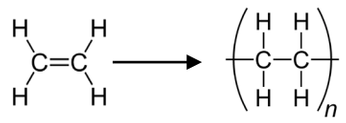
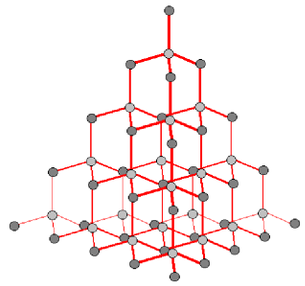
AQA BONDING, STRUCTURE AND THE PROPERTIES OF MATTER 2

Polymers

Very large molecules	*Solids at room temperature*	Atoms are linked by strong covalent bonds.	

Diamond

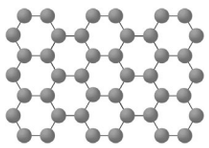
Each carbon atom is bonded to four others		Very hard.	Rigid structure.
		Very high melting point.	Strong covalent bonds.
		Does not conduct electricity.	No delocalised electrons.

Properties of small molecules

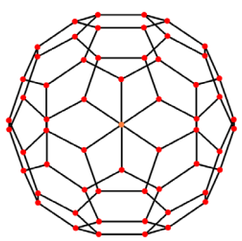
Usually gases or liquids	*Covalent bonds in the molecule are strong but forces between molecules (intermolecular) are weak*	Low melting and boiling points.	Due to having weak intermolecular forces that easily broken.
		Do not conduct electricity.	Due to them molecules not having an overall electrical charge.
		Larger molecules have higher melting and boiling points.	Intermolecular forces increase with the size of the molecules.

Graphene and fullerenes

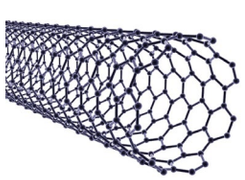
Graphene

 *Single layer of graphite one atom thick*	Excellent conductor.	Contains delocalised electrons.
	Very strong.	Contains strong covalent bonds.

Fullerenes

	Buckminsterfullerene, C_{60} First fullerene to be discovered.	Hexagonal rings of carbon atoms with hollow shapes. Can also have rings of five (pentagonal) or seven (heptagonal) carbon atoms.

Carbon nanotubes

	*Very thin and long cylindrical fullerenes*	Very conductive.	Used in electronics industry.
		High tensile strength.	Reinforcing composite materials.
		Large surface area to volume ratio.	Catalysts and lubricants.

Size of particles and their properties (Chemistry only)

Nanoparticles

Between 1 and 100 nanometres (nm) in size	1 nanometre (1 nm) = 1 x 10^{-9} metres (0.000 000 001m or a billionth of a metre).

Use of nanoparticles

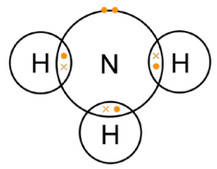
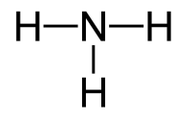
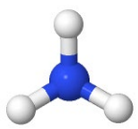
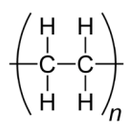
Healthcare, cosmetics, sun cream, catalysts, deodorants, electronics.	Nanoparticles may be toxic to people. They may be able to enter the brain from the bloodstream and cause harm.

Giant covalent structures

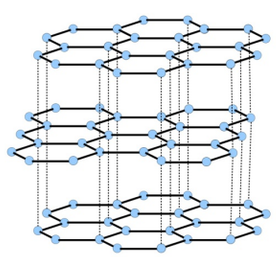
Diamond, graphite, silicon dioxide	*Very high melting points*	Lots of energy needed to break strong, covalent bonds.

Covalent bonding

Atoms share pairs of electrons

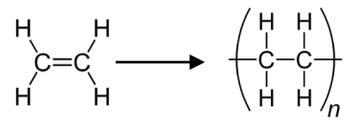
Can be small molecules e.g. ammonia	 Dot and cross : + Show which atom the electrons in the bonds come from - All electrons are identical  2D with bonds: + Show which atoms are bonded together - It shows the H-C-H bond incorrectly at 90°  3D ball and stick model: + Attempts to show the H-C-H bond angle is 109.5°
Can be giant covalent structures e.g. polymers	

Graphite

Each carbon atom is bonded to three others forming layers of hexagonal rings with no covalent bonds between the layers		Slippery.	Layers can slide over each other.
		Very high melting point.	Strong covalent bonds.
		Does conduct electricity.	Delocalised electrons between layers.

