

**Formation of Ions**

Ions are charged particles. They can be either negatively or positively charged and are made when elements lose or gain electrons. Metals lose electrons to become positively charged. Non-metals gain electrons to become negatively charged.

**Development of the periodic table.**

Dimitri Mendeleev period table was ordered by atomic mass. He left gaps to show that he believed there was some undiscovered elements.

The **modern periodic table**

Elements are ordered by proton number. It has metals on the left and non-metals on the right. It is ordered in groups and periods.

**State Symbols**

In chemical reactions, the three states of matter are represented as symbols: solid (s), liquid (l), gas (g), aqueous (aq). Aqueous solutions are formed when a substance is dissolved in water.

**Mixtures, Chromatography and Separation**

**Mixtures** – in a mixture there are no chemical bonds, so the elements are easy to separate. Examples of mixtures are air and salt water.

**Chromatography** – To separate out mixtures of two liquids with different solubility.

**Filtration** – To separate solids from liquids.

**Evaporation** – to separate a soluble salt from a solutions. A quick wat of separating out salt from water.

**Crystallisation** – To separate a soluble salt from a solution, a slower method of separating out salt.

**Distillation –** Separating a mixture of liquids with two boiling points by evaporating one liquid and then condensing it.

**Fractional distillation** – Separating out a mixture of liquids with multiple boiling points (crude oil).

**Particles in solids, liquids, and gases**

**Solids** – regular arrangement, particles close together in fixed position, strong forces, low energy and can only vibrate.

**Liquids** – irregular arrangement, close together, free to move, weaker forces, more energy.

**Gases** – irregular arrangement, particles separate, very weak forces, lots of energy, move randomly.

**History of the atom**

|  |  |  |
| --- | --- | --- |
| Scientist | date | Discovery |
| John Dalton | Start of 19th Century | Atoms were first described as solid spheres |
| JJ Thomson | 1897 | Plum pudding model – the atom is a ball of charge with electrons scattered |
| Earnest Rutherford | 1909 | Alpha scattering experiment – mass concentrated at the centre; the nucleus is charged, Most of the mass is in the nucleus. Most atoms are empty space.  |
| Niels Bohr | 1911 | Electrons are in shells orbiting the nucleus |
| James Chadwick | 1940 | Discovered that there are neutrons in the nucleus. |

**Equations and Maths**

To Calculate the relative atomic mass, use the following equation

RAM = sum of (isotope abundance x isotope mass number)

 Sum of abundances of all isotopes

**Chemical equations –**

A chemical equation can be shown by using a word equation

Magnesium + oxygen 🡪 Magnesium Oxide.

Also a symbol equation

 2 Mg + O2 🡪 2 MgO

To balance equations there must be the same number of atoms on both sides of the equation.

**Relative formula Mass**

The relative formula mass is the sum of all the relative atomic masses of the atoms in the formula.

E.g.

HCl

H = 1 Cl = 35.5

So 1 + 35.5 = 36.5

H­2SO4

H =1, S =32 O =16

(1x2) + 32 + (16x4)

= 98

**Elements**

Elements are made of atoms with the same atomic number. Atoms can be represented by symbols.

N2 – Nitrogen, F -Fluorine. O2 -Oxygen S8 - sulphur

**Isotopes** – An isotope is an element with the same **number of protons, but a different number of neutrons**. They have the same atomic number but different mass number. 1H 2H 3H.

**Compounds** – A compound is when two or more elements are chemically joined.

e.g. CO­2, NaCl, HCl

**Atoms**

Contained in the **nucleus are protons and neutrons**. Moving around the nucleus are the electron shells containing the electrons. They are negatively charged. Electrons are arranged with 2 electrons on the 1st shell, 8 on the second shell and 8 on the th

Overall, atoms have no charge; they have the same number of (positive) protons to (negative) electrons.

**Ambitious Vocabulary**

Chromatography, isotope, atomic radius, Distillation, condensing

**Fundamentals: Materials**

**Science**