Ionic Bonding Notes

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Before we look at ionic bonding itself, let's have a quick reminder about ions 😊

An ion: an electrically charged atom or particle. It has become charged by the loss or gain of electrons.

When a neutral atom loses one or more electrons, it becomes a positively charged ion (a cation). When a neutral atom gains one or more electrons, it becomes a negatively charged ion (an anion).

A cation: the name given to an ion that has a positive charge.

An anion: the name given to an ion that has a negative charge.

What is ionic bonding? Ionic bonding is the electrostatic attraction between oppositely charged ions.

What is electrostatic attraction? It's the strong force of attraction that pulls oppositely charged particles towards each other. It works on the simple rule that opposite charges attract! Because this force is very strong, it requires a lot of energy to overcome it.

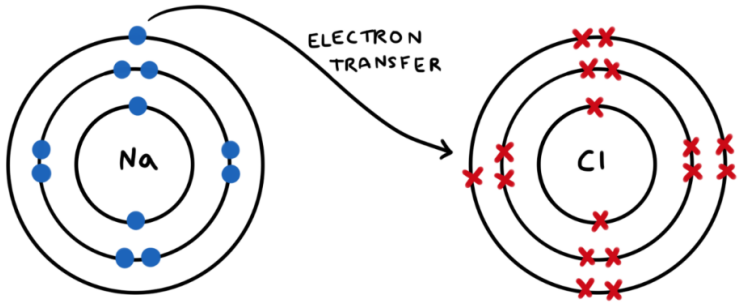
How are Ionic bonds formed? Ions are formed by the transfer of electrons between atoms so that both ions achieve a full electron configuration. The ions formed will be oppositely charged and be attracted towards each other.

Ionic bonds are typically formed when a metal atom reacts with a non-metal atom.

Let's have a look at how we draw ionic bonds between atoms. We could be asked to draw this diagrams or to complete partially drawn versions in an exam.

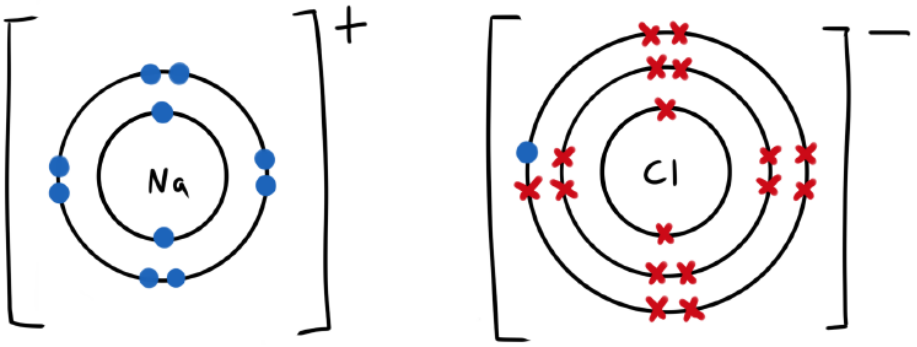
The first example below shows the ionic bond between sodium and chlorine.

