

Unit C1 - Revision Lesson 5 Hydrocarbons and combustion				
Specification learning outcomes	HSW statements	Exemplar teaching activities	Main differentiation	Resource sheets
<p>0.1 Recall the formulae of elements and simple compounds in the unit.</p> <p>0.2 Represent chemical reactions by word equations H and simple balanced equations.</p> <p>H 0.3 Write balanced chemical equations including the use of state symbols (s), (l), (g) and (aq) for a wide range of reactions in this unit.</p> <p>5.1 Describe hydrocarbons as compounds that contain carbon and hydrogen only.</p> <p>5.2 Describe crude oil as a complex mixture of hydrocarbons.</p> <p>5.3 Describe the separation of crude oil into simpler, more useful, mixtures by the process of fractional distillation (details of fractional distillation are not required).</p> <p>5.4 Recall the name and uses of the following fractions: a) gases, used in domestic heating and cooking, b) petrol, used as a fuel for cars, c) kerosene, used as fuel for aircrafts, d) diesel oil, used as fuel for some cars and trains, e) fuel oil, used as fuel for large ships and in some power stations, f) bitumen, used to surface roads and roofs.</p> <p>5.5 Describe that hydrocarbons in different fractions differ from each other in: a) the number of carbon and hydrogen atoms their molecules contain, b) boiling points, c) ease of ignition, d) viscosity.</p> <p>5.6 Describe how the complete combustion of hydrocarbons: a) involves oxidation of the hydrocarbons, b) produces carbon dioxide and water, c) gives out energy.</p> <p>5.7 Describe the chemical test for carbon dioxide (using limewater).</p> <p>5.8 Explain why incomplete combustion of hydrocarbons can produce carbon and carbon monoxide.</p>	<p>HSW 2, 3, 10, 11, 12, 13, 14</p>	<p><u>The theme of this lesson is hydrocarbons and how we use them.</u></p> <p>Starter: <i>Fuel brainstorm.</i> Ask students to jot down all they know about fuels, where they come from, how they are used and the problems their use can cause. They can present their ideas as concept maps.</p> <p>Main: <i>Crude oil questions.</i> Worksheet C1.22b allows students to revise the definition and composition of hydrocarbons. <i>Using the fractions.</i> Worksheet C1.23a revises the different fractions in crude oil. Boiling points and ease of lighting are not covered by this worksheet but could be discussed as part of this activity. <i>Products of combustion.</i> Worksheet C1.24a covers complete combustion and allows students to practice word equations. <i>Incomplete combustion concept map.</i> Help students to build a concept map to include all the information they know about incomplete combustion. Then work with the class to make sure that it covers the products of incomplete combustion, the dangers of carbon monoxide and problems caused by carbon monoxide and soot. <i>Acid rain questions.</i> Worksheet C1.26c gives students the opportunity to revise acid rain. <i>Climate change.</i> Worksheet C1.27a helps students to revise the issue of climate change.</p> <p>Plenary: <i>Hangman.</i> Use the key words from the lesson as the basis for a class game of hangman. Split the class into four or five groups and let each group in turn choose a letter, or put hands up if they think they know the word. That team gets a point for the word only if they can also explain what it means.</p> <p>Homework: Worksheet C1.28c covers materials on biofuels. Students should also be asked to write a paragraph on the advantages and disadvantages of biofuels.</p>	<p>Stretch: Students should complete worksheet C1.24b instead of C1.24a because it contains the opportunity to balance chemical equations. However, you may need to remind students of the test for carbon dioxide.</p> <p>Support: Students may need the framework of the concept map and the key words to be drawn for them. Students can then be encouraged to fill in the rest of the information.</p>	<p>Worksheet C1.24b</p> <p>Worksheet C1.22b</p> <p>Worksheet C1.23a</p> <p>Worksheet C1.24a</p> <p>Worksheet C1.26c</p> <p>Worksheet C1.27a</p> <p>Worksheet C1.28c</p>

