Ormiston Victory Academy

Subject: Chemistry

Victory Vitals

C4 – Quantitative Chemistry

Relative formula mass (M_r)

23 Na 11	12 C 6	16 O 8

Na_2CO_3

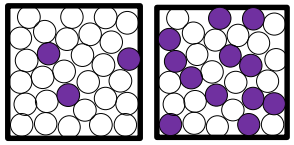
(2 x 23) + 12 + (3 x 16)

M_r = 106 g/mol

The **mass number** tells you the **relative atomic mass (A_r)** for each atom. **Relative formula mass** is the sum of the relative atomic masses for all atoms in a compound.

Conservation of mass If a reaction produces a gas, the mass appears to decrease as the gas escapes into the surroundings. If a reaction involves adding a gas from the surroundings, the mass appears to increase. However, the ***total mass of the reactants is always equal to the total mass of the products.***

Concentration The amount of substance dissolved in a given volume of solution is the concentration. It is measured in g/dm³.



Low concentration

High concentration

$$\text{concentration (g/dm}^3\text{)} = \frac{\text{mass (g)}}{\text{volume (dm}^3\text{)}}$$

As 1dm is equal to 10cm, 1dm³ is equal to 1000cm³.

$$\text{volume (dm}^3\text{)} = \frac{\text{volume (cm}^3\text{)}}{1000}$$

Higher Only Content

Moles Avogadro's number is **6.02 x 10^{23}**. It's just a number used to make counting particles easier in chemical reactions.

$$\text{number of moles (mol)} = \frac{\text{mass (g)}}{M_r \text{ (g/mol)}}$$

$$\text{mass (g)} = M_r \text{ (g/mol)} \times \text{number of moles (mol)}$$

Concentration This can also be measured in mol/dm³.

$$\text{concentration (mol/dm}^3\text{)} = \frac{\text{number of moles (mol)}}{\text{volume (dm}^3\text{)}}$$

$$\text{concentration (g/dm}^3\text{)} = \text{concentration (mol/dm}^3\text{)} \times M_r \text{ (g/mol)}$$

Gas volumes At room temperature and pressure, one mole of any gas occupies 24dm³.

$$\text{number of moles (mol)} = \frac{\text{volume (dm}^3\text{)}}{24}$$

C5 – Chemical Changes

Reactions of metals & acids

metal + oxygen → metal oxide

$4\ Na + O_2 \rightarrow 2\ Na_2O$

metal + water → metal hydroxide + hydrogen

$2\ Li + 2\ H_2O \rightarrow 2\ LiOH + H_2$

metal + acid → a salt + hydrogen

$Ca + 2\ HCl \rightarrow CaCl_2 + H_2$

metal oxide + acid → a salt + water

$MgO + H_2SO_4 \rightarrow MgSO_4 + H_2O$

metal hydroxide + acid → a salt + water

$Al(OH)_3 + 3\ HNO_3 \rightarrow Al(NO_3)_3 + 3\ H_2O$

metal carbonate + acid → a salt + water

$FeCO_3 + 2\ HO_2CCH_3 \rightarrow Fe(O_2CCH_3)_2 + H_2O + CO_2$

potassium	most reactive	K
sodium		Na
calcium		Ca
magnesium		Mg
aluminium		Al
carbon		C
zinc		Zn
iron		Fe
tin		Sn
lead		Pb
hydrogen		H
copper		Cu
silver		Ag
gold		Au
platinum	least reactive	Pt

A more reactive metal can **displace** a less reactive metal from its compound.

Word Equation: copper + silver nitrate → silver + copper nitrate

Symbol Equation: $Cu + 2\ AgNO_3 \rightarrow 2\ Ag + Cu(NO_3)_2$

Ionic Equation: $Cu + 2\ Ag^+ \rightarrow 2\ Ag + Cu^{2+}$

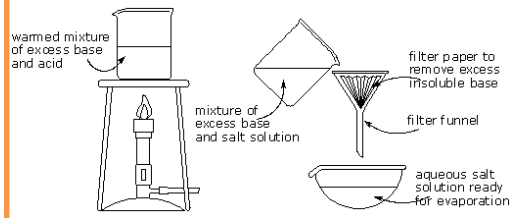
Half Equations:

$Cu - 2\ e^- \rightarrow 2\ Ag + Cu^{2+}$

$2\ Ag^+ + 2\ e^- \rightarrow 2\ Ag$

Losing Electrons **Oxidation**

Gaining Electrons **Reduction**



Required Practical: Making Salts

1. Add excess base to acid until it no longer dissolves (when all acid has reacted)
2. Filter the mixture to remove excess base.
3. Evaporate the filtrate solution and leave to dry.

All **acids** produce **hydrogen ions (H^+)** in aqueous solution. A **base** is a substance that neutralises an acid. An **alkali** is a water soluble base which produced **hydroxide ions (OH^-)** in aqueous solution.

Neutralisation Equation: $H^+ (aq) + OH^- (aq) \rightarrow H2O (l)$

Strong acid (hydrochloric, sulfuric, nitric) - fully ionised in aqueous solution.

Weak acid (ethanoic, citric, carbonic) - partially ionised in aqueous solution.

A pH less than 7 is acidic, pH 7 is neutral, a pH more than 7 is alkaline.

As the pH decreases by 1, the H+ concentration increases by a factor of 10.

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Vocabulary:

Word	Meaning
atom economy	A measure of the amount of starting materials that end up as useful products.
Avogadro constant	The number of atoms, molecules or ions in a mole of any substance (i.e., 6.02×10^{23} per mol).
mole	The amount of substance in the relative atomic or formula mass of a substance in grams.
percentage yield	The actual mass of product collected in a reaction divided by the maximum mass that could have been formed in theory, multiplied by 100.
relative formula mass, M_r	The total of the relative atomic masses, added up in the ratio shown in the chemical formula of a substance.

Word	Meaning
acid	Acids are proton donors. They release hydrogen ions (H^+) in solution.
alkali	A water-soluble base. It produces hydroxide ions (OH^-) in solution.
base	Any substance that neutralises an acid. Usually a metal oxide, hydroxide or carbonate.
displacement reaction	A reaction in which a more reactive element takes the place of a less reactive element in one of its compounds or in solution.
half equation	An equation that describes oxidation (losing electrons) or reduction (gaining electrons).
ionic equation	An equation that shows only those ions or atoms that change in a chemical reaction.
neutralisation	The chemical reaction of an acid with a base to produce a salt and water (and carbon dioxide if a carbonate is used). A solution of pH 7 is formed.
oxidation	A reaction in which oxygen is added or electrons are lost.
pH	A number which shows how strongly acidic or alkaline a solution is.
reactivity series	A list of elements in order of their reactivity.
reduction	A reaction in which oxygen is removed or electrons are gained.
strong acids	These acids completely ionise in solution and have a high concentration of H^+ (aq) ions in solution.
weak acids	Acids that do not ionise completely in aqueous solutions.

Videos

Quizzes