WJEC (Eduqas) Chemistry GCSE

5 - Bonding, Structure and Properties

Flashcards

Explain how ionic bonds form

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When a metal and a nonmetal react, the electrons in the outer shell of the metal atom are transferred to the nonmetal.

The electron transfer can be represented using a dot and cross diagram.

Explain how ions within an ionic compound are held together

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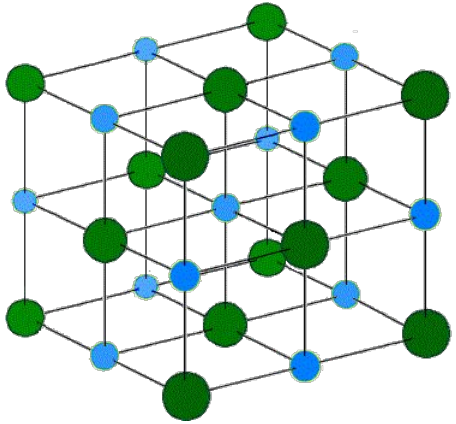
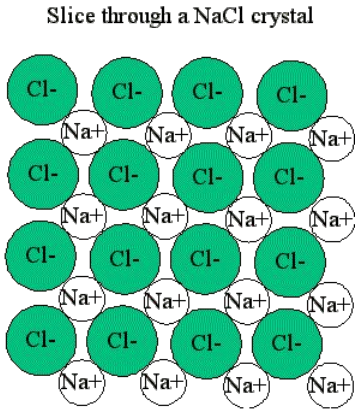
Ionic compounds are a giant structure of ions held together by electrostatic forces of attraction between oppositely charged ions. The forces act in all directions in the lattice.





Why do ionic compounds have high melting points?

Why do ionic compounds have high melting points?

The electrostatic forces between ions within the lattice are strong.

Do ionic compounds conduct electricity?

Do ionic compounds conduct electricity?

Only when molten or dissolved, as ions are able to move around and therefore conduct electricity. When solid, ionic compounds are not able to as ions are fixed in place.

What type of bonds are found in polymers?

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Covalent bonds

Explain how a covalent bond forms

Explain how a covalent bond forms

Covalent bonds form when 2 atoms share a pair of electrons in order to gain full outer shells, e.g. H_2, O_2 or polymers

What type of bonds are found in diamond?

What type of bonds are found in diamond?

Covalent bonds

List some properties of simple covalent molecules

List some properties of simple covalent molecules

Usually gases or liquids

Low boiling and melting points

Do not conduct electricity as they do not have an overall electric charge

Which forces are broken during the boiling of simple covalent molecules?

Which forces are broken during the boiling of simple covalent molecules?

Weak intermolecular forces are overcome during boiling, but the covalent bonds remain intact.

Explain, in terms of forces, why larger molecules have higher melting and boiling points

Explain, in terms of forces, why larger molecules have higher melting and boiling points

Intermolecular forces increase with the size of molecules and therefore require more energy to overcome during melting/boiling.

List some properties of giant covalent structures

List some properties of giant covalent structures

Solids with very high melting points

The atoms are linked to other atoms by strong covalent bonds

What are the properties of polymers?

What are the properties of polymers?

Very large molecules, linked to atoms by strong covalent bonds.

The intermolecular forces between polymer molecules are relatively strong, so substances are solids at room temperature.

Explain what metallic bonding is in relation to electrons

Explain what metallic bonding is in relation to electrons

The electrons in the outer shell metal atoms are delocalised and so are free to move through the whole structure. This is referred to as a ‘sea’ of electrons.

The sharing of delocalised electrons gives rise to strong metallic bonds.

List some properties of metals

List some properties of metals

High melting and boiling points

Conduct heat and electricity as delocalised electrons in their structure - move throughout the metal in the ‘sea’

Able to be bent and shaped as the layers of atoms are able to slide over each other

What are the limitations of dot and cross diagrams?

What are the limitations of dot and cross diagrams?

