

## APPENDIX

### THE EXEMPLIFICATION OF KEY SKILLS

The following tables give some examples of Chemistry contexts in which naturally occurring key skills evidence could be accumulated.

**Note: If producing certain types of evidence creates difficulties due to disability or other factors, the candidate may be able to use other ways to show achievement. The candidate should ask the tutor or supervisor for further information.**

The first table focuses on Communication (Level 3). Candidates must provide evidence to meet the standards for C3.1a, C3.1b, C3.2 and C3.3:

- Take part in a group discussion
- Make a formal presentation of at least eight minutes using an image or other support material
- Read and synthesise information from at least two documents (minimum 1000 words) about the same subject
- Write two different types of documents (one of which must be at least 1,000 words), each one giving different information about complex subjects

### COMMUNICATION: LEVEL 3

C3.1a TAKE PART IN A GROUP DISCUSSION			
Candidates must:	Evidence must show that candidates can:	Examples of evidence:	Suggested context:
Take part in a group discussion	3.1a.1 make clear and relevant contributions in a way that suits their purpose and situation 3.1a.2 respond sensitively to others and develop points and ideas 3.1a.3 encourage others to contribute.	A record from someone who has observed discussion or has made video/ audiotape of discussion.	<ul style="list-style-type: none"> <li>• The uses and hazards of radioactivity.</li> <li>• Ethanol in a social context its uses and misuses.</li> </ul>

C3.1b MAKE A FORMAL PRESENTATION			
Candidates must:	Evidence must show that candidates can:	Examples of evidence:	Suggested context:
Make a formal presentation of at least eight minutes using an image to other support material	3.1b.1 speak clearly and adapt their style of presentation to suit his /her purpose, subject, audience and situation 3.1b.2 structure what they say to progress logically through each stage of their presentation 3.1b.3 use an image or other material to support or enhance what he/she is saying.	A record from someone who has observed the presentation including a description of the image/support material or a video/ audiotape or preparatory notes with images/support material.	<ul style="list-style-type: none"> <li>• Environmental problems and their solution. Ozone depletion and the 'greenhouse' effect.</li> <li>• Halogen compounds in commerce and industry.</li> </ul>

C3.2 READ AND SYNTHESISE INFORMATION			
Candidates must:	Evidence must show candidates can:	Examples of evidence:	Suggested context:
<p>Read and synthesise information from at least two documents about the same subject.</p> <p>Each document must be at least 1000 words long</p>	<p>3.2.1 select and read relevant documents</p> <p>3.2.2 identify accurately and compare the main points and lines of reasoning</p> <p>3.2.3 present their own interpretation of the subject in a way that is coherent and brings together information from different documents to suit their purpose</p>	<ul style="list-style-type: none"> <li>• a record of what was read and why, including a note of the image.</li> <li>• Notes, highlighted text or answers to questions about material read.</li> <li>• evidence of synthesising information from notes of a presentation or a written document.</li> </ul>	<ul style="list-style-type: none"> <li>• Technical and economic factors in the siting and operation of industrial processes.</li> <li>• Industrial and biological importance of transition metals.</li> </ul>

C3.3 WRITE TWO DIFFERENT TYPES OF DOCUMENTS			
Candidates must:	Evidence must show candidates can:	Examples of evidence:	Suggested context:
<p>Write two different types of documents, each one giving different information about complex subjects</p> <p><b>One</b> document must be at least 1000 words long.</p>	<p>3.3.1 select and use a format, and style of writing that is appropriate to the purpose and complexity of the subject matter</p> <p>3.3.2 organise material coherently to suit the length, complexity and purpose of their document</p> <p>3.3.3 spell, punctuate and use grammar correctly</p> <p>3.3.4 make their meaning clear.</p>	<p>The two different documents might include an extended essay, a piece of research, complex letters, PowerPoint slides, handouts.</p>	<ul style="list-style-type: none"> <li>• The relationship between crystal structure - bonding - physical properties and uses.</li> <li>• The beneficial role of chemistry to society and the environment.</li> <li>• Industrial, commercial and medical uses of organohalogen compounds. Adverse environmental effects of CFCs.</li> <li>• Periodicity; electronegativity, nature of oxides and chlorides, amphoteric character.</li> </ul>

**APPLICATION OF NUMBER: LEVEL 3**

Candidates must:

Plan and carry out one or more activities that each includes tasks for all three of the N3.1, N3.2. (a,b,c or d) and N3.3.

