

**Additional Science B**  
**Biology B Chemistry B Physics B**

**Gateway Science Suite**

Skills Assessment Support Booklet

# Rationale

This booklet is designed to provide a supporting framework for the skills assessment component of the Gateway Suite.

This booklet should be read in conjunction with the information contained in the Additional Science Specification, J641, Unit B626.

This skills assessment is also one of the two options contained within the Gateway Separate Science Specifications

- Biology (J643 – Unit B635)
- Chemistry (J644 – Unit B645)
- Physics (J645 – Unit 655).

Teachers are able to use this style of skills assessment for any or all of the Gateway Separate Sciences.

Teachers are free to make a choice

- on an individual candidate basis
- on an individual teaching group basis
- on a whole centre basis
- for one or more than one of the Gateway Separate Science Courses.

Teachers should note that the skills assessment outlined in this booklet does NOT apply to candidates being entered for Science (J640) within the Gateway Suite.

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# Section A: *General Introduction*

The Skills Assessment component of the Gateway Science Suite represents an innovative form of internal assessment of candidates' skills for a GCSE course.

The two Pilot schemes run by OCR in the period 2003-2006, leading up to the start of the new GCSE courses, provided a useful knowledge base about both the management and assessment of these skills by teachers and the views of the candidates following the pilot courses.

The feedback from participating centres provided any necessary refinements to the skills assessment before the final version of the Gateway Science Suite was approved by QCA (and ACCAC in Wales and CCEA in Northern Ireland) for teaching from September 2006.

The Skills Assessment for Additional Science consists of three elements

- a Research Study based on one of the modules within the specification **[24 marks]**
- a Data Task based based on one of the modules within the specification **[30 marks]**
- a teacher assessment of a candidate's practical skills **[6 marks]**.

**Section B** gives detailed guidance on the Research Studies.

**Section C** provides some illustrative exemplar material for Research Studies.

**Section D** gives detailed guidance on Data Tasks.

**Section E** provides an introduction to the exemplar material for Data Tasks.

**Section F** gives details of the moderation procedure.

**Section G** gives detailed guidance on the assessment of Practical Skills.

**Section H** gives details of the way in which teachers can gain access to the OCR Interchange system for rapid, effective and immediate access to many of the documents supporting both teachers and candidates in connection with the skills assessment component of the Gateway Science Suite.

**Section I** provides examples of completed Skills Assessment Forms and a completed Centre Authentication Form.

**Section J** contains examples of candidates' work on Research Studies which is confidential.

**Section K** contains examples of candidates work on Data Tasks which is confidential.

## Section B: *Research Study*

### 2.1 Frequently asked Questions on Research Studies

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#### ***How many Research Studies does a student have to complete for Additional Science?***

Just one from the Physics, Chemistry or Biology sections. If they do more than one then the best mark counts. You cannot count marks for the separate Qualities from different Research Studies.

#### ***My students have attempted a Research Study but they didn't do very well. What can I do?***

Make sure they understand what is required for the study.

There are some 'Student-speak' performance descriptors that you can give them.

Note that the performance descriptors are different from Science in the News.

Students will not do well unless they are taught some of the skills needed.

Some of these skills are the same as they may have needed for Science in the News.

e.g. How to select relevant information from an article.

How to correctly reference the information from different sources.

How to process quantitative data and identify patterns.

How to evaluate the evidence.

How to use the data to answer the questions that are set.

Give the students some feedback and then give them another study to do.

#### ***Can students draft and redraft Research Studies?***

**No.** Students are intended to submit their original piece of work. If this is unsatisfactory, for any reason, the student should attempt another study.

#### ***Can students do research in lesson time and if so can they be given suitable stimulus material by the teacher?***

**Yes.** Some students might not complete the research as homework. Doing no research would produce zero for Quality A but the student could score for the other three qualities. You can arrange for research to be done in lesson time. If this is the case you can provide a variety of resource material e.g. relevant newspaper and magazine articles, CD-ROMs, books, Internet addresses etc. There should be opportunities for students to choose their sources and not just be given the ones to use.

***Can students take Research Studies home to complete them at home?***

**No.** The final report involving the answering of five questions has to be completed in lesson time under controlled conditions i.e. with the supervision of the teacher. The research needed to enable them to complete the report can be done without supervision. The student should attach all preliminary work to their final report.

***Can I tell the students the results of my marking of the task?***

**Yes.** This is important and provides formative feedback. You can report the results and tell the student where they could have done better but the student must not then be given the opportunity to add to or improve the work. The student should also be told that this is a provisional mark subject to moderation.

***What can students bring into class to help them do a Research Study?***

The students can bring in any research material e.g. notes, pictures etc to help them write their answer. However, charts, graphs etc. required as answers to the questions must be drawn in the supervised session.

They must **not** bring in completed answers either electronically or in a written form.

If there is any attempt to do this the work should not be counted.

***Can students word process their work and use ICT to draw graphs?***

**Yes....**

.... but you should ensure that the work is done in the allocated time.

There is no great advantage using a spellchecker as it can still lead to errors. Graphs drawn using ICT must be as good as expected if graph paper and a pencil are used. The graph must be of a sufficient size, have suitable scales, have labelled axes and the best line or curve drawn.

***What should I do if there is evidence of students producing identical work?***

If this is the case, neither student's work should be counted.

If evidence of this comes up during external moderation it is possible that GCSE results can be cancelled.

***Are students able to copy sections straight from a book or the Internet?***

Sections of work can be copied but this must be clearly referenced so that the source is clear.

Copying too much irrelevant material out of another source will make the work too long and will probably not answer the questions.

***Is there a time limit for students completing a Research Studies?***

**No.** This is up to you, but about an hour's writing up time should be sufficient for most candidates. However, if it carries over into another lesson all the work and the notes must be collected in.

### ***Can I modify the Research Studies for low attaining students?***

**No.** Research Studies are not differentiated and the differentiation is achieved by outcome. You can read the stimulus material and the questions to the students. You must not, however, give any guidance about the answers expected. In each Research Study there are five questions. The first one or two should be accessible to all students. Questions 3 and 4 are more challenging. Question 5 is usually more open-ended and there will be a variety of possible approaches. A student who has any sort of help in examinations e.g. an amanuensis can have the same help when doing a Research Study. However, for a mark to be scored in quality D (Quality of Written Communication) the writer must write exactly what the student says, including mistakes. A statement about whether or not this has been done should accompany the work.

### ***What are Anticipated Responses and how should I use them?***

Anticipated Responses are provided with the Research Study so that the teacher is aware of the likely research that students might have done and how this research might be used by students at different levels. The Anticipated Responses are confidential to the teacher and must not be given to students at any time.

### ***How do I mark the students' work against the Level of Response grid?***

Make sure you use the defined Level of Response grid and not the Student-speak ones. The Qualities for Research Studies are different from the ones for Science in the News and Data Tasks.

The Anticipated Responses will suggest which questions are likely to provide evidence for each Quality.

For each of the four Qualities A – D there are three descriptions at 2 marks, 4 marks and 6 marks. Check the work matches 2 before moving on to 4 and when it matches 4 consider whether or not there is a match to 6 marks. If, in your professional judgement, it matches 2 but does not completely match 4, you should award 3. When awarding 1, 3 or 5 some brief annotation explaining the decision should be given. This will help the Moderator to support the mark. Internal standardisation within the Centre is essential.

### ***Will the marking of the Research Studies be moderated?***

**Yes.** A Moderator, appointed by OCR, will choose to look at a range of students' work. This will be done in conjunction with the Data Task and the Practical Skills Assessment. The work will sample all attainment levels and will be selected from different teaching groups. They will check the marking against the Level of Response grid and adjust the Centre's marks, if necessary, to match the national standard. Any significant change recommended by a Moderator will be confirmed by at least one other Moderator working independently.



## 2.2 Introduction

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This element of the Skills Assessment requires each candidate to undertake some research and then to answer five specific questions. These questions are given to the student at the start.

It is therefore vital for candidates to be able to

- undertake, for themselves, some research into these issues
- interpret the information and use it to answer the questions
- show how scientific ideas have developed
- present their findings clearly and accurately using correct scientific and technical terms.

Teachers are reminded that the use of Research Studies is not solely confined to GCSE Gateway Additional Science, but is also an option available for students following the separate Gateway Biology, Chemistry and Physics courses.

## 2.3 Listing of Research Studies

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A Research Study is provided within each of the Modules forming the course.

The table below shows the titles which are available from September 2006. Additional titles will be made available in subsequent years.

Module	Title
B3	Transplants
B4	Food preservation
C3	Francium and the alkali metals
C4	The development of nanochemistry
P3	Car safety
B4	Establishing the age of artefacts
B6*	Washing hands
C5*	Monitoring pH
P5*	Satellites

Titles for B5, C6 and P6 and additional Research Studies for Additional Science modules will be added in May 2007.

- B3 Discovery of DNA
- B4 To go Organic?
- C3 Technetium

P3 Driving Safely

B6\* Compost from Kitchens

C6\* Fuel Cells

P6\* Michael Faraday and Generators

\*These topics are only designed for use with candidates following the appropriate separate science and who have chosen to be assessed on the 'Additional Science' skills rather than the 'Science' Skills.

**The Research Study on C3 The Elements used in preliminary training should not be used for assessment but can be used as a practice exercise for students. It is used later in this booklet for exemplar material.**

## 2.4 Weighting

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The allocation of a total of 24 marks to this assessment represents 40% of the total Skills Assessment component for Additional Science.

## 2.5 Number of Topics to be attempted

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A candidate can attempt any number of studies during the course, but only one of them is 'counted' for assessment purposes.

Evidence is emerging that many centres are developing their Schemes of Work in such a way as to allow candidates to attempt two Topics.

- However, before attempting the first Topic, teachers need to make sure that their students are aware of the Skills which are needed and which will be assessed.
- One of the Topics may be undertaken during the first part of the course and it will serve to develop the candidates' skills, allow the teacher to provide detailed and formative feedback and allow correction on any weaknesses which are apparent.
- This first report need not be used for assessment purposes but will enable the candidates to enhance their attainment on the second report, which is likely to be a more accurate reflection of the candidate's maximum attainment. This second report is intended be the one submitted for assessment purposes.

## 2.6 The Production of the final report on a Topic

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Candidates should be allowed about one week to undertake their research for a Research Study, and the research could replace a couple of their traditional homework exercises. The allocation of significantly more than a week for the research will tend to be counter-productive, might decrease the motivation of the candidate, and will reduce the amount of time for the consolidation of the teaching and learning of other parts of the Centre's Scheme of Work.

Candidates can undertake their research during their science lessons but should be encouraged to undertake it at home. Candidates are free to use research methods of their own choice.

The candidates must not bring in completed or partially completed answers to the 5 questions. They should bring all their preparatory work, for example in the form of rough notes, pictures or highlighted extracts from websites, to help them in the production of their final report. It may be very useful if they produce their reference list/appendix in advance of the supervised session. Any charts or graphs needed for answering the Research Study must be completed in the supervised session.

All of their preparatory work must be attached to the final report. Preparatory research which is stored on Flash Drives or on disc will need to be printed out for attachment to their final report.

Teachers are advised to remind their students to attach their preparatory work to the back of the final report. The preparatory work will be of use to teachers when the final reports are assessed.

The preparatory work will also be useful to a moderator, should the report form part of the sample to be validated at the end of the course.

Candidates are required to produce their final report, working individually and under the direct supervision of their teacher in about one hour. If this period extends into another session then all the candidate's work must be collected in and reissued at the start of the second session.

No writing frame is provided for Research Studies. Many students will be helped by a sheet giving just the five questions to be answered and sufficient space to answer the questions.

## 2.7 Assessment

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The assessment of a candidate's performance on a task is related to four different Qualities, each of which is clearly defined at a **two mark standard**, at a **four mark standard** and at a **six mark standard**.

Levels of Response at the two, four and six mark standards are very broadly linked to the performance likely to be expected from students working at, or around, GCSE grades F, C and A respectively, but teachers are advised that this alignment should be regarded as general guidance rather than being a defined and fixed linkage between response levels.

Teachers use professional judgement to match the candidate's work to the appropriate standard. Where a response exceeds one standard but does not reach the next higher standard, an intermediate mark is awarded.

A teacher's judgement on each of the performance statements should be based on a holistic consideration of what has been written. Evidence for the award of a mark in any of the Qualities to be assessed can come from any part of a student's report and consequently an atomistic approach should be avoided.

## 2.8 Levels of Response

The Level of Response grid showing the four Qualities to be assessed and the defined performance statements follows but it is also given in section 5.2 of the Specification.

