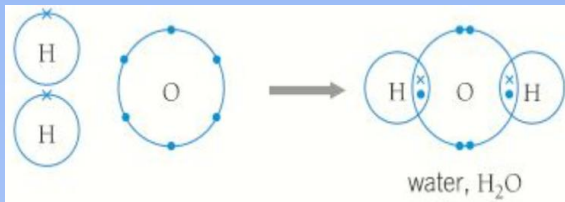


Covalent Bonding Knowledge Organiser

Previous learning: atomic structure and ionic bonding

Future learning: polymers, crude oil, A Level structure and bonding

Bonding



Use the step by step in your book to draw a covalent bonding for:

H_2 , O_2 , NH_3 , CH_4 .

Use page 44+45 to check and mark your answers.

H_2O has been done for you as an example

Common mistakes when drawing covalent bonds:

Not using dots and crosses

More electrons in the final substance than the atoms you started with

Odd number of electrons in the bond

All atoms not having full outer shells (no more **or** less!)

Major differences between ionic and covalent bonding:

Ionic	Covalent
Electrons are transferred	Electrons are shared
Ions are formed	No ions are formed
Between metal atoms and non-metal atoms	Between non-metal atoms

Key words: define the words below. Use Quizlet and the glossary to help

Covalent bond

Giant covalent

Simple molecular

Fullerene

Graphene

Diamond

Graphite

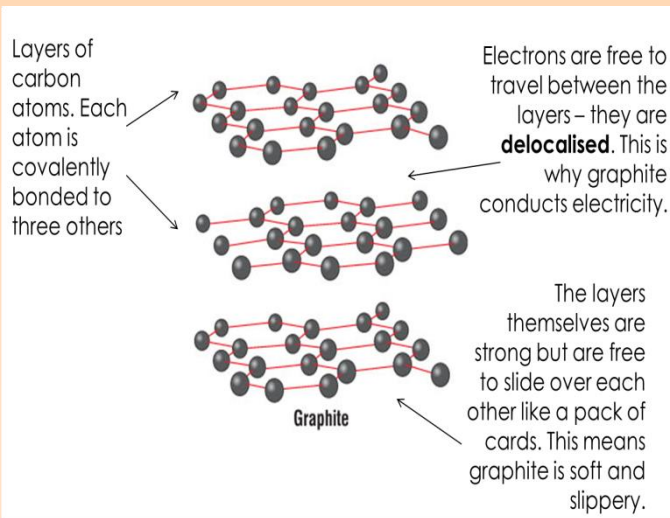
Delocalised electrons

Structure

In giant covalent structures there are strong covalent bonds between billions of atoms. Examples include silicon dioxide and diamond (see diagram to the right).

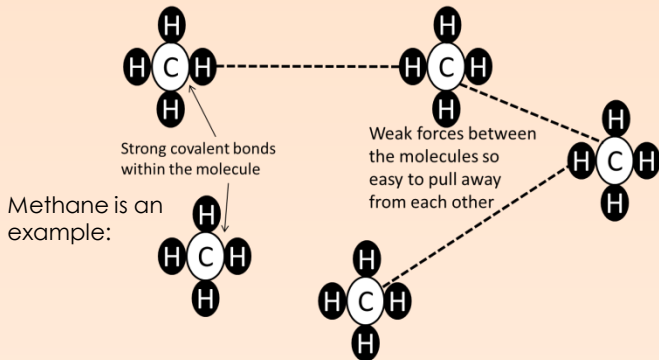
Graphite is an exception as it is arranged in layers:

Giant Covalent



In simple molecular substances **strong covalent bonds** hold the atoms in a molecule together. Molecules are held together by **weak intermolecular forces**.

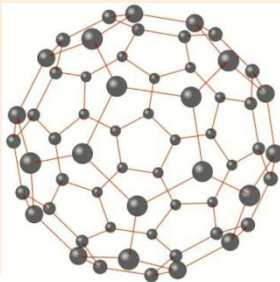
Simple Molecular



Fullerenes are spheres or tubes made up of carbon atoms. Because the atoms have three bonds only there are delocalised electrons.

Graphene is just one layer of carbon atoms from graphite (see diagram above)

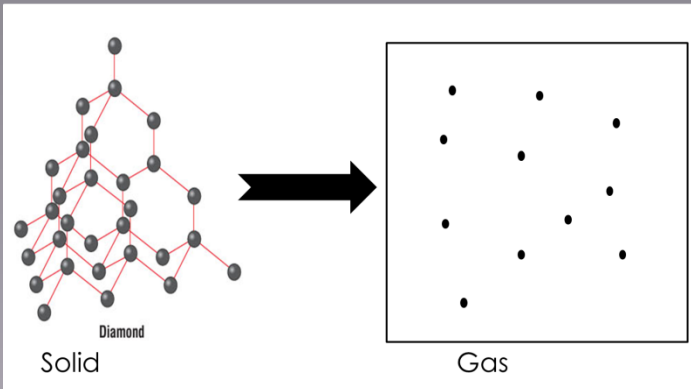
Fullerenes + Graphene



Properties

State and explain three properties of giant covalent structures

1. High melting and boiling points. This is because it requires a lot of energy to break the strong covalent bonds between atoms.



2. Other than graphite do not conduct electricity: due to there being no charged particles (electrons or ions) free to move and carry charge.

3. Other than graphite are hard: the covalent bonds are strong and hard to break.

On the reverse of the sheet explain why:

Diamond is used on the ends of industrial drills

Silicon dioxide is used to make moulds for pouring molten metal into
Graphite is used as a lubricant

State and explain two general properties of simple molecular substances:

1. Low melting and boiling points: forces holding molecules together are weak and easy to break. Note that **bigger molecules have** stronger intermolecular forces so higher melting and boiling points.

3. Do not conduct electricity: due to there being no charged particles (electrons or ions) free to move and carry charge.

On the reverse of the sheet draw a diagram and explain why water has a low melting and boiling point.

State and explain two properties of fullerenes:

1. Fullerenes are very strong (they have a high tensile strength) because of the strong covalent bonds holding the structure together.

2. They can be used as lubricants as there are only weak forces holding the fullerenes together (like with **simple molecular**).

State a use for graphene and for fullerenes

They can be used for **drug delivery** and graphene can be used for ultra-fast **computer chips**.

Extension: Do you think fullerenes should be classed as giant covalent or simple molecular? Give reasons for your answer.