Transferable Skills International GCSE Subject Mapping: Chemistry

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 chemistry information and synthesise this information to make judgements.	Examples in several parts of the specification including: 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 1.53C **Explain typical physical properties of metals, including electrical conductivity and malleability** **4.46** Understand how to deduce the structure of a monomer from the repeat unit of an addition polymer and vice versa.	e.g. SAM Paper 1 Qu 6 SAM Paper 2 Qu 3 SAM Paper 2 Qu 8	Yes
Problem solving	Apply unifying patterns and themes in chemistry and use them in new and changing situations.	Examples in several parts of the specification including: 1.26 Calculate relative formula masses (including relative molecular masses) (M_r) from relative atomic masses (A_r) 1.31 Understand how the formulae of simple compounds can be obtained experimentally, including metal oxides, water and salts containing water of crystallisation **3.7C Use bond energies to calculate the enthalpy change during a chemical reaction**	e.g. SAM Paper 1 Qu 4(b) SAM Paper 1 Qu 8 SAM Paper 1 Qu 9(e), 9(f) SAM Paper 1 Qu 10(b), 10(c) SAM Paper 1 Qu 11(d), 10(e) SAM 2 Paper 2 Qu 2 SAM 2 Paper 2 Qu 6	Yes
Analysis	Analyse and interpret data and experimental methods, drawing conclusions, which are consistent with evidence from experimental	Examples in several parts of the specification including: 1.22 Understand how the electronic configuration of a main group element is related to its position in the Periodic Table	e.g. SAM Paper 1 Qu 2	Yes

	activities.	**2.8C Explain the trend in reactivity in Group 7 in terms of electronic configurations** 2.16 Understand how metals can be arranged in a reactivity series based on their displacement reactions **2.23C Explain how the method of extraction of a metal (e.g. carbon extraction for iron and electrolysis for aluminium) is related to its position in the reactivity series**	SAM Paper 1 Qu 11 (a), 11(b), 11(c) SAM Paper 1 Qu 5 SAM Paper 2 Qu 7	
Reasoning	.Evaluate information related to chemistry and make judgements on the basis of this information.	Examples in several parts of the specification including: 2.3 Use knowledge of the properties of potassium, lithium and sodium to predict the properties of other alkali metals	e.g. SAM Paper 1 Qu3(c) SAM Paper 2 Qu1 SAM Paper 2 Qu3	Yes
Interpretation	Select, organise and present relevant information clearly and logically using appropriate vocabulary, definitions and conventions.	Examples in several parts of the specification including: 1.3 Understand how the results of experiments involving the dilution of coloured solutions and diffusion of gases can be explained 1.53C **Explain typical physical properties of metals, including electrical conductivity and malleability** 4.25 Explain why alkenes are classified as unsaturated hydrocarbons 4.4 Understand how to name compounds relevant to this specification using the rules of International Union of Pure and applied Chemistry (IUPAC) nomenclature	e.g. SAM Paper 1 Qu 2(b) SAM Paper 1 Qu 7(a) SAM Paper 2 Qu 4	Yes
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: Selection of appropriate separation method 1.10 Describe these experimental techniques for the separation of mixtures: • simple distillation • fractional distillation • filtration • crystallisation • paper chromatography.	e.g. SAM Paper 1 Qu4(c) SAM Paper 1 Qu5(a) SAM Paper 1 Qu 10(a) SAM Paper 2 Qu 2(c) SAM Paper 2 Qu 6 (b), 6(c)	e.g. Use of discussion in whole class contexts or in small groups.

Adaptive learning	Learn about unifying patterns and themes in chemistry and use them in new and changing situations.	Examples in several parts of the specification including: 1.1 Understand the three states of matter in terms of the arrangement, movement and energy of the particles 1.19 Understand how the electronic configurations of the first 20 elements can be deduced from their positions in the Periodic Table 1.23 Understand why elements in the same group of the Periodic Table have similar chemical properties **2.24C Be able to comment on a metal extraction process, given appropriate information**	e.g. SAM Paper 1 Qu 1 SAM Paper 1 Qu 6 SAM Paper 2 Qu 7(a) SAM Paper 2 Qu 9(c)	Yes
Executive function	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.	Use the embedded practicals to develop investigative skills. Evaluate their effectiveness. Plan investigations using the skills developed in the embedded practicals.		
Creativity				
Creativity	Apply existing knowledge of chemical 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 8(b) SAM Paper 1 10(a)	Yes May be evidenced in homework tasks
Innovation	Using a novel strategy to apply existing knowledge of chemistry 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 chemistry problems.	Many questions would assess this		Yes
Personal and social responsibility	Appreciate ethical issues in chemistry	2.13 Know that carbon dioxide is a greenhouse gas and that increasing amounts in the atmosphere may contribute to climate change 4.13 Understand why carbon monoxide is poisonous, in terms of its effect on the capacity of blood to transport oxygen 4.16 Understand how sulfur dioxide and oxides of nitrogen oxides contribute to acid rain		Yes

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 chemistry knowledge, 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 chemistry questions.	Some of the longer questions that require several steps would assess this.	SAM Paper 1 Qu 7(c)	Yes
Self regulation (metacognition, forethought, reflection)	Developing and refining a strategy over time for applications of chemistry, 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 chemical 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 chemistry.			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 chemistry to an audience to seek solutions.			Yes