

Metal atoms **lose valence electrons** to form **+ve ions (cations)**.

Non metal atoms **gain electrons** to form **-ve ions (anions)**.

Atoms **lose or gain electrons** to have a **full outer shell** (noble gas electronic configuration)



Valency is the **charge** on the ion.

Valency of metal ions : outer shell electrons of the metal atom. This is the **same as the group number** in the periodic table.

Valency of non metal ions : electrons needed to have noble gas electronic configuration (full outer shell). **Subtract the group number from 8 gives you the non metal valency.**

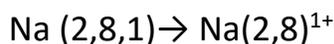
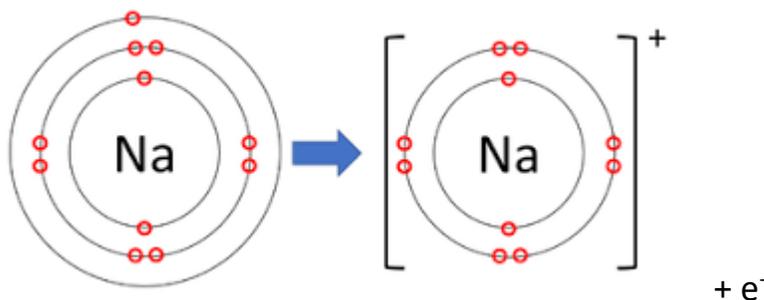
Oxygen is in group 6 , so $8-6 = 2$ (O^{2-})

Chlorine is in group 7, so $8-7 = 1$ (Cl^-)

Nitrogen is in group 5 , so $8-5 = 3$ (N^{3-})

HYDROGEN AND HELIUM ARE EXCEPTIONS BECAUSE THEY HOLD THEIR ELECTRONS IN THE FIRST OUTER SHELL ONLY.

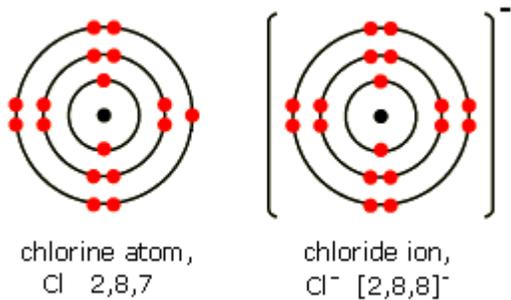
Metal ions have the same electronic configuration of the **noble gas** that is **1 period less of the metal (previous period)**.



Sodium atom : period 3

Sodium ion : period 2 (neon)

Non metal ions have the electronic configuration of the *noble gas in the same period.*



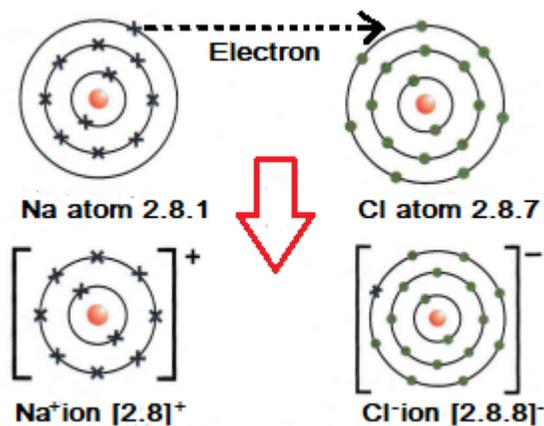
Chlorine atom (period 3)
chloride ion (period 3) argon.

IONIC BONDS: *Strong non-directional electrostatic force of attraction between cations (+ve) and anions (-ve) formed due to electron transfer.* (Bond between metal and non metal).