Research Studies: Levels of Response grid

Quality Assessed		Number of Marks					
		1	2	3	4	5	6
A	Collecting information		An attempt has been made to collect some information from at least one suitable source.		Relevant information is collected from more than one suitable source.		Relevant, detailed information is collected from more than one suitable source and is clearly referenced in the report.
B	Interpreting information		At attempt has been made to interpret the information.		The information has been interpreted but not always thoroughly and/or correctly.		The information has been interpreted effectively, with skill and understanding.
C	Developing and using scientific ideas		An attempt has been made to describe the influences and/ or development of scientific ideas.		Demonstrates some understanding of the interaction between scientific ideas and their context.		Demonstrates a clear and detailed understanding of the interaction between scientific ideas and their context.
D	Quality of written communication		Spelling, punctuation and grammar is of generally poor quality. Little or no relevant scientific or technical vocabulary is used.		Spelling, punctuation and grammar are generally sound. Appropriate scientific or technical vocabulary is used.		Spelling, punctuation and grammar show very few errors. The report shows full and effective use of relevant scientific and technical terms.

## 2.9 Obtaining copies of the Topics

Each of the Research Studies is available electronically using OCR Interchange. (See section H for details on how to use Interchange) Teachers can download the topics to be attempted by their students. The stimulus material is provided in colour but, if no colour printer is available, then a black and white version can be printed.

If the stimulus material is to be used by more than one group at different times then laminating the printed sheets may be useful.

Teachers should ensure that the copies are collected in from students when the study has been completed.

## 2.10 Communicating the results of a candidate's report

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Teachers are actively encouraged to inform candidates of the marks they have obtained in any report.

Feedback to a candidate which points out important features of the report which the candidate has produced, including any areas where an improvement is possible, is important and is another factor which will encourage motivation. However teachers should note that redrafting of a report which is to be '**counted**' for assessment purposes is not permitted. (See detailed notes below.) Teachers should also not give correct or expected answers.

## 2.11 Redrafting of students' reports

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Although redrafting of work is an assessed skill in some other GCSE subjects it does not form part of the Research Study. **The version produced in the final supervised session is the one which the teacher is required to assess.**

If there is any residual concern about the matching of the report to the expected attainment level of the candidate, for example in errors, omissions, a lack of clarity or a failure to match any of the performance statements, then the report should not be '*counted*' for GCSE purposes.

In such cases, additional formative feedback should be given to the candidate, who can subsequently undertake another Research Study taken from another module, which can then be formally assessed.

## 2.12 'Student-speak' Level of Response grid

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The active involvement of candidates in a knowledge of their own assessment is fundamental.

Before tackling a Research Study students need to be thoroughly prepared so that they understand what is expected of them.

A version of the Level of Response grid has been produced in which the formal statements linked to each of the Qualities have been re-worded to make them more accessible to the candidates. Teachers are strongly recommended to devote some lesson time to familiarise their students with these statements.

Teachers should **not** use the 'Student-speak' version of the Levels of Response for actual assessment. The student-speak versions are simply provided to help the students to understand what is required to match each quality.

## Research Study: Level of Response grid (Student – speak version)

Quality assessed	2	4	6
<b>‘What evidence have I collected?’</b>	I have collected some information about the topic.	I have used more than one suitable source to collect some information about the topic.	I have used and listed some suitable sources of information which help me to answer the questions.
<b>‘How does my evidence help me to understand the topic?’</b>	I can make a link between the information I have collected and the topic.	I can make links between the information I have collected and the topic, and then use these links in answering the questions.	I can clearly show in my answers how the information I collected helps me with the questions about the development of the ideas in the topic.
<b>‘How has my evidence helped me to understand scientific ideas?’</b>	From my research I can make some comments about scientific ideas. For example how they: <ul style="list-style-type: none"> <li>• have developed over time</li> <li>• have affected technology</li> <li>• are linked with social, economic and environmental issues.</li> </ul>	I can use the information from my research to show clearly how the scientific ideas in the topic: <ul style="list-style-type: none"> <li>• have developed over time</li> <li>• have affected technology</li> <li>• are linked with social, economic and environmental issues.</li> </ul>	My research has enabled me to write clearly and in detail about scientific ideas. I can for example describe how they: <ul style="list-style-type: none"> <li>• have developed over time</li> <li>• have affected technology</li> <li>• are linked with social, economic and environmental issues.</li> </ul>
<b>‘How well have I presented my evidence?’</b>	My answers are clear enough for other people to understand what I have written about.	I can write my answers in good English and can use some scientific words correctly.	I can answer the questions clearly and correctly using technical terms which are correct and appropriate.

# Section C: Examples of tasks and candidates' responses

## Introduction

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The following pages contain 3 examples of Research Studies reports.

**'The Discovery of the Elements'** is linked to the Chemistry content of the Additional Science course(C3) and was used extensively during the initial Inset Training sessions in autumn 2005 and spring 2006.

Teachers should note that this example is not selected from the list of approved topics given in paragraph 2.3 and therefore **should not** be used as a part of a candidate's Skills Assessment. However, teachers are able to use this example to develop the knowledge and understanding of their students in meeting the requirements for the Skills Assessment.

It has been included to illustrate the overall style and format of what is available for teachers and shows the response to the task from three candidates. It also shows how Anticipated Responses can be used.

Each candidate's response is accompanied by a detailed commentary giving reasons for the marks which have been awarded for each of the Qualities assessed.

**'Transplants' (B3) and 'Car Safety'(P3)** are linked respectively to the Biology and Physics content of the course and both have been chosen from the list of topics from which teachers can select to use with their students.

Each task is illustrated by the responses given by candidates, and each response is accompanied by a commentary on the marks which have been awarded.

**These two 'live' topics will be found in section J at the end of this booklet as they are confidential and should not be used with students as they will give students answers to the five questions.**

**Teachers can use the 'Elements' exemplar material with students to show them what they have to do.**



**The discovery of elements**

In 1808 John Dalton proposed that all elements were made up of tiny particles called atoms.

He drew up a chart of those substances he thought were elements.

Here is his chart.

ELEMENTS					
○	Hydrogen	1	⊕	Strontian	46
⊖	Azote	5	⊗	Barytes	68
●	Carbon	5	⊖	Iron	50
○	Oxygen	7	⊖	Zinc	56
⊖	Phosphorus	9	⊖	Copper	56
⊕	Sulphur	13	⊖	Lead	90
⊖	Magnesia	20	⊖	Silver	190
⊖	Lime	24	⊗	Gold	190
⊖	Soda	28	⊖	Platina	190
⊖	Potash	42	⊗	Mercury	167

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We now know that some of these substances are not elements.

Few elements were known in 1808 but there were some that Dalton did not include in his chart.

### Research:

Using reference books or the Internet find out the date of discovery of the first 92 elements. These are the ones that occur naturally.

### Research Study Report

1. Which substances in Dalton's table are not elements?  
(Note: Azote and Platina are the old names for nitrogen and platinum.)
2. Which elements were known in 1808 but are not in Dalton's table? Suggest why he might not have known about them.
3. Prepare a tally chart showing the number of elements discovered in twenty year periods from 1700 to 1940. Display your results in a suitable way.
4. Identify the two twenty year periods where the largest number of elements were discovered.
5. Attempt to find out why more elements were discovered during each of these periods.

# Research Study

## Student Advice

Your report on this topic may form part of your Skills Assessment for your GCSE Science.

### ***What do I have to do?***

- Produce a report of between **400** and **800** words on this topic.
- Your report may be hand written or word processed.
- Your report will need to include a hand written or word processed appendix which lists all the sources of data and information you have used.

### ***How long do I have to do it?***

- You will have one week to do the research and then lesson time to write up the report.

### ***How do I do my research?***

- You have been given some background information about the topic.
- You will find it gives you some data but you will need to decide what other facts you want to find out, answer the questions and write your report.
- Use the next week to carry out research into this topic. Make sure that you keep a careful record of where you get your information from because you will need to list this information at the end of the report in an appendix.

### ***What do I need to put in my report?***

The research study is divided into five sections of increasing difficulty. In the first couple of sections the information given and a little research in books or using ICT will be enough to help you answer the sections.

Later sections will need you to have carried out some research that you have planned.

- You should write about the facts that you have found out to answer the questions given in the five sections.
- You can use pictures, diagrams, graphs and tables to help anybody to understand the points you are making.
- You should make sure that the information is written down clearly and logically.
- You should always try to use correct spelling, punctuation and grammar.
- You should try to show in your report how our knowledge of the scientific ideas in this study has developed with time or influenced the world.

Wherever possible, use scientific explanations to explain your answers.

### ***How will my work be marked?***

- Your teacher will mark it using guidance from OCR.
- ***Your report will be assessed by your teacher out of 24 marks.***

***Good Luck with producing your report!***

This piece of internal assessment relates to module C3 The Periodic Table. It can address parts of C3a What are atoms like?, C3f Electrolysis and C3g Transition elements.

### **Preparing for the assessment**

It is expected that before candidates attempt this Skills Assessment they will have had some general preparation in their lessons. They will be being assessed on a number of Performance Descriptors such as their collection of evidence; their ability to link evidence to scientific explanations; the development of scientific ideas and quality of written communication, especially the correct use of scientific vocabulary. It is therefore essential that they should have some advance practice in these areas so that they can maximise their attainment.

For some candidates, access to resources may be an issue so it would be useful to ensure that sufficient sources are available at school at the time that the assessment is being undertaken and that candidates have plenty of opportunity to make use of ICT resources.

The report should be researched and written in a limited period of two weeks, allowing one week for candidates to find out information from a variety of sources, and then a further week to complete their report. Candidates should be supervised when writing their report.

### **Preparing candidates**

At the start of the Skills Assessment the candidates should be given the stimulus material and the advice to candidates. In addition they can be provided with a copy of the Performance Descriptors if the teacher thinks that this would be useful.

Teachers should only offer generic advice when carrying out the Skills Assessment.

The task is divided into five sections. The first two sections are straightforward and should provide all Foundation candidates an opportunity to get into the task. The next two sections are more demanding but should be possible for most candidates. The last section is more demanding and open-ended and is designed especially for the high-attaining candidates.

Candidates **should not** be given the opportunity to redraft their work as this is likely to require an input of specific advice. If a teacher feels that a candidate has under-performed, the marks should not be 'counted'. In such cases it is essential that the candidate be given detailed feedback on the completed assessment before undertaking another report.

Candidates should be made aware of the deadline for submitting their completed report. Should they miss the deadline for some reason e.g. illness, there are plenty of opportunities for the candidate to undertake a different Research Study.

Candidates should be advised of the importance of providing an appendix listing clearly the sources of the data that they have referred to in their report. If they have summarised or processed data they have found in their research they should include a copy of the raw data in their appendix. This will assist teachers when making judgements about a candidate's ability to interpret information.

### **Assessing the candidate's report**

The Research Study Level of Response grid should be used to determine a candidate's mark out of a total of 24 marks. A Candidate Cover Sheet is supplied which contains a copy of this grid for ease of recording marks. For each Quality, mark descriptions are given for 2, 4 and 6 marks. Intermediate marks, 1, 3 and 5, can be used where performance exceeds that required by one statement but does not adequately match that required by the next higher statement. Where an intermediate mark is awarded, annotation would be helpful the mark is placed in the appropriate box for each Quality and then the total calculated. A tick can be placed in the appropriate box for each Performance Descriptor and then the total calculated.

Before completing the Research Study cover sheet the teacher should compare the candidate's response with the anticipated responses given on the separate sheet.

**The anticipated response information is confidential and should not be shared with candidates.**

### **What materials should be provided?**

For the early sections of the task candidates need the stimulus material given and access to a source where the dates of discovery of the elements can be found.

Such sources include:

Chemistry Data Book                      Earl and Wilford Nelson 1991 ISBN 0-17-438632-X

<http://www.webelements.com/webelements/scholar/index.html>

For later sections candidates, especially working at a higher level, will need access to other resources including books and the Internet.

## OCR GCSE Gateway Additional Science

### Research Study

#### The discovery of elements – Anticipated Responses

Here are some anticipated responses for this Research Study. They are not a mark scheme but should give an indication of what candidates might achieve. This is **confidential** material which should not be discussed with candidates at any time.

**1. Which substances in Dalton's table are not elements?**

(Note: Azote and Platina are the old names for nitrogen and platinum.)

Magnesia, Lime, Soda, Potash, Strontian, Barytes.

At least four correct answers are expected. Deduct credit for a correct answer if an incorrect answer is given.

**2. Which elements were known in 1808 but are not in Dalton's table? Suggest why he might not have known about them.**

Antimony  
Barium  
Bismuth  
Boron(1808)  
Calcium  
Cerium  
Chlorine  
Chromium  
Cobalt  
Iridium  
Manganese  
Molybdenum  
Nickel  
Niobium  
Osmium  
Palladium  
Potassium  
Rhodium  
Silver  
Sodium  
Tantalum  
Tellurium  
Tin  
Vanadium  
Yttrium  
Zinc  
Zirconium

At a low level candidates will identify some of these elements (up to 6).

