

Scheme of work

Entry Level Certificate Chemistry – Component 3: Elements, mixtures and compounds

This resource provides guidance for teaching component 3: Elements, mixtures and compounds from our new Entry level certificate science. It is based on the specification (5960).

The scheme of work is designed to be a flexible medium term plan for teaching content and development of the skills that will be assessed.

We have provided it in Word format to help you create your own teaching plan – you can edit and customise it according to your needs. This scheme of work is not exhaustive; it only suggests activities and resources you could find useful in your teaching.

3.3 Component 3 – Chemistry: Elements, mixtures and compounds

Spec ref.	Summary of the specification content	Learning outcomes <i>What most students should be able to do</i>	Suggested timing (hours)	Opportunities to develop Scientific Communication skills	Opportunities to develop and apply practical and enquiry skills	Resources
3.3.1 O1	Atoms and elements	<p>Recall that all substances are made of atoms.</p> <p>Recall that an atom is the smallest part of an element.</p> <p>Describe the distribution of elements in the periodic table.</p> <p>Recall that elements in the same group of the periodic table have similar properties.</p>	1	<p>Use scientific vocabulary correctly.</p> <p>Periodic Table Bingo.</p> <p>Use AQA Teachit KS4: <i>Periodic tables – for colouring or cut and paste</i> to display metals/non-metals.</p> <p>Use AQA Teachit KS3: <i>Elements and their symbols</i> to familiarise students with the periodic table.</p>	<p>Use the interactive site to research common elements:</p> <p>Periodic table videos</p>	<p>What is a polymer?</p> <p>What are atoms?</p> <p>Elements song</p> <p>BBC Bitesize - atoms and elements</p> <p>BBC Bitesize- What is the periodic table?</p> <p>BBC Bitesize - Atoms</p> <p>BBC Bitesize - The periodic table</p>

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O2	Elements and compounds	<p>Recall that when atoms combine with different atoms a compound is formed.</p> <p>Recall that compounds can be made by metals combining with non-metals or by non-metals combining with other non-metals.</p> <p>Recognise simple compounds from their names.</p> <p>Write word equations for simple reactions.</p>	1	Write word equations for the reactions in this specification, including the reactions of metals and non-metals and the formation of oxides from non-metals.	<p>Investigate the reaction when magnesium burns in oxygen (air) to produce magnesium oxide.</p> <p>Compare the properties of iron and sulfur with those of iron sulphide.</p>	BBC Bitesize - Compounds
3.3.2 O3	States of matter	<p>Recall the three states of matter: solid, liquid and gas.</p> <p>Describe the changes between the three states using the terms melting, boiling, condensing and freezing.</p> <p>Explain the three states of matter using a simple particle model.</p>	1	<p>Use scientific vocabulary correctly.</p> <p>Take and record accurate measurements.</p>	Investigate the changes in state from ice to steam.	BBC Bitesize - Changes of state BBC Bitesize - Particle models BBC Bitesize - States of matter activity

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O4	Forms (allotropes) of carbon	<p>Recall that diamond and graphite are both forms of carbon.</p> <p>Recognise the difference in the structure of diamond and graphite.</p> <p>Explain that the different properties of diamond and graphite depend on the different structures.</p>	½	<p>Use scientific vocabulary correctly.</p> <p>Use Molymod structures to construct and describe the different forms of carbon.</p> <p>Research the different uses of graphite and diamond.</p>	Investigate the properties of graphite as a lubricant and for writing.	
3.3.3 O5	Mixtures	<p>Recall that a mixture contains two or more substances which are not chemically combined.</p> <p>Identify the appropriate method to separate mixtures by filtration, distillation, crystallisation or chromatography.</p>	2	<p>Use scientific vocabulary correctly.</p> <p>Draw and/or label apparatus correctly.</p> <p>Use AQA Teachit KS3: <i>Atoms, elements, compounds and mixtures quiz</i> to consolidate O1 – O5</p>	<p>Use filtration to separate an insoluble substance from a mixture.</p> <p>Use distillation to produce pure water from either salt water or eg copper sulfate solution.</p> <p>Use crystallisation to produce a solid from a solution.</p> <p>TDA (Teacher-devised assignment)</p>	<p>BBC Bitesize - Mixtures and compounds</p> <p>BBC Bitesize - Filtration and distillation</p>

