

AQA GCSE Chemistry

Topic 3: Quantitative chemistry

Use of amount of substance in relation to masses of pure substances

Notes

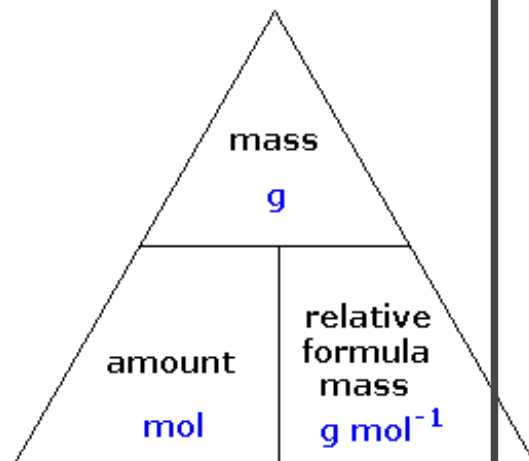
(Content in bold is for Higher Tier only)





Moles

- Chemical amounts are measured in moles. The symbol for the unit mole is mol.
- The mass of one mole of a substance in grams is numerically equal to its relative formula mass. (e.g. the Mr of iron is 56, so one mole of iron weighs 56g or the Mr of nitrogen gas, N₂, is 28 (2 x 14), so one mole is 28g)
- One mole of a substance contains the same number of the stated particles, atoms, molecules or ions as one mole of any other substance
- You can convert between moles and grams by using this triangle or the equation: mass = moles x molar mass (you may have to rearrange it)
 - E.g. how many moles are there in 42g of carbon?
 - Moles = Mass / Mr = 42/12 = 3.5 moles
- The number of atoms, molecules or ions in a mole of a given substance is the Avogadro constant: 6.02 x 10²³ per mole.



Amounts of substances in equations

- Masses of reactants & products can be calculated from balanced symbol equations
- Chemical equations can be interpreted in terms of moles
 - E.g. Mg + 2HCl -> MgCl₂ + H₂ shows that 1 mol Mg reacts with 2 mol HCl to produce 1 mol MgCl₂ and 1 mol H₂
- total moles of one element must be the same on both sides of the equation

Using moles to balance equations

- Balancing numbers in a symbol equation can be calculated from the masses of reactants and products:
 - a. convert the masses in grams to amounts in moles
 - b. convert the numbers of moles to simple whole number ratios, then you know how many moles you have of one element/compound compared to another





Limiting reactants

- In a chemical reaction with 2 reactants you will often use one in excess to ensure that all of the other reactant is used
- limiting reactant: the reactant that is used up / not in excess (since it limits the amount of products)
- If a limiting reactant is used, the amount of product produced is restricted to the amount of the excess reactant that reacts with the limiting one (so use amount of limiting reagent not one in excess for calculations)

Concentration of solutions

- Concentration of a solution can be measured in mass per given volume of solution e.g. grams per dm^3 (g/dm^3)
- To calculate mass of solute in a given volume of a known concentration use $\text{mass} = \text{conc} \times \text{vol}$ i.e. $\text{g} = \text{g}/\text{dm}^3 \times \text{dm}^3$ (think about the units!)
- a smaller volume or larger mass of solute gives a higher concentration
- a larger volume or smaller mass of solute gives a lower concentration

