Transferable Skills International GCSE Subject Mapping: Science Double Award

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.

<table>
<thead>
<tr>
<th>NRC framework skill</th>
<th>Skill interpretation in this subject</th>
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<th>Opportunity for the skill to be developed through teaching and learning approach</th>
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<tbody>
<tr>
<td>Cognitive skills</td>
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<td>Cognitive Processes and Strategies</td>
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<tr>
<td>Critical thinking</td>
<td>Using many different pieces of information from the three sciences and synthesise this information to make judgements.</td>
<td>Examples in several parts of the specification including: Biology 2.15 - 2.16 Movement of substances into and out of cells 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 Chemistry 1.22 Understand how the electronic configuration of a main group element is related to its position in the Periodic Table 1.31 Understand how the formulae of simple compounds can be obtained experimentally, including metal oxides, water and salts containing water of crystallisation 4.46 Understand how to deduce the structure of a monomer from the repeat unit of an addition polymer and vice versa. Physics 2.3 Understand why a current in a resistor results in the electrical transfer of energy and an increase in temperature, and how this can be used in a variety of domestic contexts. 6.12 Understand why a force is exerted on a current-carrying wire in a magnetic field, and how this effect is applied in simple d.c. electric motors and loudspeakers</td>
<td>e.g. Biology SAM Paper 1 Qu 6(c) SAM Paper 1 Qu 7(c) SAM Paper 1 Qu 11 Chemistry SAM Paper 1 Qu 6 Physics SAM Paper 1 Qu 8(d) SAM Paper 1 Qu12 a(iv)</td>
<td>Yes</td>
</tr>
<tr>
<td>Problem solving</td>
<td>Apply the principles and concepts of three sciences, including those related to the applications of physics, chemistry and biology in different contexts</td>
<td>Examples in several parts of the specification including: Biology 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. Chemistry 1.22 Understand how the electronic configuration of a main group element is related to its position in the Periodic Table 1.31 Understand how the formulae of simple compounds can be obtained experimentally, including metal oxides, water and salts containing water of crystallisation 4.46 Understand how to deduce the structure of a monomer from the repeat unit of an addition polymer and vice versa. Physics 1.8 Determine acceleration from the gradient of a velocity-time graph 1.9 Determine the distance travelled from the area between a velocity-time graph and the time axis. 2.19 Calculate the currents, voltages and resistances of two resistive components connected in a series circuit 3.15 Use the law of reflection (the angle of incidence equals the angle of reflection) 4.3 Use the principle of conservation of energy 5.2 Use the relationship between the pressure and volume of a fixed mass of gas at constant temperature. 7.13 Use the concept of half-life to carry out simple calculations on activity including graphical methods.</td>
<td>Yes</td>
<td></td>
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<tr>
<td>Analysis</td>
<td>Analyse and interpret data and experimental methods, drawing conclusions, which are consistent with evidence from experimental activities.</td>
<td>Examples in several parts of the specification including: Biology 2.34 Understand how the process of respiration produces ATP in living organisms 3.39 Understand how resistance to antibiotics can increase in bacterial populations, and appreciate how such an increase can lead to infections</td>
<td>Yes</td>
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<tr>
<td>Reasoning</td>
<td>Evaluate information related to physics, chemistry and biology, making judgements on the basis of this information.</td>
<td>Examples in several parts of the specification including: Biology 1.4 Understand that viruses are not living organisms 2.11 Understand how the functioning of enzymes can be affected by changes in temperature, including changes due to change in active site A. Food production 5.2 Understand the effects on crop yield of increased carbon dioxide and increased temperature in glasshouses 5.3 Understand how the use of fertiliser can increase crop yield 5.4 Understand the reasons for pest control and the advantages and disadvantages of using pesticides and biological control with crop plants Chemistry</td>
<td>e.g. Chemistry SAM Paper 1 Qu 3(c) Physics SAM Paper 1 Qu 6 (c) SAM Paper 1 Qu 12(b) Yes</td>
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<tr>
<td>Interpretation</td>
<td>Select, organise and present relevant information clearly and logically using appropriate vocabulary, definitions and conventions.</td>
<td>Examples in several parts of the specification including: Biology 2.36 Describe the differences between aerobic and anaerobic respiration 2.47 Understand the role of the intercostal muscles and the diaphragm in ventilation Chemistry 3.3 Understand how the results of experiments involving the dilution of coloured solutions and diffusion of gases can be explained 4.25 Explain why alkenes are classified as unsaturated hydrocarbons Physics 2.17 Understand why current is conserved at a junction in a circuit 3.8 Explain why there is a change in the observed frequency and wavelength of a wave when its source is moving relative to an observer, and that this is known as the Doppler Effect</td>
