

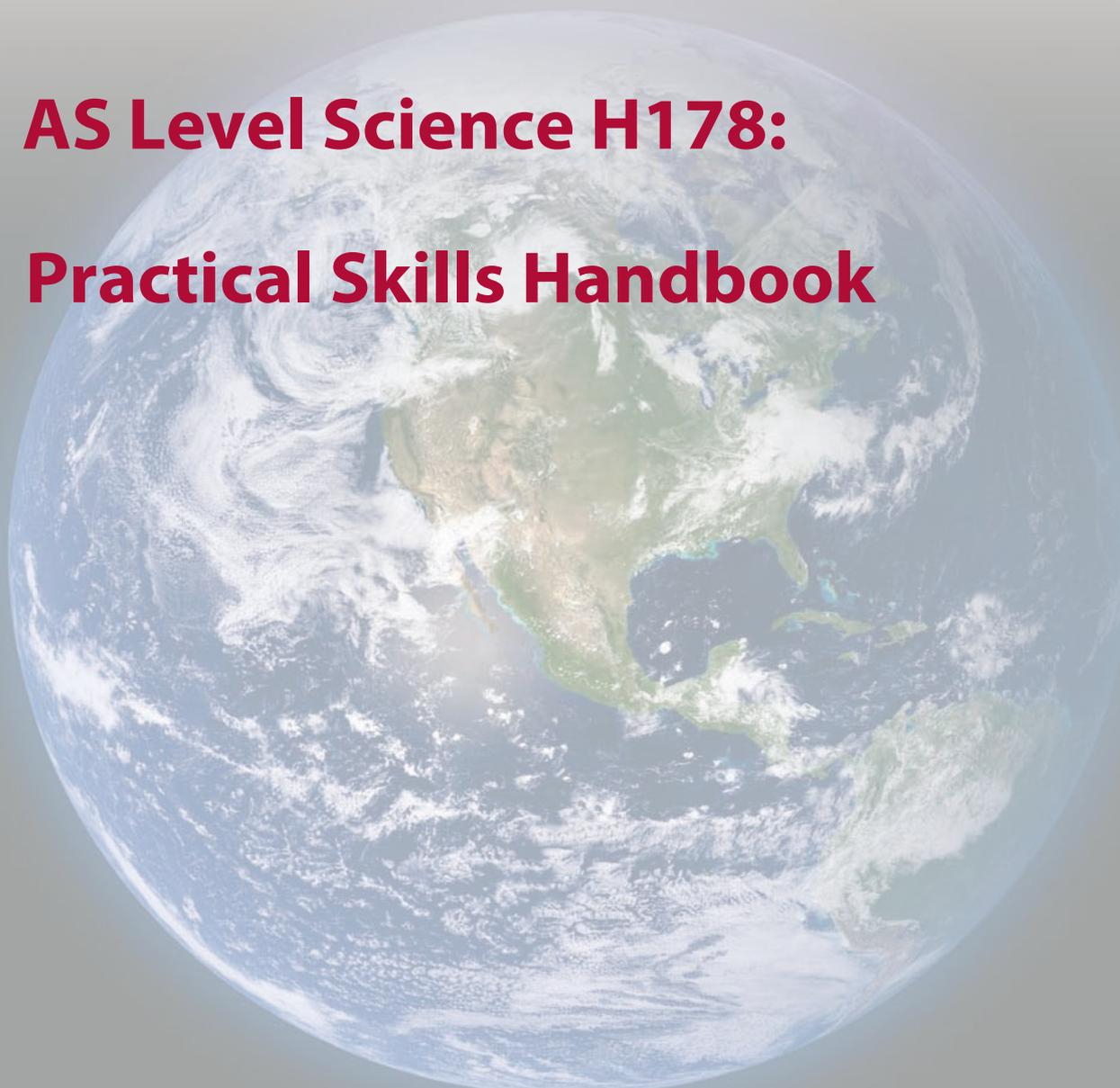


14-19 CHANGES  
A LEVEL

# *Support Materials*

## **AS Level Science H178:**

## **Practical Skills Handbook**



**Version 1.3**

**AS Level Science**



## Practical Skills Handbook

### GCE Science

OCR Advanced Subsidiary GCE in Science H178

This Practical Skills Handbook is designed to accompany the OCR Advanced Subsidiary GCE specification in Science for teaching from September 2008.

