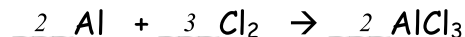


Answer each of the following questions using the equation provided. BE SURE TO BALANCE EACH EQUATION BEFORE SOLVING ANY PROBLEMS. SHOW ALL WORK.

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



- a. 2 moles of Al will react with $\frac{3}{2}$ mole(s) of Cl_2 to produce $\frac{2}{3}$ mole(s) of AlCl_3 .

- b. How many grams of AlCl_3 will be produced if 2.50 moles of Al react?

$$? \text{ g AlCl}_3 = 2.50 \text{ mol Al} \times \frac{2 \text{ mol AlCl}_3}{2 \text{ mol Al}} \times \frac{133.5 \text{ g AlCl}_3}{1 \text{ mol AlCl}_3} = 334 \text{ g AlCl}_3$$

- c. How many moles of Cl_2 must react to produce 12.3 g of AlCl_3 ?

$$? \text{ mol Cl}_2 = 12.3 \text{ g AlCl}_3 \times \frac{1 \text{ mol AlCl}_3}{133.5 \text{ g AlCl}_3} \times \frac{3 \text{ mol Cl}_2}{2 \text{ mol AlCl}_3} = 0.138 \text{ mol Cl}_2$$

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

$$? \text{ g Al} = 3.4 \text{ mol Cl}_2 \times \frac{2 \text{ mol Al}}{3 \text{ mol Cl}_2} \times \frac{27.0 \text{ g Al}}{1 \text{ mol Al}} = 61.2 \text{ g Al}$$

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

$$? \text{ mol AlCl}_3 = 17 \text{ g Al} \times \frac{1 \text{ mol Al}}{27.0 \text{ g Al}} \times \frac{2 \text{ mol AlCl}_3}{2 \text{ mol Al}} = 0.63 \text{ mol AlCl}_3$$

2. The ammonia (NH₃) 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 NH₃ formed from 1.34 moles of nitrogen.

$$? \text{ g } NH_3 = 1.34 \cancel{\text{ mol } N_2} \times \frac{2 \cancel{\text{ mol } NH_3}}{1 \cancel{\text{ mol } N_2}} \times \frac{17.0 \text{ g } NH_3}{1 \cancel{\text{ mol } NH_3}} = 45.6 \text{ g } NH_3$$

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

$$? \text{ g } H_2 = 1.34 \cancel{\text{ mol } N_2} \times \frac{3 \cancel{\text{ mol } H_2}}{1 \cancel{\text{ mol } N_2}} \times \frac{2.0 \text{ g } H_2}{1 \cancel{\text{ mol } H_2}} = 8.0 \text{ g } H_2$$

- c. How many moles of nitrogen are required to produce 11.7 moles of NH₃?

$$? \text{ mol } N_2 = 11.7 \cancel{\text{ mol } NH_3} \times \frac{1 \text{ mol } N_2}{2 \cancel{\text{ mol } NH_3}} = 5.85 \text{ mol } N_2$$

- d. How many moles of nitrogen are required to produce 11.7 grams of NH₃?

$$? \text{ mol } N_2 = 11.7 \cancel{\text{ g } NH_3} \times \frac{1 \cancel{\text{ mol } NH_3}}{17.0 \cancel{\text{ g } NH_3}} \times \frac{1 \text{ mol } N_2}{2 \cancel{\text{ mol } NH_3}} = 0.344 \text{ mol } N_2$$

- e. How many grams of hydrogen are required to form 3.5 moles of NH₃?

$$? \text{ g } H_2 = 3.5 \cancel{\text{ mol } NH_3} \times \frac{3 \cancel{\text{ mol } H_2}}{2 \cancel{\text{ mol } NH_3}} \times \frac{2.0 \text{ g } H_2}{1 \cancel{\text{ mol } H_2}} = 11 \text{ g } H_2$$