WJEC (Wales) Chemistry GCSE

2.1 - Bonding, Structure and Properties

Flashcards

What is a compound?

What is a compound?

A substance in which 2 or more elements are chemically combined

What are the three types of chemical bonds?

What are the three types of chemical bonds?

- Ionic - bonding in ionic compounds
- Metallic - bonding in metals
- Covalent - bonding in giant covalent structures and simple covalent molecules

What are the properties of ionic compounds?

What are the properties of ionic compounds?

- Strong electrostatic attraction between oppositely charged ions means ionic compounds have high melting and boiling points
- In a solid state, ionic compounds do not conduct electricity as the ions are fixed in place
- When molten/ dissolved, ions can move around so then ionic compounds conduct electricity
- They are brittle

What are the properties of metallic compounds?

What are the properties of metallic compounds?

- The layers of ions in metals are able to slide over each other, so metals are malleable and ductile
- The delocalised electrons can move through the metal and carry charge, so metals conduct electricity and heat
- Metallic bonds are very strong and require large amounts of energy to be broken, giving most metals high melting and boiling points

What are the properties of simple molecular covalent substances?

What are the properties of simple molecular covalent substances?

- Simple molecules have weak intermolecular forces between the molecules, so they have low melting and boiling points
- Do not conduct electricity because simple molecules do not have an overall charge
- They are usually gases or liquids

What are the properties of giant covalent substances?

What are the properties of giant covalent substances?

- Substances with a giant covalent structure are solids with very high melting points

Explain the bonding and structure in metallic compounds.

Explain the bonding and structure in metallic compounds.

- The electrons in the outer shell of metal atoms are delocalised and so they are free to move through the whole structure - ‘sea’ of delocalised electrons
- Metallic bonds form due to the electrostatic attraction between the positively charged metal ions and the negatively charged delocalised electrons

How does ionic bonding take place?

How does ionic bonding take place?

- Electrons in the outer shell of the metal are transferred
- Metal atoms lose electrons to become positively charged ions
- Non-metal atoms gain electrons to become negatively charged ions
- The electrostatic attraction from these oppositely charged ions forms a giant ionic lattice
- The electron transfer can be represented by a dot and cross diagram

How are covalent bonds formed?

How are covalent bonds formed?

- When atoms share pairs of electrons, they form covalent bonds
- The bonds between these atoms are strong
- Dot and cross diagrams can be drawn to represent the sharing of electrons

Why do simple molecular substances have low melting and boiling points?

Why do simple molecular substances have low melting and boiling points?

- Weak intermolecular forces between molecules - these are broken in melting or boiling, not the strong covalent bonds
- The intermolecular forces increase with the size of the molecules, larger molecules have higher melting and boiling points

What are the properties of diamond with respect to bonding and structure?

What are the properties of diamond with respect to bonding and structure?

- It is very hard, has a very high melting point and does not conduct electricity
- Each carbon is joined to 4 other carbons covalently - covalent bonds need a lot of energy to be broken = very high melting point
- This is the maximum number of bonds each carbon atom can make

What are the properties of graphite with respect to bonding and structure?

What are the properties of graphite with respect to bonding and structure?

- Each carbon is covalently bonded to 3 other carbons, forming layers of hexagonal rings which have no covalent bonds between the layers
- The layers can slide over each other due to the absence of covalent bonds between the layers, but there are weak intermolecular forces between layers - so graphite is soft and slippery
- One electron from each carbon atom is delocalised so it can conduct electricity

What are the properties of graphene with respect to bonding and structure?

What are the properties of graphene with respect to bonding and structure?

- Its structure resembles a single layer of graphite
- Graphene has a very high melting point due to the very strong covalent bonds between the carbon atoms that require large amounts of energy to be broken
- Conducts electricity due to the delocalised electrons that are free to move through its structure

What are fullerenes?

What are fullerenes?

- Molecules of carbon atoms with hollow shapes
- They are based on hexagonal rings of carbon atoms, but they may also contain rings with five or seven carbon atoms

What are carbon nanotubes?

What are carbon nanotubes?

- Cylindrical fullerenes with very high length to diameter ratios
- They have very high tensile strength and conduct electricity due to the delocalised electrons present

Do individual atoms have the same properties as bulk materials?

Do individual atoms have the same properties as bulk materials?

- No - for example, carbon atoms on their own do not have any of the properties exhibited by any of the different structures (diamond, graphite, graphene, nanotubes or fullerenes)

What are the properties of nanoparticles?

What are the properties of nanoparticles?

- 1-100 nanometers across
- Contain a few hundred atoms
- They have different properties from the ‘bulk’ properties which they form because of their high surface area to volume ratio

What are some uses of nanoparticles?

What are some uses of nanoparticles?

- Nano-silver - kills bacteria: used in wound dressings, deodorants, or to line socks and fridges to kill bacteria causing bad smell
- Nano-titanium dioxide - used in sunblock creams to block harmful UV rays without appearing white on the skin as the particles do not reflect visible light, also used in self-cleaning windows as they help break down dirt

What are the risks of nanoparticles?

What are the risks of nanoparticles?

- So small that they could potentially enter the bloodstream
- Relatively new material so long term effects are not known
- Can enter and potentially damage the environment

What are the properties and uses of thermochromic materials?

What are the properties and uses of thermochromic materials?

- Change colour when they reach a certain temperature
- Used in mugs and spoons which change colour when their contents are hot

What are the properties and uses of photochromic pigments?

What are the properties and uses of photochromic pigments?

- These pigments change colour when exposed to light
- Used in sunglasses which darken in bright sun

What are the properties and uses of polymer gels?

What are the properties and uses of polymer gels?

- Hydrogels absorb up to 1,000 times their volume in water
- Certain stimuli (changes in pH and temperature) can cause the water to be released
- Used in nappies, fake snow and hair gel

What are the properties and uses of shape memory alloys/polymers?

What are the properties and uses of shape memory alloys/polymers?

- These materials can be bent and deformed but will return to their original shape when heated
- Shape memory polymers are used in medical stitches and sports equipments such as gum shields
- Shape memory alloys are used in car bodies and plates for bone fractures