

Subject	Y10 Chemistry Threshold Concepts – Autumn Term	How to support students' learning
Structure and bonding	<p>Chemical bonds</p> <p>Explain chemical bonding in terms of electrostatic forces and the transfer or sharing of electrons</p> <p>Ionic bonding</p> <ul style="list-style-type: none"> • Draw dot and cross diagrams for ionic compounds formed by metals in Groups 1 and 2 with non-metals in Groups 6 and 7 • The charge on the ions produced by metals in Groups 1 and 2 and by non-metals in Groups 6 and 7 relates to the group number of the element in the periodic table • Work out the charge on the ions of metals and non-metals from the group number of the element, limited to the metals in Groups 1 and 2, and non-metals in Groups 6 and 7 <p>Ionic compounds</p> <ul style="list-style-type: none"> • Deduce that a compound is ionic from a diagram of its structure in one of the specified forms • Describe the limitations of using dot and cross, ball and stick, two and three-dimensional diagrams to represent a giant ionic structure • Work out the empirical formula of an ionic compound from a given model or diagram that shows the ions in the structure 	<p>Encourage your child to watch this video on ionic bonding GCSE Chemistry - What is Ionic Bonding? How Does Ionic Bonding Work? Ionic Bonds Explained #14 - YouTube</p>

Covalent bonding

- Recognise common substances that consist of small molecules from their chemical formula
- State that some covalently bonded substances have very large molecules, such as polymers
- State that some covalently bonded substances have giant covalent structures, such as diamond and silicon dioxide.

- Draw dot and cross diagrams for the molecules of hydrogen, chlorine, oxygen, nitrogen, hydrogen chloride, water, ammonia and methane
- Represent the covalent bonds in small molecules, in the repeating units of polymers and in part of giant covalent structures, using a line to represent a single bond
- Describe the limitations of using dot and cross, ball and stick, two and three-dimensional diagrams to represent molecules or giant structures
- Deduce the molecular formula of a substance from a given model or diagram in these forms showing the atoms and bonds in the molecule

Metallic bonding

- Recognise substances as metallic giant structures from diagrams showing their bonding

How bonding and structure are related to the properties of substances

The three states of matter

Encourage your child to watch this video on covalent bonding [GCSE Chemistry - Covalent Bonding #16 - YouTube](#)

Encourage your child to watch this video on metallic bonding [GCSE Chemistry - Metallic Bonding #20 - YouTube](#)

	<ul style="list-style-type: none">• Predict the states of substances at different temperatures given appropriate data• Explain the different temperatures at which changes of state occur in terms of energy transfers and types of bonding• Recognise that atoms themselves do not have the bulk properties of materials• (HT only) explain the limitations of the particle theory in relation to changes of state when particles are represented by solid inelastic spheres which have no forces between them.• (HT only) Limitations of the simple model above include that in the model there are no forces, that all particles are represented as spheres and that the spheres are solid <p>State symbols</p> <ul style="list-style-type: none">• Include appropriate state symbols in chemical equations for the reactions in this specification. <p>Properties of ionic compounds</p> <ul style="list-style-type: none">• State that ionic compounds have regular structures (giant ionic lattices) in which there are strong electrostatic forces of attraction in all directions between oppositely charged ions.• State that these compounds have high melting points and high boiling points because of the large amounts of energy needed to break the many	<p>Encourage your child to visit BBC bitesize to read about the limitations of the particle model</p> <p>Limitations of the particle model - Higher - States of matter - Eduqas - GCSE Chemistry (Single Science) Revision - Eduqas - BBC Bitesize</p>
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strong bonds

- Explain that when melted or dissolved in water, ionic compounds conduct electricity because the ions are free to move and so charge can flow

Properties of small molecules

- Use the idea that intermolecular forces are weak compared with covalent bonds to explain the bulk properties of molecular substances

Polymers

- Recognise polymers from diagrams showing their bonding and structure

Giant covalent structures

- Recognise giant covalent structures from diagrams showing their bonding and structure

Properties of metals and alloys

- Explain why alloys are harder than pure metals in terms of distortion of the layers of atoms in the structure of a pure metal

Metals and conductors

- State that metals are good conductors of electricity because the delocalised electrons in the metal carry electrical charge through the metal. Metals are

Encourage your child to watch this video on giant covalent structures [GCSE Chemistry Giant covalent structures \(Edexcel 9-1\) - YouTube](#)

	<p>good conductors of thermal energy because energy is transferred by the delocalised electrons</p> <p>Structure and bonding of carbon</p> <p>Diamond</p> <ul style="list-style-type: none"> • Explain the properties of diamond in terms of its structure and bonding <p>Graphite</p> <ul style="list-style-type: none"> • Explain the properties of graphite in terms of its structure and bonding. • Students should know that graphite is similar to metals in that it has delocalised electrons <p>Graphene and fullerenes</p> <ul style="list-style-type: none"> • Recognise graphene and fullerenes from diagrams and descriptions of their bonding and structure • Give examples of the uses of fullerenes, including carbon nanotubes <p>Triple only</p> <p><i>Bulk and surface properties of matter including nanoparticles</i></p> <p><i>Sizes of particles and their properties</i></p>	<p>Encourage your child to visit BBC bitesize and read about the structure and bonding in carbon Diamond and graphite - Giant covalent molecules - AQA - GCSE Chemistry (Single Science) Revision - AQA - BBC Bitesize</p> <p>Encourage your child to Visit this website to read about nanoscience and watch the video showing some uses Nanoscience National Geographic Society</p>
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	<ul style="list-style-type: none"> • Compare 'nano' dimensions to typical dimensions of atoms and molecules 	
Hydrocarbons	<p>Crude oil, hydrocarbons and alkanes</p> <ul style="list-style-type: none"> • Recognise substances as alkanes given their formulae • Know the names and structure methane, ethane, propane and butane <p>Fractional distillation and petrochemicals</p> <ul style="list-style-type: none"> • Explain how fractional distillation works in terms of evaporation and condensation <p>Properties of hydrocarbons</p> <ul style="list-style-type: none"> • Write balanced equations for the complete combustion of hydrocarbons with a given formula. • Knowledge of trends in properties of hydrocarbons is limited to boiling points, viscosity and flammability. <p>Cracking and alkenes</p> <ul style="list-style-type: none"> • Describe in general terms the conditions used for catalytic cracking and steam cracking. • Recall the colour change when bromine water reacts with an alkene. 	<p>Encourage your child to watch this video on crude oil and fractional distillation GCSE Chemistry - Crude Oil and Fractional Distillation #53 - YouTube</p> <p>Encourage your child to visit BBC bitesize to read about the process of cracking Cracking and alkenes - Crude oil, hydrocarbons and alkanes - AQA - GCSE Chemistry (Single Science) Revision - AQA - BBC Bitesize</p>

	<ul style="list-style-type: none">•Balance chemical equations as examples of cracking given the formulae of the reactants and products.•Give examples to illustrate the usefulness of cracking.•Explain how modern life depends on the uses of hydrocarbons. <p>Triple only</p> <p>Reactions of alkenes</p> <ul style="list-style-type: none">• Describe the reactions and conditions for the addition of hydrogen, water and halogens to alkenes• Draw fully displayed structural formulae of the first four members of the alkenes and the products of their addition reactions with hydrogen, water, chlorine, bromine and iodine.	<p>Encourage your child to watch this video on the reactions of alkenes GCSE Chemistry - Addition Reactions of Alkenes #55 - YouTube</p>
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