Transferable Skills International GCSE Subject Mapping: Human 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
Cognitive skills				
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: 1.9 understand an outline of the principles of genetic engineering including: • the production of genetically modified bacteria to produce human insulin • the production genetically modified plants to produce vaccines (e.g. hepatitis B) and the production of Golden Rice containing vitamin A to prevent blindness 1.13 describe the advantages, disadvantages and ethics in the research and use of embryonic and adult stem cells 5.10 understand a simple comparison between the nervous and hormonal systems 6.2 understand variations in diet related to age, pregnancy, climate and occupation 9.12 understand the problems associated with heart transplants	e.g. SAM paper 1 Qu 4 SAM Paper 1 Qu 5 SAM Paper 1 7(b) SAM PAPER 2 QU 2	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 movement of substances into and out of cells can be by diffusion, osmosis (understanding of water potential is required) and active transport 3.3 understand the factors that affect the rate of movement of substances into and out of cells to include the effects of surface area to volume ratio, temperature and concentration gradient 4.4 explain the relationship between voluntary muscles and bones	e.g. SAM Paper 1 Qu 3 SAM Paper 1 Qu 5 SAM Paper 2 Qu 3(b)	Yes

		to bring about movement, illustrated by the biceps and triceps muscles and associated bones in the arm and shoulder 6.7 Understand the role of digestive enzymes 8.8 understand the long term benefits of exercise on the cardiovascular system 9.8 compare the structures of arteries, veins and capillaries and understand their roles, including the pulse 11.20 understand how to interpret family pedigrees		
Analysis	Analyse and interpret data and experimental methods, drawing conclusions, which are consistent with evidence from experimental activities.	Examples in several parts of the specification including: 2.4 *practical: investigate the qualitative and quantitative content of vitamin C in food* 2.5 *practical: investigate the energy content of food* 2.7 explain the action of enzymes and how their activity is affected by: • temperature • pH • substrate concentration • competitive and non-competitive inhibitors 3.3 understand the factors that affect the rate of movement of substances into and out of cells to include the effects of surface area to volume ratio, temperature and concentration gradient 8.11 *practical: investigate the effect of exercise on the pulse rate* 12.6 investigate the effects of antibacterial agents and antibiotics on the growth of bacterial culture	e.g. SAM Paper 1 Qu 1 b SAM Paper 1 Qu 2 SAM Paper 1 Qu 3 SAM Paper 2 1(b) SAM Paper 2 Qu 5	Yes
Reasoning	Evaluate information related to biology and make judgements on the basis of this information.	Examples in several parts of the specification including: 1.7 understand that a DNA mutation involves a change in the sequence of bases which could lead to a change in the amino acid sequence and phenotype of an individual 1.9 Understand an outline of the principles of genetic engineering including: • the production of genetically modified bacteria to produce human insulin • the production genetically modified plants to produce vaccines (e.g. hepatitis B) and the production of Golden Rice containing vitamin A to prevent blindness	e.g. SAM Paper 1 Qu 1 SAM Paper 1 Qu 7 SAM Paper 2 Qu 2 SAM Paper 2 4(b)	Yes

		4.5 understand the dietary factors controlling the healthy development of muscle and bone 6.9 understand how the structure of the villus helps absorption of the products of digestion in the small intestine 7.6 understand the role of ATP in energy transfer (addition and removal of a phosphate group and associated energy requirement and release) 9.14 understand the role of beta-blockers in the treatment of circulatory disorders, for example heart failure and angina 10.8 understand the concept of homeostasis and the role of negative feedback with particular reference to temperature control and blood glucose concentration 11.19 understand patterns of monohybrid inheritance using a genetic diagram and the probabilities of outcomes 12.14 understand the differences between natural and artificial immunity and active and passive immunity		
Interpretation	Select, organise and present relevant information clearly and logically using appropriate vocabulary, definitions and conventions.	Examples in several parts of the specification including: 1.1 recognise cell structures as seen with a light microscope and electron microscope (TEM images only), including nucleus, chromosomes, cell membrane, mitochondria, endoplasmic reticulum and ribosomes 1.3 describe the structure of a DNA molecule as: • two strands coiled to form a double helix • containing nucleotides • strands linked by complementary bases • complementary bases linked by hydrogen bonds 1.4 describe DNA replication as the separation of DNA strands, the role of DNA polymerase and complementary base pairing of nucleotides 5.6 describe the pathway taken by a nerve impulse to cause a response to a stimulus 6.11 understand BMI, including the calculation of BMI, and the role of obesity as a risk factor in early onset of diabetes and the significance of high cholesterol levels in atherosclerosis 8.3 explain how the lungs are adapted for gas exchange by diffusion	e.g. SAM Paper 1 6(d) SAM PAPER 2 Qu 2	Yes

		8.10 explain why the heart rate changes during exercise and under the influence of adrenaline 9.9 know the general plan of the circulatory system to include the blood vessels to and from the heart, the lungs, the liver and the kidneys 10.9 describe the advantages and disadvantages of: • kidney transplants • kidney dialysis 12.16 explain how resistant pathogens such as MRSA arise and why they are a cause for concern		
Decision Making	Evaluate data and experimental methods, drawing conclusions, which are consistent with evidence from secondary sources and experimental activities. Suggest possible improvements and further investigations.	Examples in several parts of the specification including: 2.8 *investigate the effect of temperature and pH on enzyme activity* 5.7 *investigate the number and position of touch and temperature receptors in the skin and taste receptors in the tongue* 8.5 *investigate the effect of exercise on the rate of breathing and measure lung capacity* 8.11 *investigate the effect of exercise on the pulse rate*	e.g. SAM Paper 1 Qu 3	e.g. Use of discussion in whole class contexts or in small groups.
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: 9.19 understand how monoclonal antibodies work to detect and treat disease such as cancer 12.14 describe methods of transmission, treatment and prevention of the spread of Ebola and AIDS	e.g. SAM Paper 2 Qu 2(b)	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.		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.		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. 1.13 describe the advantages, disadvantages and ethics in the research and use of embryonic and adult stem cells 6.11 understand BMI, including the calculation of BMI, and the role of obesity as a risk factor in early onset of diabetes and the significance of high cholesterol levels in atherosclerosis 6.12 explain the importance of hygienic methods of food preparation, cooking, storage and preservation of food 8.11 understand the damage caused by smoking to the respiratory and cardiovascular system	e.g. SAMS Paper 1 Qu 1(c(ii) SAMS Paper 2 Qu 1	
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.	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
Interpersonal skills				
Teamwork and collaboration				
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
Leadership				
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