AQA BONDING, STRUCTURE AND THE PROPERTIES OF MATTER 2

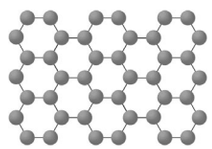
Polymers

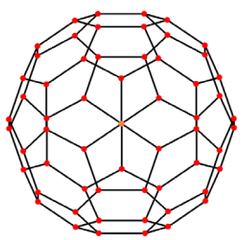
	Solids at room temperature	Atoms are linked by strong covalent bonds.	

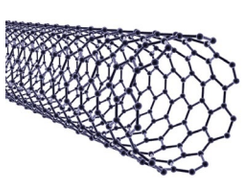
Properties of small molecules

Covalent bonds in the molecule are strong but forces between molecules (intermolecular) are weak	Low melting and boiling points.	Due to having weak intermolecular forces that easily broken.
	Do not conduct electricity.	Due to them molecules not having an overall electrical charge.
	Larger molecules have higher melting and boiling points.	Intermolecular forces increase with the size of the molecules.

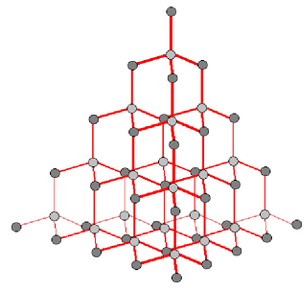
Graphene and fullerenes

 *Single layer of graphite one atom thick*	Excellent conductor.	Contains delocalised electrons.
	Very strong.	Contains strong covalent bonds.

	Buckminsterfullerene, C_{60} First fullerene to be discovered.	Hexagonal rings of carbon atoms with hollow shapes. Can also have rings of five (pentagonal) or seven (heptagonal) carbon atoms.

	*Very thin and long cylindrical fullerenes*	Very conductive.	Used in electronics industry.
		High tensile strength.	Reinforcing composite materials.
		Large surface area to volume ratio.	Catalysts and lubricants.

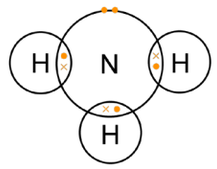
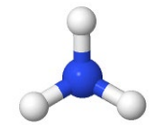
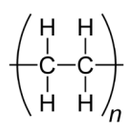
Diamond

	Very hard.	Rigid structure.
	Very high melting point.	Strong covalent bonds.
	Does not conduct electricity.	No delocalised electrons.

Giant covalent structures

	Very high melting points	Lots of energy needed to break strong, covalent bonds.

Covalent bonding

Can be small molecules e.g. ammonia		Dot and cross : + Show which atom the electrons in the bonds come from - All electrons are identical
		2D with bonds: + Show which atoms are bonded together - It shows the H-C-H bond incorrectly at 90°
		3D ball and stick model: + Attempts to show the H-C-H bond angle is 109.5°
Can be giant covalent structures e.g. polymers		

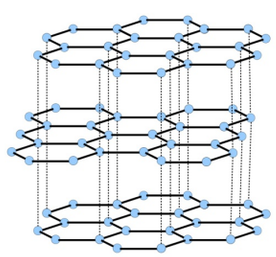
Size of particles and their properties (Chemistry only)

Nanoparticles	*Between 1 and 100 nanometres (nm) in size*	1 nanometre (1 nm) = 1 x 10^{-9} metres (0.000 000 001m or a billionth of a metre).

Use of nanoparticles

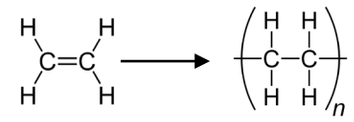
Healthcare, cosmetics, sun cream, catalysts, deodorants, electronics.	Nanoparticles may be toxic to people. They may be able to enter the brain from the bloodstream and cause harm.

Graphite

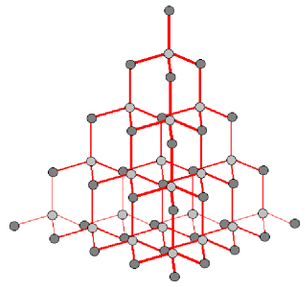
Each carbon atom is bonded to three others forming layers of hexagonal rings with no covalent bonds between the layers		Layers can slide over each other.
		Strong covalent bonds.
		Delocalised electrons between layers.

AQA BONDING, STRUCTURE AND THE PROPERTIES OF MATTER 2

Polymers

	Solids at room temperature		

Diamond

		Very hard.	Rigid structure.
		Very high melting point.	Strong covalent bonds.
		Does not conduct electricity.	No delocalised electrons.

