Calculating moles

Stoichiometry

$$n = \frac{m}{M}$$

- m = mass (g)
- M = Molar mass ($g \cdot mol^{-1}$)

* Calculate moles if given mass and the molar mass
* Work backwards to get mass or molar mass

$$n = \frac{N}{N_A}$$

- N = number of particles
- N_A = Avogadro's number $6{,}02 \times 10^{23}$

* Calculate moles if number of particles / compounds / formula units / atoms are given
* Calculate number of particles / compounds / formula units or atoms if you have moles

① $$c = \frac{n}{V}$$

- c = concentration ($mol \cdot dm^{-3}$)
- V = volume (dm^3)

OR

② $$c = \frac{m}{MV}$$

- m = mass (g)
- M = molar mass ($g \cdot mol^{-1}$)
- V = volume (dm^3)

* calculate concentration of a solution if you have moles (formula 1) or mass (formula 2)
* calculate number of moles if you have concentration + Volume

$$n = \frac{V}{V_m}$$

- V = volume (dm^3)
- V_m = molar volume at STP is 22,4 dm^3

For gases ONLY

* Calculate moles of a gas if you are given volume
* Calculate volume of a gas

Other calculations

Stoichiometry

* Mole ratios *

$N_2 + 3H_2 \rightarrow 2NH_3$

* Big numbers (coefficients) in a balanced chemical equation
* Use mole ratios to go from one compound / molecule to another

Empirical Formula

* take percentages as mass (g)
* convert each elements mass to moles using $n = \frac{m}{M}$
* Divide each mole answer by the smallest mole answer
* make sure you have whole numbers

Percentage composition (percentage by mass)

$$\%\ element = \frac{mass\ of\ element\ (g \cdot mol^{-1})}{mass\ of\ compound\ (g \cdot mol^{-1})} \times 100$$

Percentage yield

$$\%\ yield = \frac{Actual\ yield}{Theoretical\ yield} \times 100$$

Actual yield: What was actually produced

Theoretical yield: what theoretically can be produced

Percentage purity

$$\%\ purity = \frac{pure\ mols/mass}{impure\ mols/mass} \times 100$$

impure mols/mass: this is the total mass (meaning pure and impure)