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					opportunity: Compare the time needed to filter mixtures of water and calcium carbonate that has different particle sizes.	
O6	Chromatography	Describe how to separate mixtures by chromatography. Recognise that in paper chromatography, a solvent moves through the paper carrying different compounds different distances.	1	Use scientific vocabulary correctly. Measure R_f accurately and record results in an appropriate table.	TDA opportunity: Investigate the different colours in inks or food colours using paper chromatography.	
3.3.4 O7	Metals and ores	Recall that unreactive metals are found in the Earth as metals. Recall that most metals are found as compounds that need chemical reactions to extract the metal. Recall that metals less reactive than carbon can be extracted by heating the metal ore with carbon.	2	Use scientific vocabulary correctly. Limestone inquiry role play: Public inquiry resources Write a letter to eg school council to explain why drinks cans should be recycled in school.		BBC Bitesize - Properties and uses of gold BBC Bitesize - Metals

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		<p>Describe an ore as a rock containing enough metal to make it economic to extract it.</p> <p>Recognise that large amounts of rock have to be quarried or mined to get metal ores.</p> <p>Recognise that we can reduce the effects of extracting metals by recycling.</p> <p>Describe some of the social, economic and environmental effects of mining and recycling metals.</p>			<p>Model smelting by extracting copper from malachite or lead from galena using carbon.</p>	
O8	Properties of metals	<p>Recall that metals have giant structures of atoms with strong bonds between the atoms so most metals have high melting points.</p> <p>Recall that metals are:</p> <ul style="list-style-type: none"> • good conductors of electricity • good conductors of 	1	<p>Use scientific vocabulary correctly.</p> <p>Research the MP of common metals and present as a table using correct units.</p>	<p>Research everyday uses of copper and aluminium and relate these to the properties of the metals.</p> <p>TDA opportunity: Compare the properties such as</p>	<p>BBC Bitesize - Atomic structure of metals</p>

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		<p>thermal energy.</p> <p>Recognise that the uses of a metal depend on its properties eg copper and aluminium.</p>			conductivity or density of some metals.	
O9	Alloys	<p>Recall that most metals in everyday use are alloys because the pure metals are too soft for many uses eg iron, gold and aluminium.</p> <p>Recall that an alloy is produced by mixing small amount of other elements with the metal.</p> <p>Recall that steel is an alloy made by mixing carbon and other metals with iron.</p>	1	Produce a poster of the metals and alloys used in our everyday lives.	<p>Investigate the melting points of tin, lead and solder.</p> <p>TDA opportunity: Investigate the hardness of different alloys or steels.</p>	BBC Bitesize - How is steel made
3.3.5 O10	Polymers	<p>Recall that polymers are made from small molecules called monomers joined together in very long chains.</p> <p>Recognise that the use of polymers are related to their properties.</p> <p>Recall that polymers are not biodegradable (not broken down by microbes).</p>	1	<p>Use scientific vocabulary correctly: the common names of poly(ethene), poly(propene), polystyrene and PVC are acceptable. Other polymer names are not required.</p> <p>Produce a poster to show modern uses of polymers and the materials they replaced in those roles.</p>	<p>Use Molymod (or paperclips) to model polymer formation from monomers.</p> <p>Research the changes in plastic bag usage in UK since the introduction of the charge.</p>	<p>BBC Bitesize - How are plastics made?</p> <p>What is a polymer?</p>

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		Recognise that there are problems with the disposal of polymers.			TDA opportunity: Compare the biodegradability of different polymers and other materials.	

