

Sample Teaching Plan  
Unit G623: Cells and Molecules

**Suggested teaching time**

Plan is based on 12 weeks at 5 hours per week (4 hours contact time + 1 hour directed study)

This unit is assessed by a 45 minute written paper and a pre-prepared plan for an investigation. It is **not** mandatory for candidates to carry out their plan. However, it is suggested that centres allow sufficient time for some practical activities associated with the planning task to enable candidates greater access to the marking points A to X based on the marking criteria as stated in the examination booklet.

The learning activities are suggestions only. Teachers may wish to develop alternative strategies.

Week number	Specification Unit Reference and Assessment Objectives	Suggested Learning Activities	Resources
1	<p><b>3.4.2:</b> The Structure of the Cell</p> <ul style="list-style-type: none"> <li>Produce a slide of a cellular tissue and describe the structures observed within a cell using a light microscope.</li> </ul> <p><b>3.4.4:</b> Measurement of individual cells</p> <ul style="list-style-type: none"> <li>Use an eyepiece graticule to determine the relative sizes of different cells or tissue structures.</li> <li>Use a stage micrometer to determine actual dimensions of cells.</li> </ul> <p><b>3.4.2:</b> The Structure of the Cell</p> <ul style="list-style-type: none"> <li>Describe the additional structures observed using an electron microscope.</li> <li>Explain the functional differences between a light microscope and an electron microscope.</li> <li>Explain the role of the cellular organelles found in both animal and plant cells.</li> </ul>	<ul style="list-style-type: none"> <li><i>Worksheet A:</i> Production of slides and labelled drawings of the observations.</li> <li><i>Worksheet B:</i> Measurement of Individual Cells.</li> <li><i>Worksheet C:</i> Research - Produce a leaflet/PowerPoint slides to explain the functional differences between a light and an electron microscope.</li> <li><i>Worksheet D:</i> Research - Extra structures observed using an electron microscope and the roles of the cellular organelles found in both animal and plant cells.</li> </ul>	<p>Teacher-generated 'Need to know' sheets, which should include the principles, facts etc. that are likely to be assessed based on the specification references.</p> <p><i>Worksheet A:</i> The Structure of the Cell.</p> <p><i>Worksheet B:</i> Measurement of Individual Cells.</p> <p><i>Worksheet C:</i> Light and Electron Microscopy.</p> <p><i>Worksheet D:</i> The structure of plant and animal cells and their organelles.</p>

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2	<p><b>3.4.3:</b> Some of the molecules found within cells</p> <ul style="list-style-type: none"> <li>• Describe and explain the importance of carbon in biological molecules</li> <li>• Describe the structure of carbohydrates to include the formation and breaking of glycosidic bonds. Carry out tests for reducing sugar, non-reducing sugar and starch.</li> <li>• Describe the structure of proteins to include the peptide bond, alpha helix and beta pleated sheets, primary, secondary and tertiary structures and the formation of globular proteins. Carry out the biuret test for proteins.</li> <li>• Describe the structure of lipids and phospholipids to include the ester bond, saturated and unsaturated fats. Carry out emulsion tests for lipids.</li> <li>• Describe the role of phospholipids in the structure of the cell membrane, to include the fluid mosaic model.</li> </ul>	<ul style="list-style-type: none"> <li>• Teacher-led discussion; cloze activity.</li> <li>• Teacher-led discussion; completion of student worksheets.</li> <li>• Practical task: Carbohydrate food tests.</li> <li>• Teacher-led discussion Completion of student worksheets. Practical task: Protein food tests.</li> <li>• Teacher-led discussion; completion of student worksheets.</li> <li>• Practical task: Emulsion test for lipids.</li> <li>• Directed research task.</li> </ul>	<p>Teacher-generated 'Need to know' sheets for each section and worksheets for candidate tasks.</p>

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3 – 4	<p><b>3.4.3:</b> Some of the molecules found within cells</p> <ul style="list-style-type: none"> <li>• Describe and explain the function and importance of water as a biological molecule.</li> <li>• Describe the process of osmosis and explain how cells maintain their correct water balance.</li> <li>• Know that enzymes are globular proteins with a specific tertiary structure, which catalyse metabolic reactions in living organisms.</li> <li>• Describe and explain the effects of pH, enzyme concentration and substrate concentration on enzyme activity.</li> <li>• Describe and explain how the effects of temperature on enzyme activity can be investigated experimentally.</li> <li>• State that DNA is a polynucleotide, usually double stranded, made up of nucleotides containing the bases adenine (A), thymine (T), cytosine (C) and guanine (G).</li> <li>• State that a gene is a sequence of DNA nucleotides that codes for a polypeptide.</li> <li>• Outline the roles of DNA in living organisms (concept of protein synthesis considered in outline only).</li> </ul>	<ul style="list-style-type: none"> <li>• Directed task – candidate research (target audience Year 12 non-scientists).</li> <li>• Teacher-led discussion.</li> <li>• Practical activity: determination of water potential in named plant cells.</li> <li>• Teacher-led discussion.</li> <li>• Completion of student worksheets: study items/case study of exemplar data.</li> <li>• Practical activity – Effect of temperature on named enzyme (e.g. potato catalase &amp; decomposition of hydrogen peroxide; bacterial amylase on the digestion of starch).</li> <li>• Teacher-led discussion.</li> <li>• Group activity: production of flash cards for revision.</li> </ul>	<p>Teacher-generated ‘Need to know’ sheets for each section and worksheets for candidate tasks.</p>

