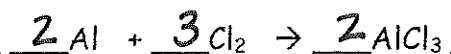


Answer each of the following questions using the equation provided. BE SURE TO BALANCE EACH EQUATION BEFORE SOLVING ANY PROBLEMS. SHOW ALL WORK.

1. In a reaction between the elements aluminum and chlorine, aluminum chloride is produced.



- a. 2 moles of Al will react with 3 mole(s) of Cl<sub>2</sub> to produce 2 mole(s) of AlCl<sub>3</sub>.

- b. How many grams of AlCl<sub>3</sub> will be produced if 2.50 moles of Al react?

$$2.50 \text{ mol Al} \times \frac{2 \text{ mol AlCl}_3}{2 \text{ mol Al}} \times \frac{133.33 \text{ g AlCl}_3}{1 \text{ mol AlCl}_3} = \boxed{333 \text{ g AlCl}_3}$$

- c. How many moles of Cl<sub>2</sub> must react to produce 12.3 g of AlCl<sub>3</sub>?

$$12.3 \text{ g AlCl}_3 \times \frac{1 \text{ mol AlCl}_3}{133.33 \text{ g AlCl}_3} \times \frac{3 \text{ mol Cl}_2}{2 \text{ mol AlCl}_3} = \boxed{.138 \text{ mol Cl}_2}$$

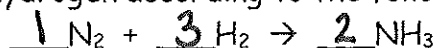
- d. How many grams of aluminum will react with 3.4 moles of chlorine?

$$3.4 \text{ mol Cl}_2 \times \frac{2 \text{ mol Al}}{3 \text{ mol Cl}_2} \times \frac{26.98 \text{ g Al}}{1 \text{ mol Al}} = \boxed{61 \text{ g Al}}$$

- e. If 17 grams of aluminum react, how many moles of aluminum chloride will be produced?

$$17 \text{ g Al} \times \frac{1 \text{ mol Al}}{26.98 \text{ g Al}} \times \frac{2 \text{ mol AlCl}_3}{2 \text{ mol Al}} = \boxed{1.3 \text{ mol AlCl}_3}$$

2. The ammonia ( $\text{NH}_3$ ) used to make fertilizers for lawns and gardens is made by reacting nitrogen and hydrogen according to the following reaction.



- a. Determine the mass in grams of  $\text{NH}_3$  formed from 1.34 moles of nitrogen.

$$1.34 \text{ mol } \cancel{\text{N}_2} \times \frac{2 \text{ mol } \cancel{\text{NH}_3}}{1 \text{ mol } \cancel{\text{N}_2}} \times \frac{17.03 \text{ g } \text{NH}_3}{1 \text{ mol } \cancel{\text{NH}_3}} = \boxed{45.6 \text{ g } \text{NH}_3}$$

- b. What is the mass in grams of hydrogen required to react with 1.34 moles of nitrogen?

$$1.34 \text{ mol } \cancel{\text{N}_2} \times \frac{3 \text{ mol } \cancel{\text{H}_2}}{1 \text{ mol } \cancel{\text{N}_2}} \times \frac{2.016 \text{ g } \text{H}_2}{1 \text{ mol } \cancel{\text{H}_2}} = \boxed{8.10 \text{ g } \text{H}_2}$$

- c. How many moles of nitrogen are required to produce 11.7 moles of  $\text{NH}_3$ ?

$$11.7 \text{ mol } \cancel{\text{NH}_3} \times \frac{1 \text{ mol } \text{N}_2}{2 \text{ mol } \cancel{\text{NH}_3}} = 5.85 \text{ mol } \text{N}_2$$

- d. How many moles of nitrogen are required to produce 11.7 grams of  $\text{NH}_3$ ?

$$11.7 \text{ g } \cancel{\text{NH}_3} \times \frac{1 \text{ mol } \cancel{\text{NH}_3}}{17.03 \text{ g } \cancel{\text{NH}_3}} \times \frac{1 \text{ mol } \text{N}_2}{2 \text{ mol } \cancel{\text{NH}_3}} = \boxed{.344 \text{ mol } \text{N}_2}$$

- e. How many grams of hydrogen are required to form 3.5 moles of  $\text{NH}_3$ ?

$$3.5 \text{ mol } \cancel{\text{NH}_3} \times \frac{3 \text{ mol } \cancel{\text{H}_2}}{2 \text{ mol } \cancel{\text{NH}_3}} \times \frac{2.016 \text{ g } \text{H}_2}{1 \text{ mol } \cancel{\text{H}_2}} = 11 \text{ g } \text{H}_2$$