

Subject	Year 11 Chemistry Threshold Concepts – Spring Term	How to support students' learning
Equilibrium	<p>Dynamic Equilibrium</p> <ul style="list-style-type: none"> • <i>When a reversible reaction occurs in apparatus which prevents the escape of reactants and products, equilibrium is reached when the forward and reverse reactions occur at exactly the same rate.</i> <p>Changing the Conditions of Equilibrium</p> <ul style="list-style-type: none"> • <i>The relative amounts of all the reactants and products at equilibrium depend on the conditions of the reaction.</i> • <i>If a system is at equilibrium and a change is made to any of the conditions, then the system responds to counteract the change.</i> • <i>The effects of changing conditions on a system at equilibrium can be predicted using Le Chatelier's Principle.</i> • <i>The relative amounts of all the reactants and products at equilibrium depend on the conditions of the reaction.</i> • <i>If a system is at equilibrium and a change is made to any of the conditions, then the system responds to counteract the change.</i> • <i>The effects of changing conditions on a system at equilibrium can be predicted using Le Chatelier's Principle.</i> 	<p>Encourage your child to visit BBC bitesize to learn what dynamic equilibrium is and what can affect it Changing the position of equilibrium - Higher - Reversible reactions - AQA - GCSE Combined Science Revision - AQA Trilogy - BBC Bitesize</p>

The Effect of Temperature

If the temperature of a system at equilibrium is increased:

- *the relative amount of products at equilibrium increases for an endothermic reaction*
- *the relative amount of products at equilibrium decreases for an exothermic reaction.*

If the temperature of a system at equilibrium is decreased:

- *the relative amount of products at equilibrium decreases for an endothermic reaction*
- *the relative amount of products at equilibrium increases for an exothermic reaction.*

The Effect of Concentration

- *If the concentration of one of the reactants or products is changed, the system is no longer at equilibrium and the concentrations of all the substances will change until equilibrium is reached again.*
- *If the concentration of a reactant is increased, more products will be formed until equilibrium is reached again.*

Encourage your child to watch this video on reversible reactions and the factors affecting equilibrium [GCSE Chemistry - Reversible Reactions and Equilibrium #49 - YouTube](#)

- *If the concentration of a product is decreased, more reactants will react until equilibrium is reached again.*

The Effect of Pressure

For gaseous reactions at equilibrium:

- *an increase in pressure causes the equilibrium position to shift towards the side with the smaller number of molecules as shown by the symbol equation for that reaction*
- *a decrease in pressure causes the equilibrium position to shift towards the side with the larger number of molecules as shown by the symbol equation for that reaction.*

The Haber Process (triple only)

- *used to produce nitrogen-based fertilisers.*
- *The raw materials for the Haber process are nitrogen and hydrogen.*
- *The purified gases are passed over a catalyst of iron at a high temperature (about 450°C) and a high pressure (about 200*
- *atmospheres). Some of the hydrogen and nitrogen reacts to form ammonia. The reaction is reversible so some of the ammonia produced breaks down into nitrogen and hydrogen*

Encourage your child to watch this video on the Haber process [GCSE Chemistry - The Haber Process Explained #76 - YouTube](#)

<p>Organic chemistry</p>	<ul style="list-style-type: none">• <i>On cooling, the ammonia liquefies and is removed. The remaining hydrogen and nitrogen are recycled.</i> <p><u>Triple only topic</u></p> <p>Alcohols</p> <ul style="list-style-type: none">• Alcohols contain the functional group –OH. Methanol, ethanol and propanol are the first three members of a homologous series of alcohols. <p>Candidates should be able to recognise alcohols from their names or formulae, but do not need to know the names of individual alcohols, other than methanol, ethanol and propanol.</p> <ul style="list-style-type: none">• Methanol, ethanol and propanol dissolve in water to form a neutral solution, react with sodium to produce hydrogen, burn in air, are used as a fuels and solvents, and ethanol is the main alcohol in alcoholic drinks. <p>Candidates are not expected to write balanced chemical equations for the reactions of alcohols other than combustion reactions.</p>	<p>Encourage your child to visit BBC bitesize to learn about alcohols and carboxylic acids Alkenes - More organic chemistry - AQA - GCSE Chemistry (Single Science) Revision - AQA - BBC Bitesize</p>
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- Ethanol can be oxidised to ethanoic acid, either by chemical oxidising agents or by microbial action. Ethanoic acid is the main acid in vinegar.
- Candidates should be aware that vinegar is an aqueous solution that contains ethanoic acid.

Carboxylic acids

- Ethanoic acid is a member of the carboxylic acids, which have the functional group -COOH .

Candidates should be able to recognise carboxylic acids from their names or formulae, but do not need to know the names of individual carboxylic acids, other than methanoic acid, ethanoic acid and propanoic acid.

- Carboxylic acids dissolve in water to produce acidic solutions react with carbonates to produce carbon dioxide react with alcohols in the presence of an acid catalyst to produce esters
- **do not ionise completely when dissolved in water and so are weak acids (HT only)**
- **aqueous solutions of weak acids have a higher pH value than aqueous solutions of strong acids with the same concentration. (HT only)**

Addition Polymers

- recognise addition polymers and monomers from diagrams in the forms shown and from the presence of the functional group C=C in the monomers
- draw diagrams to represent the formation of a polymer from a given alkene monomer
- relate the repeating unit to the monomer.

Condensation Polymers (HT only)

- **explain the basic principles of condensation polymerisation that requires two different functional groups in the monomers and the repeating units in the polymers.**
- **When these types of monomers react they join together, usually losing small molecules such as water**

Amino Acids (HT only)

- **Amino acids have two different functional groups in a molecule. Amino acids react by condensation polymerisation to produce polypeptides**
- **Different amino acids can be combined in the same chain to produce proteins.**

Encourage your child to watch this video on addition polymers [GCSE Chemistry - Addition Polymers & Polymerisation #56 - YouTube](#)

Encourage your child to watch this video on condensation polymers [GCSE Chemistry - Condensation Polymers \(Polyesters\) #60 - YouTube](#)

Encourage your child to read the information on this website on amino acids [Amino Acids \(GCSE Chemistry\) - Study Mind](#)

DNA (deoxyribonucleic acid) and other naturally occurring polymers

- DNA (deoxyribonucleic acid) is a large molecule essential for life.
- DNA encodes genetic instructions for the development and functioning of living organisms and viruses.
- Most DNA molecules are two polymer chains, made from four different monomers called nucleotides, in the form of a double helix.
- Other naturally occurring polymers important for life include proteins, starch and cellulose.

Encourage your child to watch this video on naturally occurring polymers [GCSE Chemistry - Naturally Occurring Polymers - Polypeptides, DNA, and Carbohydrates #61 - YouTube](#)