

P	V	n	T	R
Pascals (Pa)	m ³	mol	K	8.314 J/mol/K
atm	dm ³	mol	K	0.08206 atm dm ³ /mol K

One **mole** of substance is the amount of that substance that has the same number of specific particles as there are atoms in exactly 12 g of the carbon-12 isotope.

$$\text{Amount of substance (mol)} = \frac{\text{mass (g)}}{\text{molar mass } (\frac{\text{g}}{\text{mol}})}$$

The number of particles in one mole of a substance is 6.02×10^{23} . This number is called the Avogadro constant.

$$\text{number of particles} = \text{amount of substance (mol)} \times \text{Avogadro constant}$$

$$\text{Concentration } \left(\frac{\text{mol}}{\text{dm}^3} \right) = \frac{\text{number of moles of solute (mol)}}{\text{total volume of solution (dm}^3\text{)}} \\ (1 \text{ m}^3 = 1000 \text{ dm}^3)$$

Molar gas volume

Equal volumes of gases at the same temperature and pressure contain same number of atoms.

One mole of a gas occupies 24 dm³ at standard pressure (1 atm) and temperature (273 K).

$$\text{Volume of gas (dm}^3\text{)} = \text{number of moles} \times 24$$

$$\text{percentage yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100$$

$$\text{atom economy} = \frac{\text{mass of useful products}}{\text{mass of all reactants}} \times 100$$

Constructing balanced chemical equations

The number of atoms for each element is the same on both the reactant and product side.

Amount of substance

Ideal gas equation

$$P \propto \frac{1}{V} \text{ (at constant temperature)} \\ V \propto T \text{ (at constant pressure)} \\ PV = nRT$$

Relative Atomic Mass (A_r) & Relative Molecular Mass (M_r)

$$(M_r) = \frac{\text{Average mass of one molecule}}{\text{one - twelfth of the mass of one carbon - 12 atom}}$$

$$(A_r) = \frac{\text{Average mass of one atom of an element}}{\text{one - twelfth of the mass of one carbon - 12 atom}}$$

Empirical and molecular formula

Steps for finding empirical formula:

- Divide the composition of mass by the relative atomic mass.
- Divide the answer obtained by the smallest value obtained amongst the results
- Convert the number obtained to the nearest whole number

The **molecular formula** is determined by the empirical formula and relative molecular mass.