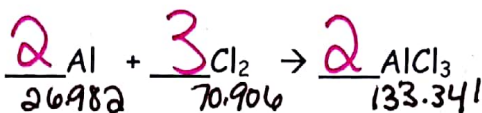


Answer each of the following questions using the equation provided. BE SURE TO BALANCE EACH EQUATION BEFORE SOLVING ANY PROBLEMS. SHOW ALL WORK.

always balance equations before solving

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 Cl₂ to produce 2 mole(s) of AlCl₃. *(from balanced equation above)*

- b. How many grams of AlCl₃ will be produced if 2.50 moles of Al react?

mole Al $\xrightarrow{\text{balanced eq}}$ mole AlCl₃ $\xrightarrow{\text{molar mass}}$ g AlCl₃

$$\frac{2.50 \text{ mol Al}}{1} \times \frac{2 \text{ mole AlCl}_3}{2 \text{ mole Al}} \times \frac{133.341 \text{ g}}{1 \text{ mole AlCl}_3} = 333.53 \text{ g AlCl}_3$$

- c. How many moles of Cl₂ must react to produce 12.3 g of AlCl₃?

g AlCl₃ \rightarrow mol AlCl₃ \rightarrow mol Cl₂

$$\frac{12.3 \text{ g AlCl}_3}{1} \times \frac{1 \text{ mol AlCl}_3}{133.341 \text{ g AlCl}_3} \times \frac{3 \text{ mol Cl}_2}{2 \text{ mol AlCl}_3} = 0.138 \text{ mol Cl}_2$$

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

* mol Cl₂ \rightarrow mol Al \rightarrow g Al

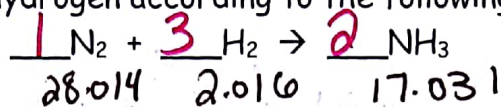
$$\frac{3.4 \text{ mol Cl}_2}{1} \times \frac{2 \text{ mol Al}}{3 \text{ mol Cl}_2} \times \frac{26.982 \text{ g Al}}{1 \text{ mol Al}} = 61.16 \text{ g Al}$$

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

g Al \rightarrow mol Al \rightarrow mol AlCl₃

$$\frac{17 \text{ g Al}}{1} \times \frac{1 \text{ mol Al}}{26.982 \text{ g Al}} \times \frac{2 \text{ mol AlCl}_3}{2 \text{ mol Al}} = 0.63 \text{ mol AlCl}_3$$

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.

$$\frac{1.34 \text{ mol N}_2}{1} \times \frac{2 \text{ mol NH}_3}{1 \text{ mol N}_2} \times \frac{17.031 \text{ g}}{1 \text{ mol NH}_3} = 45.6 \text{ g NH}_3$$

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

$$\frac{1.34 \text{ mole N}_2}{1} \times \frac{3 \text{ mol H}_2}{1 \text{ mol N}_2} \times \frac{2.016 \text{ g}}{1 \text{ mol H}_2} = 8.104 \text{ g H}_2$$

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

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

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

$$\frac{11.7 \text{ g NH}_3}{1} \times \frac{1 \text{ mol NH}_3}{17.031 \text{ g}} \times \frac{1 \text{ mol N}_2}{2 \text{ mol NH}_3} = 0.34 \text{ mol N}_2$$

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

$$\frac{3.5 \text{ mol NH}_3}{1} \times \frac{3 \text{ mol H}_2}{2 \text{ mol NH}_3} \times \frac{2.016 \text{ g}}{1 \text{ mol H}_2} = 9.072 \text{ g H}_2$$