

Exercise 9.3a

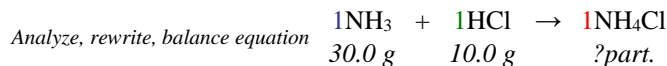
Limiting Reactants

Name: _____

Date: _____ Per: _____

DIRECTIONS: Solve the following problems in the space provided.

1. Given the equation $\text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4\text{Cl}$, find the number of particles of NH_4Cl formed if 30.0 g of NH_3 reacts with 10.0 g of HCl .



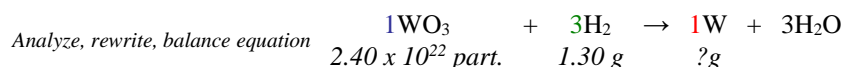
Solve for 1st reactant

$$\frac{30.0\text{ g NH}_3}{17.031\text{g NH}_3} \times \frac{1\text{ mol NH}_3}{1\text{ mol NH}_3} \times \frac{1\text{ mol NH}_4\text{Cl}}{1\text{ mol NH}_3} \times \frac{6.022 \times 10^{23}\text{ part. NH}_4\text{Cl}}{1\text{ mol NH}_4\text{Cl}} = 1.06 \times 10^{24}\text{ part. NH}_4\text{Cl}$$

Solve for 2nd reactant

$$\frac{10.0\text{ g HCl}}{36.461\text{g HCl}} \times \frac{1\text{ mol HCl}}{1\text{ mol HCl}} \times \frac{1\text{ mol NH}_4\text{Cl}}{1\text{ mol HCl}} \times \frac{6.022 \times 10^{23}\text{ part. NH}_4\text{Cl}}{1\text{ mol NH}_4\text{Cl}} = \boxed{1.65 \times 10^{23}\text{ part. NH}_4\text{Cl}}$$

2. Given the equation $\text{WO}_3 + \text{H}_2 \rightarrow \text{W} + \text{H}_2\text{O}$, find the mass of W formed if 2.40×10^{22} particles of WO_3 reacts with 1.30 g of H_2 .



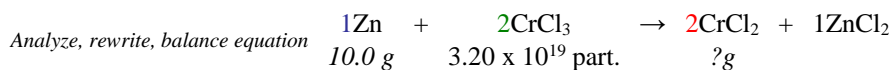
Solve for 1st reactant

$$\frac{2.40 \times 10^{22}\text{ part. WO}_3}{6.022 \times 10^{23}\text{ part. WO}_3} \times \frac{1\text{ mol WO}_3}{1\text{ mol WO}_3} \times \frac{1\text{ mol W}}{1\text{ mol WO}_3} \times \frac{183.84\text{g W}}{1\text{ mol W}} = \boxed{7.33\text{ g W}}$$

Solve for 2nd reactant

$$\frac{1.30\text{ g H}_2}{2.016\text{g H}_2} \times \frac{1\text{ mol H}_2}{2.016\text{g H}_2} \times \frac{1\text{ mol W}}{3\text{ mol H}_2} \times \frac{183.84\text{g W}}{1\text{ mol W}} = 39.6\text{ g W}$$

3. Given the equation $\text{Zn} + \text{CrCl}_3 \rightarrow \text{CrCl}_2 + \text{ZnCl}_2$, find the mass of CrCl_2 formed if 3.20×10^{19} particles of CrCl_3 reacts with 10.0 g Zn .



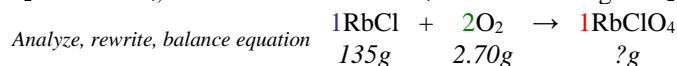
Solve for 1st reactant

$$\frac{10.0\text{ g Zn}}{65.38\text{g Zn}} \times \frac{1\text{ mol Zn}}{1\text{ mol Zn}} \times \frac{2\text{ mol CrCl}_2}{1\text{ mol Zn}} \times \frac{122.902\text{g CrCl}_2}{1\text{ mol CrCl}_2} = 37.6\text{g CrCl}_2$$

Solve for 2nd reactant

$$\frac{3.20 \times 10^{19}\text{ part. CrCl}_3}{6.022 \times 10^{23}\text{ part. CrCl}_3} \times \frac{1\text{ mol CrCl}_3}{6.022 \times 10^{23}\text{ part. CrCl}_3} \times \frac{2\text{ mol CrCl}_2}{2\text{ mol CrCl}_3} \times \frac{122.902\text{g CrCl}_2}{1\text{ mol CrCl}_2} = \boxed{0.00653\text{g CrCl}_2}$$

4. Given the equation $\text{RbCl} + \text{O}_2 \rightarrow \text{RbClO}_4$, find the mass of RbClO_4 formed if 2.70 g of O_2 reacts with 135 g RbCl .



Solve for 1st reactant

$$\frac{135\text{ g RbCl}}{120.921\text{g RbCl}} \times \frac{1\text{ mol RbCl}}{120.921\text{g RbCl}} \times \frac{1\text{ mol RbClO}_4}{1\text{ mol RbCl}} \times \frac{184.917\text{g RbClO}_4}{1\text{ mol RbClO}_4} = 206\text{ g RbClO}_4$$

Solve for 2nd reactant

$$\frac{2.70\text{ g O}_2}{31.998\text{g O}_2} \times \frac{1\text{ mol O}_2}{31.998\text{g O}_2} \times \frac{1\text{ mol RbClO}_4}{2\text{ mol O}_2} \times \frac{184.917\text{g RbClO}_4}{1\text{ mol RbClO}_4} = \boxed{7.80\text{ g RbClO}_4}$$