

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

1. 105 grams of sodium reacts with 105 grams of water to produce **sodium hydroxide** and hydrogen gas.
- $$2 \text{Na} + 2 \text{H}_2\text{O} \rightarrow 2 \text{NaOH} + 1 \text{H}_2$$

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

$$105 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.01 \text{ g H}_2\text{O}} \times \frac{2 \text{ mol NaOH}}{2 \text{ mol H}_2\text{O}} = 5.83 \text{ mol NaOH}$$

$$4.57 \text{ mol NaOH} \times \frac{40.00 \text{ g NaOH}}{1 \text{ mol NaOH}} = \boxed{183 \text{ g NaOH}}$$

2. 105 grams of copper and 105 grams of sulfur react to produce **copper (I) sulfide**.



$$105 \text{ g Cu} \times \frac{1 \text{ mol Cu}}{63.55 \text{ g Cu}} \times \frac{2 \text{ mol Cu}_2\text{S}}{4 \text{ mol Cu}} = 0.826 \text{ mol Cu}_2\text{S}$$

$$105 \text{ g S}_2 \times \frac{1 \text{ mol S}_2}{64.13 \text{ g S}_2} \times \frac{2 \text{ mol Cu}_2\text{S}}{1 \text{ mol S}_2} = 3.27 \text{ mol Cu}_2\text{S}$$

$$0.826 \text{ mol Cu}_2\text{S} \times \frac{159.2 \text{ g Cu}_2\text{S}}{1 \text{ mol Cu}_2\text{S}} = \boxed{131 \text{ g Cu}_2\text{S}}$$

3. **Boron trichloride** is the product of the reaction between 105 grams of boron and 105 grams of chlorine gas.



$$105 \text{ g B} \times \frac{1 \text{ mol B}}{10.81 \text{ g B}} \times \frac{2 \text{ mol BCl}_3}{2 \text{ mol B}} = 9.71 \text{ mol BCl}_3$$

$$0.989 \text{ mol BCl}_3 \times \frac{117.2 \text{ g BCl}_3}{1 \text{ mol BCl}_3} = \boxed{116 \text{ g BCl}_3}$$

$$105 \text{ g Cl}_2 \times \frac{1 \text{ mol Cl}_2}{70.91 \text{ g Cl}_2} \times \frac{2 \text{ mol BCl}_3}{3 \text{ mol Cl}_2} = 0.989 \text{ mol BCl}_3$$

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.

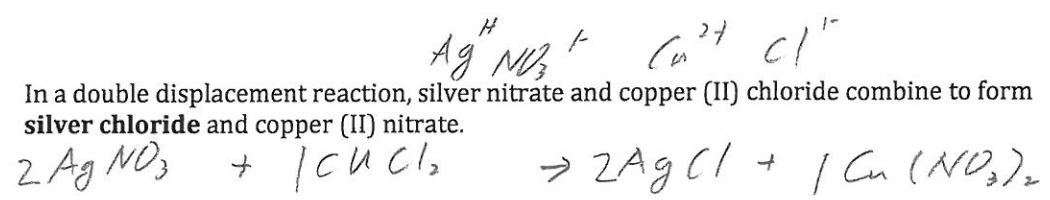


$$105 \text{ g N}_2\text{H}_2 \times \frac{1 \text{ mol N}_2\text{H}_2}{30.03 \text{ g N}_2\text{H}_2} \times \frac{5 \text{ mol N}_2}{4 \text{ mol N}_2\text{H}_2} = 4.37 \text{ mol N}_2$$

$$105 \text{ g N}_2\text{O}_4 \times \frac{1 \text{ mol N}_2\text{O}_4}{92.01 \text{ g N}_2\text{O}_4} \times \frac{5 \text{ mol N}_2}{1 \text{ mol N}_2\text{O}_4} = 5.71 \text{ mol N}_2$$

$$4.37 \text{ mol N}_2 \times \frac{28.01 \text{ g N}_2}{1 \text{ mol N}_2} = \boxed{122 \text{ g N}_2}$$

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



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

