

Key Skills Opportunities in GCE Applied Science mandatory A2 Unit 8: *Investigating the scientist's work*

Candidates produce an information pack, which can be used and understood by a group of scientific research technicians, which includes:

- a detailed and workable plan for one scientific vocational investigation, to include aims and objectives, full details of experimental work, and constraints under which the candidate worked, with documented evidence of research;
- a record of the data collected and how it was processed and interpreted;
- evidence to show how the plan was implemented safely and an evaluative scientific report on the outcomes of the investigation suitable for the technicians to understand and use.

Key Skill Detail for Communication Level 2	Opportunities in this Unit	Comments on these Opportunities	Watch Out!	Level 3 Enhancement
<p>2.1a: Take part in a group discussion:</p> <ul style="list-style-type: none"> • make clear and relevant contributions in a way that suits your purpose and situation; • respond appropriately to others; • help to move the discussion forward. 	None identified.		<p>A group is three or more people.</p> <p><i>Clear and relevant</i> contributions are required.</p> <p>The group discussion should provide opportunities for responding to a range of views and sensibilities, and for candidates to be able to take the lead in moving discussions on.</p> <p>Witness testimony should be accompanied by any support or preparation materials used.</p>	<p>Needs to be a <i>complex</i> discussion which would be in the context of the vocational area.</p> <p>Candidates must show evidence of being responsive and sensitive to others in the group, demonstrate ability to create opportunities for them to contribute to, and show that they are capable of, developing points and ideas.</p>

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<p>2.1b: Give a talk of at least four minutes:</p> <ul style="list-style-type: none"> • speak clearly in a way that suits your subject, purpose and situation; • keep to the subject and structure your talk to help listeners follow what you are saying; • use appropriate ways to support your main points. 	None identified.		<p>Talk must be given to two or three <i>familiar</i> people.</p> <p>Presentation <i>could</i> be supported by a purposeful image.</p> <p>Subject matter will usually be closely connected with work or vocational area.</p> <p>Candidates may use <i>brief</i> notes as a prompt but should not <i>read out</i> any prompt notes.</p> <p>Teachers should look for clarity of expression and evidence that the talk is well structured, keeps to the point, gives clear illustration of the main points and uses a variety of ways to support main points.</p>	<p>Needs to be a formal presentation of at least eight minutes.</p> <p>Needs to suit the purpose, subject, <i>audience</i> and situation.</p>

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<p>2.2 Read and summarise information from at least two documents about the same subject. Each document must be a minimum of 500 words long:</p> <ul style="list-style-type: none"> • select and read relevant documents; • identify accurately the main points, ideas and lines of reasoning; • summarise the information to suit your purpose. 	None identified.		<p>Documents must relate to the <i>same</i> subject.</p> <p>Candidates must work <i>independently</i> to select material from the documents.</p> <p>Evidence that <i>appropriate</i> material has been selected from the documents will be implicit in the subsequent summary/comparison.</p> <p>Candidates must identify lines of reasoning from text (and images if used) <i>accurately</i>.</p>	<p>Each document must be at least 1000 words long.</p> <p>The subject matter must be challenging, offering a number of strands of thought or different approaches.</p> <p>Candidates must demonstrate the ability to 'synthesise' the information – this must go beyond a <i>summary</i> as required at Level 2.</p>

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<p>2.3 Write two different types of documents each one giving different information. One document must be at least 500 words long:</p> <ul style="list-style-type: none"> • present relevant information in a format that suits your purpose; • use a structure and style of writing to suit your purpose; • spell, punctuate and use grammar accurately make your meaning clear. 	<p>Produce a detailed and workable plan for one scientific vocational investigation.</p> <p>Produce a record of the data collected and how it was processed and interpreted.</p> <p>Produce evidence to show how the plan was implemented safely and an evaluative scientific report on the outcomes of the investigation suitable for the technicians to understand and use.</p>		<p>Teachers can provide guidance for the appropriate format of writing required.</p> <p>Spelling and punctuation must be accurate and grammar correct, so that meaning is clear.</p> <p>Candidates should not be penalised for one or two errors providing meaning is still clear and mistakes in one document are not repeated in another.</p> <p><i>Presentation</i> material can be produced in such a way that it can be used as a type of document.</p> <p>An image may be used to convey information.</p>	<p>Each document must give information about complex subjects (those that deal with abstract or sensitive issues and lines of enquiry that are dependant on clear reasoning).</p> <p>Subject matter must be challenging with use made of specialised vocabulary where appropriate.</p> <p>One document must be at least 1000 words long.</p> <p>Candidates must have responsibility for selecting and using 'form and style'.</p>