<td>e.g. Chemistry SAM Paper 1 Qu 2(b) SAM Paper 1 Qu 7(a) Physics SAM Paper 1 Qu 8(d) SAM Paper 1 Qu 9 SAM Paper 2 Qu 2(a), 2(b)</td>
<td>Yes</td>
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<td>Decision Making</td>
<td>Evaluate data and experimental methods, drawing conclusions, which are consistent with evidence from secondary sources and experimental activities. Suggest possible improvements and further investigations.</td>
<td>Examples in several parts of the specification including: Biology 2.9 Embedded Practical: Investigate food samples for the presence of glucose, starch, protein and fat. Chemistry Selection of appropriate separation method 1.10 Describe these experimental techniques for the separation of mixtures: - simple distillation - fractional distillation - filtration - crystallisation</td>
<td>e.g. Biology SAM Paper 1 Qu 8 Chemistry SAM Paper 1 Qu4(c) SAM Paper 1 Qu5(a) SAM Paper 1 Qu 10(a) Physics</td>
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<td>Adaptive learning</td>
<td>Learn about unifying patterns and themes in the three sciences and use them in new and changing situations.</td>
<td>Examples in several parts of the specification including:</td>
<td>e.g.</td>
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<td>Biology</td>
<td>2.15 Understand how the functioning of enzymes can be affected by changes in temperature, including changes due to changes in active site.</td>
<td>Biology</td>
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<td>Chemistry</td>
<td>3.25 Predict probabilities of outcomes from monohybrid crosses.</td>
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<td>Physics</td>
<td>1.1 Understand the three states of matter in terms of the arrangement, movement and energy of the particles.</td>
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<td>1.19 Understand how the electronic configurations of the first 20 elements can be deduced from their positions in the Periodic Table.</td>
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<td>1.23 Understand why elements in the same group of the Periodic Table have similar chemical properties.</td>
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<td></td>
<td>2.9 Describe how current varies with voltage in wires, resistors, metal filament lamps and diodes, and how this can be investigated experimentally.</td>
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<td>3.4 Know that waves transfer energy and information without transferring matter.</td>
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<td>4.7 Explain the role of convection in everyday phenomena.</td>
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<td>Executive function</td>
<td>Use experimental and investigative skills based on correct and safe laboratory techniques. Evaluate the effectiveness of an investigation in terms of accuracy, validity and reliability.</td>
<td>Use the embedded practicals to develop investigative skills. Evaluate their effectiveness. Plan investigations using the skills developed in the embedded practicals e.g. &quot;plan&quot;?</td>
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<td>Creativity</td>
<td>Innovation</td>
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<td>Apply existing knowledge of scientific processes to situations set in an unfamiliar context.</td>
<td>Using a novel strategy to apply existing knowledge of scientific concepts in unaccustomed situations.</td>
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<td>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.</td>
<td>Questions involving a critical analysis of unfamiliar data in tabular or graphical form.</td>
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<td>e.g. SAM Paper 2 6(d)</td>
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<td>Intrapersonal skills</td>
<td>Adaptable skill interpretation in this subject</td>
<td>Where the skill is covered in content</td>
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<td>Intellectual openness</td>
<td>Ability to select and apply knowledge and understanding of scientific processes, which is not prompted or provided to scientific problems.</td>
<td>Many questions would assess this</td>
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<td>Yes</td>
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<th>Personal and social responsibility</th>
<th>Appreciate ethical issues in science.</th>
<th>Biology</th>
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<td></td>
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<td>2.49 Understand the biological consequences of smoking in relation to the lungs and the circulatory system, including coronary heart disease</td>
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<td>Chemistry</td>
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<td>2.13 Know that carbon dioxide is a greenhouse gas and that increasing amounts in the atmosphere may contribute to climate change</td>
