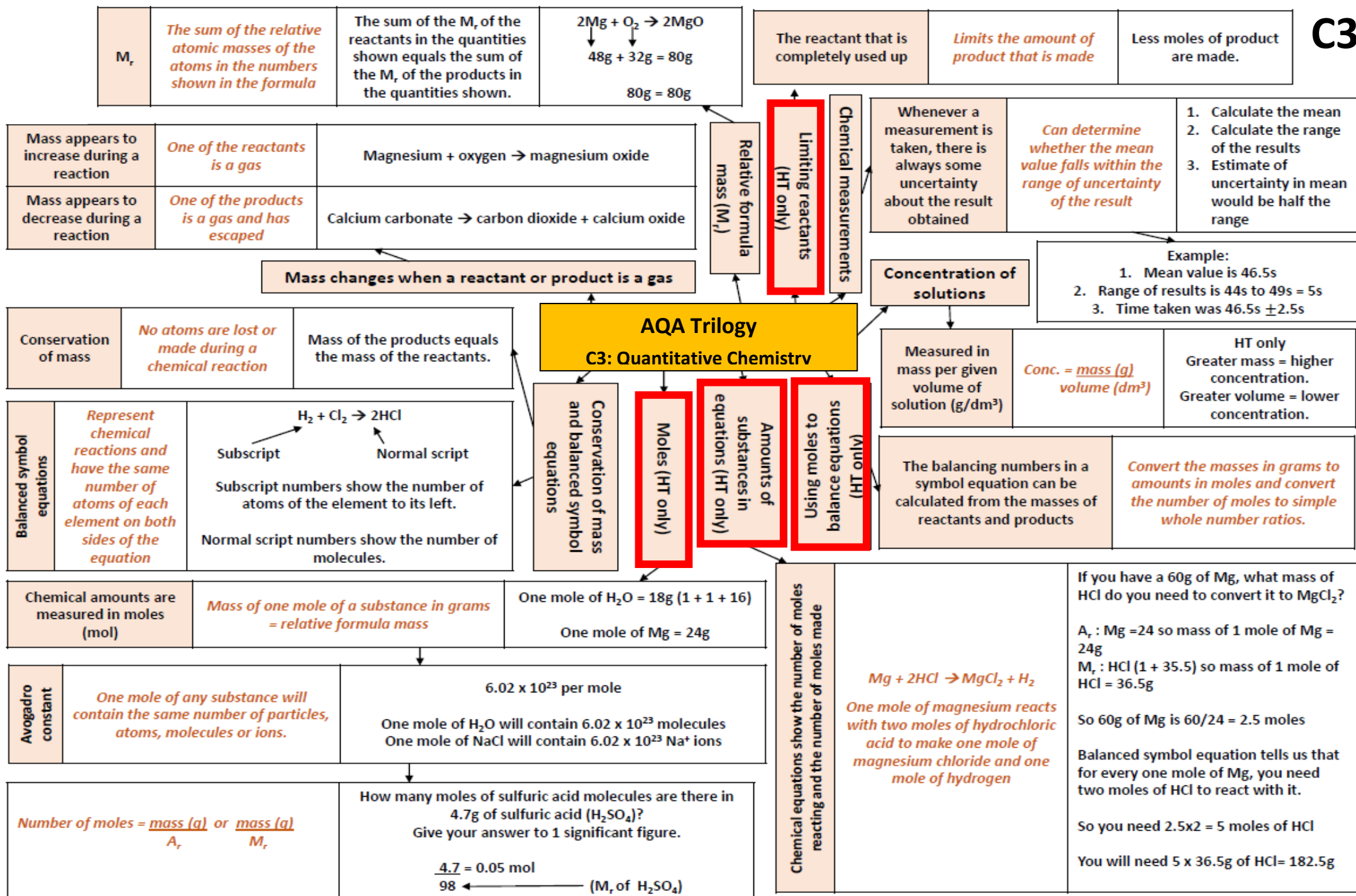
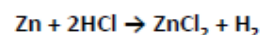




A measure of the amount of starting materials that end up as useful products	Atom economy = $\frac{\text{Relative formula mass of desired product from equation}}{\text{Sum of relative formula mass of all reactants from equation}} \times 100$	High atom economy is important or sustainable development and economic reasons
--	--	--

Calculate the atom economy for making hydrogen by reacting zinc with hydrochloric acid:



$$M_r \text{ of } \text{H}_2 = 1 + 1 = 2$$

$$M_r \text{ of } \text{Zn} + 2\text{HCl} = 65 + 1 + 1 + 35.5 + 35.5 = 138$$

$$\begin{aligned} \text{Atom economy} &= \frac{2}{138} \times 100 \\ &= \frac{2}{138} \times 100 = 1.45\% \end{aligned}$$

This method is unlikely to be chosen as it has a low atom economy.

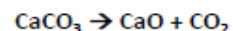
Atom economy

AQA Trilogy C3: Quantitative Chemistry

Percentage yield

HT only:

200g of calcium carbonate is heated. It decomposes to make calcium oxide and carbon dioxide. Calculate the theoretical mass of calcium oxide made.



$$M_r \text{ of } \text{CaCO}_3 = 40 + 12 + (16 \times 3) = 100$$

$$M_r \text{ of } \text{CaO} = 40 + 16 = 56$$

100g of CaCO_3 would make 56 g of CaO

So 200g would make 112g

Yield is the amount of product obtained

It is not always possible to obtain the calculated amount of a product

- The 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.

Percentage yield is comparing the amount of product obtained as a percentage of the maximum theoretical amount

$$\% \text{ Yield} = \frac{\text{Mass of product made} \times 100}{\text{Max. theoretical mass}}$$

A piece of sodium metal is heated in chlorine gas. A maximum theoretical mass of 10g for sodium chloride was calculated, but the actual yield was only 8g.
Calculate the percentage yield.

$$\text{Percentage yield} = \frac{8}{10} \times 100 = 80\%$$