Scheme of work

Entry Level Certificate Chemistry – Component 4: Chemistry in our world

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3.4 Component 4 – Chemistry: Chemistry in our world

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3.4.1 O1	Acids and metal reactions	<p>Recall that acids react with some metals to produce hydrogen.</p> <p>Recall that hydrochloric acid produces chlorides.</p> <p>Recall that sulfuric acid produces sulfates.</p> <p>Write word equations for the reactions when given the names of the reactants.</p> <p>Describe the test for hydrogen.</p>	1	<p>Use scientific vocabulary correctly.</p> <p>Write word equations using the correct terms and structure.</p> <p><i>AQA Teachit KS3: Acids and alkalis pH match up cards.</i></p> <p><i>AQA Teachit KS3: Acids and alkalis.</i></p> <p><i>AQA Teachit KS3: Acids and alkalis – prior learning.</i></p>	<p>Investigate the reactions of magnesium, zinc and iron with hydrochloric and sulfuric acids.</p> <p>Carry out the 'pop' test for hydrogen produced in these reactions.</p> <p>TDA (Teacher-devised assignment) opportunity: Investigate the amount of hydrogen produced when acids react with different metals.</p>	<p>BBC Bitesize - Neutralising acids and alkalis</p> <p>BBC Bitesize - Making salts</p>
O2	Neutralisation	<p>Recall that an acid is neutralised by an alkali or base to produce a salt and water.</p> <p>Recall that an acid is neutralised by a carbonate to produce a salt,</p>	2	<p>Use scientific vocabulary correctly.</p> <p>Write word equations using the correct terms and</p>	<p>Investigate the neutralisation of acids by bases, alkalis and carbonates.</p>	<p>Household chemicals can be used here.</p>

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		<p>water and carbon dioxide.</p> <p>Write word equations for the reactions when given the names of the reactants.</p> <p>Describe the test for carbon dioxide.</p> <p>Describe how to crystallise a salt solution to produce solid salt.</p>		<p>structure.</p> <p>AQA Teachit KS3: <i>Everyday neutralisation.</i></p> <p>AQA Teachit KS4: <i>Acid and base – making copper sulphate crystals.</i></p> <p>AQA Teachit KS3: <i>Taboo – acids and alkalis.</i></p>	<p>Carry out the limewater test for carbon dioxide.</p> <p>Produce solid salt crystals by evaporation of a salt solution.</p>	
3.4.2 O3	Energy and rate of reaction	<p>Describe reactions that transfer energy to the surroundings so that temperature increases.</p> <p>Describe reactions that take in energy from the surroundings so the temperature decreases.</p>	1	Use scientific vocabulary correctly. (<i>Students do not need to recall the terms exothermic or endothermic.</i>)	<p>Investigate the temperature changes that take place in combustion, oxidation and neutralisation reactions.</p> <p>Investigate the temperature changes when eg ammonium chloride dissolves in water or citric acid reacts with sodium hydrogen</p>	BBC Bitesize - Endothermic and exothermic reactions

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					carbonate.	
O4	Increasing the rate of a chemical reaction	Describe the increase in the rate of a reaction caused by increasing the: <ul style="list-style-type: none"> • temperature • concentration of reactants • surface area of reactants. or by adding a catalyst. Measure and record the: <ul style="list-style-type: none"> • time for a reactant to be used up • volume of gas produced • time for a solution to change colour/clarity. 	2	Use scientific vocabulary correctly. Record experimental measurements in an appropriate table using headings and units.	TDA opportunity: Investigate how to make a chemical reaction go faster.	BBC Bitesize - Rates of reaction
3.4.3 O5	Changes in Earth's atmosphere	Describe how the Earth's current atmosphere developed. Recall the word equation for photosynthesis. Describe how photosynthesis led	1	Use scientific vocabulary correctly. Write the word equation for photosynthesis. AQA Teachit KS3: <i>Earth's</i>	TDA opportunity: Investigate the production of oxygen by aquatic plants in different conditions by counting bubbles.	Atmospheric gases