Example 1: Sodium chloride NaCl



Na atom Cl atom

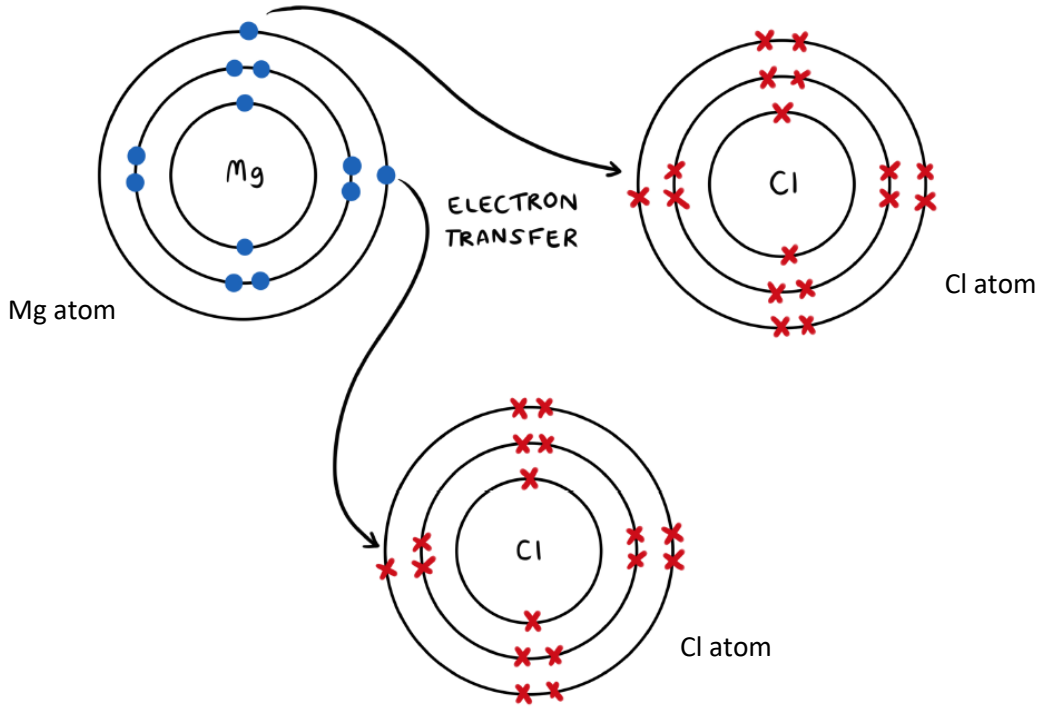
This then gives us:



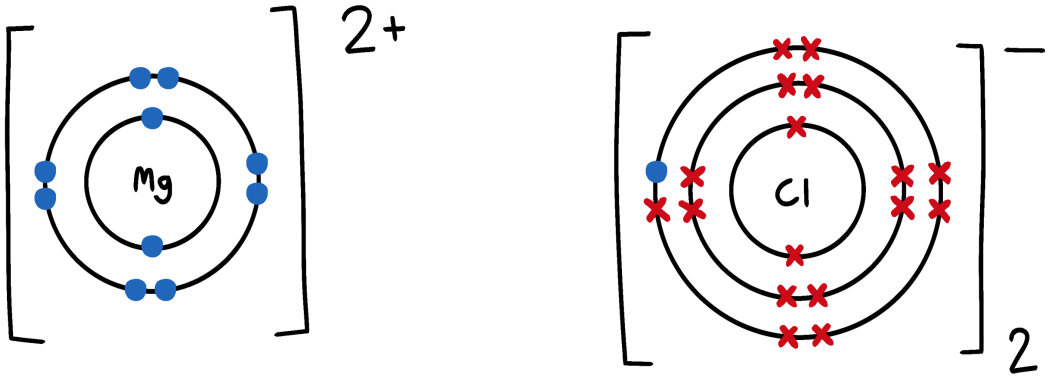
Sodium ion Na^+ Chloride ion Cl^-

The second example below shows the ionic bond between magnesium and chlorine. Here we can see that **two** chlorine atoms are required to take the two outer shell electrons from magnesium.

Example 2: Magnesium chloride $MgCl_2$



This gives us:



Magnesium ion (Mg^{2+}) 2 x Chloride ions (Cl^{-})

Exam note: if you are drawing an ion, you **must** include the following:

1. **Square brackets**.
2. **The charge of the ion in the top right**. Outside of the square brackets.
3. **The correct spread of electrons on the ions outer shell**. As you can see in the example above the Cl^{-} ion is shown with a full outer shell of electrons.

Helpful point – use dots for the electrons of one species and crosses for the other. This makes it very clear which species has lost electrons and which has gained 😊

Interesting point

Although ions are attracted to each other by the law of opposite charges they never actually collide. They are repelled by the like charges of their nuclei so vibrate between being attracted and repelled. 😊

Exam hint: if asked for a definition of ionic bonding you **must** mention that there is electron transfer between two atoms. The resulting ions then attract each other due to their opposite charges.

Also, be familiar with drawing diagrams showing electron transfer between two atoms to form ions.