At the highest level candidates will identify all, or nearly all, of these elements (20+).

Answers here probably include poor communications, lack of an international forum for scientists or difficulties in communication when scientists use different languages.

3. **Prepare a tally chart showing the number of elements discovered in twenty year periods from 1700 to 1940. Display your results in a suitable way.**

Tally chart

1700-1720		0
1721-1740		2
1741-1760		2
1761-1780		2
1781-1800		8
1801-1820		21
1821-1840		4
1841-1860		3
1861-1880		11
1881-1900		14
1901-1920		2
1921-1940		5

Candidates then should use the data to produce a bar chart. Low level candidates could be given some help doing this but this should be reflected in the assessment.

There is no credit for drawing a line graph.

Note: The exact data recorded can differ depending upon the source used.

4. **Identify the two twenty year periods where the largest number of elements were discovered.**

Candidates should identify two periods.

1801-1820 and 1881-1900



**5. Attempt to find out why more elements were discovered during each of these periods.**

In this section candidates will respond in different ways. High and middle level candidates will be including research from books or the Internet to support their answers.

An A grade candidate need only develop an answer for one of the periods but at a high level.

For each period the candidate is likely first to identify the elements discovered during the period.

1801-1820

Candidates may realise that many of these elements were extracted by electrolysis (e.g. sodium, potassium). They could include some research into the work of Sir Humphrey Davy. They may also note that many of the elements discovered in the period are transition elements. Their research may show that they are extracted from similar ores where they exist in small amounts.

1881-1900

Candidates will realise that in 1869 Mendeleef produced the first Periodic Table. They might research and find a copy of his first Periodic Tables where gaps were left for new elements. They could take germanium as an example and find out how it was discovered. The Periodic Table gave scientists help to look for missing elements.

**or**

Candidates might investigate ideas that chemical equipment became more sophisticated. This enabled more accurate measurements to be made or elements extracted when only small amounts of the element were in the ore. They could use the discovery of radium as an example.

**or**

Candidates may recognise that during this period radioactivity was discovered. This provided a further tool for scientists in their attempts to find new elements.

Candidates might research the discovery of actinium or radon.

## Marking the student's portfolio

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### **Collecting information**

You should look for the student collecting suitable evidence anywhere throughout the report. Questions 1, 2, 3 and 5 demonstrate collection of data from text or internet sources. This should be referenced in an appropriate appendix.

### **Interpreting information**

Questions 2, 3 and 4 give students the opportunity to interpret information. Questions 2 and 3 give opportunities at a low level whilst the open-ended nature of question 5 provides the opportunity for higher ability students to demonstrate this skill.

### **Quality of written communication**

This should be judged over the whole report.

## Andy Alsop 11C - The discovery of elements

---

1. Lime, soda, magnesia, phosphorous
2. Soidum, potassium, lithium, chlorine, zink.

None of these elements were discovered in England and Dalton lived in England. He would not have herd about them.

3.

1700-1720	
1721-1740	
1741-1760	
1761-1780	
1781-1800	
1801-1820	
1821-1840	
1841-1860	
1861-1880	
1881-1900	
1901-1920	
1921-1940	

4. 1801-1820 and 1881-1900

5. There were more scientists working between 1881 and 1900 than at any other time. There were a lot of elements left to discover.

I used the webelements website.

## Commentary on the report by Andy Alsop

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### Introduction

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This is a low level report. The student used a website to get information to answer the questions. There is no evidence of other sources used in the report.

### Question 1

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Andy gives four answers - three correct and one incorrect. This is equivalent to two correct answers. This is evidence of interpreting information at a low level.

### Question 2

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The student identifies five correct answers which again represents a low level answer for Quality B. There is no evidence for the suggestion given by the candidate. Some of these elements **were** discovered in England. The answer would have been more worthy if the places where these elements had been discovered had been given.

### Question 3

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The tally sheet is a way of displaying the information collected. It is not absolutely correct- more elements than listed are shown. It enables the student to identify the two ranges required in Question 4

### Question 4

---

These two ranges are correct.

### Question 5

---

There are two statements made but there is no evidence to support them. Most people would not believe the first statement and the second statement is at a very low level.

## Marks awarded

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### Quality A Collecting information

---

Matches the statement for 2 marks but does no more. An award of **2 marks** is made.

### Quality B Interpreting information

---

There is some evidence of interpreting information in Q2, 3 and 4. Overall an award of **3 marks** seems reasonable.

### Quality C Developing and using scientific ideas.

---

There is little evidence in Q5 and certainly no support was given. An award of **0 marks** was made.

### Quality D Quality of Written Communication

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There were a number of simple spelling mistakes and little written to justify awarding more than **2 marks**.

**Total 7 marks**

# Britany Brown 11C – Research Study on the Discovery of Elements

John Dalton was a scientist in the 18<sup>th</sup> Century and he died in 1844. In 1808 he devised a way to lay out the elements that he knew in a table. He used his own symbols. It also shows some compounds.

ELEMENTS		Plat. 4.	
			1. Hydrogen, its relative weight 1
			2. Azote 5
			3. Carbone or charcoal 5
			4. Oxygen 7
			5. Phosphorous 9
			6. Sulphur 13
			7. Magnesia 20
			8. <u>Lime</u> 23
			9. <u>Soda</u> 28
			10. <u>Potash</u> 42
			11. Strontites 46
			12. <u>Barytes</u> 68
			13. Iron 38
			14. Zinc 56
			15. Copper 56
			16. Lead 95
			17. Silver 100
			18. Platina 100
			19. Gold 140
			20. Mercury 167

He has put three elements in his table that we now know are not elements. These are Lime, Soda, Potash and Barytes.

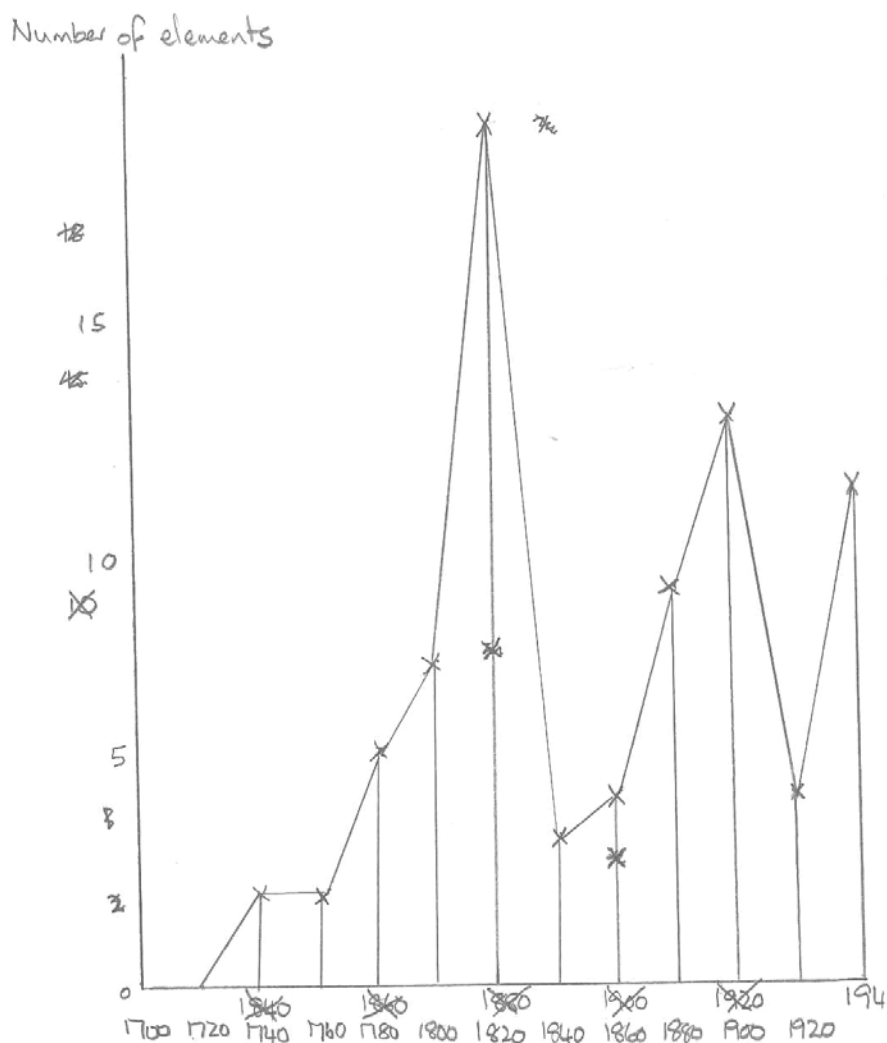
There were a lot of elements known in 1808 that Dalton has not included in his table, like chlorine that was discovered in 1774, cobalt discovered in 1751, manganese, nickel and nitrogen were all known in 1808. This could be because they were found on the other side of the earth from where he was so the facts had not reached him.

There were a lot of elements discovered in the 18<sup>th</sup>, 19<sup>th</sup> and early part of 20<sup>th</sup> as shown in this tally.

Period	Tally	Total
1700-20		0
1721-40		2
1741-60		2
1761-80		5
1781-1800		7
1801-20		19
1821-40		3
1841-60		4
1861-80		9
1881-1900		13
1901-20		4
1921-40		11

The tally shows a pattern of when an element is found it builds up to the discovery of lots of elements and then suddenly there are very few found as maybe the last element they found is not as much help to find the next element so there is a slow down in the discovery of elements.

I have plotted the results



I can see that the two peaks on the graph are between 101 –1820 and 1881-1900.

The reason for such a lot of elements being found in a short period could be because they have found a reactive element that could help in the discovery of new ones because the next one may not be very reactive so if they have the reactive element and the new rock containing something new they could heat them together and if heat, light, sound or a change in appearance they may have discovered a new element by reduction. U would be left with a element oxide and a new element.

## Bibliography

<http://scienceworld.wolfram.com/biography/Dalton.html>

[www.rod.beaon.claranet/elements.htm](http://www.rod.beaon.claranet/elements.htm)

<http://weblemoyne.edu/~giunta/dalton.html>

<http://www.chemheritage.org/EducationalServices/cemach/ppt/jd/html>



## Commentary on the report by Britany Brown

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### Introduction

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This report is slightly better than the report by Andy Alsop. The student has listed a number of sources but it is not very clear where they are used. For example, the first website is used to identify the date of Dalton's birth which is irrelevant in answering the questions.

### Question 1

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Britany gives three correct answers. This is evidence of interpreting information at a low level.

### Question 2

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She identifies five correct answers and gives the date of discovery of some of them as evidence.

Her suggestion that some elements were discovered on the other side of the earth is reasonable but it would have been better if she could have supported this with some information about where the elements were discovered.

### Question 3

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The tally sheet is a way of displaying the information collected. However, the attempt to draw a line graph to display the data is completely flawed.

### Question 4

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These two ranges are correct but she has written 101 instead of 1801.

### Question 5

---

There are many errors in spelling, punctuation and grammar. Scientific ideas were not well developed.

## Marks awarded

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### Quality A Collecting information

---

Matches the statement for 2 marks but there is evidence of some more research done. If it had been more clearly shown how the information was used an award of 4 marks might be considered. An award of **3 marks** is made.

### Quality B Interpreting information

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There is some evidence of interpreting information in Q2, 3 and 4. Overall an award of **4 marks** seems reasonable.

### Quality C Developing and using scientific ideas.

---

There is some attempt to answer but the answer is very confused and sketchy. She was trying to use the ideas of displacement reactions. However, the answer is not worthy of more than **2 marks**.

### Quality D Quality of Written Communication

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There were a number of simple spelling mistakes and little written to justify awarding more than **2 marks**.

