

Topic – Bonding + its properties

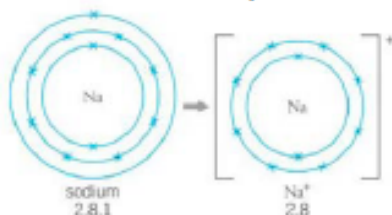


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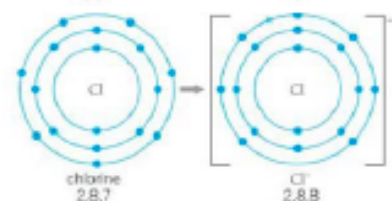
Ionic bonding

ionic bond: the electrostatic attraction between oppositely charged ions (+ and -)

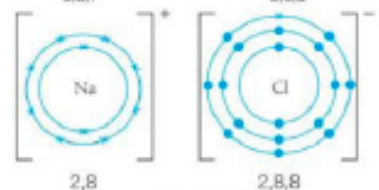
When metal atoms react with a non-metal atoms, electrons are transferred to form ions.



Metal atoms lose electrons to become positively charged ions and gain a full outer-shell.



Non-metal atoms gain electrons to become negatively charged ions and gain a full outer-shell.



Opposite charges attract so the oppositely charged ions bond together.

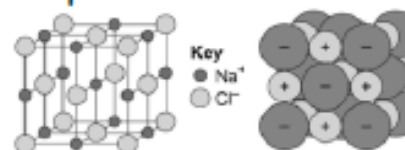
The elements in certain groups of the periodic table produce ions with particular charges:

Group 1: forms +1 ions
Group 2: forms +2 ions

Group 6: forms -2 ions
Group 7: forms -1 ions

Giant ionic compounds

Ionic compounds have regular structures (a lattice) with strong electrostatic forces of attraction in all directions between oppositely charged ions.



| Property | Explanation |
|--|--|
| High melting and boiling points. | Strong electrostatic forces between oppositely charged ions take a lot of energy to break. |
| Can't conduct electricity when solid | When solid, the ions are fixed so cannot move to carry a charge. |
| Can conduct electricity when molten or in a solution | When molten or dissolved, the ions are free to move and carry a charge. |

Formulas of ionic compounds depend on how many of each ion there is and this depends on the charge of the ion.

These ions are made of more than one element

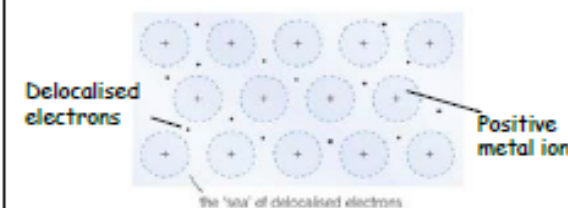
| Name of ion | Ion formula |
|-------------|-------------------------------|
| Sulfate | SO ₄ ²⁻ |
| Carbonate | CO ₃ ²⁻ |
| Nitrate | NO ₃ ⁻ |
| Hydroxide | OH ⁻ |
| Ammonium | NH ₄ ⁺ |

The numbers of ions in a formula must give an equal number of positive and negative charges.

| Compound | Ions present | Formula |
|--------------------|--------------------------------------|-------------------|
| Sodium chloride | Na ⁺ and Cl ⁻ | NaCl |
| Sodium oxide | Na ⁺ and O ²⁻ | Na ₂ O |
| Magnesium oxide | Mg ²⁺ and O ²⁻ | MgO |
| Magnesium chloride | Mg ²⁺ and Cl ⁻ | MgCl ₂ |

Metallic bonding

metallic bond: the electrostatic attraction between positively-charged metal ions which share a sea of delocalised electrons.



Properties of metals and alloys

| Property | Explanation in terms of bonds |
|------------------------------|---|
| High melting point | It takes a lot of energy to break strong metallic bonds. |
| Conduct heat and electricity | Electrons are delocalised so are free to move and carry heat or charge (current). |
| Malleable and ductile | Atoms arranged in layers that slide over each other making metals easy to shape. |

Pure metals are too soft for many uses and so are mixed with other metals to make alloys which are harder. The different sizes of particles in an alloy disrupt the layers and change the properties.