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		to changes in the early atmosphere.		<i>atmosphere – spot the difference.</i>		
O6	The current atmosphere	Describe how most carbon dioxide from the early atmosphere has been locked up as carbonates and fossils in rocks. Recall the present composition of the Earth's atmosphere.	½	Use scientific vocabulary correctly. Use a pie-chart to show the composition of the Earth's atmosphere.	TDA opportunity: Compare the amount of carbon dioxide in fresh air and exhaled air.	BBC Bitesize - Exploring gases
3.4.4 O7	Crude oil and fuels	Recall that crude oil is a mixture of a large number of compounds. Describe the location of crude oil. Explain how useful fuels, such as petrol and diesel, are produced from crude oil by fractional distillation.	1	Use scientific vocabulary correctly. Card sort to match fractions with their uses. AQA Teachit KS4: <i>Modelling fractional distillation.</i> AQA Teachit KS4: <i>Crude oil: fractional distillation</i> (cut and paste diagrams)	Compare prepared samples of fractions from crude oil. Observe a demonstration of fractional distillation of prepared crude oil sample.	What is crude oil? How oil refining works Youtube - Crude Oil distillation process BBC Bitesize - Fractional distillation What are fossil fuels?

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O8	Burning fuels	<p>Recall that the products of total combustion of a fuel are carbon dioxide, water vapour and oxides of nitrogen.</p> <p>Recall that some fuels produce sulfur dioxide when burned.</p> <p>Recall that partial combustion due to a limited air supply results in the production of carbon monoxide and, often, soot particles.</p> <p>Explain why burning fossil fuels may harm the environment.</p> <p>Recall that:</p> <ul style="list-style-type: none"> • oxides of sulfur and nitrogen (N_{ox}) cause acid rain and may harm human health • carbon monoxide can cause death • solid particles can cause global dimming and harm human health. 	2	<p>Use scientific vocabulary correctly.</p> <p>Research and discuss the impact of burning fossil fuels on the environment.</p> <p>Research and discuss the use of carbon monoxide monitors in the home.</p>	<p>Investigate the products of combustion.</p> <p>Compare 'roaring' and 'safety' Bunsen burner flames.</p> <p>Investigate the production of acid rain (spray a large cotton wool 'cloud' with water; hold above burning matches; squeeze the 'cloud' over a UI solution).</p> <p>TDA opportunity:</p> <p>Compare the amount of soot produced when burning different fuels.</p>	<p>BBC Bitesize - Combustion of natural gas</p> <p>BBC Newsround - Global warming</p> <p>Learn Chemistry - Identifying the products of combustion</p> <p>NHS - Carbon monoxide poisoning</p> <p>BBC Bitesize - Products and effects of combustion</p>

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O9	Human influences on the atmosphere	<p>Recall that carbon dioxide is produced by burning fossil fuels.</p> <p>Recall that methane is produced from landfills and farming.</p> <p>Describe the effects of increased carbon dioxide and methane on the temperature of the atmosphere.</p>	1	Discuss the effects of increased atmospheric temperature on global warming.		<p>BBC Bitesize - How do we know the Earth is getting warmer?</p> <p>BBC Bitesize - Fossil fuels and the environment</p>
3.4.5 O10	Water for drinking	<p>Recall that safe drinking water has few dissolved substances and low levels of microbes.</p> <p>Describe how safe drinking water is produced by filtration and sterilisation.</p>	1	<p>Use scientific vocabulary correctly.</p> <p>Order information to produce a flow chart to show the purification of water.</p>	<p>Distil a salt water solution to produce fresh water.</p> <p>TDA opportunity: Investigate the amount of dissolved solids in water from different locations by evaporating samples and weighing residues.</p>	<p>BBC Bitesize - Water purity</p> <p>Portsmouth Water - Resources</p>