**Total 11 marks**

## Charlie Cotton 11A – Research Study on the Discovery of Elements

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1. Barytes, Lime, Soda, Potash, Strontian, Magnesia

2. Antimony, Barium, Bismuth, Calcium, Cerium, Chromium, Cobalt, Indium, Manganese, Nickel, Osmium, Palladium, Potassium, Rhodium, Silver, Sodium, Tin, Vanadium, Zinc, Zirconium

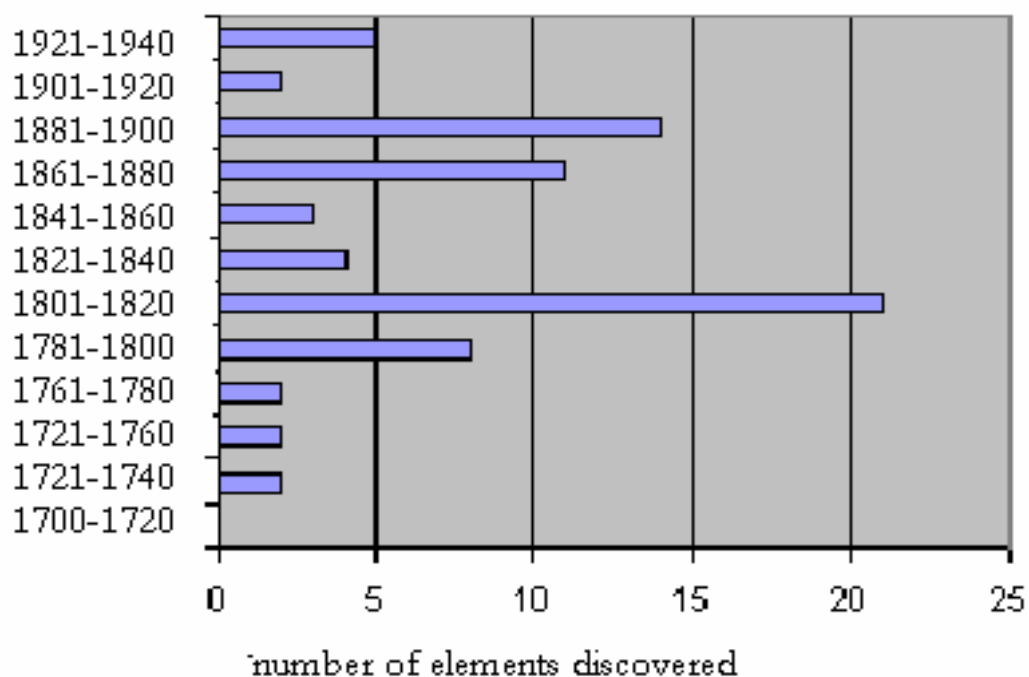
At the beginning of the nineteenth century scientists were not able to easily communicate with each other. They were not aware of the work of scientists in other parts of the world.

3. Tally chart

Period	Tally	Total
1700-20		0
1721-40		2
1741-60		2
1761-80		5
1781-1800		7
1801-20		19
1821-40		3
1841-60		4
1861-80		9
1881-1900		13
1901-20		4
1921-40		11

#### 4. Bar chart

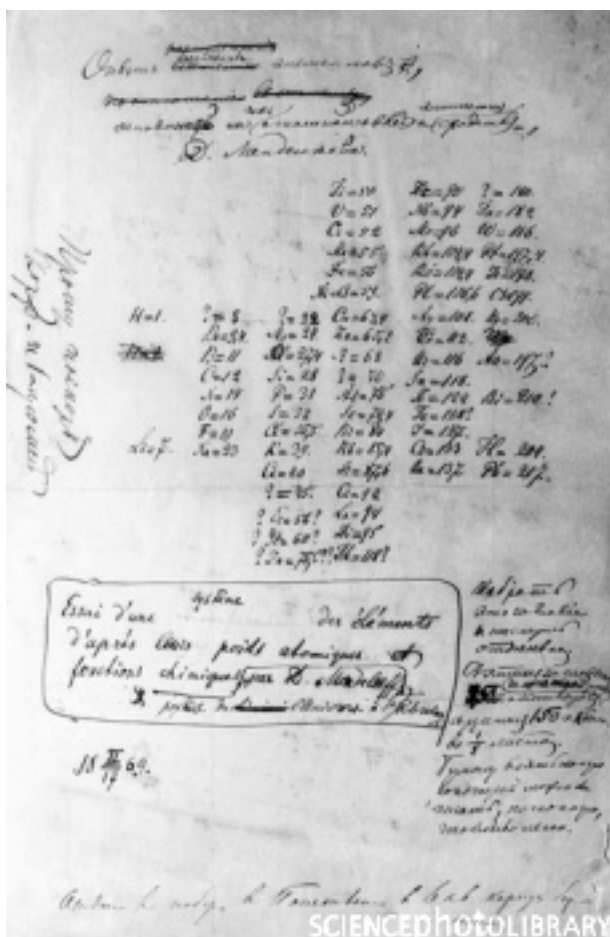
**Number of elements discovered in twenty years periods**



#### 5. 1801-1820 and 1881-1900

In 1869 Mendeleef produced the first Periodic Table.

The first table he produced is shown below.



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He included all the known elements in order of increasing mass. He arranged them in vertical columns rather than in rows as we do today.

In order to keep elements with similar properties in the same row, he left gaps when he thought a new element must exist but had not been discovered. Scientists then looked for elements to fill these gaps.

He predicted the properties of these elements. For example an element similar to silicon was called eka-silicon (or the next silicon). This set scientists off trying to discover these elements. Eventually in 1886 this element was discovered by Clemens Alexander Winkler, a German chemist. He called it germanium after his country. It was discovered by analysis of a mineral called argyrodite- a silver germanium sulfide  $\text{Ag}_8\text{GeS}_6$



© MARICOPA COMMUNITY COLLEGES <http://chemlab.pc.maricopa.edu/periodic/Ge.html>

This information came from Biographical Dictionary of Scientists and <http://chemlab.pc.maricopa.edu/periodic/Ge.html>

There was a close agreement between Mendeleef's predicted properties for eka-silicon and germanium. The work of Mendeleef led to the discovery of other elements in the period 1881-1900.

Sources used

[www.webelements.co.uk](http://www.webelements.co.uk)

Mendeleef's first periodic table- [www.sciencephotolibrary.com](http://www.sciencephotolibrary.com)

Biographical Dictionary of Scientists

published by Harper Collins ISBN 0 00 470109 7

<http://chemlab.pc.maricopa.edu/periodic/Ge.html>

## Commentary on the report by Charlie Cotton

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### Question 1

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This was answered correctly.

### Question 2

---

Twenty correct answers were given with no incorrect ones. The suggestion given is feasible.

### Question 3

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The tally chart and the bar chart are completely correct.

### Question 4

---

The two ranges chosen were correct.

### Question 5

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The student has chosen one possible route and has gone into considerable detail. Finding out about how germanium was discovered is not easy and required the use of several sources together.

## Marks awarded

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### Quality A

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Charlie identified suitable sources and showed correctly how the information was used. An award of **6 marks** is secure.

### Quality B

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There is evidence in Q1, 2 and 3 of the student interpreting information. An award of **6 marks** can be made.

### Quality C

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There is evidence of the student appreciating the development of scientific ideas. An award of **6 marks** can be made.

### Quality D

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There are no errors in spelling, punctuation and grammar. There is correct use of scientific terminology. An award of **6 marks** can be made.

**Total 24 marks**



# Section D: *Data Task*

## 4.1 Frequently asked Questions on Data Tasks

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### ***How many Data tasks does a candidate have to complete for Gateway Additional Science?***

**One** from the Physics, Chemistry or Biology sections of the specification. If candidates do more than one of them, then the best total mark is counted for assessment. All the marks must be taken from the same Data Task: counting marks for the different Qualities in different tasks is **not** permitted.

### ***My candidates have attempted a Data Task but their performance was lower than I had expected. What can I do?***

Ensure that candidates know exactly what is required of them when attempting a Task.

They do need to be taught the skills required. For example:

- Are they aware of the requirements for successful plotting of their data in a graphical format?
- Are they able to process quantitative data and identify patterns?
- Can they make relevant comments about the patterns?
- Are they aware of the differences between accuracy, reliability and validity?
- Are they able to evaluate the overall quality of the evidence they have collected?
- Do they realise that they have to link what they have found out to the underpinning 'science' associated with the task?

### ***Can candidates draft and redraft their responses to Data tasks?***

**No.** Candidates must submit their original response to each of the five questions given to them by their teacher after they have collected their data. If their response is found to be unsatisfactory, for any reason, then the candidate should attempt another task.

### ***Do candidates have to collect their own data for a Data Task?***

**No.** Candidates are not assessed on the collection of the data. They are therefore free to work on their own, in small groups, or to watch a demonstration or to collect data from other sources.

### ***Do candidates have to collect their data in lesson time?***

**Not necessarily.** The specialist equipment and materials which might be needed if the Data Task is practically-based might only be available at the centre, and there could be Health and Safety aspects linked with some of them. The data collection for such tasks will have to be carried out under teacher supervision. For other Data Tasks it is possible for some candidates to collect their data safely, on their own or working with others, outside the laboratory, or from the World Wide Web. The teacher is expected to make a professional decision depending on the nature of the Task.

***Can candidates complete their work at home?***

**No.** The final report, based on five questions given by the teacher, after the data has been collected must be completed by a candidate working alone, in lesson time and under controlled conditions i.e. under the direct supervision of the teacher.

The collection of data can be done without supervision. The candidate must attach all the data which they have collected to their final report.

***Can I tell the candidates the results of my marking of the task?***

**Yes.** This is essential and provides formative feedback. You can report the results and tell the candidate where they could have done better but the candidate must **not** then be given the opportunity to add to or improve their answers. The candidate should also be told that this is a provisional mark subject to moderation.

***What can candidates bring into class when they answer the five questions?***

The candidates need to bring in the data they have collected so that they can answer the questions they will be given in the supervised session. Their data needs to be paper-based and may be attached to the end of their final report. Candidates cannot bring into the final session any data which is stored electronically. Similarly, graphs must be drawn in the supervised session under controlled conditions.

They must not bring in answers, either partially completed or fully completed, either electronically or in a written form to the final session. If there is any attempt to do this the work should not be counted.

***Can candidates word process their answers to the five questions?***

**Yes**, but only if they work alone under the direct supervision of their teacher under controlled conditions. Spellcheckers can be used since the candidates are not assessed on the overall quality of their final responses.

***Can candidates use ICT to draw their graphs?***

**Yes.** However, graphs drawn using ICT must be as good as expected if graph paper and a pencil had been used. The graph must be of a sufficient size, have labelled linear axes and the most suitable line or curve drawn.

***What should I do if there is evidence of candidates producing identical answers to the five questions they are given?***

If this is the case, neither candidate's work should be counted. If evidence of this comes up during external moderation it is possible that GCSE results can be cancelled.

***Is there a time limit for candidates to collect their data?***

**No.** However it is expected that about one hour of lesson time should be sufficient.

***Is there a time limit for candidates completing a Data Task ?***

**No.** This is up to you, but about an hour's writing up time should be sufficient for most candidates. However, if it carries over into another lesson all the work and the notes must be collected in.

***I have low attaining candidates. What help can they have?***

The background stimulus material can be read to them with any necessary clarification to ensure that they understand what the Data Task actually involves. Candidates should have been taught, to an appropriate standard, the underlying science behind the Data Task before they attempt to collect their Data.

***Do I need to use the writing frame with my candidates?***

**No.** The generic writing frame is intended for lower attaining candidates to help them structure their answers. It might hinder able candidates, since they will write sufficient to fill the space provided and this might not allow access to the highest marks. The higher-attaining candidates can be given the five questions and answer them on lined paper.

***How do I mark the candidates' work against the Level of Response grid?***

Make sure you use the Level of Response grid for the Data Task and not the ones provided as 'Student-speak'.

For each of the five Qualities A – E, there are three descriptions at **2** marks, **4** marks and **6** marks. Check the work matches **2** before moving on to **4** and when it matches **4** consider whether or not there is a match to **6** marks. If, in your professional judgement, it matches **2** but does not completely match **4** you should award **3**. When awarding **1**, **3** or **5** some brief annotation explaining the decision should be given. This will help the Moderator to support the mark. Internal standardisation within the Centre is essential.

***Will the marking of the Data Tasks be moderated?***

**Yes.** A Moderator, appointed by OCR, will consider a range of candidates' work, in the same way as has been done before. The work will sample all attainment levels and will be selected from different teaching groups. They will check the marking against the Level of Response grid and adjust the centre's marks if necessary to match the national standard. Any significant change recommended by a Moderator will be confirmed by at least one other Moderator working independently.

***Can I develop my own Data Tasks for my candidates?***

**No.** Centres need to choose the Data Task only from the selection provided by OCR. Up-to-date information on the range of Data Tasks available is available from OCR Interchange and from the dedicated web-site ([www.gcse-science.com](http://www.gcse-science.com)) but teachers should be aware that confidential information about the Data Tasks is only available on Interchange. Information about Interchange is provided in section H of this booklet.

## 4.2 Introduction

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The Data Tasks are primarily designed as a focus to allow candidates to develop the skills of collecting, recording, processing, analysing, and evaluating data, and then to consolidate these skills by linking them to the knowledge and understanding of contents of the appropriate modules forming part of the GCSE Additional Science course.

