



Chemistry	Working towards expected outcomes	Working at expected outcomes	Working beyond expected outcomes
	Your child is not yet making the expected progress within this course.	Your child is achieving the expected progress for this point within the course.	Your child is exceeding the expected progress.
Y10 Autumn 1 Organic Chemistry	<p>Students working towards expected outcomes in Year 10 can:</p> <ul style="list-style-type: none">• Identify alkenes as hydrocarbons with the functional group C=C.• Recognise alcohols by their functional group –OH.• Identify carboxylic acids by their functional group –COOH.• Identify alcohols from their names or given formulae.• Identify carboxylic acids from their names or given formulae.• Recognise addition polymers and monomers from diagrams with functional group C=C in the monomers.• List the names of the first four alcohols: methanol, ethanol, propanol, and butanol.• List the names of the first four carboxylic acids: methanoic acid, ethanoic acid, propanoic acid, and butanoic acid.• Explain that DNA is a large molecule essential for life and encodes genetic instructions.	<p>Students working at expected in Year 10 can:</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 alkenes and their products when reacted with hydrogen, water, chlorine, bromine, and iodine.• Describe the reactions of the first four alcohols when they react with sodium, burn in air, are added to water, or react with an oxidising agent.• Explain the conditions for fermentation of sugar using yeast to produce ethanol.• Describe the reactions of the first four carboxylic acids with carbonates, their solubility in water, and their reactions with alcohols.• Explain why carboxylic acids are weak acids in terms of their ionisation and pH.• Draw diagrams to show the formation of a polymer from an alkene monomer and relate the repeating unit to the monomer.• Explain how alkenes are used to make polymers like poly(ethene) and	<p>Students working beyond expected in Year 10 can:</p> <ul style="list-style-type: none">• Explain the principles of condensation polymerisation, focusing on how functional groups in monomers allow them to join, forming large polymers.• Describe how amino acids undergo condensation polymerisation to form polypeptides and proteins.• Describe the structure of DNA, focusing on its double helix shape and how two polymer chains of nucleotides encode genetic information.• Explain the importance of naturally occurring polymers such as proteins, starch, and cellulose, and understand their monomeric units.



Y10 Autumn 2

Chemical Change
(Part 1)

- Recognise basic reactions: metals react with oxygen to form oxides, and oxidation involves the gain of oxygen.
- Describe metal reactions with water or dilute acids.
- Understand the reactivity series and how a more reactive metal can displace a less reactive one.
- Understand neutralisation: acids neutralise alkalis, bases, and carbonates to produce salts and water.
- Identify strong and weak acids (e.g., hydrochloric acid vs. ethanoic acid) and their basic properties.
- Perform basic titrations to measure the reacting volumes of acids and alkalis.
- Measure pH with universal indicator or a pH probe.
- Recognise the process of salt preparation from acid-base reactions and crystallisation.

poly(propene) through addition polymerisation.

- Explain condensation polymerisation, where two monomers with two functional groups join together, releasing small molecules like water.
- Describe the basic structure of DNA as a double helix made from polymer chains of nucleotides.
- Explain oxidation and reduction in terms of oxygen gain/loss and relate it to metal reactions.
- Evaluate experimental data to order metals by reactivity and predict displacement reactions.
- Describe metal extraction using carbon for metals less reactive than carbon.
- Predict products of acid-base and acid-carbonate reactions and write simple equations.
- Perform titrations to find accurate volumes of reacting solutions.
- Understand acid strength in terms of ionisation and its effect on pH.
- Prepare salts from insoluble substances and describe the crystallisation process.

- Analyse and explain electron transfer in oxidation and reduction beyond metal-oxygen reactions.
- Understand metal extraction processes in detail, including electron transfer during reduction.
- Use ionic and half-equations to describe redox reactions.
- Explain acid-base reactions in detail.
- Explain changes in pH for strong vs. weak acids and predict how these affect hydrogen ion concentration.
- Optimise salt preparation methods, considering factors like temperature and concentration.



