Chemical Bonding

Types of Bonding

- Strong
  - Bonds that require > 100 kJ mol^{-1} to break
- Weak
  - Bonds that require < 100 kJ mol^{-1} to break

Strong Bonding

- Metallic
- Ionic
- Covalent

Metallic Bonding

- Occurs in metallic elements and alloys
- Regular 3D lattice of positive charged ions
- Surrounded by electrons from outer shells from metal “Sea of Electrons”
- Strong attraction between cations and electrons hold the lattice together

Ionic Bonding

- Occurs in compounds formed between a metal and a non – metal
- Electrons are transferred from the metal to the non – metal atoms
- Metal becomes a positive ion (Cation)
- Non Metal becomes a negative ion (Anion)
- A regular 3D lattice is formed

Ionic Bonding

- A Cation is surrounded by anions
- An Anion is surrounded by cations
- Strong electrostatic charges between the cations and anions hold the lattice together

Covalent Bonding

- Occurs in compounds containing non metallic elements
- The atoms share outer shell electrons
- Both atoms get a full outer shell of electrons
- Some substances form 3D lattices, these are very hard and have high MP

Covalent Bonding

- Some substances form smaller clusters of atoms called molecules
- Bond inside the molecule are strong, the bonds between molecules are weak
- Molecular substances hence are soft and easily melt

Weak Bonding

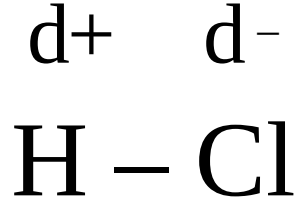
- Dispersion forces
- Dipole – Dipole moments
- Hydrogen bonds
- Ion – dipole moments

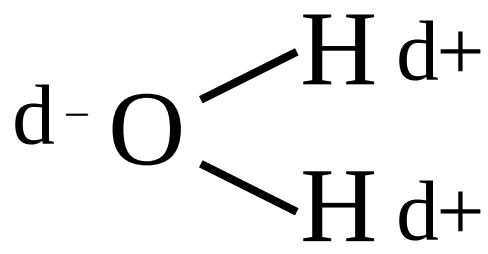
Dispersion Forces

- Present between all particles but generally too weak to notice
- Hold together molecules in non – polar molecular substances
- Such substances tend to be weak and have low MP
- Forces increase in strength as number of electrons in molecule increases

Dipole – Dipole Attractions

- Occurs between atoms which have covalent bonding where the electron drawing power is different
- Partial negative and positive charges created on the atoms





Dipole – Dipole Attractions

- Molecules arrange themselves so oppositely charged ends of molecules are close

Hydrogen Bonds

- Dipole – dipole moments containing an Hydrogen atom bonded to a highly electronegative element
  - eg flourine, nitrogen, oxygen
- Stronger than a usual dipole – dipole moment
- Water has a higher MP / BP as a result

Ion – Dipole moment

- Occurs between an ion and a polar molecule