Overall through one or more activities, candidates must:

- use two different types of sources, including a large data, i.e. over 50 items of data (N3.1)
- carry out calculations to do with a,b,c and d (N3.2)
- present findings in two different ways using charts, graphs or diagrams (N3.3)

<b>N3.1 PLAN AN ACTIVITY AND GET RELEVANT INFORMATION FROM RELEVANT SOURCES</b>			
<b>Candidates must:</b>	<b>Evidence must show candidates can:</b>	<b>Examples of evidence:</b>	<b>Suggested context:</b>
Plan an activity and get relevant information from relevant sources.	3.1.1 plan how to get and use the information needed to meet the purpose of the activity 3.1.2 obtain the relevant information 3.1.3 choose appropriate methods to get the results needed and to justify choice	A plan with a clear description of the activity, its purpose and how information will be obtained. Copies of source materials.	Plan, using e.g. textbooks/journals, and interpret information obtained in order to determine the effect of concentration on rate (AS)/the rate equation for a suitable reaction (A2). e.g. the reaction between hydrogen peroxide and iodide ions in acid solution. Work in pairs to investigate a particular reactant, and exchange data for other reactants to obtain a large data set. IT <i>could</i> be used in interfacing/data logging to obtain experimental data.

<b>N3.2 USE THIS INFORMATION TO CARRY OUT MULTI-STAGE CALCULATIONS</b>			
<b>Candidates must:</b>	<b>Evidence must show candidates can:</b>	<b>Examples of evidence:</b>	<b>Suggested context:</b>
Use this information to carry out multi-stage calculations to do with: a. amounts or sizes b. scales or proportions c. handling statistics d. using formulae.	3.2.1 carry out calculations to appropriate levels of accuracy clearly showing their methods 3.2.2 check methods and results to help ensure that errors are found and corrected	Multi-stage calculations for each of a, b, c and d showing methods, appropriate rounding and levels of accuracy; how the candidate checked that the methods and results made sense.	Calculate the rate of reaction at each concentration of a specific reactant. Obtain a large data set to include the rates of varying concentrations of each reactant.

<b>N3.3 INTERPRET THE RESULTS OF YOUR CALCULATIONS, PRESENT YOUR FINDINGS AND JUSTIFY YOUR METHODS</b>			
<b>Candidates must:</b>	<b>Evidence must show candidates can:</b>	<b>Examples of evidence:</b>	<b>Suggested context:</b>
Interpret the results of their calculations, present their findings and justify their methods	3.3.1 select appropriate levels of accuracy clearly showing their methods 3.3.2 present their findings effectively 3.3.3 describe what their results tell them and whether they meet their purpose	Findings presented in two different ways. An explanation of the results with reference to their plan in N3.1. Notes on how the results from the calculations met the purpose of the activity.	Interpret the results and deduce the effects of concentration on rate (AS)/and write the rate equation for the investigated reaction (A2).  Presentation of the findings <i>could</i> include the use of IT to produce graph(s), chart(s) and diagram(s).

### INFORMATION and COMMUNICATION TECHNOLOGY: LEVEL 3

Candidates must plan and carry through a number of different tasks, one of which must be a major task covering ICT3.1, ICT3.2 and ICT3.3. Each component ICT3.1, ICT3.2 and ICT3.3 must be covered at least twice and ICT3.3 must be covered for at least two different audiences. Smaller tasks may be used to ensure each component is covered.

Overall, through two or more activities, the candidate must:

- include at least one ICT based information source
- include at least one non ICT based information source
- use at least one example of text, one example of number and one example of image
- use one example of combined information such as text and number, or image and number or text and image
- present evidence of purposeful use of email, one of these emails must have an attachment related to the task.

