

1.28-1.47, 1.48-1.50 Bonding and Structure (Y10)

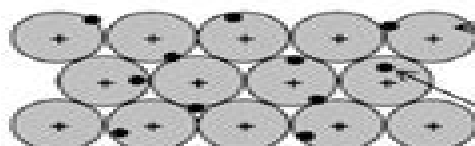
There are 3 types of chemical bonding:

Ionic bonding	Covalent bonding	Metallic bonding
- formed between <u>metal</u> and <u>non-metal</u> atoms. - involves electrons being <u>transferred</u> to gain full outer shells. - found in <u>ionic compounds</u> eg. sodium chloride (NaCl) and aluminium oxide (Al_2O_3). - results in giant ionic structures eg. sodium chloride (NaCl) and aluminium oxide (Al_2O_3).	- formed between <u>non-metal</u> atoms. - involves electrons being <u>shared</u> to gain full outer shells. - found in <u>covalent compounds</u> eg. carbon dioxide (CO_2) and methane (CH_4) and in some <u>non-metal elements</u> eg. H_2, Cl_2, N_2, O_2. - results in simple molecular or giant covalent structures.	- formed between <u>metal</u> atoms. - involves electrons becoming <u>delocalised</u>. - found in <u>metals</u>, eg. potassium (K), copper (Cu), iron (Fe). - results in giant metallic structures.

Metallic crystals

Metals, eg. copper, consist of a regular arrangement of positive ions surrounded by a sea of delocalised electrons.

The outer shell electrons from each atom become delocalised. The structure is held together by the strong electrostatic forces between the positive ions and the sea of delocalised electrons. Lots of energy is needed to overcome these strong electrostatic forces so metals have high melting points.



The layers of ions slide over each other when a force is applied but the structure does not break apart because it is held together by the delocalised electrons. This makes metals malleable – they can be hammered into shape.

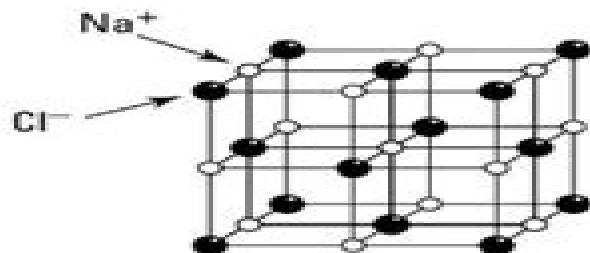
The delocalised electrons are free to move throughout the structure, making metals good conductors of electricity.

Ionic compounds

Ionic compounds, eg. NaCl , consist of a regular arrangement of positive and negative ions. Electrons from the metal atoms are transferred to the non-metal atoms so that all the atoms have full outer shells. The metal atoms lose their outer shell electrons to become positively charged (they are oxidised), and the non-metal atoms gain electrons to become negatively charged (they are reduced).

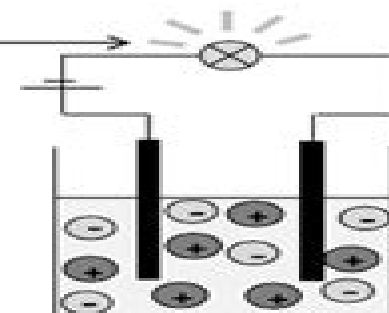
The oppositely charged ions are attracted together, forming a regular arrangement called a lattice or giant ionic structure.

Ionic compounds conduct electricity when they are molten or in solution because the ions are free to move. Solid ionic compounds do not conduct because the ions are fixed in the lattice.



Strong electrostatic forces between oppositely charged ions give ionic compounds high melting points. The higher the charge on the ions, the higher the melting point and boiling point.

← The 3d structure of sodium chloride.



Ionic And Metallic Bonding Chapter Quiz Answers

John Moore, Richard H. Langley



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