In many cases the Data Tasks provide the opportunity for candidates to collect for themselves first-hand data using practical techniques based on activities in a laboratory.

To some extent they represent a development of aspects of the assessment of Skill Areas A and E of the scientific investigations in earlier specifications in GCSE Science. Teachers should therefore be broadly familiar with some of the requirements involved.

The Data Task Assessment also serves as a way of ensuring (together with the Research Study) that there is an opportunity for curriculum enrichment and a wider variety of skills development for those candidates who have also studied, or are studying, Gateway Science.

Teachers are reminded that the use and assessment of Data Tasks is also part of an option available for those candidates following any or all of the associated GCSE Gateway courses in Biology, Chemistry and Physics.

It needs to be stressed that the assessment of Data Tasks does **not** form part of the GCSE Gateway **Science** course (J640).

## 4.3 Listing of Data Tasks

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One Data Task is linked to each of the modules forming part of the Additional Science course. Further Tasks will be added in subsequent years to provide additional opportunities both for teachers and for candidates.

The list available in the first year of the course is printed below.

Module	Title
B3	Enzymes and temperature
B4	Stomatal Density and water loss
C3	Electrolysis and concentration
C4	Conditions for the Haber process
P3	Bouncing Balls
P4	Fuses – does the thickness matter?
B6*	Immobilising Enzymes
C5*	Measuring gases
P5*	Refraction

Further titles will be added in May 2007

- B3 Finger on the Pulse
- B4 Osmosis
- C3 Decomposition
- P3 Slopes
- B5\* Cress
- C6\* Hardness of Water
- P6\* Thermistors

\*These Titles have been included for use with candidates following the appropriate separate science courses in Biology, Chemistry and Physics. They are **not** available for use with candidates following Gateway Additional Science.

## 4.4 Weighting of Data Tasks

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The allocation of 30 marks to this part of the Skills Assessment for Additional Science, which represents 50% of the Skills Assessment total, is indicative of its importance.

## 4.5 Numbers of Data Tasks to be attempted

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Teachers are free to select as many Data Tasks from the listing as they wish, and this number will reflect both the Centre's Scheme of Work and the amount of curriculum time available. However only the overall best performance in one of the Data Tasks can be 'counted' for assessment purposes, and all of the marks in this one will need to be incorporated into the total.

The use of the best component marks chosen from performance based on different Titles is not allowed. [The principle of 'cherry-picking' by utilising the best individual marks taken from more than one Task is not permissible.]

Before a Data Task is attempted, it is vital that teachers make certain that their candidates are fully aware of the Skills which will be needed and assessed. Further details of this are given in Section 4.6.

Additional advice is also provided as '*Teacher Guidance*' in the Support material for each Data Task which can be downloaded from the OCR Interchange website (See section H).

It seems likely that many centres will decide to allow their candidates to attempt two Data Tasks at different times during their course. The first of these will be attempted during the early part of the course and the candidates can then be given individual formative 'feedback' on their performance. This will help to ensure that they will be able to maximise their performance in the second one they attempt.

## 4.6 Preparing candidates

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### A Linking with the content of the Item

Each of the Data Tasks is clearly linked to the defined content of an Item within the Module and it is essential that there is integration of the teaching and learning of the subject content and the subsequent production of a report by the candidate. Teachers do need to ensure that the relevant scientific content has been effectively covered, to an appropriate standard depending on the likely attainment level of the candidates, before they attempt to start their Task.

Teachers also need to appreciate that a Data Task is not a simple 'bolt-on' exercise to be attempted separately and in isolation.

## B Linking with the Skills element

If candidates are not fully aware of which Skills are required, and how they are going to be assessed, then there is likely to be a significant mis-match between their expected attainment level and their actual performance.

Teachers are therefore strongly recommended to carry out a skills audit to determine the extent to which previous teaching and learning has enabled each student to:

<b>Quality A Interpreting the data</b>	
	work out averages from repeated readings they have taken
	present their data in a format of their own devising
	construct a simple chart to display their data
	show their data in a bar chart or graph when provided with a grid with the axes and scales labelled for them
	determine suitable scales and axes on graph paper to display their data appropriately
	plot their data in a suitable graphical format without additional guidance
	plot their data accurately
	choose the most appropriate line to use in graphical displays
<b>Quality B Analysis of the data</b>	
	select a single result from their display and to use it as a basis for a simple conclusion
	manipulate, in very simple terms, any quantitative evidence they have discovered
	process quantitative evidence
	compare individual results
	make simple comparisons between different pieces of data
	identify trends and patterns in data
	determine and comment on the trends and patterns shown in their evidence
<b>Quality C Evaluation of the Data</b>	
	be aware of the likely accuracy of their evidence
	be able to cross-link their evidence to other sources
	be able to decide if their evidence is sufficiently reliable
	be able to appreciate the uncertainty in scientific evidence
	be able to decide if their evidence is valid
	make comparative judgements about the significance of different pieces of evidence
	be able to comment on any limitations of the data they have collected
<b>Quality D Justifying a conclusion</b>	
	link an outcome to previous experience
	make a simple conclusion about their evidence
	justify in simple terms any conclusion they have made
	link their data and conclusions to the associated scientific principles
	make detailed conclusions from all the evidence they have collected and describe how these can be justified by reference to the associated science

Quality E Planning further work	
	be able to suggest ways of extending the task to obtain more data
	be able to suggest, with some justification, how the data gained can be extended to provide more information about the topic
	write in detail about ways of extending the topic to provide further evidence to support the conclusions

Teachers will need to make a professional judgment on the extent to which the statements printed above are appropriate for their own candidates.

It is likely that some of these skills will have been covered to an appropriate standard in

- the assessment of '*Science in the News*' from Gateway Science
- the teaching and learning from previous Key Stages
- other subject areas of their Key Stage 4 curriculum.

Class discussions centred on the '*Student-speak*' version of the defined Levels of Response for the assessment of Data Tasks will provide additional guidance and clarification for the students of what they have to do to match each Level of Response.



## 4.7 Producing a report on a Data Task

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### Stage 1: preparing the candidates

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- Ensure that the relevant content from the Item has been covered to an appropriate level.
- Explain what the task involves by working through the stimulus material with them.
- Make it clear that the candidates will not be assessed on the collection of the data.

### Stage 2: candidates collecting their data

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- The teacher will need to determine, depending on the particular task, whether candidates can work on their own or in small groups to collect first-hand data, or whether they need to watch a teacher demonstration.
- In some cases the candidates could use ICT to collect their data.
- The candidates do not necessarily need to be supervised whilst they are collecting their data, but the teacher will need to make a professional judgment on this which may depend on
  - .....the resources required for the collection of the data,
  - .....an appreciation of any Health and Safety aspects,
  - .....the likely attainment level of the candidates.
- Normally an allowance of about an hour of laboratory time should be sufficient for candidates to collect their data, but some may require longer than this.
- The candidates need to be reminded to record their data clearly and carefully since they will need to use it for the supervised 'write-up' of their report.

### Stage 3: candidates using their data

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Teachers should undertake a review of the data each candidate has collected to determine whether or not it is of suitable quality to be used during the supervised session.

[Further details of this are given in section 4.8].

Candidates are required to work on their own during the supervised session and working under controlled conditions will be necessary so that they are able to concentrate on the task.

Each candidate will need to be supplied with a set of questions (normally five) for use with the processing, analysis and evaluation of their data.

The report produced during the supervised session can be hand-written or word processed.

However, if ICT is used by a candidate in the production of the report on the Data Task, then teachers need to ensure they can clearly authenticate, with confidence, that the report is entirely the work of the candidate working alone. For this reason, none of the data collected can be brought into the supervised session in electronic format. A paper copy of the data collected may be attached to the candidate's report.

Some candidates may need to be provided with a Writing Frame to guide them in answering the questions. A suitable Writing Frame is downloadable with each Task using Interchange.

Teachers should also be aware that for higher-attaining candidates a Writing Frame can easily reduce their marks since such candidates will be constrained by the limitations imposed by the number of lines provided for the answers. Lined paper is advisable for such candidates.

Once a candidate's answers have been marked, they can be handed back temporarily to the candidate in lesson time, at the discretion of the teacher, so that feedback can be given. The answer sheets should then be collected back at the end of the lesson and kept securely.

**Candidates should not be allowed an opportunity to correct, augment or redraft their answers.** If the performance of a candidate is lower than normally expected from them then another, different, Data Task can be completed and the feedback given after the first report should help to improve their performance.

Normally about one hour should be sufficient for the candidates to answer the five questions, but this time can be extended if necessary. However if the time is extended then the partially-completed answers should be collected and stored securely by the teacher.

## 4.8 The use of 'Fall-Back Data'

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The support material available with each of the Data Tasks includes a set of suitable data which might be needed by the candidate, and can be supplied by the teacher.

There are two main reasons why this additional data has been provided:

- In some cases the quality of the data collected – possibly through no fault of the candidate – may be low and will therefore not be appropriate for use as a basis for the assessment of the five qualities during the supervised session. It is for this reason that teachers are requested to review the data which has been collected by candidates before the supervised session starts, and to consider whether to replace it.
- In other cases the nature of the Data Task itself does not lead to even the highest-attaining candidate being able to collect sufficient 'quality' data in a reasonable period of time. In such cases the 'fall-back' data can be issued to all candidates, after providing an explanation for its use, at the start of the supervised session.

In some cases candidates might be prompted to use the ‘Fall-Back’ data to check on the reliability of their own.

Whilst the actual collection of data does not form part of the assessment, some teachers might be tempted – possibly because of time-constraints – not to allow the candidates to collect their own data.

**Teachers are strongly advised against adopting this procedure.**

Whilst it might not disadvantage candidates in the actual processing of the data, there is a very strong possibility that the marks obtained by candidates in connection with the evaluation of the data will not match their likely attainment. For example, the fact that a candidate is faced with the task of ensuring that the method adopted does allow for the collection of suitable data does provide a direct stimulus for making comments about the quality of the data or difficulties in collecting it.

## 4.9 Assessment of a candidate’s performance

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The assessment of a candidate’s performance on a Data Task is linked to five different Qualities, each of which is clearly defined at a **two mark standard**, at a **four mark standard** and at a **six mark standard**.

Levels of Response at the two, four and six mark standards are very broadly linked to the performance likely to be expected from candidates working at or around GCSE grades F, C and A respectively, but teachers are advised that this alignment should only be regarded as general guidance rather than being a defined and fixed linkage between response levels.

An essential feature of the Skills Assessment for Data Tasks is that the differentiation between the performance of candidates will be by **outcome** rather than by **task**. Only the highest attaining candidates are likely to attain the six mark standard in all five of the assessed Qualities. Teachers must, therefore, ensure that there is a “secure” and supportable match to all aspects before an award of six marks is made for a performance in any Quality.

Teachers need to use professional judgement to match a candidate’s work to the appropriate standard. Where a response exceeds one standard but does not reach the next higher standard, an intermediate mark is awarded.

A teacher’s judgement on each of the performance statements should be based on a holistic consideration of what has been written. Evidence for the award of a mark in any of the Qualities to be assessed can come from any part of a candidate’s report and consequently an atomistic approach should be avoided.

## 4.10 Annotation

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The QCA ‘*Code of Practice for the conduct of GCSE Examinations*’ requires teachers to show how the marks have been awarded and one convenient way of meeting this requirement is by hand-written annotation on each candidate’s report. Teachers could indicate the mark awarded for each Quality in the form of, for example, B5, in the margin together with any other comments required to support their judgement.

Annotation is always valuable since moderators are able to gain further information about the reasons why a particular performance statement has been matched. Annotation is especially important if marks of **1**, **3** or **5** have been awarded, since this can indicate clearly why the teacher considered that *'...a candidate's performance was better than 4 but not sufficient for 6...'*

Moderators always welcome detailed annotation since this inevitably helps them to *'...go along with the Centre's judgements....'* if any of the decisions appear to be finely balanced.

Annotation is especially important for lower-attaining candidates who may have some difficulty in expressing themselves clearly and succinctly.

The use of annotation by teachers to support oral comments made by lower-attaining candidates is acceptable.