***OCR will update this document on a regular basis. Please check the OCR website ([www.ocr.org.uk](http://www.ocr.org.uk)) at the start of the academic year to ensure that you are using the latest version***

#### **Version 1.3**

The only changes made between version 1.1 and 1.2 were the incorporation of updated screenshots on pp. 9 and 10, the inclusion of an Interchange Help Sheet and the removal of FAQs, these are now available as a separate document.

The only change since version 1.2 is an update to the Health & Safety information in Section 7. No other changes have been made.

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# 1 Introduction

The new GCE AS specification in Science has been introduced for teaching from September 2008. The new specification is set out as units, subdivided into teaching modules. Each teaching unit is assessed by its associated unit of assessment. Guidance notes are provided within specifications to assist teachers in understanding the requirements of each unit.

This Handbook plays a secondary role to the Specification itself. The specification is the document on which assessment is based and this Handbook is intended to elaborate on the content of the specification to clarify how skills are assessed and what practical experience is necessary to support an assessment. The Practical Skills Handbook should therefore be read in conjunction with the Specification.

During their study of Science, candidates are expected to acquire experience of planning, carrying-out, interpreting, analysing and evaluating experiments and it is important to recognise that these aspects of practical work require both teaching and continuing practice. Experience has shown that evaluating experiments and suggesting improvements to the procedures employed is a difficult skill for candidates to master.

Planning skills will **not** be directly examined as part of the Centre-based assessment but may be tested within the theory papers. Other skills will be internally assessed by the centre using the scheme shown on the next page.

## 2 The assessment model

### Summary of the model

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Practical and investigative skills developed within contexts encountered during Advanced Subsidiary GCE Science (for Unit G643) are assessed by means of two types of task (Case Study and Practical) at each level.

Thus, candidates are required to carry out **two** tasks at AS:

1. Case Study [15 marks]
2. Practical task [25 marks]

Tasks will be chosen from a selection provided by OCR *via* the secure Interchange website. Initially, a choice of three Tasks will be offered for each type. All Tasks will be refreshed or replaced each year and additional tasks may be made available. They will be available until 15 May in each year. Tasks for the following year will be available from early June.

The Case Study will enable candidates the opportunity to research further an area of the specification and to use their research to produce a written report under controlled conditions.

**Candidates carry out all of their assessed tasks under direct teacher supervision.**

Each task is internally assessed using a mark scheme provided by OCR *via* the Interchange website.

**Candidates may attempt more than one task from each task type with the best mark from each type being used to make up the overall mark. A candidate is only permitted one attempt at each task.**

For each candidate, centres will supply OCR with a single mark out of 40. Each practical skills unit is teacher assessed and externally moderated by OCR. Although practical tasks can be used throughout the year, entry for the AS practical skills units is available only in the June session of each year.

The mark schemes supplied by OCR will be based on the following criteria:

	Assessable learning outcomes
<b>1. Case Study</b>	Candidates should be able to:
Candidates will be required to use secondary and/or primary sources to investigate a specific area of scientific research or study. They will then produce a short report. This report will require candidates to:	(a) Select and use suitable sources of information and data (including appropriate referencing techniques);
<ul style="list-style-type: none"><li>• demonstrate understanding of the science underlying the study;</li></ul>	(b) Demonstrate understanding of the ethical, safe and skilful techniques and processes used by other scientists;
	(c) Explain and evaluate the results of the work of other scientists.

- 
- demonstrate understanding of the practical tasks used by the scientists involved in the research. Including any ethical issues;
  - process, analyse or explain the data in a way which allows them to identify the main conclusions, patterns or trends in the research of these scientists;
  - consider the reliability and validity of the data
  - demonstrate that they have used a variety of sources.

Tasks will be provided by OCR, including stimulus material and mark schemes.

Each task will be teacher-marked and a single mark of 15 submitted..

Reading research and preliminary discussion may be carried out in any appropriate way (see FAQ).

However, the final report must be produced under controlled conditions in the classroom or laboratory.

