Stoichiometry Review WS #2 Name: Zack Lee

Calculate the number of grams of **bolded** product.

Na H_2O Na OH

1. 105 grams of sodium reacts with 105 grams of water to produce **sodium hydroxide** and hydrogen gas. $2Na + 2H_2O \rightarrow 2NaOH + 1H_2$

$$105\,g\,Na \times \frac{1\,mol\,Na}{22.99\,g\,Na} \times \frac{2\,mol\,NaOH}{2\,mol\,Na} = 4.57\,mol\,NaOH$$

$$105\,g\,H_2O \times \frac{1\,mol\,H_2O}{18.01\,g\,H_2O} \times \frac{2\,mol\,NaOH}{2\,mol\,H_2O} = 5.83\,mol\,NaOH$$

$$4.57\,mol\,NaOH \times \frac{40.00\,g\,NaOH}{mol\,NaOH} = \boxed{183\,g\,NaOH}$$

2. 105 grams of copper and 105 grams of sulfur react to produce **copper (I) sulfide**. $4Cu + 1S_2 \rightarrow 2Cu_2S$

$$105\,g\,Cu \times \frac{1\,mol\,Cu}{63.55\,g\,Cu} \times \frac{2\,mol\,Cu_2S}{4\,mol\,Cu} = 0.826\,mol\,Cu_2S$$

$$105\,g\,S_2 \times \frac{1\,mol\,S_2}{64.13\,g\,S_2} \times \frac{2\,mol\,Cu_2S}{1\,mol\,S_2} = 3.27\,mol\,Cu_2S$$

$$0.826\,mol\,Cu_2S \times \frac{159.2\,g\,Cu_2S}{1\,mol\,Cu_2S} = \boxed{131\,g\,Cu_2S}$$

3. **Boron trichloride** is the product of the reaction between 105 grams of boron and 105 grams of chlorine gas. $2B + 3Cl_2 \rightarrow 2BCl_3$

$$105\,g\,B \times \frac{1\,mol\,B}{10.81\,g\,B} \times \frac{2\,mol\,BCl_3}{2\,mol\,B} = 9.71\,mol\,BCl_3$$

$$9.71\,mol\,BCl_3 \times \frac{117.2\,g\,BCl_3}{1\,mol\,BCl_3} = \boxed{1136\,g\,BCl_3}$$

$$105\,g\,Cl_2 \times \frac{1\,mol\,Cl_2}{70.91\,g\,Cl_2} \times \frac{2\,mol\,BCl_3}{3\,mol\,Cl_2} = 0.987\,mol\,BCl_3$$

4. In a rocket, 105 grams of hydrazine (N_2H_2) and 105 grams of dinitrogen tetroxide are mixed. They react vigorously to form **nitrogen** gas and water. The energy produced from this reaction is great enough to lift the rocket into space. $4N_2H_2 + 1N_2O_4 \rightarrow 5N_2 + 4H_2O$

$$105\,g\,N_2H_2 \times \frac{1\,mol\,N_2H_2}{30.03\,g\,N_2H_2} \times \frac{5\,mol\,N_2}{4\,mol\,N_2H_2} = 4.37\,mol\,N_2$$

$$105\,g\,N_2O_4 \times \frac{1\,mol\,N_2O_4}{92.01\,g\,N_2O_4} \times \frac{5\,mol\,N_2}{1\,mol\,N_2O_4} = 5.71\,mol\,N_2$$

$$4.37\,mol\,N_2 \times \frac{28.01\,g\,N_2}{1\,mol\,N_2} = \boxed{122\,g\,N_2}$$

$Ag^{1+}NO_3^{1-}$ Cu^{2+} Cl^{1-}

5. In a double displacement reaction, silver nitrate and copper (II) chloride combine to form **silver chloride** and copper (II) nitrate.

$2AgNO_3 + 1CuCl_2 \rightarrow 2AgCl + 1Cu(NO_3)_2$

6. Liquid octane (C_8H_{18}) combusts to form **carbon dioxide** and water.

$2C_8H_{18} + 25O_2 \rightarrow 16CO_2 + 18H_2O$

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