

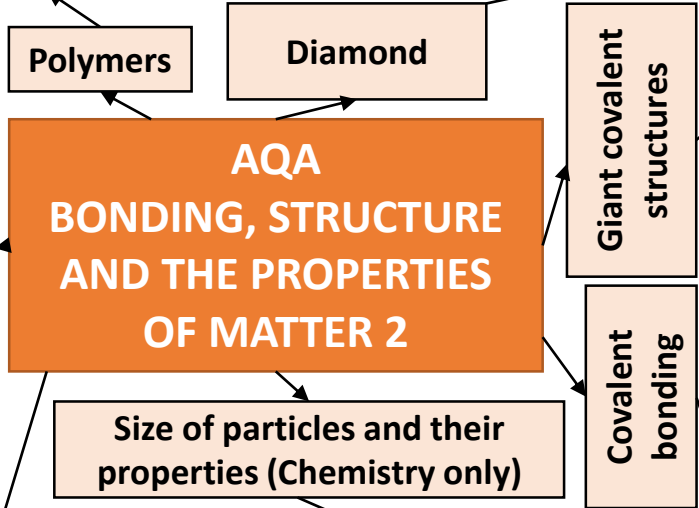


Very large molecules	<i>Solids at room temperature</i>	Atoms are linked by strong covalent bonds.	
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<i>Each carbon atom is bonded to four others</i>		Very hard.	Rigid structure.
		Very high melting point.	Strong covalent bonds.
		Does not conduct electricity.	No delocalised electrons.

Usually gases or liquids	<i>Covalent bonds in the molecule are strong but forces between molecules (intermolecular) are weak</i>	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.

Properties of small molecules



Diamond, graphite, silicon dioxide	<i>Very high melting points</i>	Lots of energy needed to break strong, covalent bonds.
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Graphene		Excellent conductor.	Contains delocalised electrons.
		Very strong.	Contains strong covalent bonds.

Size of particles and their properties (Chemistry only)	
Nanoparticles	<i>Between 1 and 100 nanometres (nm) in size</i>
	1 nanometre (1 nm) = 1 x 10 ⁻⁹ metres (0.000 000 001m or a billionth of a metre).

Use of nanoparticles

<i>Healthcare, cosmetics, sun cream, catalysts, deodorants, electronics.</i>	Nanoparticles may be toxic to people. They may be able to enter the brain from the bloodstream and cause harm.
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Atoms share pairs of electrons	<i>Can be small molecules e.g. ammonia</i>	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°
	<i>Can be giant covalent structures e.g. polymers</i>	

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.
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Carbon nanotubes		<i>Very thin and long cylindrical fullerenes</i>	Very conductive.	Used in electronics industry.
			High tensile strength.	Reinforcing composite materials.
			Large surface area to volume ratio.	Catalysts and lubricants.

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