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<p>2.1 Interpret information from a suitable source:</p> <ul style="list-style-type: none"> • choose how to get the information you need to meet the purpose of your activity; • obtain relevant information; • choose appropriate methods to get the results you need. 	<p>Show evidence of a wide range of relevant research, selected from a number of sources with suitable validation, identifying constraints you will have to work under and how they can be overcome.</p>		<p>Candidates must show that they can use the <i>source</i> to obtain information that is relevant to the <i>purpose</i> of the activity and can select, unaided, appropriate methods to get the required results.</p> <p>Evidence should include how choices are made.</p> <p>There needs to be evidence of information obtained from two different sources, one of which must be a chart or graph.</p>	<p>Candidates must show performance in planning and getting relevant information.</p> <p>Two different types of sources are needed, including a large data set (i.e. over 50 items).</p> <p>Candidates must justify choices made in identifying appropriate methods for getting information.</p>

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<p>2.2 Use your information to carry out calculations to do with:</p> <ul style="list-style-type: none"> a amounts or sizes b scales or proportion c handling statistics d using formulae: <ul style="list-style-type: none"> • carry out calculations, clearly showing your methods and levels of accuracy; • check your methods to identify and correct any errors, and make sure your results make sense. 	Produce a record of data collected and how it was processed and interpreted.	Carry out a number of complex calculations.	<p>Candidates must check their calculations and, in all cases, appropriate levels of accuracy need to be applied.</p> <p>Data used for part d needs to make comparison of two sets of data that makes use of 20 items.</p> <p>Calculations should involve two or more steps using information from N2.1.</p> <p>If additional activities need to be carried out to meet all requirements for N2.2 then <i>each</i> activity must include tasks for N2.2 <i>and</i> N2.3 or N2.1 <i>and</i> N2.2.</p>	<p>Calculations using information from N3.1 should involve at least two stages, i.e. where results from <i>one</i> stage are used to provide some data calculations at the <i>next</i> stage.</p> <p>Checking and accuracy at the appropriate level also apply.</p>

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<p>2.3 Interpret the results of your calculations and present your findings:</p> <ul style="list-style-type: none"> • select effective ways to present your findings; • present your findings clearly using a chart, graph or diagram and describe your methods; • use more than one way of presenting your findings; • describe what your results tell you and how they meet your purpose. 	<p>Produce evidence to show how the plan was implemented safely.</p> <p>Produce an evaluative scientific report on the outcomes of the investigation suitable for the technicians to understand and use.</p>		<p>Findings from N2.1 and N2.2 could be developed to provide evidence for N2.3.</p> <p>Candidates must present findings in two different ways using charts, graphs or diagrams.</p> <p>In interpreting results and presenting findings, candidates need to select forms of presentation to match effectively the types of information being presented.</p> <p>Candidates must describe <i>both</i> the methods used and what the results of the calculations mean in terms of meeting the purpose of the activity.</p> <p>ICT can be used.</p>	<p>Evidence should show that candidates can <i>select</i> and <i>justify</i> methods of presentation and present findings effectively in two different ways, appropriate to the nature of the data being presented.</p> <p>If ICT is used to produce these, it is essential that candidates check their accuracy and explain them fully.</p>

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Key Skill Detail for ICT Level 2	Opportunities in this Unit	Comments on these Opportunities	Watch Out!	Level 3 Enhancement
<p>2.1 Search for and select information to meet your needs. Use different information sources for each task and multiple search criteria in at least one case:</p> <ul style="list-style-type: none"> • select information relevant to the tasks. 	<p>Show evidence of a wide range of relevant research, selected from a number of sources.</p>		<p>Both ICT-based and non-ICT-based information sources are required.</p> <p>The relationship between the information selected and its <i>purpose</i> needs to be clear.</p> <p>Multi-criteria searching required for ICT-based information.</p> <p>This search information may be used in ICT 2.2 and 2.3.</p>	<p>There needs to be clear evidence of <i>the planning process</i> in the use of ICT.</p> <p>Candidates must produce evidence of <i>appropriate</i> and <i>effective</i> searches for finding and selecting relevant information from ICT and non-ICT sources.</p>
<p>2.2 Enter and develop the information to suit the task and derive new information:</p> <ul style="list-style-type: none"> • enter and combine information using formats that help development; • develop information and derive new information as appropriate. 	<p>Keep records of the data collected and show how it was processed and interpreted.</p> <p>Produce a description and explanation of the results presented in a suitable format.</p> <p>Show suitable processing and interpretation of the data collected, relating to the objectives of the investigation.</p>		<p>Combined information must be developed, e.g. 'text and number' or 'text and image'.</p> <p>New information must be added from <i>other</i> sources.</p>	<p>Candidates must present evidence of <i>purposeful</i> use of e-mail; one of these e-mails must have an attachment related to it.</p> <p>Candidates must demonstrate the use of software features to improve efficiency.</p>

