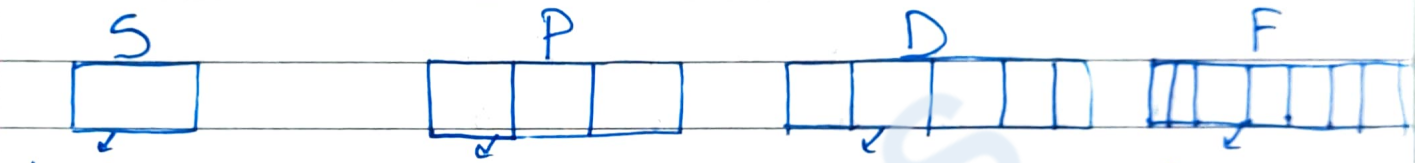
Electrons in Atoms

→ Shells consists of subshells which consist of atomic orbitals.

→ Subshells are = S P D F

each subshell has an orbital (atomic orbital)

an atomic orbital can be occupied by one (min) or two (max) electrons



1 orbital — max $e^- = 2$

3 orbitals — max $e^- = 6$

5 orbitals — max $e^- = 10$

7 orbitals — max $e^- = 14$

→ Filling shells and orbitals

→ Carbon

IF there is an empty orbital the electron first fills that, because if they come in same orbital it will cause spin pair repulsion.

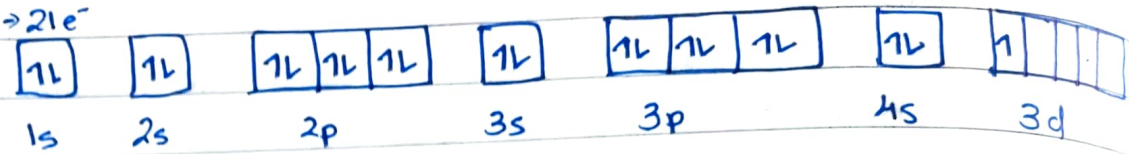
→ Electronic Configuration - $1s^2\ 2s^2\ 2p^2$

→ Sodium

→ Electronic Configuration - $1s^2\ 2s^2\ 2p^6\ 3s^1$

→ This can be written as - [Ne] $3s^1$ because Electronic Configuration of Ne is $1s^2\ 2s^2\ 2p^6$

→ Scandium → 21 e^-



→ Electronic Configuration - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^1$ ✗

Note: even if 3d is filling after 4s it should always be written before 4s. = $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^1\ 4s^2$ ✓

→ If any element loses electrons the electrons are removed from the outermost shell, so if scandium is losing one electron, it will be removed from 4s.

→ Copper and Chromium are exceptions for Electronic configuration

Cu - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^1$

Cr = $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^1$

→ Subshells on periodic table

S P D F

→ Ionisation Energy

→ The 1st ionisation energy of an element is the energy needed to remove an electron from 1 mole of an atom of an element in the gaseous state to form 1 mole of gaseous 1+ ion.

→ Factors affecting Ionisation energy

Nuclear Charge	Atomic Radius	Shielding
as it increases the force of attraction increases so ionisation energy also increases $C \propto I.E$	as it increases the distance from nucleus increases so force of attraction decreases, so ionisation energy also decreases. $A.R \propto \frac{1}{I.E}$	if a shell is full it shields the nuclear charge, and does not allow it to reach the outermost e⁻. so I.E decreases when S increases $S \propto \frac{1}{I.E}$

→ Trends in ionisation energies.

→ The outermost electrons require the least amount of energy.

→ As the shell changes there is a sudden jump in the I.E.

→ When you see this sudden jump, you can make out that the shell is changed

ex. 1000 kJ 1500 kJ 1700 kJ 12000 kJ 12500 kJ

1st 2nd 3rd 4th

Sudden Jump

This tells us that the last shell contained 3 electrons.

→ Trend in first ionisation energy down the group.

→ ionisation energy decreases.

→ N.C increases I.E increases

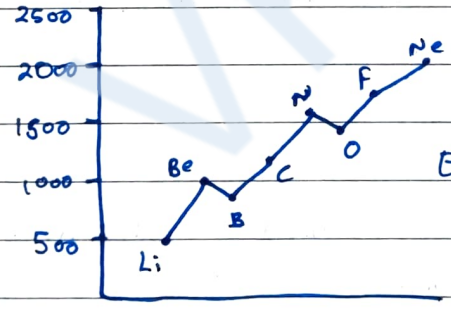
→ A.R increases I.E decreases

→ Shielding increases I.E decreases

→ so overall it decreases.

→ Trend in first ionisation energy accross the period.

→ ionisation energy increases



Boron and Oxygen are exceptions.

Exception Boron - Be has 4 e^- $1s^2$ $2s^2$

B has 5 e^- $1s^2$ $2s^2$ $2p^1$

as we know 2p is further away from the nucleus so it is easier to remove, so I.E Decreases.

Exception Oxygen

→ Nitrogen has 7 e^- = $1s^2$ $2s^2$ $2p^3$

↑↓ ↑↓ ↑ ↑ ↑

Oxygen has 8 e^- = $1s^2$ $2s^2$ $2p^4$

↑↓ ↑↓ ↑↓ ↑ ↑

The electrons are already repelling so it is easy to remove that e^-. This is called SPIN PAIR REPULSION.