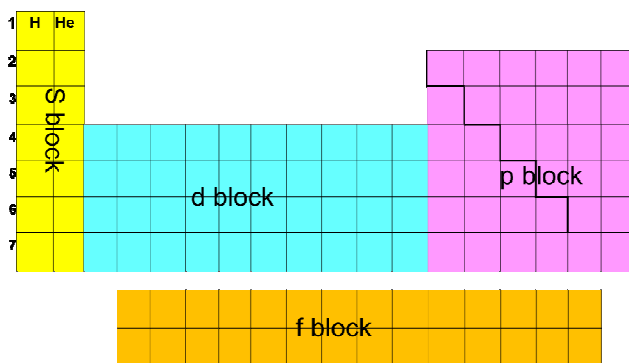


# Periodicity

## 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.

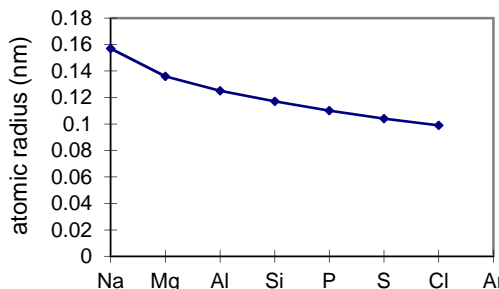
Period 2 = Li, Be, B, C, N, O, F, Ne  
 Period 3 = Na, Mg, Al, Si, P, S, Cl, Ar



## Atomic radius

Atomic radii **decrease** as you move 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

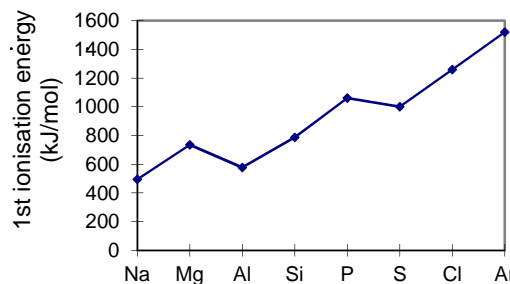


## 1st ionisation energy

There is a **general trend** across is 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 **sulphur**. Sulphur'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

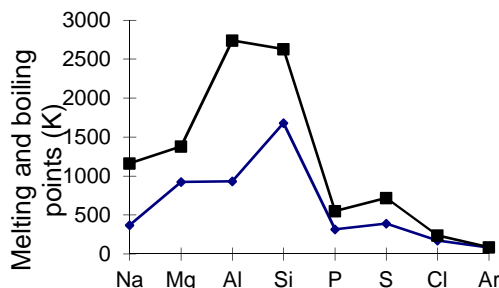
For **Na, Mg, Al- Metallic** bonding : strong bonding – gets stronger the more electrons there are in the outer shell that are released to the sea of electrons. A smaller positive centre also makes the bonding stronger. Higher energy is needed to break bonds.

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

**Cl<sub>2</sub>(g), S<sub>8</sub>(s), P<sub>4</sub>(s)- simple Molecular** : weak **van der waals** between molecules, so little energy is needed to break them – low mp+ bp

S<sub>8</sub> has a higher mp than P<sub>4</sub> because it has more electrons (S<sub>8</sub> =128)(P<sub>4</sub>=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<sub>2</sub>,O<sub>2</sub> molecular (gases! Low mp as small v der w)  
 Ne monoatomic gas (very low mp)