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<p>2.3 Present combined information such as text with image, text with number, image with number:</p> <ul style="list-style-type: none"> develop the presentation so that the final output is accurate and shows consistent use of formats; use layout appropriate to the types of information. 	<p>Produce an achievable and logically presented plan of your investigation.</p> <p>Produce a clear and accurate report of the outcomes of the investigation which could be used and understood by research technicians.</p>		<p>Final work must be accurate, clear and saved appropriately.</p> <p>Candidates must present evidence of <i>purposeful</i> use of e-mail.</p> <p>Candidates must <i>select and use</i> an appropriate layout for presenting combined information.</p>	<p>Work needs to be checked for accuracy and sense.</p> <p>Candidates must develop the structure and content of the presentation in consultation with others, with evidence of how work was refined in response to others.</p> <p>Candidates must present information in a way that is appropriate to its purpose and <i>audience</i>.</p> <p>Candidates must present evidence of at least one e-mail <i>with attachment</i> related to the task – candidates are not required to receive and open attachments if this is not appropriate to the tasks.</p>

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Key Skill Detail for Improving Own Learning and Performance Level 2	Opportunities in this Unit	Comments on these Opportunities	Watch Out!	Level 3 Enhancement
<p>2.1 Help set targets with an appropriate person and plan how these will be met:</p> <ul style="list-style-type: none"> • provide information to help set realistic targets what you want to achieve; • identify clear action points for each target and you will manage your time; • identify how to get the support you need and arrangements for reviewing your progress. 	None identified.		<p>Candidates must set <i>realistic</i> targets and identify <i>clear</i> action points for each target. Evidence is likely to include plans of two short-term targets.</p> <p>Candidates need to identify how to get the support they need and arrangements for reviewing their progress.</p> <p>Plans should not be produced in retrospect.</p>	<p>Candidates must provide evidence of setting at least three targets and will <i>record</i> their plan.</p>

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<p>2.2 Take responsibility for some decisions about your learning, using your plan to help meet targets and improve your performance:</p> <ul style="list-style-type: none"> • use your action points to help manage your time well; revising your plan when needed; • choose ways of learning to improve your performance, working for short periods without close supervision; • identify when you need support and use this effectively to help you meet targets. 	None identified.		<p>Teachers need to ask candidates questions based around <i>Part A</i>, to check their awareness of different learning styles.</p> <p>A learning log may be the most useful form of evidence for this component.</p> <p>Other forms of evidence could include records from people who have seen the candidate work and observed how they managed their time.</p> <p>Candidates need to show they have improved their performance through using at least two different ways of learning.</p>	<p>Candidates must manage their time effectively to meet deadlines, revising their plans where necessary.</p> <p>Candidates must choose ways of learning to <i>improve</i> their performance.</p> <p><i>At times</i>, candidates must work independently.</p>

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<p>2.3 Review progress with an appropriate person and provide evidence of your achievements:</p> <ul style="list-style-type: none"> • identify what you learned, and how you have used your learning in another task; • identify targets you have met and evidence of your achievements; • identify ways you learn best and how to further improve your performance. 	None identified.		<p>Candidates must identify at least two targets <i>they have met</i> and provide evidence of their achievements.</p> <p>These achievements must be drawn from at least two different ways of learning.</p> <p>Candidates must identify clearly how they used learning from <i>one</i> task to meet <i>another</i>.</p> <p>In the context of communication with an appropriate person, evidence of what candidates have said may include records produced by them <i>or</i> the teacher.</p> <p>Candidates must focus on the requirements of <i>IOLP</i> when evaluating and reviewing and not the <i>project outcome</i> itself.</p>	<p>In reviewing progress, candidates must provide information on ways they have used their learning to meet new demands and on factors affecting the quality of their outcome.</p> <p>There should also be evidence, drawn from consultation with appropriate people, to show how candidates agreed ways to further improve performance.</p>

