

**IGCSE Chemistry: Organic Chemistry 2****Whole Unit Overview**

(Please note: (S) denotes material in the Supplement (Extended syllabus) only)

Learning Outcomes		Suggested Teaching Activities	Resources
14.7	Describe the formation of ethanoic acid by the oxidation of ethanol with atmospheric oxygen and with acidified potassium dichromate(VI).	This can be shown by a simple test tube experiment.  Awareness of implications for storage of ethanol to prevent spoilage.	
	Describe ethanoic acid as a typical weak acid.	Link to Acids, Bases and Salts.	
	Describe the reaction of ethanoic acid with ethanol to give an ester (ethyl ethanoate).	This can be shown by a simple test tube experiment.  Pupils can be given samples of esters to smell. Awareness of importance of sweet-smelling esters as food and cosmetics additives.	
14.8	Describe macromolecules in terms of large molecules built up from small units (monomers), different macromolecules having different units and/or different linkages.	Demonstrations of the preparation of poly(styrene) or poly(acrylates) are possible here.  Link to Unit 4, Organic 1, importance of crude oil as a raw material for polymers and its finite supply.	Notes on addition polymers: <a href="http://www.rjclarkson.demon.co.uk/junior/junior1.htm#Jun%20org%20-%20alkene%20poly">http://www.rjclarkson.demon.co.uk/junior/junior1.htm#Jun%20org%20-%20alkene%20poly</a> <a href="http://www.polymer-age.co.uk/">http://www.polymer-age.co.uk/</a>

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(a)	Name some typical uses of plastics and of man-made fibres.	<p>Relate this to everyday items such as drinks containers, detergent bottles and other household items as well as clothes.</p> <p>Look at the underneath of bottles to determine the polymer and on clothing labels to find the fibre(s) used.</p> <p>Opportunity for display work about clothes, packaging (real packaging can be stuck to display) or building to show where polymers are used, their names, classification as synthetic or natural and diagrammatical representation of polymerisation. Issues of disposal (see below) can be included.</p>	<a href="http://www.polymer-age.co.uk/">http://www.polymer-age.co.uk/</a>
	Describe the pollution problems caused by non-biodegradable plastics.	<p>Issues to discuss include...</p> <ul style="list-style-type: none"> <li>• economic barriers to the collection, sorting and processing of waste for recycling.</li> <li>• environmental effects of burning and landfill.</li> <li>• centuries scale longevity of examples such as disposable nappies and packaging.</li> <li>• students can carry out a survey to collect, classify and weigh a day's discarded plastic waste.</li> </ul>	<a href="http://www.greenteacher.com/">http://www.greenteacher.com/</a> <a href="http://www.modplas.com/">http://www.modplas.com/</a>
	Deduce the structure of the polymer product from a given alkene and vice versa.	Opportunity to reinforce the importance of writing clear structural formulae here.	

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	Describe the formation of nylon ( a polyamide) and <i>Terylene</i> (a polyester) by condensation polymerisation, the structure of nylon being represents as  and the structure of <i>Terylene</i> as	The formation of Nylon can be demonstrated by the reaction of a diacid chloride with a diamine (Nylon Rope Trick).  Students can gently melt nylon granules on a tin lid and draw out a 'fishing line' using a glass rod.	
(b)	Name proteins, fats and carbohydrates as the main constituents of food.	Food packaging labels and 'healthy eating' claims on labels can be used as a source of discussion.  Link to Biology IGCSE.	Extensive information about sugar: <a href="http://www.sucrose.com/">http://www.sucrose.com/</a>
	Describe proteins as possessing the same (amide) linkages as nylon but with different units.	Stress the O=C-N-H group present linking the monomers together.	
	Describe the hydrolysis of proteins to amino acids (structures and names <i>not</i> required).	Opportunity to link to experimental use of locating agents in chromatography, Unit 5, Chemical Analysis Techniques and 14.8 b below. Awareness of the use of this process as a diagnostic tool to identify when patients lack a particular amino acid.	
	Describe fats as esters possessing the same linkage as <i>Terylene</i> but with different units.	Stress the O=C-O- group present linking the monomers together.	

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	Describe soap as a product of hydrolysis of fats.	<p>Experiment/demonstration possible using common vegetable oils and concentrated sodium hydroxide solution.</p> <p>Issues for discussion include...</p> <ul style="list-style-type: none"> <li>• the changing social preference for using vegetable oil rather than animal fat (such as whale blubber) as a raw material.</li> <li>• the use of potential food crops as 'cash crop' sources of oil for soap.</li> </ul>	<a href="http://www.britissoap.co.uk/soap-making.htm">http://www.britissoap.co.uk/soap-making.htm</a>
	Describe complex carbohydrates in terms of a large number of sugar units, considered as , joined together by condensation polymerisation.		
7.1	Describe the use of photosynthesis as the reaction between carbon dioxide and water in the presence of chlorophyll and sunlight (energy) to produce glucose.	<p>Link this with Biology IGCSE.</p> <p>Awareness of the importance of photosynthesis as a means of producing a renewable energy resource.</p>	<a href="http://www.pbs.org/ktca/newtons/9/phytosy.html">http://www.pbs.org/ktca/newtons/9/phytosy.html</a>
14.8 (b)	Describe the acid hydrolysis of complex carbohydrates (e.g. starch) to give simple sugars.	Awareness of the importance of this reaction to the ability of animals to absorb food for energy as soluble sugar from ingested insoluble complex carbohydrate (link to Biology IGCSE).	

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	<p>Describe the fermentation of simple sugars to produce ethanol (and carbon dioxide) (molecular formulae of sugars <i>not</i> required).</p>	<p>Experiment / demonstration of fermentation possible combined with distillation to produce alcohol (link to Organic Chemistry 1 and Biology IGCSE).</p> <p>Awareness of limitations on industrial conditions to increase the rate of this reaction due to living organism involved (yeast).</p> <p>Link to important potential of ethanol as a renewable fuel.</p>	
	<p>Describe, in outline, the usefulness of chromatography in separating and identifying the product of hydrolysis of carbohydrates and proteins.</p>	<p>Experiments possible include the separation of a mixture of amino acids using ninhydrin as a locating agent (link to Experimental Analysis Techniques).</p> <p>(see notes above, section 14.8 a).</p>	