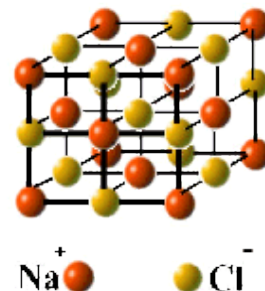


# Bonding and Structure



The key areas of study in this topic are:

- Ionic and covalent bonding
- Shapes of simple molecules and ions
- Electronegativity
- Intermolecular forces

By the end of this topic I should be able to:

	Start	End
Describe ionic bonding as the electrostatic attraction between positive and negative ions		
Construct 'dot-and-cross' diagrams to represent ionic bonding		
Explain the solid structures of giant ionic lattices, resulting from oppositely charged ions strongly attracted in all directions e.g. NaCl		
Explain the effect of structure and bonding on the physical properties of ionic compounds, including melting and boiling points, solubility and electrical conductivity in solid, liquid and aqueous states		
Describe a covalent bond as the strong electrostatic attraction between a shared pair of electrons and the nuclei of the bonded atoms		
Construct 'dot-and-cross' diagrams of molecules and ions to describe: <ul style="list-style-type: none"> <li>• single covalent bonding</li> <li>• multiple covalent bonding</li> <li>• dative covalent (coordinate) bonding</li> </ul>		
Use the term average bond enthalpy as a measurement of covalent bond strength		
Know and be able to draw the shapes of, and bond angles in, molecules and ions with up to six electron pairs (including lone pairs) surrounding the central atom as predicted by electron pair repulsion.		
Explain the relative repulsive strengths of bonded pairs and lone pairs of electrons (lone pairs repel more than bonded pairs)		
Use electron pair repulsion to explain the following shapes of molecules and ions: linear, non-linear, trigonal planar, pyramidal, tetrahedral and octahedral		
Know the bond angles for common examples of each shape		

Describe electronegativity as the ability of an atom to attract the bonding electrons in a covalent bond		
Interpret Pauling electronegativity values		
<p>Explain:</p> <ul style="list-style-type: none"> <li>molecules containing covalently-bonded atoms with different electronegativities having a polar bond and permanent dipole</li> <li>how permanent dipole(s) and molecular shape can lead to a molecule being polar and having an overall dipole</li> </ul> <p>E.g. H<sub>2</sub>O and CO<sub>2</sub> both have polar bonds but only H<sub>2</sub>O has an overall dipole.</p>		
<p>Explain intermolecular forces based on</p> <ul style="list-style-type: none"> <li>permanent dipole–dipole interactions</li> <li>induced dipole - dipole interactions</li> </ul>		
Explain hydrogen bonding as intermolecular bonding between molecules containing N, O or F and the H atom of –NH, –OH or HF		
<p>Explain the anomalous properties of H<sub>2</sub>O resulting from hydrogen bonding:</p> <ul style="list-style-type: none"> <li>the density of ice compared with water</li> <li>its relatively high melting and boiling points</li> </ul>		
Explain the solid structures of simple molecular lattices, as covalently bonded molecules attracted by intermolecular forces e.g. I <sub>2</sub> and ice		
Explain the effect of structure and bonding on the physical properties of covalent compounds with simple molecular lattice structures including melting and boiling points, solubility and electrical conductivity.		

**In all topic areas you should be able to demonstrate and apply your knowledge and understanding.**