ICT 3.1 SEARCH FOR INFORMATION, USING DIFFERENT SOURCES			
Candidates must:	Evidence must show candidates can:	Examples of evidence:	Suggested context:
Search for information, using different sources, and multiple search criteria in at least one case.	3.1.1. plan how to obtain and use information required for the task 3.1.2 make selections based on judgements of relevance and quality.	<ul style="list-style-type: none"> <li>• a plan showing how the resources will be best used and how information is suited to the task</li> <li>• appropriate and effective searches for relevant information from ICT and non ICT sources</li> <li>• annotated printouts, copies of sources material, records from observing the candidate.</li> </ul>	Plan and use different databases, such as CD Roms and the Internet to search for and select information on <b>one</b> of the following: <ul style="list-style-type: none"> <li>• The effect of physico-chemical principles on rate and yield in the Haber <b>and</b> Contact processes.</li> <li>• The use of spectrometry to solve analytical problems in medicine <b>and</b> industry/environment.</li> </ul>

ICT 3.2 ENTER AND DEVELOP THE INFORMATION AND DERIVE NEW INFORMATION			
Candidates must:	Evidence must show candidates can:	Examples of evidence:	Suggested context:
Enter and develop, explore and derive new information	3.2.1 enter and bring together information using formats that help development 3.2.2 use software features to improve the efficiency of their work 3.2.3 annotate/document their work to show that they understood the process and have taken account the views of others.	Print-outs or record of someone who observed use of ICT showing how information has been explored, developed and new information derived	Explore, develop and exchange the information obtained in IT3.1 to derive new information to <ul style="list-style-type: none"> <li>• Obtain the optimum conditions for the production of ammonia <b>and</b> sulphuric acid.</li> <li>• Identify a suitable technique for the determination of drugs in medicine <b>and</b> heavy metal poisoning in industry/environment.</li> </ul>

ICT 3.3 PRESENT COMBINED INFORMATION			
Candidates must:	Evidence must show candidates can:	Examples of evidence:	Suggested context:
Present combined information such as text with image, text with number, image with number	3.3.1 develop the presentation so that it is accurate, clear and presented consistently, taking into account the views of others 3.3.2 present their final output effectively using a format and style that suit their purpose and audience.	<ul style="list-style-type: none"> <li>• annotated working drafts, records of screen displays that show development of structure and content in response to feedback</li> <li>• print-outs or a static or dynamic screen display of final work, including text, images and numbers.</li> </ul>	Present the information obtained from IT3.2 and IT3.3, to <b>two</b> different audiences, using Word Processing and Desk Top Publishing packages, importing into text a minimum of <b>one</b> chart and <b>one</b> set of numerical data.

### WORKING WITH OTHERS: LEVEL 3

Candidates must provide at least one example of meeting the standards for WO3.1, WO3.2 and WO3.3, to include work in a group or team situation. They must check progress on two occasions (for WO3.2).

W03.1 PLAN WORK WITH OTHERS			
Candidates must:	Evidence must show candidates can:	Examples of evidence:	Suggested context:
Plan work with others	3.1.1 agree realistic objectives for working and what needs to be done to achieve them 3.1.2 share relevant information to help agree roles and responsibilities 3.1.3 agree suitable working arrangements with those involved	<ul style="list-style-type: none"> <li>a plan showing an understanding of the objectives, working arrangements and responsibilities .</li> <li>records from someone who observed the process</li> <li>Reports from team members, responses to assessor questioning, audio/video recordings.</li> </ul>	investigations concerning e.g. Reaction Kinetics which require planning, collection and interpretation of large sets of data provide opportunities for situations involving both working in pairs and with groups. One such example, concerning the reaction between hydrogen peroxide and iodide ions in acid solution, is given under the Key Skill of Application of Number N3.1, N3.2, N3.3. (or see below)

