RAFFLES INSTITUTION RAFFLES PROGRAMME - YEAR THREE CHEMISTRY

ATOMIC STRUCTURE

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Bohr Model - A fixed number of electrons can be accommodated in any one shell ($2n^2$)

Noble gases have 8 electrons in their valence shell (except helium with 2 electrons)

Atoms may lose or gain electrons to achieve noble gas configuration, becoming either positively-charged cations or negatively-charged ions.

Atoms in the same group have the same number of valence electrons and hence chemical properties.

Atoms in the same period have the same number of electron shells.

Proton Number = Atomic Number = No. of protons

Neutron Number = No. of neutrons

Electron Number = No. of electrons

Nucleon Number = Mass Number = Atomic Mass Number = No. of protons + No. of neutrons

In an atom Proton Number = Electron Number

Proton:	+1	1
Neutron:	0	1
Electron:	-1	$\frac{1}{1836}$

Isotopes are atoms with the same number of protons but different number of neutrons.

Isotopes have the same number of electrons and hence the same number of chemical properties, but different masses and hence different physical properties.

Relative Atomic Mass (Ar) - The average mass of one atom taking into account the different isotopes and their relative proportion.

Relative Molecular Mass (Mr) - The sum of the Relative Atomic Masses of the atoms in the molecule.

Ionization Energy (IE) - The amount of energy needed to remove one electron from a gaseous atom

The IE required to remove an electron from a fully filled valence shell is much more than that required to remove an electron from a partially filled valence shell. Hence, the jump in IE is much larger when an electron from a fully filled valence shell is lost.

Wave-mechanical Model - Electrons are arranged in shells with different principal quantum numbers, each with increasing energy levels further away from the nucleus.

The number of subshells in each shell equals the shell number.

S subshell - 1 orbital, P subshell - 3 orbitals, D subshell - 5 orbitals, F subshells - 7 orbitals

Each orbital can hold two electron, each with an opposite spin.

The electrons fill the orbitals in this order (1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s) but lose electrons in this order (6s, 5f, 5d, 5p, 5s, 4f, 4d, 4p, 4s, 3d, 3p, 3s, 2p, 2s, 1s)