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## 2. Practical Task

Candidates carry out a practical task using instructions supplied by OCR. Candidates carry out an analysis of the data obtained and an evaluation of their procedure.

Tasks and specific mark schemes (based on the adjacent generic criteria) will be provided by OCR.

Each task will be teacher marked.

A single mark out of 25 will be submitted.

Candidates should be able to:

- (a) demonstrate skilful and safe practical techniques, to include
    - appreciation of the nature of hazards in scientific work and take appropriate precautions.
  - (b) make and record observations with appropriate precision and accuracy to include:
    - make and record measurements to an appropriate degree of accuracy and precision:
    - organise and communicate results in a suitable way
  - (c) analyse and interpret results to reach valid conclusions.
  - (d) evaluate the methodology used in experimental work, to include:
    - assessing the reliability and accuracy of experimental results;
    - identify weaknesses in an experimental method;
    - select simple improvements to experimental procedures
-

The assessment of practical skills will include the following qualities which will need to be developed before candidates carry out the practical tasks.

	<b>Quality A1</b>	<b>Quality A2</b>
<b>Strand A</b>	Demonstrate skilful and safe practical techniques using suitable qualitative methods.	Demonstrate skilful and safe practical techniques using suitable quantitative methods.

	<b>Quality B1</b>	<b>Quality B2</b>
<b>Strand B</b>	Make and record valid observations; organise results suitably.	Make and record accurate measurements to an appropriate precision.

	<b>Quality C1</b>	<b>Quality C2</b>
<b>Strand C</b>	Recognise and interpret data, identify anomalies and reach valid conclusions.	Analyse, interpret and evaluate experimentally derived results quantitatively to reach valid conclusions.
	<b>Quality C3</b>	<b>Quality C4</b>
	Assess the reliability and accuracy of an experimental task; Identify significant weaknesses in experimental procedures and measurements.	Understand and select simple improvements to the experimental procedures and measurements.

The qualities assessed by each task type, Case Study and Practical Task, are shown below.

#### G643: AS Task Types

Task type	Quality								Assessment outcome			Total
	A1	A2	B1	B2	C1	C2	C3	C4	AO1	AO2	AO3	
<b>Case Study</b>			✓		✓	✓	✓		4	4	7	15
<b>Practical Task</b>	✓	✓	✓	✓	✓	✓	✓	✓	5	10	10	25
<b>TOTAL</b>												<b>40</b>

## Downloading Practical Skills tasks

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Tasks, Mark Schemes, and Instructions for Teachers and Technicians are provided to centres (as separate PDF files combined into one zip file) via OCR's secure website, Interchange (<https://interchange.ocr.org.uk>).

Copies of the Practical Skills Handbook and coursework forms are also available via Interchange and via OCR's public website ([www.ocr.org.uk](http://www.ocr.org.uk)).

**(PDF files require the use of adobe acrobat reader. Free copies of acrobat reader are available from <http://www.adobe.com/uk/products/acrobat>; If you use Windows 95, 98, ME, or NT, a zip program such as WinZip or PKZip can be used to extract the files. Windows XP has a built-in zip extractor.)**

### How to use OCR Interchange

OCR Interchange is a secure extranet enabling registered users to administer qualifications on-line. 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.

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 GCE Science pages and download documents when you need them.

The website address for Interchange is:

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

The teacher who has downloaded these materials is responsible for ensuring that they are stored securely so that candidates do not have the opportunity to access them. A record should be kept of the dates on which materials are downloaded.

Distribution of the Practical Tasks is limited to those candidates who are currently undertaking that Task. Task sheets should be photocopied and issued to candidates at the start of the Task. They must be counted out and in; numbering the documents may help to keep track of them. All unused Tasks and candidates' scripts must be collected after the assessment and stored securely or destroyed.

**Candidates must not take Tasks out of the room where assessments are taking place.**

**Under no circumstances can candidates be allowed to see the mark schemes.**

Science Materials pages are arranged according to qualification level and subject (see below).

