

# Edexcel IAL Chemistry

## A-Level

### Topic 7 - Intermolecular forces

#### Flashcards

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What types of intermolecular forces are there?



# What types of intermolecular forces are there?

- Temporary, instantaneous dipole interactions (London forces).
- Permanent dipole-dipole interactions.
- Hydrogen bonding.



# How do London forces occur between molecules?



## How do London forces occur between molecules?

There is an uneven distribution of electrons around the molecule. This creates an uneven distribution of charge. This creates a temporary dipole in the molecule, which in turn induces dipoles in neighbouring molecules.



# What is a permanent dipole-dipole interaction?



# What is a permanent dipole-dipole interaction?

The electrostatic attraction between oppositely charged permanent dipoles of neighbouring molecules.



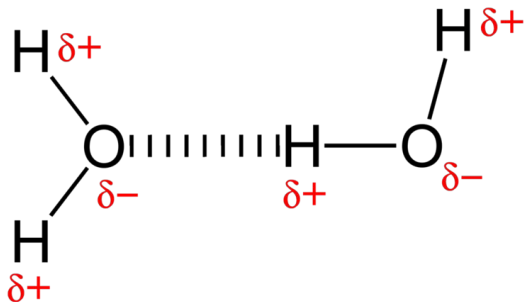
# What are hydrogen bonds?





# What are hydrogen bonds?

Hydrogen bonds are the electrostatic attraction between electron deficient hydrogens and a highly electronegative atom - commonly nitrogen, fluorine or oxygen.



# Why does water have a high melting and boiling point?



# Why does water have a high melting and boiling point?

Hydrogen bonds form between water molecules due to the electronegative oxygen and the slightly positive hydrogen atom. Hydrogen bonds require a lot of energy to break (they are the strongest of the 3 types of intermolecular force).



Explain, with reference to hydrogen bonds, the difference in the densities of ice and water



Explain, with reference to hydrogen bonds, the difference in the densities of ice and water

When water freezes, the water molecules form a crystalline structure held together by hydrogen bonding. Ice is less dense than water because the hydrogen bond orientation in ice causes the molecules to push farther apart, lowering the density.



Why do the boiling and melting points of alkanes increase as the length of the carbon chain increases?



Why do the boiling and melting points of alkanes increase as the length of the carbon chain increases?

Alkanes only have intermolecular London forces between them. Longer chain alkanes have more electrons and a larger surface area to interact with each other, they therefore have more London forces which take more heat energy to break. Therefore more energy is required to overcome these London forces.



Why does branching in alkanes decrease the melting/boiling point of the molecule?





## Why does branching in alkanes decrease the melting/boiling point of the molecule?

Branching in alkanes decreases the surface area of contact that the molecules have with each other. The number of London forces between the molecules decreases with increased branching, so the energy needed to break the molecules apart decreases.



# What is volatility?



## What is volatility?

Volatility describes the ease of a substance to vaporise.

A substance with high volatility evaporates more readily than a substance with low volatility.



Why is the volatility of alcohols much less than the volatility of alkanes with a similar number of carbon atoms?



Why is the volatility of alcohols much less than the volatility of alkanes with a similar number of carbon atoms?

Alcohols have hydrogen bonds between their molecules due to the -OH group. These bonds are much stronger than the London forces between alkanes so they take much more heat energy to break. Therefore the boiling point of an alcohol is greater than that of the corresponding alkane.



Why do the boiling points of hydrogen halides decrease down the group?



# Why do the boiling points of hydrogen halides decrease down the group?

As we move down the group the electronegativity of the halogens decrease. Therefore the polarity of the halogen-hydrogen bond decreases, making the intermolecular dipole-dipole forces weaker, so they take less energy to break.



What is the relationship between the enthalpy change of hydration of an ion and its solubility in water?





What is the relationship between the enthalpy change of hydration of an ion and its solubility in water?

The more exothermic the enthalpy change of hydration of an ion, the greater its solubility in water.



# Why are alcohols soluble in water?



# Why are alcohols soluble in water?

Alcohols form hydrogen bonds with the water molecules.



# Why are some covalent molecules insoluble in water?



# Why are some covalent molecules insoluble in water?

Molecules that are non-polar or have a very small polar part on them are insoluble in water because they do not form interactions with the polar water molecules.



How can you identify whether a substance will be soluble in a particular solvent or not?



How can you identify whether a substance will be soluble in a particular solvent or not?

The substance should have similar intermolecular forces to the solvent that it is being dissolved in.

