

GCSE Knowledge Organiser

Unit 1 Atomic Structure

SCIENCE

ONE

Atoms, elements & compounds

Atoms:

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



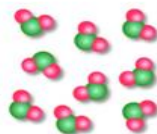
Elements:

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



TWO

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) 23
(Atomic number) 11



Mass Number:
The number of protons & neutrons in the nucleus

Size and mass:

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

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

THREE

Atoms:

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

Isotopes:

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



Relative Atomic Mass:

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

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

FOUR

Early ideas:

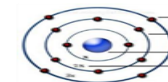
Before the discovery of the electron atoms were tiny spheres, they couldn't be divided

Plum pudding:

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

Development of the model of the atom:

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



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

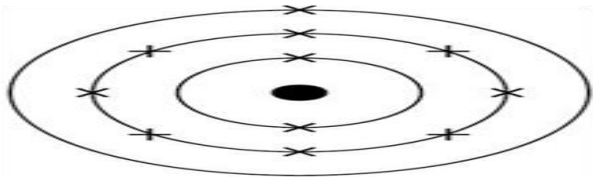
Alpha particle scattering:

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

FIVE

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



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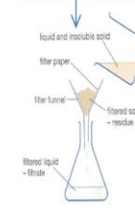
SCIENCE

SIX

Mixtures:

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

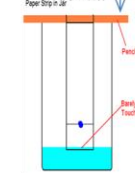
Filtration:
Separating soluble and insoluble substances



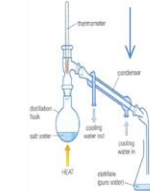
Crystallisation:
Removing a liquid leaving a solid behind



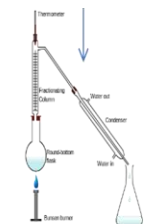
Chromatography:
Separating solutions dissolved in the same solvent



Simple distillation:
Separating a liquid from its solvent



Fractional distillation:
Separating 2 different liquids based on different boiling points



SEVEN



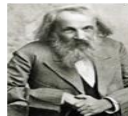
Early tables:

- 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



Today:

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

Development of the periodic table:

As more elements were discovered scientist tried to classify them

EIGHT

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