The screenshot shows the OCR Interchange website interface. At the top, the OCR logo and 'interchange' text are visible, along with a user login status 'You are logged in as: [username]'. Below the header, there is a navigation menu on the left with sections 'By task' and 'By qualification'. The main content area is titled 'Science coordinator materials' and lists several subjects: Biology, Chemistry A, Chemistry B (Salters), Geology, Human Biology, and Physics A. Each subject has a 'More detail' link. Annotations with arrows point to specific elements: 'Qualification level' points to the list of levels (Entry Level, GCSE Gateway, GCE AS/A2); 'General GCE information' points to the text about confidentiality and assessment; and 'Subject (click to view)' points to the 'Geology' link.

The user simply clicks on the relevant link to access the relevant subject material. Any important notices are shown at the top of the page along with useful supporting materials (e.g. the specification, the Practical Skills Handbook, forms) and a 'Getting started' file (which includes an Abstract and title for each assessment task for the current assessment year). Tasks are arranged according to level and type (Qualitative, Quantitative and Evaluative, see below). Hovering the mouse pointer over a Task or document link generates a summary of the file.

Simply clicking on the Task link allows you to download the zipped material to your desktop. The zip file contains everything you need to complete the task (instructions, task and mark scheme). All files have a unique name so there is no danger of overwriting material on your computer.

→ Admin

**By qualification**

- GCE, GCSE, Principal Learning...
- OCR Nationals
- Functional Skills
- Skills for Life
- NVQ

## Chemistry A

Less detail ▲

### Notices

- ⓘ **Note to teachers/technicians** – Remember to trial experiments before candidates undertake them. For Quantitative Tasks it is vital that centre results are recorded and are then submitted with the sample for moderation
- ⓘ All Mark Schemes along with a revised Practical Skills Handbook (incorporating updated FAQs) will be published from 1 September 2009. A revised *Data Sheet for Chemistry A* (data unchanged but presentation of NMR data improved) was published on 1 June 2009
- ⓘ Note that there is not a coursework summary sheet/coursework cover sheet for GCE Chemistry A. Please remember to group the candidate's three best Tasks together loosely (e.g. with a treasury tag) when submitting work to the Moderator
- ⓘ **Note** All Tasks for assessment between 1 June 2008 and 14 May 2009 have been removed. Instructions and Mark Schemes remain confidential assessment material for the lifetime issued in subsequent years. Archive Mark Schemes are available to facilitate checking if they will be removed on **30 September 2009**. Tasks should only be marked using the specific assessment period (e.g. 1 June 2009 to 14 May 2010 Tasks should only be marked using the version published for that period, not any Archive versions)
- ⓘ A Notice to centres was issued for an F323 Specimen Assessment Task in November 2008, see the public [website](#)

**Important notices appear in a box here**

**Additional information regarding registering for e-mail updates**

**Supporting materials for download, e.g. forms, specification, Practical Skills Handbook, Getting Started file**

**E-mail updates**  
To be notified by e-mail when changes are made to these **GCE Chemistry** pages please e-mail [GCESciencetasks@ocr.org.uk](mailto:GCESciencetasks@ocr.org.uk) including your centre number, centre name, a contact name and the subject line **GCE Chemistry A**

**Supporting Materials**

- Getting Started (PDF 58KB)
- Practical Skills Handbook (PDF 700KB)
- Chemistry A Specification (PDF 1.4MB)
- Chemistry A Data Sheet (PDF 155KB)
- Task 1 Spreadsheet (XLS 29KB)
- Centre Authentication Form (CCS160) (ZIP 289KB)
- Coursework Enquiry Form (DOC 116KB)
- Centre Report Form (DOC 117KB)

**Document summary (activated by hovering the mouse pointer over a link)**

**Getting Started**  
Abstracts and titles for all Tasks available for assessment between 1 June 2009 and 14 May 2010. Note that Tasks and Instructions for 1 June 2009 to 14 May 2010 will be published to Interchange from 1 June 2009. Mark Schemes will be published to Interchange from 1 September 2009

**AS**

Qualitative Tasks	Quantitative Tasks	Evaluative Tasks
<a href="#">Task 1</a> (ZIP 410KB)	<a href="#">Task 1</a> (ZIP 926KB)	<a href="#">Task 1</a> (ZIP 884KB)
<a href="#">Task 2</a> (ZIP 324KB)	<a href="#">Task 2</a> (ZIP 722KB)	<a href="#">Task 2</a> (ZIP 675KB)
<a href="#">Task 3</a> (ZIP 750KB)	<a href="#">Task 3</a> (ZIP 254KB)	<a href="#">Task 3</a> (ZIP 289KB)
<a href="#">Archive</a> (ZIP 1MB)	<a href="#">Archive</a> (ZIP 1MB)	<a href="#">Archive</a> (ZIP 1MB)

