

## Transferable Skills International GCSE Subject Mapping: Biology

Transferable skills will help students cope with the different demands of degree study and provide a solid skills base that enables them to adapt and thrive in different environments across educational stages; and ultimately into employment. A good international education should enable students to start developing transferable skills as early as possible. Developing these transferable skills where they naturally occur as part of the International GCSE curriculum can help build learner confidence and embed the importance of this well-rounded development.

Our approach to enhancing transferable skills in our International GCSEs ensures that it is not only the academic and cognitive skills that are developed, but those broader elements that universities highlight as being essential for success. Skills such as self-directed study, independent research, self-awareness of own strengths and weaknesses and time-management are skills that students cannot learn from a textbook but have to be developed through the teaching and learning experience that can be provided through an international curriculum.

In the tables below, we have taken a framework of skills and provided mapping to suggest where each skill can be assessed, and where each skill could be developed for this subject. This will enable teachers and learners to understand where they are developing each skill, and examples of how they can develop each skill through this International GCSE.

NRC framework skill	Skill interpretation in this subject	Where the skill is covered in content	Where the skill is explicitly assessed in examination	Opportunity for the skill to be developed through teaching and learning approach
<b>Cognitive skills</b>				
Cognitive Processes and Strategies				
Critical thinking	Using many different pieces of information from biology and synthesise this information to make judgements.	Examples in several parts of the specification including:  2.15 - 2.16 Movement of substances into and out of cells  <b>2.40 – 2.45 Understand and explain the different aspects of gas exchange in living organisms</b>  4.12 Understand the biological consequences of pollution of air by sulfur dioxide and by carbon monoxide  j. Co-ordination and response Understand how organisms are able to respond to changes in their environment	e.g. SAM Paper 1 Qu 6(c)  SAM Paper 1 Qu 7(c)  SAM Paper 1 Qu 11  SAM paper 2 Qu 3	Yes
Problem solving	Apply unifying patterns and themes in biology and use them in new and changing situations.	Examples in several parts of the specification including:  3.2 Understand that fertilisation involves the fusion of a male and female gamete to produce a zygote that undergoes cell division and develops into an embryo.  <b>3.16B Describe a DNA molecule as two strands coiled to form a double helix, the strands being linked by a series of paired bases: adenine (A) with thymine (T), and cytosine (C) with guanine (G)</b>  3.24 Understand how to interpret family pedigrees  <b>3.35B Understand how a change in DNA can affect the phenotype by altering the sequence of amino acids in a protein</b>	e.g.  SAM Paper 1 Qu 9  SAM Paper 2 Qu 5	Yes
Analysis	Analyse and interpret data and experimental methods, drawing conclusions, which are consistent with evidence	Examples in several parts of the specification including:  2.34 Understand how the process of respiration produces ATP in living organisms	e.g.  SAM Paper 1 Qu 3	Yes

	from experimental activities.	<p>3.39 Understand how resistance to antibiotics can increase in bacterial populations, and appreciate how such an increase can lead to infections</p> <p>2.67 Understand how factors may increase the risk of developing coronary heart disease</p> <p>4.5 Understand how abiotic and biotic factors affect the population size and distribution of organisms</p> <p><b>4.11B Describe the stages in the nitrogen cycle, including the roles of nitrogen fixing bacteria, decomposers, nitrifying bacteria and denitrifying bacteria</b></p> <p><b>4.18B Understand the effects of deforestation, including leaching, soil erosion, disturbance of evapotranspiration and the carbon cycle, and the balance of atmospheric gases.</b></p>	<p>SAM Paper 1 Qu 8</p> <p>SAM Paper 2 Qu 6</p>	
Reasoning	Evaluate information related to biology and make judgements on the basis of this information.	<p>Examples in several parts of the specification including:</p> <p>1.4 Understand that viruses are not living organisms</p> <p>2.11 Understand how the functioning of enzymes can be affected by changes in temperature, including changes due to change in active site</p> <p><b>2.42B Understand how the structure of the leaf is adapted for gas exchange</b></p> <p>A. Food production</p> <p>5.2 Understand the effects on crop yield of increased carbon dioxide and increased temperature in glasshouses</p> <p>5.3 Understand how the use of fertiliser can increase crop yield</p> <p>5.4 Understand the reasons for pest control and the advantages and disadvantages of using pesticides and biological control with crop plants</p>	<p>e.g.</p> <p>SAM Paper 2 Qu's 1(b), 1(c), 1(d)</p> <p>SAM Paper 2 Qu 3</p>	Yes
Interpretation	Select, organise and present relevant information clearly and logically using appropriate vocabulary, definitions and conventions.	<p>Examples in several parts of the specification including:</p> <p>2.36 Describe the differences between aerobic and anaerobic respiration</p> <p>2.47 Understand the role of the intercostal muscles and the diaphragm in ventilation</p> <p><b>2.57B Understand how the rate of transpiration is affected by changes in humidity, wind speed, temperature and light intensity</b></p>	<p>e.g.</p> <p>SAM Paper 2 Qu's 1(b), 1(c)</p>	Yes
Decision Making	Evaluate data and experimental methods, drawing conclusions, which are consistent with evidence from secondary sources and	<p>Examples in several parts of the specification including:</p> <p>2.9 <i>Embedded Practical: Investigate food samples for the presence of glucose, starch, protein and fat.</i></p>	<p>e.g.</p> <p>SAM Paper 1 Qu 8</p>	e.g. Use of discussion in whole class contexts or in small groups.

