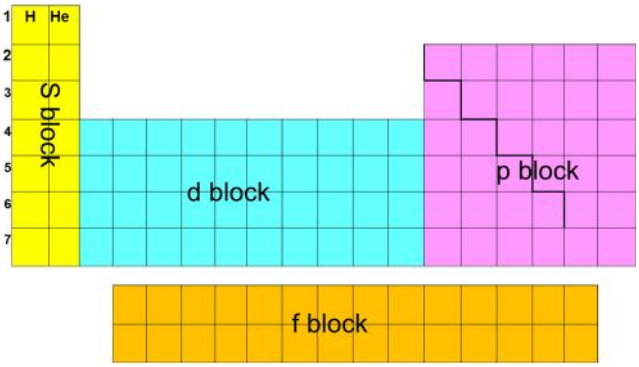
2.1 Periodicity

Periodicity is the repeating pattern of physical or chemical properties going across the periods



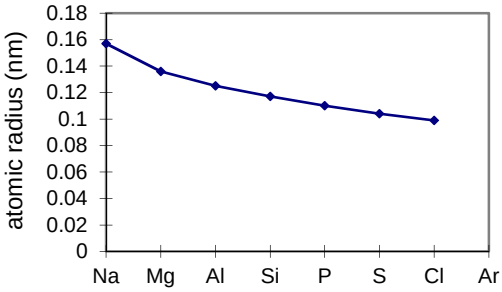
Classification of elements in s, p, d blocks

Elements are classified as s, p or d block, according to which orbitals the highest energy electrons are in.

Period 2 = Li, Be, B, C, N, O, F, Ne
Period 3 = Na, Mg, Al, Si, P, S, Cl, Ar

Atomic radius

Atomic radii **decrease** from left to right across a period, because the **increased number of protons** create more positive charge attraction for **electrons which are in the same shell** with similar shielding.



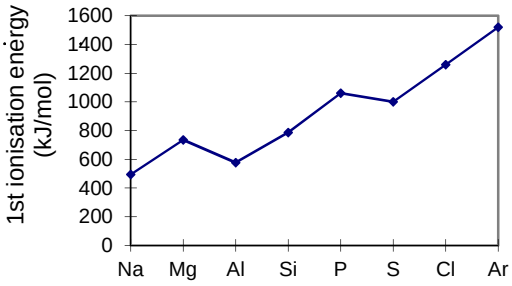
Exactly the same trend in period 2

1st Ionisation Energy

There is a **general trend** across to **increase**. This is due to **increasing number of protons** as the electrons are being added to the same shell.

There is a **small drop between Mg + Al**. Mg has its outer electrons in the 3s sub shell, whereas **Al is starting to fill the 3p** subshell. Al's electron is slightly easier to remove because the **3p electrons are higher in energy.**

There is a **small drop** between **phosphorous** and **sulfur.** Sulfur's outer electron is being **paired up** with an another electron in the **same 3p orbital**.
When the second electron is added to an orbital there is a slight **repulsion** between the two negatively charged electrons which makes the second electron easier to remove.



Exactly the same trend in period 2 with drops between Be & B and N to O for same reasons- make sure change 3s and 3p to 2s and 2p in explanation!

Melting and boiling points

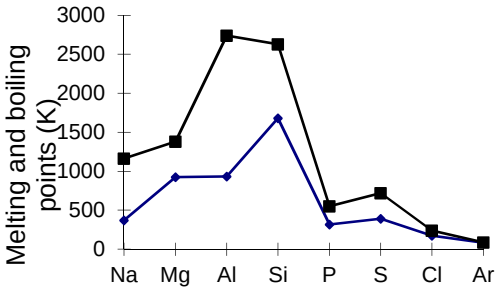
For **Na, Mg, Al- Metallic** bonding : strong bonding – gets stronger the more electrons there are in the outer shell that are released to the sea of electrons. A smaller sized ion with a greater positive charge also makes the bonding stronger. Higher energy is needed to break bonds.

Si is Macromolecular: many strong covalent bonds between atoms, high energy needed to break covalent bonds– very high mp +bp

$Cl_{2\,(g)}$, $S_{8\,(s)}$, $P_{4\,(S)}$- simple molecular : weak **van der waals** between molecules, so little energy is needed to break them – low mp+ bp

S_8 has a higher mp than **P_4** because it has more electrons (S_8 =128)(P_4=60) so has stronger v der w between molecules

Ar is monoatomic weak **van der waals** between atoms



Similar trend in period 2
Li,Be metallic bonding (high mp)
B,C macromolecular (very high mp)
N_2,O_2 molecular (gases! Low mp as small v der w)
Ne monoatomic gas (very low mp)