

Subject: Chemistry		Year: 11		Ability: All	
Topic	Organic Chemistry	Chemical analysis	Chemistry of the atmosphere	Using resources	
Topic overview	How to explain how crude oil is formed, separated and used.	To understand how qualitative tests in chemistry can be used to identify specific chemicals.	How the atmosphere of the Earth has evolved and changed over time to become the present atmosphere and then looking at problems that affect the atmosphere.	How industries use the Earth's natural resources to manufacture useful products. Chemists seek to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products.	
Students will learn...	How hydrocarbons react and behave	The uses and merits of instrumental methods of analysing chemicals.	The composition of the atmosphere in the past and now. How other factors affect the atmosphere's composition and the effects this has.	Evaluate the environment and ways to be sustainable and minimise the impact humans on the environment.	
What Golden Knowledge will pupils learn and remember?	<p>Students understand how crude oil is formed and that that it is found in rocks and that it is a mixture of hydrocarbons</p> <p>Students understand how to use the general formulae for alkanes and alkenes in order to predict and explain the formulae of hydrocarbons.</p> <p>Students understand that hydrocarbons have different properties based on chain length in order to compare and contrast different organic molecules and to explain the process of fractional distillation.</p> <p>Students understand that long chain molecules can be cracked into smaller molecules and write equations in order to represent these reactions. Pupils understand that cracking is used to create smaller molecules and alkenes in order to explain that the rationale for cracking molecules is to meet the demand for shorter chain hydrocarbons (to use them for example, as fuels)</p> <p>Students have a knowledge of the structure and bonding of alkenes so that they are able to represent the first four alkenes, describe addition reactions and draw fully displayed formulae of the products.</p> <p>Students have a knowledge of alcohols, alkenes, carboxylic acids so that they are able to draw and recognise the first four in each homologous series and give details for specific reactions of alcohols.</p>	<p>Students will learn that pure substances melt and boil and specific temperatures so that they are able to distinguish between pure and impure substances using boiling and melting point data.</p> <p>Students will learn what is meant by a 'formulation' in Chemistry so that they can identify formulations; explain what makes a formulation and the uses of formulations.</p> <p>Students will learn about the process and theory of how chromatography works to separate substances so they can carry out and interpret simple chromatography experiments including calculating R_f values.</p> <p>Students will use these skills to plan and carry out a required practical to calculate the R_f value for a selection of coloured substances.</p> <p>Students will learn about testing gases so that they can identify hydrogen, oxygen and carbon dioxide using these methods.</p> <p>Students will learn series of inorganic tests to identify if an ion is present in a compound so that they are able to apply this knowledge to a practical scenario where they will use tests to identify the ions in unknown single ionic compounds. (HT pupils will be able to write ionic equations for the test reactions).</p>	<p>Students will recall processes such as combustion, respiration and photosynthesis to enable them to explain processes that have led to the evolution of the atmosphere, for example the changing levels of carbon dioxide and oxygen.</p> <p>Students need to be able to link the carbon cycle from the biology section of the course to the increase in carbon dioxide levels in our atmosphere today and how this contributes to global warming and how this can lead to climate change. Students need to know the contributing factors to climate change and how their effect on global warming can be reduced.</p> <p>Students will be able to recall pollutants released through combustion of fossil fuels and this will enable students also need to evaluate the different environmental issues caused from burning fuels.</p> <p>Students will recall the composition of the early atmosphere and the current atmosphere so students can compare the how these have changed and what has caused this.</p> <p>Students will be able to use this as a way of explaining how the earth's climate is likely to change in the future as greenhouse gas emissions continue to rise in conjunction with other environmental issues such as deforestations and acidification of the oceans.</p> <p>Students will link knowledge of Infrared radiation and its absorption and remission, from KS3 as well as human activity to the Greenhouse effect, global</p>	<p>Students will need to know terms finite and sustainability so they can explain the use of resources to support sustainability.