## 4.11 Levels of Response

Quality Assessed		Number of Marks					
		1	2	3	4	5	6
A	Interpreting the data	A limited number of results are displayed in tables, charts or graphs using given axes and scales.		Data is displayed using appropriate tables, charts or graphs, allowing some errors in scaling or plotting.		Data is displayed to show general relationships using appropriate complex charts or diagrams e.g. histograms, scatter-grams, or in graphs with correctly selected scales and axes.	
		At least one trend / pattern is identified and outlined correctly.		The main trend(s)/pattern(s) are described correctly and there is some evidence of processing quantitative data.		The main trends/ patterns are described correctly with reference to the quantitative data. The data has been processed to reveal additional information and/or detect anomalies.	
B	Analysis of the data	An attempt has been made to consider the quality of the data and the methods used to collect it.		There is consideration of the reliability of the data and an attempt to identify how the methods used enabled valid data to be collected.		There is detailed consideration of the data in terms of both validity and reliability and a clear appreciation of the limitations of the methods used.	
		A conclusion is given which is related to the data collected.		A considered conclusion is given with justification based on an analysis of the data collected and linked to the underpinning science.		A considered conclusion is given with a well-argued justification based on careful analysis of the data and clearly linked to relevant scientific knowledge and understanding.	
C	Evaluation of the data	Some consideration is given to further relevant practical work.		Relevant further practical work is planned in detail.		There is detailed consideration of relevant further practical work and a clear appreciation of how this would further understanding of the topic.	
		A conclusion is given which is related to the data collected.		A considered conclusion is given with justification based on an analysis of the data collected and linked to the underpinning science.		A considered conclusion is given with a well-argued justification based on careful analysis of the data and clearly linked to relevant scientific knowledge and understanding.	
D	Justifying a conclusion	Some consideration is given to further relevant practical work.		Relevant further practical work is planned in detail.		There is detailed consideration of relevant further practical work and a clear appreciation of how this would further understanding of the topic.	
		A conclusion is given which is related to the data collected.		A considered conclusion is given with justification based on an analysis of the data collected and linked to the underpinning science.		A considered conclusion is given with a well-argued justification based on careful analysis of the data and clearly linked to relevant scientific knowledge and understanding.	
E	Planning further work	Some consideration is given to further relevant practical work.		Relevant further practical work is planned in detail.		There is detailed consideration of relevant further practical work and a clear appreciation of how this would further understanding of the topic.	
		A conclusion is given which is related to the data collected.		A considered conclusion is given with justification based on an analysis of the data collected and linked to the underpinning science.		A considered conclusion is given with a well-argued justification based on careful analysis of the data and clearly linked to relevant scientific knowledge and understanding.	

## 4.12 Additional guidance on the interpretation of the Level of Response grid

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### Quality A (Interpreting the Data)

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Candidates must in some way ‘use’ the data they have collected. Simply recording the data they have collected during the practical session without making any use of it during the supervised session, does not allow a match to any of the marks in Quality A.

An award of **two marks** might be possible if the candidate is able to collect about five pieces of data and is then able to display them as a pie-chart or on a graph grid (which might have 0.5 cm or 1.0 cm ruling) and with the scales and axes provided for them by the teacher. In some cases candidates might be able to amend the display of the data they have collected in a more appropriate manner and this also could allow the consideration of a match to the two mark standard.

**Four marks** might be possible if the candidate collects sufficient data which could provide the basis for identification of a trend/pattern and is able to display the data graphically. One or two minor errors in plotting the data points would not automatically prevent a match to the four mark performance. Teachers are reminded that a sheet providing a suitable 2 mm grid ruling with sufficient ‘white-space’ to allow candidates to add scales, labels and units is available with the support material provided with each Data Task.

An award of **six marks** would be appropriate for a candidate who is able to draw a suitable graph of a quality which is difficult to improve upon. Such a graph would be of a suitable size, have correctly chosen axes which were correctly labelled with appropriate units and have all of the points correctly plotted. There is also an expectation that a candidate will have taken repeat readings and to have based their plotting on the accurate determination of the mean values. If repeat readings were inappropriate for any reason then there would normally be a comment from a candidate by way of explanation. A suitable line of best fit would have been drawn on the graph, and the candidate would be expected to comment on whether or not a smooth line or a ‘dot-to-dot’ graph was the most appropriate.

### Quality B (Analysing the Data)

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An award of **2 marks** would be appropriate for a candidate who was able to identify a simple pattern in the data which had been collected. In many cases, an ‘...er.....er...’ statement (For example: ‘The higher the drop, the greater the bounce.’) would have been made by the candidate from a simple consideration of the evidence collected.

A candidate who could correctly process the data which had been collected and was able to make comments on the patterns and/or trends revealed by the data could be considered for an award of **4 marks**.

Candidates to be considered for an award of **6 marks** would be expected to comment in detail about the trends which the data revealed. A candidate would also be able to comment on the overall quality of the data collected, with respect to additional information revealed by the data or to make significant comments on any anomalies which had been revealed during the collection of it.

## Quality C (Evaluating the Data)

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At the **2 mark** standard there is an expectation that a candidate would make a simple and generalised comment about the overall quality of the data which had been collected. There might also be a simple comment about any difficulties experienced in the collection of it.

A candidate who is aware of the likely accuracy of the data collected and is also able to make a comment on the likely reliability (possibly in terms of the differences in the values of repeat readings) of what has been collected could be considered for a match to **4 marks**.

For consideration of a match to the **6 mark** Level of Response there is a clear requirement for a candidate to be able to comment, in some detail and with justification, about the reliability and validity of the data collected. In addition there is an expectation that there would be an indication of ways in which the method of collection presented difficulties in obtaining data of the highest quality.

## Quality D (Justifying a conclusion)

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A candidate who was able to make a single simple conclusion, not necessarily linked to the underpinning science of the Data Task, gathered from the collection of the data could be considered for an award of **2 marks**.

For a secure award of **4 marks**, a candidate would be expected to make a justified conclusion from the collection of the data. At some point the candidate should use the word ‘.....because.....’ (or a synonym) .This should then be clearly linked to the knowledge and understanding of the science of the Task.

A match to the **6 mark** Level of Response would require detailed comments (at around the standard of a GCSE grade A candidate) which could be linked both to the conclusions gathered from the data collected and to well-reasoned explanations of the underlying principles of the ‘science’ of the Task.

## Quality E (Planning further work)

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If a candidate made a simple reference to ways of collecting additional data about the topic then an award of **2 marks** might be appropriate.

An award of **4 marks** could be appropriate for a candidate who was able to make clear comments about ways of collecting additional data to extend the knowledge and understanding of the ‘science’ of the topic. For this Level of Response, a candidate would also have to provide a sufficient amount of detail to enable another student to carry out the stated procedure.

A match to **6 marks** would require a candidate to communicate a clear and detailed method of ways of obtaining additional information about the Topic. The candidate would also have to make precise references to ways in which the procedure suggested would enable some further understanding of the Topic to be developed.

## 4.13 'Student-speak' version of the Levels of Response

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One of the core principles underpinning all of the specifications contained within the GCSE Gateway Suite is that candidates should be fully aware of what is required for assessment purposes. For this reason, a set of 'Student-speak' Levels of Response descriptions have been provided to familiarise the candidates with the requirements needed for successful matching within each of the five Qualities.

Teachers will find that the time spent in discussing these 'Student-speak' Levels of Response will be a significant factor in ensuring that each candidate is able to maximise their attainment. Many teachers will have these mounted as part of a display as well as providing each candidate with their own copy.

**Teachers should not to use the 'Student-speak' version of the Levels of Response for actual assessment.** The 'Student-speak' versions are simply provided to help the candidates to understand what is required to match each quality. There has been, therefore, some simplification of the wording to ensure that the 'language-level' is appropriate.



## 4.14 Obtaining copies of the Data Tasks

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Each of the Data Tasks is available electronically using OCR Interchange. Details of how teachers can access Interchange are given in Section H.

Nominated teachers can download the Data Tasks to be attempted by their candidates. The candidate stimulus material is provided in colour but if no colour printer is available then a black and white printer can be used. This material has been designed to be photocopied onto two sides of A4 paper.

In order to reduce printing costs, especially if the candidate stimulus material is to be used by more than one group at different times, laminating and numbering the printed sheets may be useful.

Teachers should ensure that the copies are collected in from candidates when the Data Task has been completed.

Each Data Task is accompanied by additional support material to be used either by candidates or by teachers.

- Teacher Guidance
- 'Fall-back' Data
- Student information sheet for Step 1
- Student information sheet for Step 2
- Student information sheet for Step 2 (as a Writing Frame)
- Level of Response grid – 'Student-speak' version
- Graph paper (optional) both landscape and portrait

## 4.15 Communicating the results of candidates' work

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Following the completion of Step 2 of a Data Task it is essential that the teacher informs the candidate of the marks which have been awarded.

Teachers also need to inform candidates that the marks which have been awarded are provisional ones and subject to external moderation.

'Feedback' to a candidate which points out important features of the answers which the candidate has produced, including any areas where an improvement is possible is vital, and is another factor which will encourage better motivation on the part of the candidate. However teachers should note that redrafting of the answers to a Data Task which is to be 'counted' for assessment purposes is **not** permitted.

## Data Task: Level of Response grid– (Student-speak version)

Quality assessed		2	4	6
<b>A</b>	<b>Interpreting my data</b>	I can show my data as a simple bar chart or on the graph paper my teacher gave me.	I can show my data in a graph.	I can choose suitable scales and axes to show my data in graphical format (as graphs, histograms or scatter-grams) with suitable lines of best fit when appropriate.
<b>B</b>	<b>Analysing my data</b>	I can write about a pattern I have found in my data.	I can process the data I have collected and can write about the trends and patterns I have discovered.	I can write in detail about the trends I have discovered when I processed the data I collected, and I can write about any anomalies in the data.
<b>C</b>	<b>Evaluating my data</b>	I can write a sentence about how good I think my data is.	I can write about the accuracy and reliability of the data I have collected.	I can write in detail about the validity of the data I have collected and can make comments about the limitations of the methods I used to collect it.
<b>D</b>	<b>Justifying my conclusions</b>	I can make a simple conclusion about my data.	I can make at least one conclusion about the patterns in my data, and can use my knowledge and understanding of science to explain my conclusion.	I can make detailed conclusions from a careful and detailed analysis of my data. My conclusions can be clearly linked to the scientific knowledge and understanding associated with the task.
<b>E</b>	<b>My ideas for more work on this topic</b>	I can write about how to get more data about this topic.	I can write about ways of collecting more data to increase the quality of the conclusions I have been able to make.	I can write in detail about the collection of additional data about the task and can justify this by writing about the way this would either help to make my conclusions more secure or to increase my understanding of the topic.

## 4.16 Redrafting of candidates' work

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A candidate's ability to redraft a piece of work in order to improve it is a useful Skill and one which is assessed in other GCSE subjects taken during Key Stage 4.

However this is **not** permitted in connection with the assessment of Data Tasks.

**The report which is produced during the supervised session is the one which the teacher is required to assess.**

If there are concerns about the matching of the answers given to the expected level of attainment of a candidate, for example in errors, omissions, a lack of clarity or a failure to match any of the performance statements, then the report should not be 'counted' for GCSE purposes.

In such cases, additional formative feedback should be given to the candidate, who can subsequently undertake another Data Task selected from another module, which can then be formally assessed.

# Section E

## 5.1 Exemplar material

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### Introduction

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This section concerns five examples of completed Data Tasks. These are from candidates at differing attainments, and each response is accompanied by a detailed commentary outlining the rationale for the awards of the marks in each of the Qualities.

#### **Candidate A: Bouncing Balls**

This is from a low-attaining candidate who has successfully collected some data and has produced a report with some help and guidance from the teacher.

#### **Candidate B: Bouncing Balls**

This report is from a candidate who was able to collect a range of data but who appeared to lose interest during the supervised session and the marks obtained reflect this reduction of effort.

#### **Candidate C: Bouncing Balls**

This represents a piece of work from a candidate of the highest attainment level who has not only collected a good range of valid data but has produced high-quality answers to each of the five questions.

#### **Candidate D: Enzymes and temperature**

This represents a report from a candidate of above average attainment who has collected some data and has processed it successfully.

#### **Candidate E: Electrolysis**

This candidate collected some data but the quality of it was such that the teacher decided to provide the 'fall-back data' in order that the five questions given in the supervised sessions could be attempted with the expectation that the candidate's likely attainment could be successfully matched.

Exemplar work from candidates A – E can be found in Section K at the end of this booklet. This work is confidential and should not be shown to candidates as it would give them answers to some parts of the data tasks.
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# Section F: *Moderation*

## 6.1 Moderation and moderation procedures

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A sample of a Centre's assessed work from Research Studies and Data Tasks will be externally validated by a moderator appointed by OCR. The moderator will review a sample of the judgements made by the teachers at the Centre to ensure that these are correctly aligned to common standards. The judgements made by the teachers will be adjusted, if necessary, to conform to the agreed standards.

Each teacher involved in the preparation of candidates is required to sign a Centre Authentication Form, and this form will need to be included in the material sent to the moderator.

The marks awarded for the Research Study and Data Task (together with the mark awarded for Practical Skills) should be submitted to OCR by 15<sup>th</sup> May in the year in which the Skills assessment is required using the appropriate forms prepared by OCR or equivalent forms generated in the Centre.

