



The Sutton Academy

Knowledge Rich Curriculum Plan

SCIENCE- Chemistry Year 11

Lesson/Learning Sequence	Intended Knowledge: <i>Students will know that...</i>	Prior Knowledge: <i>In order to know this, students need to already know that...</i>	Working Scientifically	Tiered Vocabulary and Reading Activity	Support
Lesson: Crude Oil	- Students will know that crude oil is a finite resource found in rocks - Students will know that crude oil is the remains of ancient biomass consisting mainly of plankton buried in mud. - Students will know that crude oil is a mixture of a very large number of compounds - Students will know that hydrocarbons are molecules that contain hydrogen and carbon only. - Students will know that most of the compounds in crude oil are hydrocarbons - Students will know that alkanes are a type of hydrocarbon - Students will know that alkanes have the general formula C_nH_{2n+2}. - Students will know that the first four alkanes are methane (1 C), ethane (2 C), propane (3 C) and butane (4 C). - Students will know how to draw the first 4 alkanes. - Students will know how to work out the formulae of alkanes from a given number of carbons or hydrogens.	- Students need to already know that crude oil is found in the ground - Students need to already know that crude oil is a fossil fuel	Make models of alkane molecules using the molecular modelling kits.	Tier 2 Finite: a resource that won't naturally replenish Tier 3 Biomass: matter from living organisms Plankton: microscopic organisms found in the sea or fresh water Hydrocarbon: a molecule containing hydrogen and carbon atoms only	BBC Bitesize Knowledge organiser Tassomai Kay Science
Lesson: Fractional Distillation	- Students will know that fractions are groups of hydrocarbons that contain molecules with similar number of carbon atoms - Students will know that crude oil can be separated into the fractions using fractional distillation - Students will know that fractions can be processed to produce fuels and feedstock for the petrochemical industry.	Students need to already know that crude oil is a mixture of hydrocarbons. Students need to already know that boiling is the change of state from liquid to gas Students need to already know that condensation is the change of state from gas to liquid	Use a variety of models such as representational, spatial, descriptive, computational and mathematical to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts.	Tier 2 Tier 3 Fractions: a group of molecules that have similar boiling points	BBC Bitesize Knowledge organiser Tassomai Kay Science

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	- Students will know that we use a lot of the products from fractions. - Students will know that fractional distillation works through evaporation and condensation. - Students will know that the different fractions are separated by their boiling points.				
Lesson: Properties of Hydrocarbons	- Students will know that as hydrocarbons get longer, the boiling point increases - Students will know that as hydrocarbons get longer, the viscosity increases - Students will know that as hydrocarbons get longer, the flammability decreases. - Students will know that combustion is the reaction between hydrocarbons and oxygen, and releases a lot of energy. - Students will know how to write equations for the combustion of hydrocarbons.	<i>Students need to already know that flammability is how easily something can set on fire</i> <i>Students need to already know that boiling point is the temperature a substance changes state between a liquid and gas.</i>	Investigate the properties of different hydrocarbons.	Tier 2 Viscosity: A measure of how thick a fluid is	BBC Bitesize Knowledge organiser Tassomai Kay Science
Lesson: Cracking and Alkenes	- Students will know that hydrocarbons can be broken down to produce smaller useful molecules. - Student will know that the process of breaking down the hydrocarbons is known as cracking. - Students will know that cracking can be done using catalytic cracking and steam cracking. - Students will know that catalytic cracking uses a temperature of around 550 °C and a zeolite catalyst. - Students will know that steam cracking uses a higher temperature of over 800 °C and no catalyst.	<i>Students need to already know that hydrocarbons can have different lengths</i> <i>Students need to already know that hydrocarbons contain carbon and hydrogen</i>	Recognise substances that are alkenes from their names or from given formulae in these forms. Visualise and represent 2D and 3D forms including two-dimensional representations of 3D objects.	Tier 2 Decolourise: Remove colour Tier 3 Cracking: a method used to split long alkane molecules into smaller molecules (an alkane and an alkene) Catalyst: A substance that speeds up a chemical reaction	BBC Bitesize Knowledge organiser Tassomai Kay Science

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	- Students will know that cracking alkanes produces a shorter alkane and an alkene. - Students will know that alkenes are a type of hydrocarbon that contains a carbon carbon double bond. - Students will know that when bromine water is added to alkenes it decolourises (orange to colourless), but it doesn't decolourise with alkanes. - Students will know that there is a high demand for fuels with small molecules. - Students will know how to write balanced equations for cracking. - Students will know how to explain the importance of cracking.			without itself being used up	
Lesson: Reactions of Alkenes (TRIPLE ONLY)	- Students will know that the reaction of functional groups of organic compounds determines the reactions of organic compounds. - Students will know that alkenes combust, but they tend to burn with smoky flames compared to alkanes. - Students will know that alkenes react with hydrogen, water and halogens. - Students will know that the reaction of alkenes are addition reactions, so that double bond becomes a single carbon-carbon bond. - Students will know how to draw the first 4 alkenes. - Students will know how to draw the products of the addition reactions of alkenes.	<i>Students need to already know that alkenes are hydrocarbons with carbon-carbon double bonds.</i>	<i>Use a variety of models such as representational, spatial, descriptive, computational and mathematical to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts.</i>	Tier 2 Tier 3 Functional group: part of a molecule that determines how it reacts Addition: reaction where groups are added to molecules	BBC Bitesize Knowledge organiser Tassomai Kay Science