W03.2 SEEK TO DEVELOP CO - OPERATION AND CHECK PROGRESS TOWARDS YOUR AGREED OBJECTIVES			
Candidates must:	Evidence must show candidates can:	Examples of evidence:	Suggested context:
Seek to develop co - operation and check progress towards their agreed objectives	3.2.1 organise and carry out tasks efficiently to meet their responsibilities 3.2.2 seek effective ways to develop co-operation including ways to resolve conflict 3.2.3 share accurate information on progress agreeing changes where necessary to achieve objectives	Records of how the candidate organised and carried out tasks, maintained cooperative working relationships and how conflict was resolved. These can include a log, statements written by others with whom the candidate worked	collection of data from experimental results/databases to determine equilibrium concentration values that are then used to calculate $K_c/K_p$ for some reactions e.g. ammonia/sulphur trioxide production, esterification, hydrolysis at different temperatures. The activity <i>could</i> be used to link to the Key Skill of Application of Number N3.2 and Information Technology IT3.1. (or see above or below)

W03.3 REVIEW WORK WITH OTHERS AND AGREE WAYS OF IMPROVING			
Candidates must:	Evidence must show candidates can:	Examples of evidence:	Suggested context:
Review work with others and agree ways of improving collaborative work in future	3.3.1 agree the extent to which work with others has been successful and the objectives have been met 3.3.2 identify factors, including the role in influencing the outcome 3.3.3 agree ways of improving the work with others in the future, including interpersonal skills	<ul style="list-style-type: none"> <li>statement written by the candidate and others involved in the process.</li> <li>report, written with others, on ways to improve future collaborative work</li> </ul>	a presentation of the Petrochemical Industry. This <i>could</i> involve components such as fractional distillation, cracking, uses of related products, availability of resources and alternative energy sources. The activity <i>could</i> be used to link to the Key Skill of Communication C3.1, C3.2. (or see above)

### IMPROVING OWN LEARNING AND PERFORMANCE: LEVEL 3

Candidates must provide at least one example of meeting the standard for LP3.1, LP3.2 and LP3.3 (the example should cover at least three targets). Overall, candidates must show they can use at least two different ways of learning to improve their performance.

LP3.1 SET TARGETS USING INFORMATION FROM APPROPRIATE PEOPLE			
	Evidence must show candidates can:	Examples of evidence:	Suggested context:
Set targets using information from appropriate people and plan how these will be met	3.1.1. seek information on ways to achieve what they want to do, and identify factors that might affect their plans 3.1.2. use this information to set realistic targets and identify clear action points 3.1.3. plan how they will manage their time use, support, review progress and overcome possible difficulties.	<ul style="list-style-type: none"> <li>an action plan that includes three learning targets, deadlines and dates for reviewing progress</li> <li>records to show that the candidate sought and used information from others to set targets</li> <li>response to assessor questioning on factors that might affect the planning</li> </ul>	The following <b>contexts</b> could be used to generate evidence for LP3.1, LP3.2 and LP3.3. <ul style="list-style-type: none"> <li>practical work related to AS/A topics† e.g. stoichiometry, thermochemistry, kinetics.</li> <li>identification of unknown compounds: empirical formulae <i>could</i> be determined from elemental composition; deduction of molecular formulae using e.g. titration values, mass spectrometer values and gravimetric results. Structure elucidation <i>could</i> be performed as a practical activity. Infrared, ultraviolet-visible and nuclear magnetic resonance spectroscopy <i>could</i> be used to support structure elucidation.</li> <li>write a document on periodicity and the chemistry of the <i>s</i> &amp; <i>p</i> blocks and transition elements.</li> </ul>
LP3.2 TAKE RESPONSIBILITY FOR YOUR LEARNING			
Candidates must:	Evidence must show candidates can:	Examples of evidence:	Suggested context:
Take responsibility for their learning, using their plan to help meet targets and improve performance.	3.2.1 manage their time effectively to meet deadlines, revising their plan as necessary 3.2.2 choose ways of learning to improve their performance, working at times independently and adapting approaches to meet new demands 3.2.3 reflect on their progress, seeking feedback and relevant support to help them meet their targets.	A log of learning with notes of: <ul style="list-style-type: none"> <li>how the candidate used at least two different leaning styles</li> <li>how the candidate sought feedback and support and how they implemented it.</li> <li>any revisions made to the plan</li> <li>records from those who have seen the effective management of time</li> </ul>	see above
LP3.3 REVIEW PROGRESS AND ESTABLISH EVIDENCE OF YOUR ACHIEVEMENTS			
Candidates must:	Evidence must show candidates can:	Examples of evidence:	Suggested context:
Review progress and establish evidence of their achievements.	3.3.1 provide information on the ways they have used their learning to meet new demands and on factors affecting quality of their outcomes 3.3.2 identify targets they have met and gather evidence of their achievement. 3.3.3 Consult appropriate people to agree ways to improve further their performance.	Notes, records to show: <ul style="list-style-type: none"> <li>the candidate achieved what they set out to do using their different leaning styles</li> <li>how they used their learning to meet new demands</li> <li>how they agreed with others to improve future performance</li> </ul>	see above