A copy of these forms will also be sent to the appointed moderator, who will select the sample to be considered. The number of portfolios to be sampled will be based on the number of candidates entered, but will be up to a maximum of 20 from each Centre. The moderator will sample across the whole range of marks and from all the teachers involved. Centres will need to send this sample to the moderator within a specified time-period.

The internal standardisation of the judgements made by all of the teachers involved in the preparation of candidates for the examination is vital. The marks awarded by a Centre will form a single order of merit. It is therefore essential that this listing is valid and reliable, and for this reason there must be clear evidence from the Centre that steps have been taken to ensure that each of the teachers is using a common interpretation of the way in which the Level of Response grid is being used.

Centres will need to inform their moderator of the methods which have been used to ensure this internal standardisation.

If a moderator experiences difficulties in validating the judgements made for the initial sample of work requested from the Centre, then additional samples may be required.

The candidates' work will be returned after moderation and a report giving detailed comments on the overall quality of the work submitted will be sent to the Centre at the time the results are issued.

## 6.2 Authentication of candidates' work.

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The QCA '*Code of Practice for the conduct of GCSE Examinations*' requires that every teacher involved in the internal assessment of Skills has to ensure that each piece of assessed work can be authenticated with confidence as being the work of the candidate who submits it. This is particularly important when candidates have undertaken some of their work not under the direct supervision of their teacher.

A teacher may have some residual concerns about the extent to which the response does not represent the work of a particular candidate. For example, if there is evidence that too much help has been given or that a candidate has simply copied work directly from another candidate, then that piece of work should not be 'counted' for assessment purposes.

In such circumstances the candidate can usually be asked to produce another Research Study.

If teachers do discover cases of deliberate plagiarism this should be dealt with using the Centre's own disciplinary procedures.

If malpractice is not discovered by the Centre but is later suspected by a moderator then OCR's malpractice procedures will be implemented. If there has been malpractice then penalties will be applied to all candidates involved.

## 6.3 Resubmitting a Research Study or Data Task

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A candidate may resubmit a Research Study or a Data Task on a subsequent occasion for Additional Science or as a element of the Skills Assessment for Biology, or Chemistry, or Physics, depending on the subject matter.

The marks confirmed by the moderator when the piece was first submitted cannot be 'carried-forward', but teachers will be able to remark it in the light of any comments made by the moderator and it will be re-moderated when it is re-submitted.

## 6.4 Record Keeping - sending the sample to the moderator

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Skills assessment unit entries can only be made in the June session. The deadline for submitting the candidate's marks is the 15<sup>th</sup> May. Once the marks have been submitted a moderator will request a sample of the candidates' work. The sample requested will depend on the number of candidates entered but will not exceed 20.

For each candidate in the sample the following needs to be prepared:

- The best Research Study completed by the Candidate should have a candidate coversheet attached showing the marks for each of the four qualities and the total mark, out of 24, for the whole Research Study.
- The best Data Task completed by the candidate should have a candidate cover sheet attached showing marks for each of the five qualities and the total mark out of 30 for the whole Data Task.
- The mark awarded for Practical Skills will already have been submitted to OCR on the original mark sheet.
- The total mark for each candidate should be checked against the total mark submitted to OCR on the original mark sheet.

In addition to the candidates' work, a Centre Authentication form CCS160 needs to be signed by any teachers who moderated the work and sent to the moderator. Without this authentication form, candidates' GCSE results will not be released.

Samples of the Research Study and Data Task coversheets, Candidate Record card and Centre Authentication form are provided in Section J.

The documents used for moderation are updated on a yearly basis and may be subject to modification. Each year, instructions and updated forms will be sent to Centres and it is advisable to use the latest versions of the forms and check instructions for changes to procedure.

## 6.5 Annotation

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The QCA 'Code of Practice for GCSE Examinations' requires teachers to show how the marks have been awarded and one convenient way of meeting this requirement is by hand-written annotation on each candidate's report.

Teachers could indicate the mark awarded for each quality in the form of, for example, B5, in the margin together with any other comments if this is required to support their judgement.

Annotation is always valuable since moderators are able to gain further information about the reasons why a particular performance statement has been matched. Annotation is especially important if marks of 3 or 5 have been awarded, since this can indicate clearly why the teacher considered that *'...a candidate's performance was better than 4 but not sufficient for 6...'*

Moderators always welcome detailed annotation since this inevitably helps them to *'...go along with the Centre's judgements....'* if any of the decisions appear to be finely balanced.

Annotation is especially important for lower-attaining candidates who may have some difficulty in expressing themselves clearly and succinctly.

The use of annotation by teachers to support oral comments made by lower-attaining candidates is acceptable.



# Section G: *Practical Skills*

## 7.1 Frequently Asked Questions

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### ***Is the mark given moderated in any way?***

**No.** The marks given by the teacher are accepted by the moderator and no attempt is made to moderate the marks against any other component.

### ***When should the mark be assigned to the candidate?***

Normally towards the end of the course when a teacher has a good impression of the overall practical ability of the student concerned.

### ***Should the mark be given by observation of a single practical exercise?***

**No.** It should be a mark based on a teacher's overall assessment of a candidate's practical ability.

### ***What if I have a candidate who is limited academically but is very good at practical work?***

There is no reason why such a candidate cannot score full marks for the practical skills part of the assessment.

### ***Could I give a mark of six to all my candidates?***

This is certainly possible in theory but it would be surprising if all candidates in a particular group were of the same very high standard of competence.

### ***How do I decide what mark to give to each candidate?***

You consider your experience of that candidate taking part in practical work and assign them a level based on the assessment grid provided.

### ***What if a student has had more than one teacher over the time of the course?***

This is a common situation in many Centres and is most easily overcome in a departmental meeting where a brief discussion can usually arrive at an agreed level.

### ***What if two teachers disagree about the level a candidate should be given?***

If the difference is irreconcilable and there is only a one mark difference then perhaps that higher level should be given as at least one member of staff has experienced the candidate performing at that level throughout the course.

### ***In Additional Science do separate assessments have to be made for Biology, Chemistry and Physics?***

**No,** only one assessment has to be made. If three different teachers are involved assessment can be made by one teacher and perhaps confirmed by the others.

### ***What if a student has had a great deal of absence?***

Since the assessment is made over the whole of the course, it should still be possible to give the candidate a valid level.

## 7.2 Introduction

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Practical skills are assessed in this way because marks given in the Data Task are given for the analysis and interpretation of data and results together with the planning of further practical activity. There are no marks given for actually carrying out the practical work.

Some credit must be given to the candidate for the use of these skills and so the teacher is asked to give a mark which gives an overview of the skills the candidate has shown throughout the course.

This mark is based on the professional judgement of the teacher. It is a mark out of six given on the basis of the descriptions of performance in the syllabus.

## 7.3 Assessment

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The specification provides the grid below as a guide to the performance expected at the different levels.

However, it also states that a candidate is expected to be able to:

- work accurately and safely
- work individually and with others
- collect first hand data.

Quality Assessed	Number of marks					
	1	2	3	4	5	6
Working safely and accurately		Practical work is carried out safely and accurately under close supervision and with much guidance.		Practical work is carried out safely and accurately with some guidance.		Practical work is carried out safely and accurately with awareness of risks.

## 7.4 Assessment of a candidate's performance

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Since the Level of Response grid makes no reference to two of the things which a candidate is expected to be able to do, some further explanation may be helpful.

One possibility is to use descriptions of 'typical candidates at each level'. Three such descriptions at levels 2, 4 and 6 are given on the next page.

**Level 6**

The candidate is capable of working well unsupervised and as a member of a group. In group work they make a significant contribution to the work of the group. The candidate consistently produces accurate results and works safely seeing possible hazards before they occur.

**Level 4**

The candidate works well individually though guidance may be needed to keep them on task. They can work co-operatively as a member of a group and accurate results are usually obtained. The candidate works safely in normal situations.

**Level 2**

The candidate needs supervision in order to complete individual work and tends to let others do the work in group situations. They are capable of producing accurate results if suitably guided. Supervision is needed to ensure safe working.

Marks would be awarded on a best fit basis, with candidates not quite making a higher level being given marks of 1, 3 or 5 as appropriate.

## 7.5 Applying the Criteria

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Below you will find 'pen portraits' of six students. You have probably taught students similar to these yourselves.

On the basis of these descriptions what marks out of six would you give each of them?

### 1) Sophie

Sophie is a girl who isn't really interested in Science. She is quite willing to sit and copy out of a book or perhaps complete a work sheet if it isn't too demanding. She finds participation a strain and doesn't really pay attention.

She likes practical work when the teacher demonstrates an experiment, especially if it is well presented or spectacular. She doesn't mind group practical work, where she is the one who copies down all the results neatly for everyone else but avoids actually taking part.

Conclusions, when she bothers to write one down, tend to be very similar to those of the rest of the group and be based on their results.

### 2) David

David is very keen, he stays behind after lessons to ask questions. He likes practical work but then he likes theory lessons as well. He takes a lot of trouble over written work though it isn't always correct.

He is a bit of a loner and, if given the chance, will work, carefully and accurately, on his own in practical lessons. When working in a group others tend to let him do all the practical work 'because he likes it'. They work out the answers, draw the graphs and tell him what to do.

### 3) Scott

Scott is a bright boy, keen to do well but not quite so keen to do all the necessary work. He relies too much on his ability and this applies to practical work as well.

When working alone his work can be rushed in order to achieve a set of results as quickly as possible. When working in a group he can tend to try to take over. If others resist his attempts, he withdraws and lets them get on with it.

Nevertheless his analysis and evaluation skills are good so his outcomes from practical work are well above average.

### 4) Amandeep

Amandeep is a quiet softly spoken girl, her work is always well presented and of a high standard. She lacks confidence in practical work and thus tends to work rather slowly though always safely.

However, the care she takes ensures that results are good, as is the final outcome of the task.

When working in a group she will work well with the others, though she would tend to defer to a more confident student who may well be less expert in the task concerned.

## 5) Charley

Charley is a joker, he likes to be 'one of the lads' and can be disruptive at times. Nevertheless he is an able boy and can produce 'the goods' when he perceives that there is a need.

In normal practical sessions he could well be one of the ones messing about but when he perceives the session as important or interesting he would be the one who organises his 'cronies' to produce surprisingly good and accurate work.

His own work is of variable quality with pieces for assessment well above average, whereas everyday tasks, not being 'important', are treated in a more cavalier fashion.

## 6) Holly

Holly is the girl for whom things go wrong. It is not that she's clumsy, unsafe or incompetent, she's just accident prone.

If working alone, she sometimes needs more than one attempt but will persevere until she gets the correct result. If working in a group she tends to let others do the manipulative work because 'it always goes wrong for me'. She takes an active part in group work though and achieves well, always making a significant contribution.

Name	Mark	Reason
Sophie	2	Sophie is not unsafe in practical work because she rarely does any. Only when pushed into it does she take an active part in group work. She does the bare minimum when working individually unless closely supervised.
David	5	Although David is only of average ability he is very capable practically and his keen interest ensures good results. Only his weaknesses in group work detract from his overall performance.
Scott	4	Scott's work, though usually reasonably accurate, is often rushed and so not always safe. His work in groups is also not ideal. If he cannot be in charge he is not really interested. 4 marks is a reasonable compromise mark.
Amandeep	4/5	Amandeep's lack of confidence does not necessarily reduce her mark. Her work is of good quality and her results are accurate. She works well in a group situation though sometimes her lack of confidence is a handicap. This denies her the mark of 6.
Charley	4	Some of Charley's work probably merits 6 marks. When he puts his mind to it he can work safely and achieve accurate results. This assessment is however an overall assessment for the course and so his general attitude must also be taken into consideration.
Holly	5	Things go wrong for Holly but she realises the problem and carries on to achieve good results in spite of setbacks. She takes an active part in group work only missing out on the setting up of apparatus and the like. She takes a full part in taking measurements, which she does very well.

Please remember, though, that it is a teacher's judgement which gives this mark. Anyone who taught these six students would know a lot more about them than was revealed in the 'pen portraits'. They would have more evidence to base a more valid mark on.

## Section H: Using Interchange

All stimulus material for the Gateway skills assessment can be obtained from OCR Interchange.

OCR Interchange is a secure extranet enabling registered users to administer qualifications online. Your Examinations Officer is probably using OCR Interchange to administer qualifications already. If this is not the case, then your Centre will need to register. For information on registration see the notes in the next section.

Your Examinations Officer will be able to:

- download the relevant documents for you by adding the role of 'Science Coordinator' to their other roles or
- make you a New User (Science Coordinator role) so that you can access the GCSE Gateway Sciences pages and download documents when you need them.