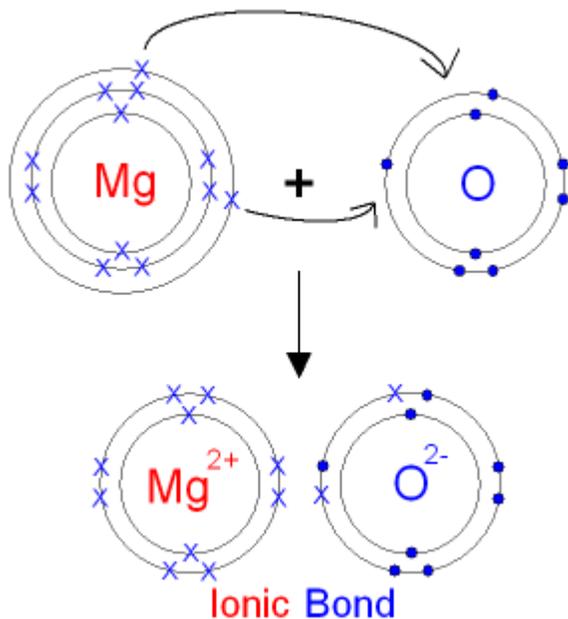
Both ions have a noble gas electronic configuration/full outer shell.

Metals lose their valence electrons **to non-metals** to form an **IONIC BOND**.

Examples : NaCl, AlCl₃, KBr.



NOTE: Cl⁻ HAVE LARGER IONIC RADIUS THAN Na⁺ BECAUSE Cl⁻ HAVE 3 ELECTRON SHELLS WHILE Na⁺ HAS ONLY 2 ELECTRON SHELLS .



Formula = **MgO**

Mg is in group 2, valency = +2

O is in group 6, valency = -2

One magnesium atom reacts with one oxygen atom. Magnesium has 2 valence electrons, and one oxygen atom requires 2 electrons to have the noble gas electronic configuration. So one atom of magnesium reacts with one atom of oxygen.

Ionic bonds are formed when electrons are transferred from one atom to another and forms ions. There is strong electrostatic force of attraction between ions to make ionic bonding.

Lattice: Lattice is the regular arrangement of particles.

Lattice in ionic compounds: lattice is the regular arrangement of alternating positive and negative ions.

Physical Properties of Ionic compounds

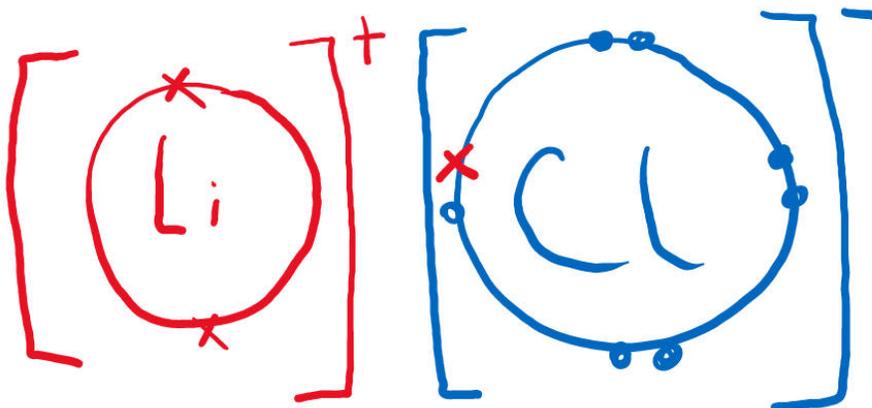
1. They have high melting and boiling points because the force of attraction between ions is very high. Large amount of energy needed to overcome these strong attractive forces.
2. They conduct electricity when molten or dissolved in water because then ions are free to move.
3. Most of them are soluble.

Example

- (b) Predict the formula of the compound formed between Ca^{2+} and N^{3-} . [1]
- (c) Draw a dot-and-cross diagram to show the electron arrangements in the **two** ions present in lithium chloride, LiCl . Show outer shell electrons only. Include the charges on the ions.

(b) Ca_3N_2

(c)



Lithium being in group 1 with electronic conf of 2,1 will lose the outer shell electron thus will have a full outer shell of 2 electrons becoming +1 in charge

Chlorine in group 7 with electronic conf of 2,8,7 will gain 1 electron which was lost by lithium thus will have a full outer shell of 8 electrons becoming -1 in charge

Make sure to represent electrons of each element differently for example X for lithium and O for chlorine and also the electron gained by chlorine should be different .lastly, don't forget charges.

Why do ionic compounds have high melting and boiling point?

In ionic compounds there is strong electrostatic force of attraction between oppositely charged ions (positive and negative ion) so more energy is required to overcome these forces.