AQA GCSE Chemistry

Topic 3: Quantitative chemistry

Yield and atom economy of chemical reactions (chemistry only)

Notes

(Content in bold is for Higher Tier only)

Percentage yield

$$\text{Percentage yield} = \frac{\text{Amount of product produced}}{\text{Maximum amount of product possible}} \times 100$$

- It is not always possible to obtain the calculated amount of a product for 3 reasons:
  - Reaction may not go to completion because it is reversible
  - Some of the product may be lost when it is separated from the reaction mixture
  - Some of the reactants may react in ways different to the expected reaction
- Yield: amount of product obtained
- **To calculate the theoretical mass of a product from a given mass of reactant and the balancing equation for the reaction:**
  - **Calculate mol. of reactant by using mol. = mass / molar mass**
  - **Use balancing numbers to find mol. of product (e.g. 2HCl + Mg -> $MgCl_2$ if you have 2 mol. of HCl, you would divide by 2 to get 1 mol. of $MgCl_2$.)**
  - **Calculate theoretical mass of a product by then using mass = mol. x molar mass**

Atom economy

- A measure of the amount of starting materials that end up as useful products
- Important for sustainable development and for economic reasons to use reactions with high atom economy

= (Mr of desired product from reaction / sum of Mr of all reactants) x 100

- **Possible reasons why a particular reaction pathway is chosen/not chosen: atom economy, yield, rate, equilibrium position and usefulness of by-products**