Y10 Spring 1

Chemical Change
(Part 2)

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| <p>Y10 Spring 1</p> <p>Chemical Change
(Part 2)</p> | <ul style="list-style-type: none">• Recognise electrolysis by understanding that electrolytes are substances that conduct electricity when molten or dissolved in water.• Predict the products when molten ionic compounds (like lead bromide) undergo electrolysis.• Demonstrate they know that positive ions move to the negative electrode (cathode) and negative ions move to the positive electrode (anode).• Understand that water's ions influence the products at the electrodes, with hydrogen at the cathode and oxygen at the anode, unless halides are present.• Perform experiments on electrolysis of aqueous solutions using inert electrodes and make simple predictions. | <ul style="list-style-type: none">• Describe how ionic compounds, when molten or dissolved, conduct electricity, and how electrolysis occurs at the cathode and anode.• Predict the products of electrolysis of molten and aqueous ionic compounds, including simple examples like lead bromide or zinc chloride.• Recognise when electrolysis is used to extract metals, especially for reactive metals like aluminium, and explain why it requires high energy.• Describe the reactions at the cathode (reduction) and anode (oxidation) during electrolysis.• Investigate the electrolysis of aqueous solutions to confirm predictions and explore the products produced at the electrodes.• Write basic half-equations for electrolysis reactions, such as for hydrogen or oxygen formation.• Write and balance half equations: Write and balance half equations for the reactions occurring at both electrodes during electrolysis, explaining oxidation and reduction processes.• Discuss the use of electrolysis in the extraction of metals like aluminium and why mixtures (like cryolite) are used.• Explain why electrodes degrade over time (e.g., in aluminium extraction) and why the electrolyte needs to be maintained. | <ul style="list-style-type: none">• Predict products for more complex electrolysis reactions (e.g., aqueous solutions with multiple ions) and provide detailed reasoning based on reactivity.• Develop hypotheses and critically analyse data from electrolysis investigations, drawing connections between observed results and theoretical predictions. |
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Y10 Spring 2 and
Summer 1

Chemical
Calculations

- Recognise that mass is conserved in chemical reactions, meaning the total mass of reactants equals the mass of products.
- Demonstrate they know that chemical equations represent the atoms involved, and the number of atoms on both sides must be equal.
- Demonstrate they know that the relative formula mass (M_r) is the sum of the relative atomic masses of all atoms in a formula.
- Understand how to calculate the number of moles from mass using relative formula mass.

- Accurately describe that in a chemical reaction, no atoms are lost, and the mass of reactants equals that of products.
- Balance chemical equations in terms of atom count on both sides.
- Use the relative formula mass to calculate the moles in a given mass of substance, and vice versa.
- Calculate the percentage yield of a product and understand factors that affect it, such as reversible reactions or product loss.
- Interpret and use mole ratios in balanced equations to calculate the mass of products and reactants.
- Calculate concentration in mol/dm^3 and understand its relationship with solute mass and solution volume. Use titration results to find concentrations of unknown solutions.
- Identify and explain the role of a limiting reactant in determining the amount of product in a reaction.
- Calculate gas volumes using the ideal gas law

- Use detailed calculations to find the atom economy of a reaction and explain why certain pathways are chosen based on this, alongside factors like yield and rate.
- Use moles to convert between mass and volume of gases and calculate the theoretical yield in more complex reactions.
- Evaluate reaction pathways using data on atom economy, yield, and other variables to assess efficiency and sustainability.



Y10 Summer 2

Energy Changes

- Recognise that energy is conserved in reactions, and the amount of energy remains the same before and after the reaction.
- Demonstrate they know that exothermic reactions release energy to the surroundings, making the temperature of the surroundings rise.
- Demonstrate they know that endothermic reactions absorb energy, causing the temperature of the surroundings to drop.
- Recognise real-world uses of exothermic and endothermic reactions, like self-heating cans, hand warmers, and sports injury packs.
- Measure temperature changes when substances react or dissolve in water during practical experiments.

- Draw reaction profiles (energy diagrams) showing the relative energy of reactants and products, activation energy, and overall energy change for both exothermic and endothermic reactions.
- Explain that activation energy is the minimum energy required for a reaction to occur.
- Conduct experiments measuring temperature changes during reactions, like acid plus metal or acid plus carbonate.
- Understand that energy is absorbed to break bonds and released when new bonds are formed.
- Calculate the overall energy change of a reaction using bond energies, including energy absorbed to break bonds and energy released when bonds are formed.
- Compare the use of hydrogen fuel cells with rechargeable batteries and cells, considering their advantages and limitations.

- Evaluate the influence of catalysts on the reaction profile, particularly their effect on lowering the activation energy and speeding up the reaction rate.
- Critique the practical applications of exothermic and endothermic reactions, considering factors like sustainability, efficiency, and environmental impact.
- Explain the half-equations for the oxidation and reduction reactions in hydrogen fuel cells, and discuss the implications of these reactions for energy production and efficiency.