</p> <p>Students will be able to give examples of finite resources and renewable resources and distinguish between the two.</p> <p>Students will be able to identify examples of renewable resources which have been employed in agricultural and industrial applications to reduce reliance on non-renewable materials. They will develop an understanding of the process involved in making products and the importance of life cycle assessments. This will enable them to explain the importance of recycling and being sustainable.</p> <p>Students will build on knowledge learned in KS3 and KS4 about separation techniques to able them to describe industrial treatment of water and make evaluations on the cost implication of water treatment.</p> <p>(HT Students will build on knowledge gained about extraction of metal from ores and know that modern biological techniques for ore extraction include phytomining and bioleaching can be used to access scarce resources in a more environmentally friendly manner).</p> <p>Students will learn about the manufacture of products from the Earth's resources gaining this knowledge will enable them to relate the properties of materials to their uses and suggest appropriate materials for uses. Students</p>	

	<p>Students have an understanding of addition, condensation and natural polymers and how they are produced so that they are able to draw diagrams to show the production of polymers from monomers.</p> <p>Students have an understanding of amino acids and how they react through condensation polymerisation so that they are able to show repeating units and explain that they can be combined to form proteins.</p>	<p>Students will learn about the instruments used in industry to increase speed and accuracy of results, including flame emission spectroscopy, so that they can evaluate the advantages and disadvantages of instrumental methods of analysis against chemical tests and interpret an instrumental result given appropriate data.</p>	<p>climate change, carbon footprints, acid rain and human health.</p>	<p>will learn how corrosion occurs in ferrous metals and how this can be prevented.</p> <p>Students will learn about the Haber process as an example of an industrial process this will enable pupils to make links between knowledge of factors effecting the rate of a reaction and yield, use and need of fertilisers and also the safe manufacture of a product. (HT will go on to consider the economics of the process to obtain the optimum yield). Students will be able to describe the differences between the industrial and laboratory preparation methods of a fertiliser and compare the processes.</p>
<p>What prior knowledge should pupils already know?</p>	<p>Covalent bonding (Chemistry, Y9 Matter) Writing chemical equations (Chemistry, Y10, Chemical Change)</p>	<p>Students will have learnt the differences between elements, compounds, atoms and mixtures and know about separation techniques (Matter 1, year 7. Unit 1 Chemistry, Year 9). They will know what melting and boiling points are. The particle model will have been used to explain the change of state and diagrams used to explain mixtures.</p> <p>Students will have knowledge of ions and types of ions (Unit 2 Chemistry, Year 9. Unit 4, Chemistry Year 10).</p> <p>Students will have had experience carrying out simple chromatography to separate simple mixtures. (Matter, Year 7. Unit 1 Chemistry, Year 9)</p> <p>Students will have used litmus paper to identify chlorine gas during the electrolysis required practical. (Unit 4, Year 10) They may have also used limewater to identify carbon dioxide as a product of respiration during the respiration Biology unit (Material cycles and energy, Year 7 and 8).</p>	<p>Students will have studied (Earth 1 year 7) learning the structure of the earth from which carbonate rocks and sedimentation and fossilisation will be learned.</p> <p>Students will have learnt about earth's atmosphere, composition and global warming. (Earth 2 year 8).</p> <p>Students will have learnt the reactants and products of respiration, combustion and photosynthesis (Ecosystems 2 year 8) (Reactions 2 year 8) (Year 10 Biology unit 4). (Year 10 Unit 7 Chemistry)</p> <p>Students will have learnt about infrared radiation and absorption. (Waves year 8).</p>	<p>Students should know from KS3 and KS4 about the relative scarcity of resources and the impact that extracting them has on the environment. (Earth 1 year 7) (Earth 2 year 8) (year 10 physics unit 2).</p> <p>Students should understand that all matter is composed of tiny particles (atoms) of which 109 are naturally occurring. They should know how some of these elements are obtained from their natural sources: Ore extraction – reactivity series and electrolysis, crude oil extraction and fractional distillation and the environmental impacts of these techniques. They should understand the effect of greenhouse gases on the environment and their contribution to climate change whilst being able to suggest sustainable and carbon neutral alternatives. (Earth 1 year 7) (Earth 2 year 8) (year 10 physics unit 2).