# Chemical Bonding Part 1



We Believe You Can Fly

# The Chemistry Specialist



# **Different Structures**

## Mg vs CCl<sub>4</sub> (giant metallic vs simple molecular)

## Structure + Bonding

Mg has a giant metallic lattice structure with strong electrostatic forces of attraction between the cations and sea of delocalised mobile electrons.

CCI<sub>4</sub> is non-polar and has a simple molecular structure with weak instantaneous dipole – induced dipole forces of attraction between its molecules.

#### Energy

Since the strong electrostatic forces of attraction between the cations and sea of delocalised mobile electrons in Mg is stronger than the weak instantaneous dipole – induced dipole forces of attraction in  $CCI_4$ , more energy is required to overcome this stronger force of attraction. Hence, Mg has higher melting/boiling point than  $CCI_4$ .

# Same Structures Different Bonding

*Cl*₂ vs NH₃ (simple molecular)

# Structure

Both Cl<sub>2</sub> and NH<sub>3</sub> have a simple molecular structure.

#### Bonding

*Cl*<sub>2</sub> is non polar and has weak instantaneous dipole – induced dipole forces of attraction between its molecules.

NH<sub>3</sub> is polar and has strong hydrogen bonding between its molecules.

# Energy

Since hydrogen bonding in NH<sub>3</sub> is stronger than the instantaneous dipole – induced dipole forces of attraction in  $Cl_2$ , more energy is required to overcome this stronger force of attraction. Hence, NH<sub>3</sub> has higher melting/boiling point than  $Cl_2$ .

# Same Structures Same Bonding

NaCl vs MgCl2 (giant ionic)

## Structure

Both **NaCl** and **MgCl**<sup>2</sup> have a giant ionic lattice structure.

## Bonding

Both NaCl and MgCl<sub>2</sub> have strong electrostatic forces of attraction between their 2 oppositely charged ions.

# Energy

Since both compounds has the same anion but the charge of  $Mg^{2+}$  is larger than that of Na<sup>+</sup> and the ionic radius of  $Mg^{2+}$  is smaller than that of Na<sup>+</sup>,  $MgCl_2$  has a larger lattice energy and has stronger ionic bond which requires more energy to overcome. Hence,  $MgCl_2$  has higher melting/boiling point than NaCl.

# Same Structures Same Bonding H2O vs HF (simple molecular)

Both H<sub>2</sub>O and HF have a simple molecular structure.

# Bonding

Both H<sub>2</sub>O and HF are polar and have hydrogen bonding between its molecules.

# Energy

Since H<sub>2</sub>O has on AVERAGE 2 hydrogen bonds per molecule while HF has on AVERAGE 1 hydrogen bond per molecule, H<sub>2</sub>O has more extensive hydrogen bonds which requires more energy to overcome. Hence, H<sub>2</sub>O has higher melting/boiling point than HF.