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Key Skill Detail for Working with Others Level 2	Opportunities in this Unit	Comments on these Opportunities	Watch Out!	Level 3 Enhancement
<p>2.1 Plan work with others:</p> <ul style="list-style-type: none"> • identify what you need to achieve together; • share relevant information to identify what needs to be done and individual responsibilities; • confirm the arrangements for working together. 	None identified.		<p>In a group or team situation candidates must identify what is being <i>achieved</i> – this evidence could be from <i>using</i> a plan that clearly shows the objectives, responsibilities and working arrangements, or it could be from teacher questioning.</p> <p>Candidates must <i>share information with others</i> to identify responsibilities.</p>	<p><i>It is unlikely that this opportunity will address Level 3 criteria.</i></p>
<p>2.2 Work co-operatively towards achieving the identified objectives:</p> <ul style="list-style-type: none"> • organise and carry out tasks safely using appropriate methods, to meet your responsibilities; • support co-operative ways of working to help achieve the objectives for working together; • check progress, seeking advice from an appropriate person when needed. 	None identified.		<p>The most useful forms of evidence are direct observation by video or teacher, or audio recordings.</p> <p>Candidates must show how they have supported co-operative working – e.g. shown willingness to help sort out a disagreement, or adapted own behaviour to avoid offending others.</p>	

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<p>2.3 Review your contributions and agree ways to improve work with others:</p> <ul style="list-style-type: none"> • share relevant information on what went well and less well in working with others; • identify your role in helping to achieve things together; • agree ways of improving your work with others. 	None identified.		<p>In sharing relevant information, candidates must show that they have listened to, and responded appropriately to, feedback from others.</p> <p>Candidates must identify their <i>own</i> role in helping to achieve things – it is not necessary for objectives to have been met – but candidates must <i>agree</i> ways of improving work with others.</p> <p>Candidates can provide evidence by written or recorded statements.</p>	

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Key Skill Detail for Problem Solving Level 2	Opportunities in this Unit	Comments on these Opportunities	Watch Out!	Level 3 Enhancement
<p>2.1 Identify a problem, with help from an appropriate person, and identify different ways of tackling it:</p> <ul style="list-style-type: none"> • provide information to help identify a problem, accurately describing its main features; • identify how you will know the problem has been solved; • come up with different ways of tackling the problem. 	<p>Identify and plan a scientific vocational investigation.</p> <p>Identify the aims and objectives of the investigation.</p>		<p>Teachers need to probe candidates' underpinning knowledge of different 'ways' of tackling problems.</p> <p>Evidence can be in a variety of forms – handwritten, electronically produced, oral or visual.</p>	<p>Requires exploring three different ways of tackling a problem.</p>

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<p>2.2 Plan and try out at least one way of solving the problem:</p> <ul style="list-style-type: none"> confirm with an appropriate person how you will try to solve the problem; plan what you need to do, identifying the methods and resources you will use; use your plan effectively, getting support and revising your plan when needed to help tackle the problem. 	Produce an achievable and logically presented plan, which shows a sound knowledge and understanding of the aims and objectives set.	Show evidence of a wide range of relevant research, selected from a number of sources with suitable validation, identifying constraints you will have to work under and how they can be overcome.	<p>Teachers need to probe candidates' underpinning knowledge of planning methods.</p> <p>If no changes were made to their plan, the teacher needs to question the candidate on how they <i>would have</i> adapted their plan to get around obstacles.</p> <p>If support was not obtained/used, the teacher needs to question the candidate on where/how their plan <i>could have</i> benefited from obtained/used support.</p> <p>Candidates must have evidence that they <i>did</i> communicate with the appropriate person (e.g. teacher, supervisor) to confirm the option they took forward.</p>	Requires exploring three different ways of tackling a problem.

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<p>2.3 Check if the problem has been solved and identify ways to improve problem solving skills:</p> <ul style="list-style-type: none"> • check if the problem has been solved by accurately using the methods you have been given; • describe clearly the results, including the strengths and weaknesses of how you tackled the problem; • identify ways of improving your problem solving skills. 	<p>Produce a logical and accurate report of the outcomes of the investigation.</p> <p>Assess the reliability of the data and how well the investigation achieved its aims.</p> <p>Produce an evaluation of the investigation.</p>		<p>The problem may not necessarily have been solved, but teachers must still probe each candidate's <i>knowledge</i> of problem-solving methods.</p> <p><i>Checking</i> if the problem has been solved may be observed or video recorded.</p>	<p>Requires exploring three different ways of tackling a problem.</p>