The website address for Interchange is:

<https://interchange.ocr.org.uk>

When you are logged in you will see a screen with a bright purple band down the left-hand side. Click on the SUBJECT SPECIFIC menu item and from the drop-down list select GCSE Gateway Sciences. You will then see a screen like the one below.

**OCR Interchange**  
RECOGNISING ACHIEVEMENT

**GCSE GATEWAY SCIENCE SUITE**

SCIENCE IN THE NEWS & CAN-DO | RESEARCH STUDY | DATA TASKS

**Can-Do Tasks**

Candidate Record Cards can be downloaded by selecting the appropriate file. A completed Record Card will need to be submitted for any candidate selected for the moderation sample.

There are separate Candidate Record Cards for Science B (J640), Biology B (J643), Chemistry B (J644) and Physics B (J645). An electronic mark book is also available.

See [www.gcse-science.com](http://www.gcse-science.com) for more details.

**Science In The News**

The Science in the News (SN) materials produced by OCR are listed below. All resources required by teachers and candidates to carry out each task are provided by downloading the appropriate file.

Please note that any information marked "confidential" should be stored in a secure place so that students cannot obtain access to it.

Candidates entered for Science (J640) Unit 3 B625 should only undertake tasks from modules B1, B2, C1, C2, P1 and P2.

Candidates entered for the separate sciences Biology, Chemistry and/or Physics should only undertake the tasks related to that subject.

The Science in the News materials will be updated on a regular basis. New stimulus materials will be added and other materials may be updated so that new versions become available.

Only one Science in the News is required to be completed.

The tasks are listed in alphanumerical order.

8.54kb	<a href="#">B1 - Should the use of Cannabis be legalised?</a>	0.16 Seconds
8.53kb	<a href="#">B2 - Should whale hunting be banned?</a>	0.16 Seconds
8.56kb	<a href="#">C1 - Should we stop giving crisps to young children?</a>	0.16 Seconds
8.53kb	<a href="#">C2 - Are congestion zones a good idea?</a>	0.16 Seconds
8.53kb	<a href="#">P1 - Should we spend time in the sun?</a>	0.16 Seconds
8.55kb	<a href="#">P2 - Does the UK need new Nuclear Power stations?</a>	0.16 Seconds

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There are three separate pages:

- Science in the News & Can-Do Tasks
- Research Study
- Data Tasks.

These are accessed by clicking on the appropriate blue tab.

The stimulus materials for each type of skills assessment are provided as pdf documents which can be downloaded. These documents are in colour but can be printed using either a colour or a black and white printer.

The teacher who has downloaded these materials is responsible for ensuring that any pages labelled **confidential** are stored securely so that students do not have the opportunity to access them.



It is intended that the circulation of the stimulus material is limited to those students who are currently undertaking a particular assessment task. These materials should be photocopied and issued to students at the start of the task so that they can do advanced preparation e.g. research for Science in the News. This material must then be collected from the students after the final supervised session, when they have completed the report. Numbering the documents may help to keep track of them.

## Registering for Interchange

If your Examinations Officer is not already a registered user of Interchange then he/she will need to register before the Gateway stimulus materials can be downloaded.



The screenshot shows a web browser window displaying the OCR Interchange website. The page has a dark blue header with the OCR logo and the text 'OCR Interchange' and 'RECOGNISING ACHIEVEMENT'. Below the header, there is a 'Welcome' section with a 'Welcome' heading. The main content area is divided into three sections: 'Login', 'New User', and 'Interchange Info'. The 'Login' section contains fields for 'Login ID', 'Username', and 'Password', with a 'Login' button. The 'New User' section contains a 'Sign Up' button. The 'Interchange Info' section contains links to 'Adobe Acrobat Reader' and 'Revised Terms and Conditions for use of the Interchange'.

This is a straightforward process:

- Go to the website – <https://interchange.ocr.org.uk>
- The first page has a New User section
- Click on Sign Up to access the OCR Interchange Agreement Form 1
- Download this document and fill in your details
- Return form by post to OCR Customer Contact Centre, Westwood Way, Coventry, CV4 8JQ or fax the form back to 024 76 851633
- OCR will then contact the Head of Centre with the details needed for the Examinations Officer to access OCR Interchange.

## Adding a new user with the role of Science Coordinator

To add a new user and set their level of access to OCR Interchange:

1. Click **Add/Edit Users** to display a list of all current users at your Centre.
2. Click on **Add New User**.

3. Enter user details as described in the table below:

User Name	Minimum of 2 characters.
Password	Minimum of 7 characters. Must be a combination of upper and lower case and numbers.
Surname	Minimum of 2 characters.
Forename	Minimum of 2 characters.
Email address	You must enter a valid email address for all users.

4. Click on the **Roles** tab to set the user role and determine the user's level of access to OCR Interchange.

5. Select the **role** of Science Coordinator on the left-hand side of the screen. With the role of Science Coordinator you will be able to view and download stimulus materials.

6. Click the **greater than arrow (>)**. The role now appears on the right-hand side of the screen, indicating it has been selected.

7. Click the **User** tab.

8. Click **Add**.

You will receive notification on screen if your new user was added successfully or not. Errors are indicated by a red asterisk (\*) and are detailed on screen.

**Please note that it usually takes 20 minutes for the new user to be able to access OCR Interchange.**

## Section I: *Examples of completed skills assessment forms*

For each candidate in the sample requested by the moderator the following need to be prepared:

- The best Research Study completed by the candidate with a candidate cover sheet attached showing the mark for each of the four qualities and the total mark, out of 24, for the whole Study.
- The best Data Task completed by the candidate with a candidate cover sheet attached showing the mark for each of the five qualities and the total mark out of 30, for the whole task.
- The skills assessment record filled in to show the mark out of 24 for the Research Study, the mark out of 30 for the Data Task and the mark out of 6 for Practical Skills. The total mark, out of 60, should be recorded and checked against the mark submitted to OCR on the original mark sheets.

In addition to the candidates' work, a centre authentication form CCS160 needs to be signed by any teachers who moderated the work and sent to the Moderator. Without this authentication form, candidates' GCSE results will not be released.

**Research Study Title**

**Centre Number**  **Candidate Number**

**Candidate Name**

Quality Assessed		Number of Marks					
		1	2	3	4	5	6
<b>A</b>	<b>Collecting information</b>  3  /6		An attempt has been made to collect some information from at least one suitable source.	√	Relevant information is collected from more than one suitable source.		Relevant, detailed information is collected from more than one suitable source and is clearly referenced in the report.
<b>B</b>	<b>Interpreting information</b>  4  /6		An attempt has been made to interpret the information.		The information has been interpreted but not always thoroughly and/or correctly. √		The information has been interpreted effectively, with skill and understanding.
<b>C</b>	<b>Developing and using scientific ideas</b>  4  /6		An attempt has been made to describe the influences and/or development of scientific ideas.		Demonstrates some understanding of the interaction between scientific ideas and their context. √		Demonstrates a clear and detailed understanding of the interaction between scientific ideas and their context.
<b>D</b>	<b>Quality of written communication</b>  5  /6		Spelling, punctuation and grammar is of generally poor quality. Little or no relevant scientific or technical vocabulary is used.		Spelling, punctuation and grammar are generally sound. Appropriate scientific or technical vocabulary is used.	√	Spelling, punctuation and grammar show very few errors. The report shows full and effective use of relevant scientific and technical terms.

**16**

**Total Mark awarded**

**/ 24**

**Data Task Title** Fuses – does the thickness matter?

**Centre Number** 35517 **Candidate Number** 4321

**Candidate Name** Hugo First

Quality Assessed		Number of Marks					
		1	2	3	4	5	6
A	<b>Interpreting the data</b>  5  /6	A limited number of results are displayed in tables, charts or graphs using given axes and scales.		Data is displayed using appropriate tables, charts or graphs, allowing some errors in scaling or plotting.		Data is displayed to show general relationships using appropriate complex charts or diagrams. e.g. histograms, scatter-grams, or in graphs with correctly selected scales and axes. ✓	
		At least one trend/pattern is identified and outlined correctly.		The main trend(s)/ pattern(s) are described correctly and there is some evidence of processing quantitative data. ✓		The main trends/patterns are described correctly with reference to the quantitative data. The data has been processed to reveal additional information and/or detect anomalies.	
C	<b>Evaluation of the data</b>  4  /6	An attempt has been made to consider the quality of the data and the methods used to collect it.		There is consideration of the reliability of the data and an attempt to identify how the methods used enabled valid data to be collected. ✓		There is detailed consideration of the data in terms of both validity and reliability and a clear appreciation of the limitations of the methods used.	
		A conclusion is given which is related to the data collected. ✓		A considered conclusion is given with justification based on an analysis of the data collected and linked to the underpinning science.		A considered conclusion is given with a well-argued justification based on careful analysis of the data and clearly linked to relevant scientific knowledge and understanding.	
E	<b>Planning further work</b>  3  /6	Some consideration is given to further relevant practical work.		Relevant further practical work is planned in detail. ✓		There is detailed consideration of relevant further practical work and a clear appreciation of how this would further understanding of the topic.	

19

**Total Mark awarded**

**/ 30**

**Skills Assessment Record**

**GCSE Gateway Additional Science B626**

**Centre Name** \_\_\_\_\_ Occara School \_\_\_\_\_

**Centre Number**

3	5	5	1	7
---	---	---	---	---

**Candidate Number**

4	3	2	1
---	---	---	---

**Candidate Name**    Hugo First \_\_\_\_\_

The Moderator appointed by OCR will require a completed copy of this Skills Assessment Record for each of the candidates whose work is required for moderation. The assessed Science in the News report and cover sheet should be enclosed within this Skill Assessment Record for each of these candidates.

Centres will need to keep adequate records of the attainment of all of their candidates for GCSE Gateway Additional Science, and may use this form as a means of keeping records. However, centres are free to devise and develop their own record-keeping systems, providing that such a system will (if required by OCR for moderation purposes) allow each candidate's performance to be verified by a Moderator.

<b>Summary of Skills Assessment Attainment</b>		
Research Study	Mark out of <b>24</b>	<b>16</b>
Data Task	Mark out of <b>30</b>	<b>19</b>
Practical Skills	Mark out of <b>6</b>	<b>4</b>
Transfer this total to the MS1 form and submit by May 15 <sup>th</sup> in the year of entry for this unit	Total mark out of 60	<b>39</b>
Name of teacher completing this form		
Date of completion and submission of marks	12 <sup>th</sup> May      Year 2008	

**One** copy of this form must be completed for **each** unit or coursework component and signed by the appropriate person(s). The completed form **must** accompany the coursework or portfolios submission to the moderator/examiner or be inspected by the visiting moderator for Entry Level, GCSE, GNVQ, VCE and GCE qualifications.

**It is now a requirement of the Code of Practice that this authentication form is signed.**

**'Authentication of candidates' work** – *The internal assessor must present a written declaration that the candidates' work was conducted under the required conditions as laid down by the specification.'*

Centre Name  Centre No 

3	3	5	1	7
---	---	---	---	---

Specification or Unit title

Qualification or Unit number/component code 

B	6	2	6		
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Session  Year 

2	0	0	8
---	---	---	---

Moderated unit (Please tick box if yes)  *In this case this form must accompany the sample posted to the moderator or inspected by the visiting moderator*

or

Examined unit  *In this case this form must accompany the packet of coursework which is posted to the examiner or assessed by the visiting examiner.*

(Please tick box if yes)

*Signature(s) of internal assessor(s) – i.e. person(s) responsible for carrying out internal assessment and/or supervision (in the case of examined coursework) of work:  
I/We the undersigned confirm that the candidates' work was conducted under the required conditions as laid down by the specification.*

Signature:.....Michael Ramsey .....Print name.....MICHAEL RAMSEY .....

Signature:.....Mary Seacole .....Print name:.....MARY SEACOLE.....

Signature:..... Print name:.....

**Please continue on a separate sheet if required.**

In order to support internal assessors in authenticating their candidates' work an example of a standard Candidate Authentication Statement is provided on the OCR Website ([www.ocr.org.uk](http://www.ocr.org.uk)). Alternatively centres may wish to continue to use their own internal arrangements for candidate authentication, but these must provide equivalence to the standard Candidate Authentication Statement.



# Section J: Confidential Examples of Research Studies and candidates' responses

**Please note that Section J has been removed from this version of the Skills Assessment Support Booklet. Teachers can, however, find a full copy of the booklet with this section included on Interchange.**

# Section K: Confidential Examples of Data Tasks and candidates' responses

Please note that Section K has been removed from this version of the Skills Assessment Support Booklet. Teachers can, however, find a full copy of the booklet with this section included on Interchange.