Stoic[illegible]ometry: Mass-Mass Problems

1. $2KClO_3 \rightarrow 2KCl + 3O_2$

   How many grams of potassium chloride are produced if 25 g of potassium chlorate decompose?

   $25\,g\,KClO_3 \times \frac{1\,mol\,KClO_3}{122.55\,g\,KClO_3} \times \frac{2\,mol\,KCl}{2\,mol\,KClO_3} \times \frac{74.55\,g\,KCl}{1\,mol\,KCl} =$ **15 g KCl**

2. $N_2 + 3H_2 \rightarrow 2NH_3$

   How many grams of hydr[illegible]gen are necessary to react completely with 50.0 g of nitrogen in the above reaction?

   $50.0\,g\,N_2 \times \frac{1\,mol\,N_2}{28.02\,g\,N_2} \times \frac{3\,mol\,H_2}{1\,mol\,N_2} \times \frac{2.02\,g\,H_2}{1\,mol\,H_2} =$ **10.8 g H_2**

3. How many grams of ammonia are produced in the reaction in Problem 2?

   $50.0\,g\,N_2 \times \frac{1\,mol\,N_2}{28.02\,g\,N_2} \times \frac{2\,mol\,NH_3}{1\,mol\,N_2} \times \frac{17.04\,g\,NH_3}{1\,mol\,NH_3}$ **60.8 g NH_3**

4. $2AgNO_3 + BaCl_2 \rightarrow 2AgCl + Ba(NO_3)_2$

   How many grams of silver chloride are produced from 5.0 g of silver nitrate reacting with an excess of barium chloride?

   $5.0\,g\,AgNO_3 \times \frac{1\,mol\,AgNO_3}{169.91\,g\,AgNO_3} \times \frac{2\,mol\,AgCl}{2\,mol\,AgNO_3} \times \frac{143.35\,g\,AgCl}{1\,mol\,AgCl}$ **4.2 g AgCl**

5. How much barium chloride is necessary to react with the silver nitrate in Problem 4?

   $5.0\,g\,AgNO_3 \times \frac{1\,mol\,AgNO_3}{169.91\,g\,AgNO_3} \times \frac{1\,mol\,BaCl_2}{2\,mol\,AgNO_3} \times \frac{208.20\,g\,BaCl_2}{1\,mol\,BaCl_2} =$ **3.1 g $BaCl_2$**

Stoichiometry: Mixed Problems

1. $N_2 + 3H_2 \rightarrow 2NH_3$

   What volume of NH_3 at STP is produced if 25.0 g of N_2 is reacted with an excess of H_2?

   $25.0\,g\,N_2 \times \frac{1\,mol\,N_2}{28.02\,g\,N_2} \times \frac{2\,mol\,NH_3}{1\,mol\,N_2} \times \frac{22.4\,L\,NH_3}{1\,mol\,NH_3} =$ **40.0 L**

2. $2KClO_3 \rightarrow 2KCl + 3O_2$

   If 5.0 g of $KClO_3$ is decomposed, what volume of O_2 is produced at STP?

   $5.0\,g\,KClO_3 \times \frac{1\,mol\,KClO_3}{122.55\,g\,KClO_3} \times \frac{3\,mol\,O_2}{2\,mol\,KClO_3} \times \frac{22.4\,L\,O_2}{1\,mol\,O_2} =$ **1.4 L**

3. How many grams of KCl are produced in Problem 2?

   $5.0\,g\,KClO_3 \times \frac{1\,mol\,KClO_3}{122.55\,g\,KClO_3} \times \frac{2\,mol\,KCl}{2\,mol\,KClO_3} \times \frac{74.55\,g\,KCl}{1\,mol\,KCl} =$ **3.0 g**

4. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

   What volume of hydrogen at STP is produced when 2.5 g of zinc react with an excess of hydrochloric acid?

   $2.5\,g\,Zn \times \frac{1\,mol\,Zn}{65.39\,g\,Zn} \times \frac{1\,mol\,H_2}{1\,mol\,Zn} \times \frac{22.4\,L\,H_2}{1\,mol\,H_2} =$ **0.86 L**

5. $H_2SO_4 + 2NaOH \rightarrow H_2O + Na_2SO_4$

   How many molecules of water are produced if 2.0 g of sodium sulfate are produced in the above reaction?

   $2.0\,g\,Na_2SO_4 \times \frac{1\,mol\,Na_2SO_4}{142.05\,g\,Na_2SO_4} \times \frac{1\,mol\,H_2O}{1\,mol\,Na_2SO_4} \times \frac{6.02\times10^{23}\,molec.\,H_2O}{1\,mol\,H_2O} =$ **8.5×10^{21} molec**

6. $2AlCl_3 \rightarrow 2Al + 3Cl_2$

   If 10.0 g of aluminum chloride are decomposed, how many molecules of Cl_2 are produced?

   $10.0\,g\,AlCl_3 \times \frac{1\,mol\,AlCl_3}{133.33\,g\,AlCl_3} \times \frac{3\,mol\,Cl_2}{2\,mol\,AlCl_3} \times \frac{6.02\times10^{23}\,molec.\,Cl_2}{1\,mol\,Cl_2} =$ **6.77×10^{22} molec**

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