } O_2 \xrightarrow{\times \frac{2}{3}} 0.020\text{ mole } KClO_3 \xrightarrow{\times 122.55\text{ g/n}}$ 2.5 g

2. Given the reaction

$$4\,NH_{3(g)} + 5\,O_{2(g)} \rightarrow 4\,NO_{(g)} + 6\,H_2O_{(g)}$$

how many grams of NH_3 will be required to react with 80 g of O_2?

$80\text{ g } O_2 \xrightarrow{\div 32} 2.5\text{ moles } O_2 \xrightarrow{\times \frac{4}{5}} 2\text{ mole } NH_3 \xrightarrow{\times 17\text{ g/mole}}$ 34 g NH_3 ~~2.5 g~~ 34 g

3. A chemist decides to react 2.0 g of VO with 5.75 g of Fe_2O_3 to produce V_2O_5 and FeO. How many grams of V_2O_5 can be obtained?

limiting Reagent

$2\,VO + 3\,Fe_2O_3 \rightarrow 6\,FeO + V_2O_5$ 2.18 g

$\frac{2\text{ g}}{66.94\text{ g/n}} = 0.0299\text{ mole } VO$

4. Determine the weight of CO_2 and H_2O produced on burning 104 g of C_2H_2 in excess oxygen. $2\,C_2H_2 + 5\,O_2 \rightarrow 4\,CO_2 + 2\,H_2O$ 352 g CO_2 72 g H_2O

$104\text{ g} \xrightarrow{\div 26\text{ g/n}} 4\text{ mole } C_2H_2 \xrightarrow{\times \frac{4}{2}} 8\text{ mole } CO_2 \xrightarrow{\times 44\text{ g/n}} =$ 352 g CO_2

$\xrightarrow{\times \frac{2}{2}} 4\text{ mole } H_2O \xrightarrow{\times 18\text{ g/n}}$ 72 g H_2O

5. Silver bromide, used in photography may be prepared from $AgNO_3$ and NaBr. In this double replacement reaction, calculate the mass of each required to produce 245 g of AgBr? $AgNO_3 + NaBr \rightarrow AgBr + NaNO_3$

$\frac{245\text{ g } AgBr}{188\text{ g/mole}} = 1.30\text{ mole } AgBr \xrightarrow{\times \frac{1}{1}} 1.30\text{ mole } AgNO_3 \xrightarrow{\times 170\text{ g/mole}}$ 222 g $AgNO_3$

$\xrightarrow{\times \frac{1}{1}} 1.30\text{ mole } NaBr \xrightarrow{\times 103\text{ g/mole}}$ 134 g $NaBr$

6. What mass of sulfur must combine with aluminum to form 100 g of aluminum sulfide? $2\,Al + 3\,S \rightarrow Al_2S_3$

$\frac{100\text{ g } Al_2S_3}{150\text{ g/mole}} = 0.667\text{ mole } Al_2S_3 \xrightarrow{\times \frac{3}{1}} 2.0\text{ moles } S \xrightarrow{\times 32\text{ g/mole}}$ 64 g S