</p> <p>Students will know about oxidation in terms of gain of oxygen and be able to write word and symbol equations for simple oxidation reactions (HT will have a more secure understanding). (Year 10 Unit 4 chemistry). Students will also have knowledge about alloys and the structure of metals. (Year 9 unit 2 chemistry).</p> <p>In KS3 they will have learnt about polymers, composite materials, glass and ceramics. (Year 8 Matter 2)</p> <p>Students will have an understanding about the use of fertilisers from previous Biology units (Year 9 Biology unit 3) (Year 10 unit 3 Biology) (Year 10 unit 4 biology), they will know why they are used and the problems associated. The example of the Haber process may have been used in (Year 10 unit 6 chemistry) to demonstrate how changing conditions can affect a reaction.</p> <p>Students will know about the effect of changing pressure, temperature and use of a catalyst from (Year 10 unit 6 chemistry).</p>
<p>What skills will pupils learn and apply?</p> <p>(disciplinary knowledge)</p>	<p>The knowledge of the names and formulae of hydrocarbons can be transferred to any area of chemistry where pupils are asked to write equations or complete calculations</p> <p>The skill of comparing organic molecules supports pupils in future units where they are asked to compare and contrast different types of resources.</p>	<p>Use of laboratory equipment to measure volumes and safely combine chemicals.</p> <p>Evaluate risks during a practical.</p> <p>Predict using the periodic table patterns in reactions.</p> <p>Practical skills of collecting gas or measuring the mass of reaction mixtures.</p> <p>Safe handling of reactions with temperature change or evolution of gases during reactions.</p>	<p>Chemical reactions and how to construct a chemical equation. Mathematical skills, use of positive and negative numbers. Graphical interpretation.</p> <p>Evaluating data and interpreting patterns.</p> <p>Make judgements about developments in terms of social, economic and environmental factors.</p>	<p>Extracting information from graphs and tables in order to make comparisons and draw conclusions.</p> <p>Evaluating the social, economic and environmental issues around the extraction and use of resources.</p> <p>Analysing pH of wet samples in a lab and separation techniques of filtration and distillation.</p> <p>An understanding of industrial techniques that can be used as a solid base for further study or entry into the work place.</p>

		Maths skills utilised in calculating Rf values.		Improved understanding of maths through use of ratios and standard form to express concentration.
Key vocabulary pupil will know and learn	Fractional Distillation Cracking Intermolecular forces Viscosity Volatility Polymer	Pure Formulation Rf value Qualitative Instrumental Flame emission spectroscopy	Atmosphere Greenhouse gases Sulphur dioxide Nitrogen oxide Carbon monoxide Particulates	Potable Desalination Distillation Sterilisation Phytomining Bioleaching
How will pupil understanding be checked &/or assessed?	Each school in the Trust follows the same assessment cycle process. All students will complete an informal key piece assessment every half term (at least) which take a variety of formats to assess golden knowledge learnt over the previous lessons. The key piece assessments are either retrieval-based questions to help students retrieve their prior golden knowledge, scientific literacy questions where students have to practice applying their golden knowledge to exam style questions in different contexts or exam style questions using a variety of command words such as describe, explain and evaluate. Students will then complete a short improvement activity based on gaps identified in the informal key piece and teachers will check these to ensure gaps have closed. In addition to these informal key piece assessments, all students complete a formal assessment at least every term which synoptically assess their retention and application of key golden knowledge learnt in Biology, Chemistry and Physics. Teachers will then use the Science Trust QLA tracker to identify gaps in knowledge; reteach accordingly and then students will complete a range of improvement style activities to close those gaps which are then checked by the teacher either through live marking or collection of books. Further details of the Science SHARE Assessment and Feedback policy can be found here: Q of E			