### PROBLEM SOLVING: LEVEL 3

Candidates must provide at least one example of meeting the standard for PS3.1, PS3.2 and PS3.3. The example should include exploring at least three different ways of tackling a problem (for PS3.1).

PS3.1 EXPLORE A PROBLEM AND IDENTIFY WAYS OF TACKLING IT			
Candidates must:	Evidence must show candidates can:	Examples of evidence:	Suggested context:
Explore a problem and identify ways of tackling it.	3.1.1 identify, analyse and accurately describe the problem and agree with others how they will know it has been solved 3.1.2 select and use a variety of methods to come up with different ways of tackling the problem 3.1.3 compare the main feature and risks of each approach and justify the methods they decide to use.	<ul style="list-style-type: none"> <li>description of the problem, analysis of its features, and methods used for exploring it.</li> <li>statements endorsed by appropriate people of how the candidate will know the problem has been solved</li> <li>description of three different options for solving the problem</li> <li>responses to assessor questioning</li> </ul>	Explore one complex problem such as how to <ul style="list-style-type: none"> <li>find the enthalpy change of neutralisation of a 0.1M 'unknown' acid with 0.1M sodium hydroxide, coming up with <b>three</b> options, e.g. thermometric titration, 'standard' calorimetric technique, finding the pH to determine if tabulated strong acid - strong alkali datum is the required value.</li> <li>analyse a mixture of solids, coming up with <b>three</b> options e.g. qualitative analysis, mass spectrometry, IR etc.</li> </ul>

PS3.2 PLAN AND IMPLEMENT AT LEAST ONE WAY OF SOLVING THE PROBLEM			
Candidates must:	Evidence must show candidates can:	Examples of evidence:	Suggested context:
Plan and implement one way of solving the problem	3.2.1 plan their chosen way of solving the problem and get the go-ahead from an appropriate person 3.2.2 put their plan into action, effectively using feedback from others to help tackle the problem 3.2.3 regularly check progress towards solving the problem, and revising their approach as necessary	<ul style="list-style-type: none"> <li>a plan to show how the problem will be solved using the option chosen, including any revisions</li> <li>records of getting the go-ahead to solve the problem from the appropriate person and how support was sought and used</li> <li>records to show that progress was checked.</li> </ul>	Plan and implement <b>one</b> method <ul style="list-style-type: none"> <li>for determining the enthalpy change of neutralisation (provided the acid is weak and unknown then tabulated data values are not feasible.)</li> <li>of analysis e.g. qualitative.</li> </ul>

PS3.3 CHECK IF THE PROBLEM HAS BEEN SOLVED AND REVIEW YOUR APPROACH TO PROBLEM SOLVING			
Candidates must:	Evidence must show candidates can:	Examples of evidence:	Suggested context:
Check if the problem has been solved and review their approach to problem solving	3.3.1 apply systematic methods (agreed with an appropriate person), to check if the problem has been solved 3.3.2 describe fully the results and draw conclusions on how successful they were in solving the problem 3.3.3 review their approach to problem solving, including whether other approaches might have proved more effective	<ul style="list-style-type: none"> <li>description of methods used and whether the problem was solved</li> <li>review of problem solving methods and whether these could be improved</li> <li>responses to assessor questioning.</li> </ul>	Check if the problem has been solved, describe the results and review whether alternative methods, <ul style="list-style-type: none"> <li>e.g. thermometric titration/ calorimetric technique</li> <li>e.g. mass spectrometry/IR, if available might have proved more effective.</li> </ul>