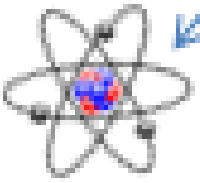
Atoms, elements & compounds

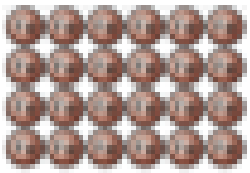
Atoms;

Everything is made of atoms, it is the smallest part of an element



Elements;

There are about 100 different elements, each with a symbol



Compounds;

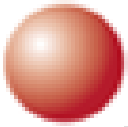
- Are formed by elements in chemical reactions
- Are 2 or more elements that are chemically combined

Development of the model of the atom;

New experimental evidence may lead to the model being changed or replaced

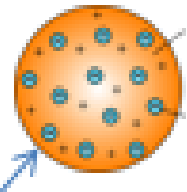
Early ideas;

Before the discovery of the electron atoms were tiny spheres, they couldn't be divided



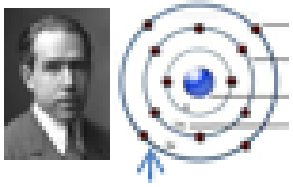
Plum pudding;

After the electron was discovered the atom became a ball of positive charge with negative electrons scattered in it



Niels Bohr;

Adapted the nuclear model suggesting electrons in orbitals at set distance

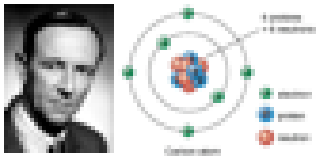


Nucleus development;

Experiments now show nucleus is made of smaller particles of positive charge

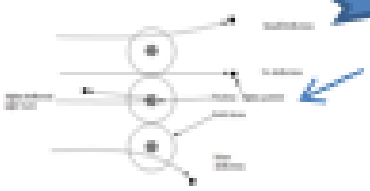
James Chadwick;

Evidence to show the existence of neutrons in the nucleus



Alpha particle scattering;

Showed that the mas of an atom was concentrated in the centre, it was charged too



4.1 Atomic structure (Chemistry)

Atoms;

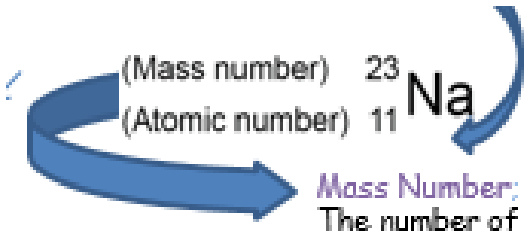
An atom has no overall charge, the number of protons = the number of electrons

Relative charges;

Name of particle	Relative charge
Proton	+1
Neutron	0
Electron	−1

Atomic number;

The proton number, it is different for every element



Mass Number;

The number of protons & neutrons in the nucleus

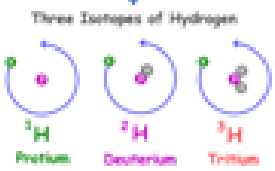
Size and mass;

- Very small, radius is 0.1nm ($1x10^{-10}$m)
- Mass is mainly in the nucleus

Name of particle	Relative mass
Proton	1
Neutron	1
Electron	Very small

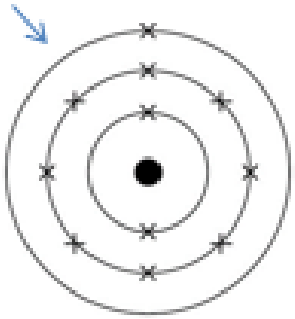
Isotopes;

- Atoms that have the same number of protons (element), but different numbers of neutrons



Electronic configurations;

- Electrons fill the lowest energy levels first
- This starts from the nucleus, following a set pattern up to the following maximum
- 1st shell – 2 electrons
- 2nd shell – 8 electrons
- 3rd shell – 8 electrons
- 4th shell – 2 electrons



Relative Atomic Mass;

- This is the mass of the element that takes into account the relative abundance of isotopes,
- Calculated by=

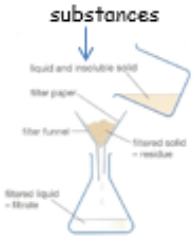
$$\frac{(\text{mass} \times \text{abundance}) + (\text{mass} \times \text{abundance})}{100}$$

Mixtures;

Are elements not chemically combined and can be separated by the following methods

Filtration;

Separating soluble and insoluble substances

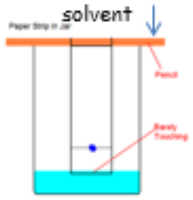


Crystallisation;

Removing a liquid leaving a solid behind

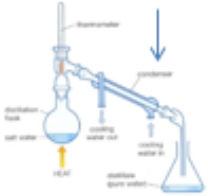
Chromatography;

Separating solutions dissolved in the same solvent



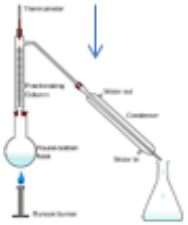
Simple distillation;

Separating a liquid from its solvent



Fractional distillation;

Separating 2 different liquids based on different boiling points




Early tables:

- First attempts to classify elements were made before subatomic particles were discovered
- Based on atomic weight
- Wrong groups used

Mendeleev;

Overcome the problems of atomic weight. He did this by;

- Leaving gaps
- Changing the order of the elements
- Predicted elements were discovered
- Differences were accounted for by isotopes

Development of the periodic table;

As more elements were discovered scientist tried to classify them

Today;

- Elements with similar properties arranged in groups
- Based on properties
- All have the same number of electrons in the outer shell

Modern periodic table;

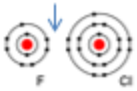
The arrangement of elements in a table based on proton number, properties and outer electron number

Group 1;

- Alkali metals
- 1 outer electron
- Reactivity increases going down the group

Group 7;

- Halogens
- 7 outer electrons
- Non-metals
- Molecules made of pairs of atoms



Group 0;

- Noble gases
- Unreactive/ stable – full outer shell of electrons
- Don't form molecules easily
- boiling point increases going down group

$^{4}_{2}He$ helium $^{20}_{10}Ne$ neon $^{40}_{18}Ar$ argon

Metals & non-metals;

Metals;

- Majority of elements are metals
- Form positive ions
- Found on left hand side, middle and bottom of table

Non-metals;

- Form negative ions
- Found on right hand side and top of table