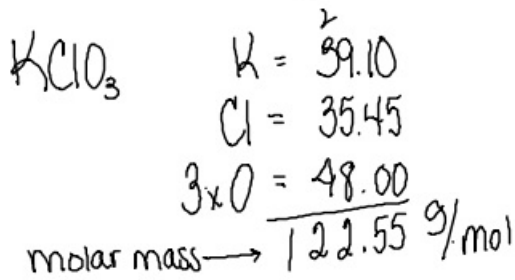


3/7 Stoichiometry

The relationship between the relative quantities of substances taking part in a reaction or forming a compound.

The mole

1 mole = 22.4 L of gas = 6.022×10^{23} atoms ^{or} molecules = molar mass (g from P.T.)



when converting using the mole system:

$$\text{amt given} \times \frac{\# \text{ label needed}}{\# \text{ label given}} =$$

Practice:

① given: 2.5 mol Ca need: ? g

$$2.5 \text{ mol Ca} \times \frac{40.08 \text{ g Ca}}{1 \text{ mol Ca}} = 100.2 \rightarrow 100 \text{ g Ca or } 1.0 \times 10^2 \text{ g Ca}$$

② given: 200 L F₂ need: ? atoms

$$200 \text{ L F}_2 \times \frac{6.022 \times 10^{23} \text{ atoms}}{22.4 \text{ L}} = \boxed{5 \times 10^{24} \text{ atoms}}$$

③ given: 4 mol Al need: ? g (m.m. = 26.98g)

$$\begin{array}{l} 4 \text{ mol Al} \times \frac{26.98 \text{ g}}{1 \text{ mol}} = 107.9 \rightarrow 100 \text{ g or } \boxed{1 \times 10^2 \text{ g Al}} \\ \uparrow \\ \text{1sf} \end{array}$$

$$1 \text{ mole} = 6.022 \times 10^{23} \begin{matrix} \text{atoms} \\ \text{-or-} \\ \text{molecules} \end{matrix} = 22.4 \text{ L of gas} = \text{molar mass in grams (P.T.)}$$

- ① Determine the given amount
- ② Determine what's needed?
- ③ Determine molar mass if needed
- ④ Create conversion factor (2 of 4 mole equalities)

$$\text{amt given} \times \frac{\# \text{ needed label}}{\# \text{ given label}} =$$

Practice:

- ① given: 2.5 mol Ca needed: ? grams of Ca (molar mass of Ca 40.08g)

$$\underbrace{2.5 \text{ mol Ca}}_{2 \text{ of}} \times \frac{40.08 \text{ g Ca}}{1 \text{ mol}} = \frac{100.2 \text{ g Ca}}{100 \text{ g Ca}} \frac{1.002 \times 10^2 \text{ g Ca}}{1.0 \times 10^2 \text{ g Ca}}$$

- ② given: 200 L F need: ? atoms F

$$\underbrace{200 \text{ L F}}_{1 \text{ sf}} \times \frac{6.022 \times 10^{23} \text{ atoms F}}{22.4 \text{ L F}} = \frac{5.37 \times 10^{24} \text{ atoms F}}{5 \times 10^{24} \text{ atoms F}}$$

- ③ given: 4 mol Al needs: ? grams of Al

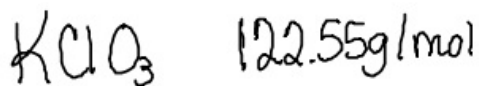
$$4 \text{ mol Al} \times \frac{26.98 \text{ g Al}}{1 \text{ mol Al}} = 107.92 \text{ g Al} \rightarrow 100 \text{ g Al}$$

$$537258 \xrightarrow{1 \text{ sf}} 500000$$

$$\frac{1.0792 \times 10^2 \text{ g Al}}{1 \times 10^2}$$

Percent Composition (give 2 decimal places)

$$\frac{\text{the total of one element}}{\text{the total of molecule}} \times 100$$



$$\text{K} \frac{39.10\text{g}}{122.55\text{g}} \times 100 = 31.92\% \text{K}$$

$$\text{Cl} \frac{35.45\text{g}}{122.55\text{g}} \times 100 = 28.93\% \text{Cl}$$

$$\text{O}_3 \frac{48.00\text{g}}{122.55\text{g}} \times 100 = 39.17\% \text{O}$$