	experimental activities. Suggest possible improvements and further investigations.	<b>2.33B Investigate the energy content in a food sample</b>		
Adaptive learning	Learn about unifying patterns and themes in biology and use them in new and changing situations.	Examples in several parts of the specification including:  2.15 Understand how the functioning of enzymes can be affected by changes in temperature, including changes due to change in active site  3.25 Predict probabilities of outcomes from monohybrid crosses  <b>3.36B Understand how most genetic mutations have no effect on the phenotype, some have a small effect and rarely do they have a significant effect</b>	e.g. SAM Paper 1 Qu 9 (c), 9(d)  SAM Paper 2 Qu 2	Yes
Executive function	Plan investigations using experimental and investigative skills based on correct and safe laboratory techniques. Evaluate the effectiveness of an investigation in terms of accuracy, validity and reliability.	Use the embedded practicals to develop investigative skills. Evaluate their effectiveness. Plan investigations using the skills developed in the embedded practicals.	e.g. Any of the embedded practicals	Yes
Creativity				
Creativity	Apply existing knowledge of biological processes to situations set in an unfamiliar context.	Command words such as 'show that' and 'comment on' require candidates to use ideas developed within the specification to answer questions set in an unusual context.	e.g. SAM Paper 1 Qu 1(b)  SAM Paper 1 Qu 6(c)  SAM Paper 1 Qu 10(c)  SAM Paper 1 Qu 12 (c)(ii)	Yes May be evidenced in homework tasks
Innovation	Using a novel strategy to apply existing knowledge of biology concepts in unaccustomed situations.	Questions involving a critical analysis of unfamiliar data in tabular or graphical form.	e.g. SAM Paper 1 Qu 8  SAM Paper 1 Qu 11  SAM Paper 2 Qu 3 (b)  SAM Paper 2 Qu 4(b)	Yes

NRC framework skill	Skill interpretation in this subject	Where the skill is covered in content	Where the skill is explicitly assessed in examination	Opportunity for the skill to be developed through teaching and learning approach
Intrapersonal skills				

Intellectual openness				
Adaptability	Ability to select and apply knowledge and understanding of scientific processes, which is not prompted or provided to biology problems.	Many questions would assess this		
Personal and social responsibility	Appreciate ethical issues in biology	e.g. <b>2.6B Understand the advantages and disadvantages of using stem cells in medicine</b>  <b>2.49</b> Understand the biological consequences of smoking in relation to the lungs and the circulatory system, including coronary heart disease		
Continuous learning	Planning and reflecting on own learning- setting goals and meeting them regularly			Yes Students identify areas where they need extra help or practice.
Intellectual interest and curiosity	Identifying a problem under own initiative, planning a solution and carrying this out.			Yes .
Work ethic/conscientiousness				
Initiative	Using knowledge of biology, independently (without guided learning), to further own understanding.			Yes Reading magazines such as New Scientist
Self-direction	Planning and carrying out investigations under own direction.			Yes
Responsibility	Taking responsibility for any errors or omissions in own work and creating a plan to improve.			Yes
Perseverance	Actively seeking new ways to continue and improve own learning despite setbacks.			Yes
Productivity	Develop a fluency in technical language so sophisticated answers of depth are produced in extended answers to biology questions.	Some of the longer questions that require several steps would assess this.	e.g. SAM Paper 1 Qu 6(c)	Yes
Self regulation (metacognition, forethought, reflection)	Developing and refining a strategy over time for applications of biology, to different contexts reflecting on the success or otherwise of the strategy			Yes
Ethics	Producing output with a specific moral purpose for which one is accountable.			Yes
Integrity	Taking ownership for own work and willingly responds to questions and challenges.			Yes
Positive Core Self Evaluation				
Self monitoring/self evaluation/self reinforcement	Planning and reviewing own work as a matter of habit.			Yes

NRC framework skill	Skill interpretation in this subject	Where the skill is covered in content	Where the skill is explicitly assessed in examination	Opportunity for the skill to be developed through teaching and learning approach
<b>Interpersonal skills</b>				
<b>Teamwork and collaboration</b>				
Communication	Able to communicate a biological process or technique (verbally or written) to peers and teachers and answer questions from others.			Yes e.g. in group discussion
Collaboration	Carrying out a peer review to provide supportive feedback to another.			Yes
Teamwork	Working with other students in practical work so that everyone's contribution is valued and effective.	Numerous opportunities for collaborative practical work.		Yes
Co-operation	Sharing own resources and own learning techniques with other students.			Yes
Interpersonal skills	Using verbal and non-verbal communication skills in a dialogue about biology.			Yes
<b>Leadership</b>				
Leadership	Leading others in a group activity to effectively develop learning.			Yes
Responsibility	Taking responsibility for the outcomes of a team exercise even if one is not solely responsible for the output.			Yes
Assertive communication	Chairing a debate, allowing representations and directing the conversation to a conclusion.			Yes
Self presentation	Presenting an issue in biology to an audience to seek solutions.			Yes