1. Mass ↔ Moles

Moles=Mass (g)Molar Mass (g/mol)

Or rearranged:

Moles = Molar Mass(g/mol) × Mass (g)

This lets you convert between the amount you weigh on a balance and the number of moles.

2. Moles ↔ Particles

Number of particles=Moles$\times 6.022\times 10^{23}$

Or rearranged:

Moles = Number of particles ÷ 6.022×10^{23}

This formula lets you calculate how many atoms, molecules, or ions are in a given sample.

3. Moles ↔ Volume of Gas (at STP)

For gases at **STP** (standard temperature and pressure: 0°C, 1 atm):

Volume (L) = Moles × 22.4Lmol

Or:

Moles = Volume (L22.4Lmol

This is especially useful for gas calculations in reactions.

4. Moles ↔ Volume of Gas (Room Conditions)

At room temperature (around 25 °C) and 1 atm pressure, the molar gas volume is about **24 dm^3 (24 L)** instead of 22.4 L.

Moles = Volume (dm^3) ÷ 24 dm^3/mol

This is very common in high school and introductory college chemistry.

5. Moles in Solution (Using Concentration)

N = c×Vn = c × Vn = c×V

Where:

- nnn = number of moles
- ccc = concentration (mol/dm^3)

- VVV = volume of solution (dm^3)

If volume is given in cm^3, convert to dm^3 first by dividing by 1000.

6. Mole Ratios from Balanced Equations

Moles of substance ACoefficient of A = Moles of substance BCoefficient of B

This lets you use the **coefficients from a balanced chemical equation** to relate the amounts of reactants and products.