<p>5.9 Describe how carbon monoxide behaves as a toxic gas.</p> <p>5.10 Demonstrate an understanding of the problems caused by incomplete combustion producing carbon monoxide and soot in appliances that use carbon compounds as fuels.</p> <p>5.11 Explain why impurities in some hydrocarbon fuels result in the production of sulfur dioxide.</p> <p>5.12 Demonstrate an understanding of some problems associated with acid rain caused when sulfur dioxide dissolves in rainwater.</p> <p>5.13 Describe how various gases in the atmosphere, including carbon dioxide, methane and water vapour, trap heat from the Sun and that this keeps the Earth warm.</p> <p>5.14 Demonstrate an understanding that the Earth's temperature varies and that human activity may influence this.</p> <p>5.15 Demonstrate an understanding that the proportion of carbon dioxide in the atmosphere varies, owing to human activity, and that chemists are investigating methods to control the amount of the gas in the atmosphere by: a) iron seeding of oceans b) converting carbon dioxide into hydrocarbons.</p> <p>5.16 Evaluate how far the correlation between global temperature and the proportion of carbon dioxide in the atmosphere provides evidence for climate change.</p> <p>5.17 Describe biofuels as being possible alternatives to fossil fuels.</p> <p>5.18 Recall that one example of a biofuel is ethanol obtained by processing sugar cane or sugar beet and that it can be used to reduce the demand for petrol.</p> <p>5.19 Evaluate the advantages and disadvantages of replacing fossil fuels with biofuels, including: a) the fact that biofuels are renewable b) that growing the crops to make biofuels requires land and may affect the availability of land for growing food c) the balance between the carbon dioxide removed from the atmosphere as these crops grow and the carbon dioxide produced when they are transported and burnt.</p>				
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Unit C1 - Revision Lesson 6 Fuels and polymers				
Specification learning outcomes	HSW statements	Exemplar teaching activities	Main differentiation	Resource sheets
<p>5.20 Demonstrate an understanding of the factors that make a good fuel, including: a) how easily it burns, b) the amount of ash or smoke it produces, c) the comparative amount of heat energy it produces, (calculations involving conversion to joules are not required), d) how easy it is to store and transport.</p> <p>5.21 Recall that a simple fuel cell combines hydrogen and oxygen to form water and that this reaction releases energy.</p> <p>5.22 Evaluate the advantages and disadvantages of using hydrogen, rather than petrol, as a fuel in cars.</p> <p>5.23 Describe petrol, kerosene and diesel oil as non-renewable fossil fuels obtained from crude oil, and methane as a non-renewable fossil fuel found in natural gas.</p> <p>5.24 Compare the temperature rise produced when the same volume of water is heated by different fuels.</p> <p>5.25 Recall that alkanes are saturated hydrocarbons, which are present in crude oil.</p> <p>5.26 Recall the formulae of the alkanes methane, ethane and propane, and draw the structures of these molecules to show how the atoms are bonded together (no further knowledge of bonding is required in this unit).</p> <p>5.27 Recall that alkenes are unsaturated hydrocarbons.</p> <p>5.28 Recall the formulae of the alkenes ethene and propene and draw the structures of their molecules to show how the atoms are bonded together (no further knowledge of bonding is required in this unit).</p> <p>5.29 Describe how bromine water is used to distinguish between alkanes and alkenes.</p> <p>5.30 Describe how cracking involves the breaking down of larger saturated hydrocarbon molecules (alkanes) into smaller, more useful ones, some of which are unsaturated (alkenes).</p>	<p>HSW 1, 3, 5, 6, 7, 10, 11, 12, 13, 14</p>	<p><u>The theme of this lesson is fuels and plastics.</u></p> <p>Starter: <i>Thinking about words.</i> Give students a list of words and phrases. For example, hydrocarbon, fractional distillation, length of carbon chain, complete combustion, incomplete combustion, acid rain, climate change and biofuels. Ask students to put 1-5 against each word to show how confident they are that they know the meaning. Then read out the words one by one and ask for a show of hands for scores of 4 and 5. If this leaves one or two words which students have difficulty with, revise their meanings.</p> <p>Main: <i>Fuels.</i> Ask students to list the characteristics of a good fuel, remind them what a non-renewable fuel is, and remind them what a fuel cell does. Worksheet C1.29b enables students to revise fuels further. <i>Fuels investigation.</i> Ask students to plan a practical to investigate which fuel gives out most heat energy. Ask them to write down a rough plan, hand it to their partner and ask them to then add anything they think that their partner has missed off the plan. <i>Alkanes and alkenes.</i> Worksheet C1.31c is a good summary of alkanes and alkenes. It is a good idea to remind students at this point what 'unsaturated' and 'saturated' means. <i>Cracking questions.</i> Worksheet C1.32c contains some questions on fractions and cracking. This would also be a good point to remind students how paraffin can be cracked in the laboratory. <i>Polymers spider diagram.</i> Ask students to draw a spider diagram about polymers. Make sure that they include a definition of what a polymer is, describe how polymers are made from monomers and give some examples of polymers along with their properties and uses.</p> <p>Plenary: <i>Key facts.</i> Ask each student to write down three facts learnt during the lesson. Then ask them to share their facts in groups and to compile a master list of facts, including the most common fact learnt and the least common fact. Select a spokesperson for one group at random to share its ideas with the class. Then ask if other groups had the same 'most common fact'.</p> <p>Homework: Worksheet C1.34b asks students to consider the advantages and disadvantages of using polymers. They should also be asked to explain the advantages and disadvantages of biodegradable polymers.</p>	<p>Stretch: Students should use worksheet C1.31d instead of C1.31c and should complete the extra challenge question.</p> <p>Students should complete worksheet C1.32d instead of C1.32c. This worksheet contains Higher material on the demand for smaller hydrocarbons.</p> <p>Instead of the spider diagram on polymers, pupils should complete worksheet C1.33b.</p> <p>Students could complete C1.34c as an extra piece of homework.</p> <p>Support: Students may need help to envisage the molecules in alkanes and alkenes, and models may help (please note that students are not expected to know about bonds at this level).</p>	<p>Worksheet C1.29b Worksheet C1.31c Worksheet C1.31d Worksheet C1.32c Worksheet C1.32d Worksheet C1.33b Worksheet C1.33d Worksheet C1.34b Worksheet C1.34c</p>

<p>H 5.31 Explain why cracking is necessary, including by using data on the composition of different crude oils and the demand for fractions in crude oil.</p> <p>5.32 Describe the cracking of liquid paraffin in the laboratory.</p> <p>5.33 Recall that: a) many ethene molecules can combine together in a polymerisation reaction b) the polymer formed is called poly(ethene) (conditions and mechanisms not required but H equations required).</p> <p>5.34 Describe how other polymers can be made by combining together other monomer molecules, to include poly(propene), poly(chloroethene) (PVC) and PTFE.</p> <p>5.35 Relate uses of the polymers poly(ethene), poly(propene), poly(chloroethene) (PVC) and PTFE to the properties of the compounds.</p> <p>5.36 Recall that most polymers are not biodegradable, persist in landfill sites, and that many produce toxic products when burnt.</p> <p>5.37 Explain how some problems associated with the disposal of polymers can be overcome: a) by recycling, b) by developing biodegradable polymers.</p>				
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