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<td>4.13 Understand why carbon monoxide is poisonous, in terms of its effect on the capacity of blood to transport oxygen</td>
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<td>4.16 Understand how sulfur dioxide and oxides of nitrogen oxides contribute to acid rain</td>
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<td></td>
<td>Physics</td>
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<td></td>
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<td>3.13 Explain the detrimental effects of excessive exposure of the human body to electromagnetic waves</td>
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<td>7.16 Describe the dangers of ionising radiations</td>
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<td>Yes</td>
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<th>Continuous learning</th>
<th>Planning and reflecting on own learning-setting goals and meeting them regularly</th>
<th>Yes</th>
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<td>Intellectual interest and curiosity</td>
<td>Identifying a problem under own initiative, planning a solution and carrying this out.</td>
<td>Yes in sections like astronomy</td>
</tr>
<tr>
<td>Work ethic/conscientiousness</td>
<td>Planning and reflecting on own learning-setting goals and meeting them regularly</td>
<td>Yes</td>
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<th>Initiative</th>
<th>Using scientific knowledge, independently (without guided learning), to further own understanding.</th>
<th>Yes Reading New Scientist</th>
</tr>
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<td>Self-direction</td>
<td>Planning and carrying out science based problem solving under own direction.</td>
<td>Yes</td>
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<p>| Students identify areas where they need extra help or practice. | Yes |</p>
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<th>Responsibility</th>
<th>Taking responsibility for any errors or omissions in own work and creating a plan to improve.</th>
<th>Yes</th>
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<td>Perseverance</td>
<td>Actively seeking new ways to continue and improve own learning despite setbacks.</td>
<td>Yes</td>
</tr>
<tr>
<td>Productivity</td>
<td>Develop a fluency in technical language so sophisticated answers of depth are produced in extended answers to scientific questions.</td>
<td>Some of the longer questions that require several steps would assess this.</td>
</tr>
<tr>
<td>Self regulation (metacognition, forethought, reflection)</td>
<td>Developing and refining a strategy over time for applications of science, to different contexts reflecting on the success or otherwise of the strategy</td>
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<tr>
<td>Ethics</td>
<td>Producing output with a specific moral purpose for which one is accountable.</td>
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<tr>
<td>Integrity</td>
<td>Taking ownership for own work and willingly responds to questions and challenges.</td>
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<tr>
<td>Positive Core Self Evaluation</td>
<td>Planning and reviewing own work as a matter of habit.</td>
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### NRC framework skill

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<td>Interpersonal skills</td>
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<tr>
<td>Communication</td>
<td>Able to communicate a scientific process or technique (verbally or written) to peers and teachers and answer questions from others.</td>
<td>Yes e.g. in group discussion</td>
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<tr>
<td>Collaboration</td>
<td>Carrying out a peer review to provide supportive feedback to another.</td>
<td>Yes</td>
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</tr>
<tr>
<td>Teamwork</td>
<td>Working with other students in a science based problem-solving exercise.</td>
<td>Numerous opportunities for collaborative practical work.</td>
<td>Yes</td>
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<tr>
<td>Co-operation</td>
<td>Sharing own resources and own learning techniques with other students.</td>
<td>Yes</td>
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<tr>
<td>Interpersonal skills</td>
<td>Using verbal and non-verbal communication skills in a dialogue about science.</td>
<td>Yes</td>
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<tr>
<td>Leadership</td>
<td>Leading others in a group activity to effectively solve a scientific problem</td>
<td>Yes</td>
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<tr>
<td>Responsibility</td>
<td>Taking responsibility for the outcomes of a team</td>
<td>Yes</td>
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<tr>
<td>Skill</td>
<td>Description</td>
<td>Yes/No</td>
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<tr>
<td>Assertive communication</td>
<td>Chairing a debate, allowing representations and directing the conversation to a conclusion.</td>
<td>Yes</td>
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<tr>
<td>Self presentation</td>
<td>Presenting a scientific problem or idea to an audience to seek solutions.</td>
<td>Yes</td>
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