1. Percentage yield (TRIPLE ONLY)

$$\text{percentage yield} = \frac{\text{actual mass of product produced}}{\text{maximum theoretical mass of product possible}} \times 100\%$$

Worked example - A company process 200 tonnes of calcium carbonate a day and makes 98 tonnes of calcium oxide. $CaCO_3 \rightarrow CaO + CO_2$

M_r of $CaCO_3$ = 100, M_r of CaO = 56

Balanced equation states that 100 tonnes of $CaCO_3$ produces 56 tonnes of CaO assuming 100% yield. 200 tonnes could produce 112 tonnes.

Percentage yield = $\frac{98}{112} \; x \; 100\%$ = 87.5%

Percentage yield can never = 100%

2. Atom economy (TRIPLE ONLY)

$$\text{percentage atom economy} = \frac{\text{relative formula mass of the desired product from equation}}{\text{sum of the relative formula masses of the reactants from equation}} \times 100\%$$

Worked example - Atom economy of reaction that produces calcium oxide from calcium carbonate. $CaCO_3 \rightarrow CaO + CO_2$

M_r of $CaCO_3$ = 100, M_r of CaO = 56

Atom economy = $\frac{56}{100} \; x \; 100\%$ = 56%

Uses of atom economy are to conserve Earth's resources and minimise pollution.
Atom economy can = 100%

3. Titration calculations (TRIPLE HT ONLY)

A titration is used to determine the concentration of an acid or alkali.

Worked example – What is the concentration of sodium hydroxide when 50cm³ is titrated with 25cm³ of 1.0 mol/dm³ hydrochloric acid.

$NaOH + HCl \rightarrow NaCl + H_2O$
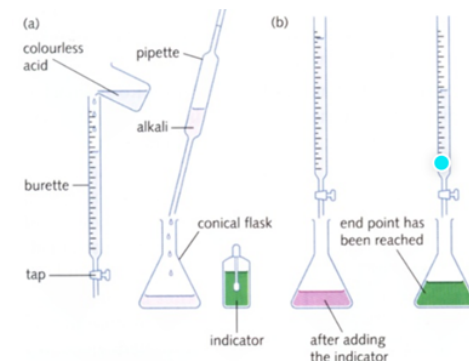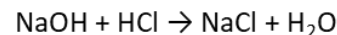
	Sodium hydroxide (NaOH)	Hydrochloric acid (HCl)
Volume	50cm3	25cm³
Concentration	0.5 mol/dm³	1.0 mol/dm³
Number of moles	0.025 moles	0.025 moles
Ratio	1 :	1

4. Volume of gases (TRIPLE HT ONLY)

1 mole of any gas occupies 24 dm³	If at 20°C and 1 atmosphere pressure
Equal moles occupy the same volume	