Resources available	<p>Each school has their own shared area for each year group in each key stage. Lessons are planned to follow the SHARE Science lesson structure guidance document which can be found here: SCIENCE SHARE MAT lesson structure guidance.docx</p> <p>In summary:</p> <ol style="list-style-type: none"> 1. First 5/Do Now to retrieve prior learning needed for the foundations of new learning. 2. I do/explicit instruction/guided explanation/teacher input through expert curriculum delivery. 3. We do/modelling where appropriate to show students how to remember and apply the key golden knowledge to different contexts. 4. You do/Independent practice to retrieve and practice applying the key golden knowledge to a variety of contexts. 5. Final 5 to retrieve key golden knowledge learnt in the lesson. <p>All schools have these SHARE Science curriculum plans, delivery plans which sit underneath these to guide staff on when to deliver each section of the curriculum and then schemes of learning and lesson resource folders to adapt in order to meet the unique needs of the students and classes they teach. All shared resources which are common across all schools can be found in the SHARE Science folder here: Home (click on the documents tab at the top of the page)</p> <p>All QA including lesson visits, work scrutiny and student voice will prioritise the SHARE Science Q of E Non-Negotiables Checklist which can be found here: SCIENCE SHARE MAT Non negotiables Q of E QA check list.docx</p> <p>All lesson resources are focussed on retrieval (through the Retrieve to Remember strategy) and practice, and this is built into these curriculum plan through effective sequencing of golden knowledge components.</p> <p>There are also KS3 and KS4 Golden Knowledge booklets for staff which outline the key golden knowledge linked to the exam specifications and National Curriculum at KS3 and KS4. These can be found here: Golden Knowledge</p> <p>If staff can't get access to any of the folders above, please request access through joanna.richards@sharemat.co.uk</p>			
Notes	This topic is important because carbon chemistry forms a separate branch of chemistry and is a fundamental component of the subject its own right.			
Why this topic is important...	Learning about organic chemistry now is important as it brings together pupils' knowledge of bonding, chemical reactions and enables them to understand key terminology used to describe the properties of resources before they learn about chemical resources later in the key stage.	This topic will equip students with the knowledge to identify the specific chemicals found within substances, it will open doors to analytical chemistry careers and bring a deeper understanding to the work of forensic scientists and drug control scientists. In this topic students are exposed to how and why formulations exist and how these are put together this lays the foundations for students to go on to create their own novel formulations for use in many industries.	This topic is important as it allows students to make deeper connections between processes learnt in science already such as combustion and respiration and understand how these impact the earth and it's atmosphere on a macro scale.	This topic will allow Students to understand processes that occur in industry to give potable water. It links the separation techniques to real life examples as well as links to osmosis from Biology to provide an example of an industrial process. History Students and Geography students may also make links with locations around the world that have different water processing techniques as well as the political issues raised. Students will be informed about their choices as they become responsible adults, will they choose to own a car, recycle more, re use more etc.
			Students will learn about data analysis techniques and interpret graphs. The unit allows Students to be informed and gives them the opportunity to make informed judgements as adults about their choices and the impact they have on the Earth and other organisms. There are also lots of interesting careers	A deeper understanding of the theory behind the industrial processes and the chemical industry. Pupils will also tie

<p>Learning about organic chemistry and hydrocarbons is important because pupils who go on to study chemistry in KS5 will be required to understand the importance of the C-C bond and the C=C bond and functional groups.</p>	<p>The topic creates links across many of the fundamentals of Chemistry, linking the properties of chemicals to detection methods and the uses of these chemicals. These links help students to remember more and form a solid basis for new knowledge as they progress to the next topics in KS4 and into KS5.</p>	<p>linked to this unit that are not just about Chemistry. Pupils that are interested in Biology, Geography and Ecology may take skills about recognising patterns and evaluating the impact of human behaviour on the planet.</p>	<p>together many aspects of the Biology and Chemistry course to understand the links between processes and human impact on the planet.</p>
--	---	---	--