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5	<p><b>3.4.4:</b> Measurement of cell populations and the significance of this data</p> <ul style="list-style-type: none"> <li>• Describe and explain how and why scientists in biomedical research and pathology laboratories study cells, cell counts and manifestations of cell changes.</li> <li>• Describe and explain how to use a haemocytometer to determine the number of cells in a specific volume of liquid.</li> <li>• Describe and explain how and why the brewing industry and pathology labs use Coulter counters.</li> </ul>	<ul style="list-style-type: none"> <li>• Case Study.</li> <li>• Study Item worksheet.</li> <li>• Practical.</li> <li>• Candidate directed research.</li> </ul>	<p>Teacher-generated 'Need to know' sheets for each section and worksheets for candidate tasks.</p>
6	<p><b>3.4.5:</b> Investigation of the work of molecular biologists in cellular research</p> <ul style="list-style-type: none"> <li>• Describe and explain how cell counts can be used in the investigation of anaemia and leukaemia.</li> <li>• Describe and explain how cervical smear tests are analysed in a hospital pathology laboratory for positive and negative results.</li> <li>• Explain the diagnostic tests, to include the use of monoclonal antibodies, which can be used to identify diseases.</li> </ul>	<ul style="list-style-type: none"> <li>• Research cell counts in diagnosis and treatment of anaemia and leukaemia. Produce an illustrated leaflet.</li> <li>• Case Study.</li> <li>• Teacher-led discussion and case study / worksheet item.</li> </ul>	<p>Teacher-generated 'Need to know' sheets for each section and worksheets for candidate tasks.</p>

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7	<p><b>3.4.5:</b> Investigation of the work of molecular biologists in cellular research</p> <ul style="list-style-type: none"> <li>• Describe the clinical symptoms of cystic fibrosis and Huntington’s chorea, as examples of genetic disease and their effects on the individual.</li> <li>• Discuss the moral and ethical implications of diagnostic testing for genetic disorders.</li> </ul>	<ul style="list-style-type: none"> <li>• Case study assignment.</li> <li>• Produce a PowerPoint presentation and handout on the chosen genetic disease. Your presentation must include the following points: (i) .....etc.</li> <li>• Research/case study/role play and subsequent discussion outlining the moral and ethical issues associated with diagnostic testing for genetic diseases. Include arguments for and against.</li> </ul>	<p>Teacher-generated ‘Need to know’ sheets for each section and worksheets for candidate tasks.</p> <p>Various audio/visual resources available to promote balanced discussions.</p>
8	Assessment period	<ul style="list-style-type: none"> <li>• Specification review.</li> <li>• Identify areas covered, revise essential content.</li> <li>• Identify weaknesses, omissions.</li> <li>• Exam technique.</li> <li>• Past paper questions.</li> <li>• Peer assessment.</li> </ul>	<p>Teacher-generated worksheets for candidate tasks and appropriate stationery items to enable revision strategies e.g. production of mind maps / flash cards.</p> <p>Photocopies of examination questions and mark scheme answers to enable prompt self-assessment.</p>

Week number	Specification Unit Reference and Assessment Objectives	Suggested Learning Activities	Resources
9 – 12	3.4.1: Planning an investigation	<p>Teacher-led</p> <ul style="list-style-type: none"> <li>• Marking criterion A.</li> <li>• Marking criteria B – C.</li> <li>• Marking criteria D – G.</li> <li>• Marking criteria H – I.</li> <li>• Marking criteria J – K.</li> <li>• Marking criteria L – M.</li> <li>• Marking criteria N – P.</li> <li>• Marking criteria Q – R.</li> <li>• Marking criteria S – T.</li> <li>• Marking criteria U – V.</li> <li>• Marking criteria W – X.</li> </ul> <p>• Peer assessment – mark and discuss a pre-prepared plan against the marking criteria.</p>	<p>Teacher-generated background information sheets:</p> <ul style="list-style-type: none"> <li>• General principles of planning an investigation.</li> <li>• What do the marking criteria mean in terms of writing the plan?</li> </ul> <p>Photocopies of past G623/INST, G623/PLAN and G623/INSERT.</p> <p>Photocopies of the unmarked exemplar plans at Grades A and E.</p>