① $\text{HCl} = 36.46\text{g/mol}$

$$\text{H} \frac{1.01\text{g}}{36.46\text{g}} \times 100 = 2.77\% \text{H}$$

$$\frac{35.45\text{g}}{36.46\text{g}} \times 100 = 97.23\% \text{Cl}$$

② Ag 63.50% Ag

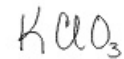
N 8.25% N

O 28.25% O

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Stoichiometry:

$$1 \text{ mole} = 22.4 \text{ L of gas} = 6.022 \times 10^{23} \text{ atoms or molecules} = \text{molar mass in grams (from the Per. Table)} \\ * 2 \text{ decimal places}$$



$$\text{K} \quad 39.10 \text{ g}$$

$$\text{Cl} \quad 35.45 \text{ g}$$

$$3 \times \text{O} \quad 48.00 \text{ g} \\ \hline 122.55 \text{ g/mol}$$

$$\text{amt given} \times \frac{\# \text{ label needed}}{\# \text{ label given}} =$$

$$(1 \text{ mole}) = 6.022 \times 10^{23} \text{ atoms or molecules} = 22.4 \text{ L of gas} = \text{molar mass in grams (P.T.)}$$

Practice:

$$\textcircled{1} \text{ given: } 2.5 \text{ mol Ca} \quad \text{need: } ? \text{ g Ca}$$

$$2.5 \text{ mol Ca} \times \frac{40.08 \text{ g Ca}}{1 \text{ mol}} = 100.2 \text{ g Ca} \quad \text{ans. } 1.0 \times 10^2 \text{ g Ca}$$

on each card (4 cards)

$$1 \text{ mole}$$

$$6.022 \times 10^{23} \text{ atoms or molecules}$$

$$22.4 \text{ L of gas}$$

$$\text{molar mass from P.T.}$$

$$\textcircled{2} \text{ given: } 200 \text{ L F} \quad \text{need: } ? \text{ atoms of F}$$

$$200 \text{ L F} \times \frac{6.022 \times 10^{23} \text{ atoms}}{22.4 \text{ L}} = 5.37 \times 10^{24} \text{ atoms of F}$$

$$\textcircled{3} \text{ given: } 4 \text{ mol Al} \quad \text{need: } ? \text{ grams of Al}$$

$$4 \text{ mol Al} \times \frac{26.98 \text{ g Al}}{1 \text{ mol Al}} = 107.92 \text{ g Al}$$

$$\textcircled{5} \text{ given: } 6.0 \text{ L O}_2 \quad \text{need: } ? \text{ g O}_2$$

$$6.0 \text{ L O}_2 \times \frac{32.00 \text{ g O}_2}{22.4 \text{ L O}_2} = 85.714 \text{ g O}_2 \rightarrow 8.6 \text{ g O}_2$$

Percent Composition (2 decimal places)

$\frac{\text{the mass of the element}}{\text{molar mass of the compound}} \times 100$

$$\text{KClO}_3 = 122.55 \text{ g/mol}$$

$$\% \text{K} \quad \frac{39.10 \text{ g}}{122.55 \text{ g}} \times 100 = \boxed{31.91\% \text{ K}}$$

$\% \text{Cl}$

$$\% \text{O} \quad \frac{35.45 \text{ g}}{122.55 \text{ g}} \times 100 = \boxed{28.93\% \text{ Cl}}$$

$$\frac{48.00 \text{ g}}{122.55 \text{ g}} \times 100 = \boxed{39.17\% \text{ O}_3}$$

① $\text{HCl} = 36.46 \text{ g/mol}$

$$\text{H} \quad \frac{1.01 \text{ g}}{36.46 \text{ g}} \times 100 = \boxed{2.77\% \text{ H}}$$

$$\frac{35.45 \text{ g}}{36.46 \text{ g}} \times 100 = \boxed{97.23\% \text{ Cl}}$$

②

Ag	63.50% Ag
N	8.25% N
O	28.25% O

③ $\text{BaCrO}_4 = 253.33 \text{ g/mol}$

$$\frac{137.33 \text{ g}}{253.33 \text{ g}} \times 100 = \boxed{54.20\% \text{ Ba}}$$

$$\frac{64.00 \text{ g}}{253.33 \text{ g}} \times 100 = \boxed{25.26\% \text{ O}}$$

$$\frac{52.00 \text{ g}}{253.33 \text{ g}} \times 100 = \boxed{20.53\% \text{ Cr}}$$

Conversion #6 = $\boxed{1.2 \times 10^{24} \text{ atoms}}$