Shows how atoms are bonded and the electrons

Does not show the 3D arrangement of molecules

Does not include intermolecular forces (the ones broken when boiling/melting simple molecules)

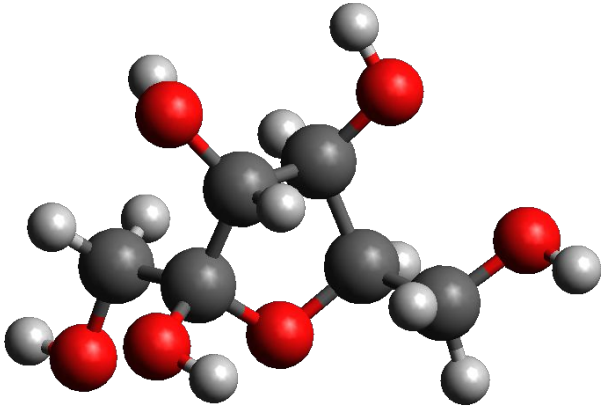
What are the limitations of ball and stick diagrams?

What are the limitations of ball and stick diagrams?

Shows how atoms are bonded and the 3D shape

Does not show electrons or chemical symbols

Does not include intermolecular forces (the ones broken when boiling/melting simple molecules)



https://commons.wikimedia.org/wiki/File:Fructose_3D_ball-and-stick_model.png CC-BY-SA-3.0

What are the limitations of 3D diagrams?

What are the limitations of 3D diagrams?

3D arrangement shown

Does not show bonding or electrons

Does not include intermolecular forces (the ones broken when boiling/melting simple molecules)

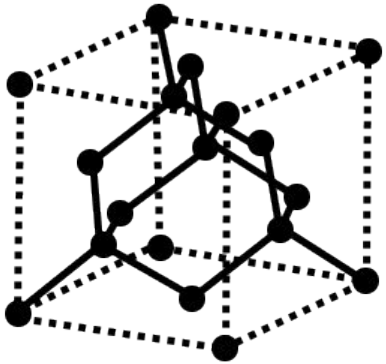
Explain the formation of diamond

Explain the formation of diamond

Each carbon is joined to 4 other carbons joined by covalent bonds

This is the maximum number of bonds each carbon atom can make

Extremely hard, very high melting points, does not conduct electricity



Diamond Structure

https://commons.wikimedia.org/wiki/File:Allotropes_Of_Carbon.png
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Explain the formation of graphite

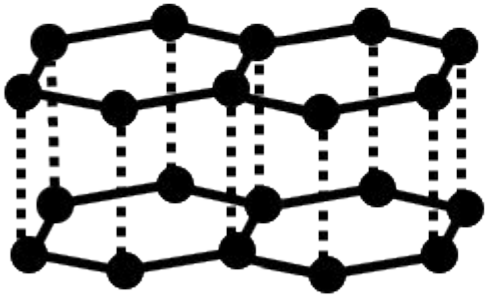
Explain the formation of graphite

Each carbon is covalently bonded to 3 other carbons

Layers of hexagonal rings are formed, with no covalent bonds between layers and weak intermolecular forces

The layers can slide over each other and so graphite is soft and slippery

One electron from each carbon atom is delocalised, making graphite similar to metals and able to conduct electricity



Graphite Structure

What are fullerenes?

What are fullerenes?

Fullerenes contain different numbers of carbon atoms.

Molecules form hollow shapes, based on hexagonal rings of carbon atoms

Cylindrical fullerenes with very high length:diameter used as carbon nanotubes

What is graphene?

What is graphene?

Single layer of graphite

Properties make it useful in electronics and composites

How does surface area:volume change as particles become bigger?

How does surface area:volume change as particles become bigger?

Larger particles have a smaller surface area to volume ratio and so become less reactive

What are nanoparticles?

What are nanoparticles?

1-100 nanometers across

Include fullerenes

Different properties to the ‘bulk’ chemical its made from due to their high surface area:volume

Smaller quantities are needed to be effective

List some uses of nanoparticles and their relevant properties

List some uses of nanoparticles and their relevant properties

Catalysts - high surface area to volume ratio

Stronger, lighter building materials

High selective sensors

New cosmetics - titanium dioxide nanoparticles so small that they do not reflect visible light so no white marks

Lubricant coatings for artificial joints and gears - reduce friction

List some risks of using nanoparticles

List some risks of using nanoparticles

So small that they could potentially enter the bloodstream

Many feel that the risks are not yet known so more testing is required