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Lesson: Alcohols (TRIPPLE ONLY)	- Students will know that alcohols contain the function group -OH - Students will know that methanol, ethanol, propanol and butanol are the first four members of the alcohols - Students will know how to represent the first 4 alcohols. - Students will know that alcohols react with sodium, oxygen and oxidising agents. - Students will know how to represent the products of the reactions of alcohols. - Students will know that ethanol is produced when sugar solutions are fermented using yeast.	Students need to already know that functional groups are parts of organic molecules	Opportunities when investigating reactions of alcohols	Tier 2 Tier 3 Oxidising agent: substance that will oxidise another substance Fermentation: The chemical breakdown of a substance using yeast Yeast: a microscopic fungus	<i>BBC Bitesize</i> <i>Knowledge organiser</i> <i>Tassomai</i> <i>Kay Science</i>
Lesson: Carboxylic Acids (TRIPLE ONLY)	- Students will know that carboxylic acids have the functional group -COOH - Students will know that the first four members of the carboxylic acids are methanoic acid, ethanoic acid, propanoic acid and butanoic acid. - Students will know how to represent carboxylic acids. - Students will know that carboxylic acids react with carbonates and alcohols - Students will know how to represent the products of reactions between carboxylic acids and carbonates and alcohols - Students will know that carboxylic acids are weak acids	Students need to already know that a weak acid is an acid that only partially ionises.	Opportunities within investigation of the reactions of carboxylic acids.	Tier 2 Tier 3 Weak acids: Acids that partially ionise	<i>BBC Bitesize</i> <i>Knowledge organiser</i> <i>Tassomai</i> <i>Kay Science</i>

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Lesson: Addition Polymerisation (TRIPLE)	- Students will know that alkenes are used to make polymers through addition polymerisation. - Students will know that in addition polymerisation many small molecules (monomers) join together to form very large molecules (polymers) - Students will know how to represent addition polymers	Students need to already know that alkenes are hydrocarbons that contain carbon-carbon double bonds	Use models to represent addition polymerisation	Tier 2 Tier 3 Monomer: small molecule that joins together to form polymers	<i>BBC Bitesize</i> <i>Knowledge organiser</i> <i>Tassomai</i> <i>Kay Science</i>
Lesson: Condensation Polymerisation (TRIPLE)	- Students will know that condensation polymerisation involves monomers with two functional groups. - Students will know that when condensation polymerisation takes place small molecules (such as water) are lost. - Students will know that diols are compounds that contain two alcohol groups - Students will know that dioic acids are compounds that contain two carboxylic acid groups - Students will know how to represent the formation of condensation polymers.	Students need to already know that polymers are made up of monomers	Visualise and represent 2D and 3D forms including two-dimensional representations of 3D objects	Tier 2 Tier 3 Diol: a molecule that contains 2 alcohol groups Dioic acid: a molecule that contains two carboxylic acid groups	<i>BBC Bitesize</i> <i>Knowledge organiser</i> <i>Tassomai</i> <i>Kay Science</i>
Lesson: Amino Acids (TRIPLE)	- Students will know that amino acids have two different functional groups in a molecule - Students will know that amino acids react by condensation polymerisation to produce polypeptides. - Students will know that different amino acids can be combined in the same chain to produce proteins - Students will know how to represent condensation polymerisation of amino acids.	Students need to already know that amino acids make up protein		Tier 2 Tier 3 Polypeptide: Polymer formed when amino acids combine through condensation polymerisation	<i>BBC Bitesize</i> <i>Knowledge organiser</i> <i>Tassomai</i> <i>Kay Science</i>

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Lesson: DNA and other polymers (TRIPLE)	- Students will know that DNA is a large molecule. - Students will know that DNA molecules are made up of two polymer chains, from 4 different monomers called nucleotides - Students will know that examples of other naturally important polymers are cellulose, proteins and starch. - Students will know that the monomer of cellulose and starch is glucose - Students will know that the monomer of proteins is amino acids.	Students need to already know that DNA is a double helix		Tier 2 Tier 3 Cellulose: polymer that is found in plant cell walls Starch: naturally occurring polymer found in plant leaves Nucleotide: monomer of DNA, containing sugar, phosphate group and a base.	<i>BBC Bitesize</i> <i>Knowledge organiser</i> <i>Tassomai</i> <i>Kay Science</i>