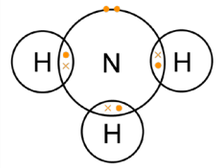
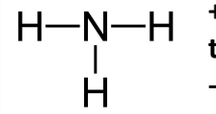
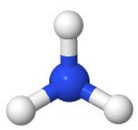
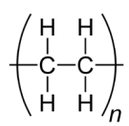
Giant covalent structures

		Lots of energy needed to break strong, covalent bonds.

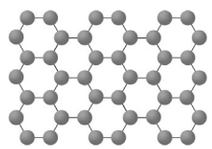
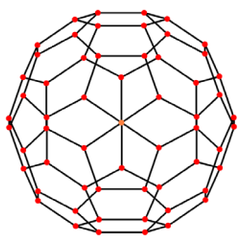
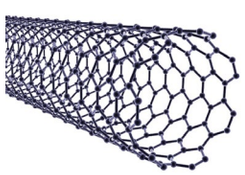
Properties of small molecules

	Low melting and boiling points.	Due to having weak intermolecular forces that easily broken.
	Do not conduct electricity.	Due to them molecules not having an overall electrical charge.
	Larger molecules have higher melting and boiling points.	Intermolecular forces increase with the size of the molecules.

Covalent bonding

	Dot and cross : + Show which atom the electrons in the bonds come from - All electrons are identical	
	2D with bonds: + Show which atoms are bonded together - It shows the H-C-H bond incorrectly at 90°	
	3D ball and stick model: + Attempts to show the H-C-H bond angle is 109.5°	
		

Graphene and fullerenes

	Excellent conductor.	Contains delocalised electrons.	
	Very strong.	Contains strong covalent bonds.	
		Hexagonal rings of carbon atoms with hollow shapes. Can also have rings of five (pentagonal) or seven (heptagonal) carbon atoms.	
		Very conductive.	Used in electronics industry.
		High tensile strength.	Reinforcing composite materials.
		Large surface area to volume ratio.	Catalysts and lubricants.

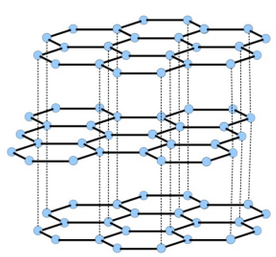
Size of particles and their properties (Chemistry only)

Nanoparticles		1 nanometre (1 nm) = 1 x 10^{-9} metres (0.000 000 001m or a billionth of a metre).

Use of nanoparticles

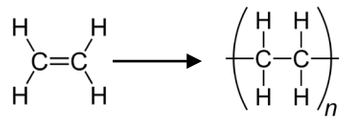
	Nanoparticles may be toxic to people. They may be able to enter the brain from the bloodstream and cause harm.

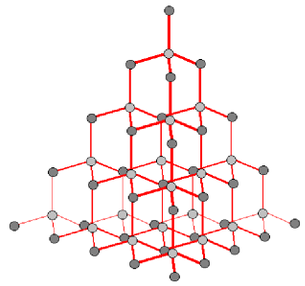
Graphite

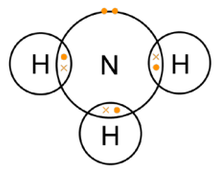
			Layers can slide over each other.
			Strong covalent bonds.
			Delocalised electrons between layers.

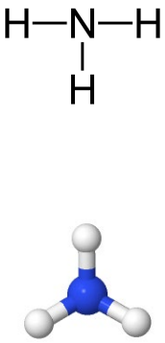
AQA BONDING, STRUCTURE AND THE PROPERTIES OF MATTER 2

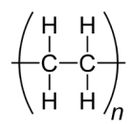
- Polymers
- Diamond
- Properties of small molecules
- Giant covalent structures
- Covalent bonding
- Size of particles and their properties (Chemistry only)
- Graphene and fullerenes
- Nanoparticles
- Use of nanoparticles
- Graphite

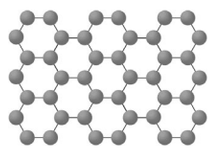


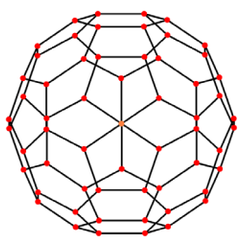


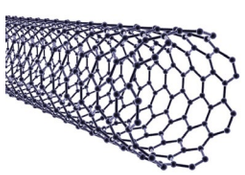


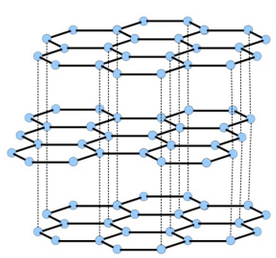












better hope – brighter future