**A2**

Qualitative Tasks	Quantitative Tasks	Evaluative Tasks
<a href="#">Task 1</a> (ZIP 308KB)	<a href="#">Task 1</a> (ZIP 289KB)	<a href="#">Task 1</a> (ZIP 287KB)
<a href="#">Task 2</a> (ZIP 650KB)	<a href="#">Task 2</a> (ZIP 518KB)	<a href="#">Task 2</a> (ZIP 237KB)
<a href="#">Task 3</a> (ZIP 497KB)	<a href="#">Task 3</a> (ZIP 450KB)	<a href="#">Task 3</a> (ZIP 268KB)

**Zipped Tasks for download**

## E-mail updates

To be notified by e-mail when changes are made to the **GCE Science** page on Interchange please e-mail [GCESciencetasks@ocr.org.uk](mailto:GCESciencetasks@ocr.org.uk) including your centre number, a contact name and the subject line **GCE Science**. It is strongly recommended that all centres register for e-mail updates.

## Registering for Interchange

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

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.

## Administration and regulations

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### Availability of Tasks

Mark schemes, Tasks and Instructions for Teachers and Technicians will be available until **15 May** in each year. Tasks for the following year will be available from early June.

It is intended that Tasks should form part of the normal teaching programme and so may be taken by candidates at any time during the year. Where possible, a Task should be administered immediately after the knowledge; understanding and skills required for the Task have been taught.

Level	Unit & Task	First Tasks on Interchange by	Coursework submission date
AS	G643 Case Study (×3) Practical Task (×3)	June 2008	15 May each year from 2009

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### Security

**It is the responsibility of the centre to ensure that downloaded Tasks, mark schemes, instructions (including any copies made of these documents), and candidates' scripts are stored securely. Any breach in security must be reported to OCR as soon as possible by submitting a written report (a blank report form is available on Interchange) from the Head of Centre to the Subject Officer detailing the circumstances, the candidates concerned and any action taken.**

The instructions for each assessed Task contain information to allow teachers to check the availability of the necessary apparatus and chemicals and for any solutions to be prepared in advance.

Tasks, mark schemes and Instructions can be downloaded at any time as long as they are kept secure. The instructions summarise the information that may be given to candidates regarding assessed Tasks; no information must be given either directly or indirectly to candidates relating to the content of the Tasks or the marking.

Candidates' scripts for all completed Tasks must be stored securely and they should be available for moderation. Centres should retain Tasks securely until such time as they are clear that candidates will not wish to re-submit work to OCR in future sessions. At this point the work should be securely destroyed.

### How to use the Tasks

There are at least three Tasks available of each type: Case Study and Practical Task. These may be used in a variety of ways. For example, candidates may complete all three of the Practical Tasks and the teacher can then submit the best mark. Alternatively, the teacher may use the first Task for formative assessment, the second for submission of marks and keep the third in reserve in case a particular candidate does not perform well on the second Task.

A candidate is not permitted to have more than one attempt at a single Task, or to re-write or change a Task once it has been submitted to the teacher for marking.

### **The experiments**

The experiments used in the Tasks have been trialled. The Instructions provided should ensure that the candidates are able to collect appropriate data in the time available. However, it is vital that the teacher trials the Tasks before they are attempted by the candidates to ensure that:

- appropriate materials and equipment are available;
- the experiment works and generates the expected data.

On some occasions it may be necessary to provide a data set against which candidates' results can be compared. In such cases this requirement will be stated in the Instructions for Teachers and Technicians.

Teachers may make appropriate changes to the materials and apparatus listed in the Instructions where these make provision easier/cheaper and they have no impact on the outcome, or demand, of the experiment. Other changes can be made to, for example, volumes/concentrations/amounts in order to make the experiment work as intended and to ensure that candidates are able to make appropriate observations/measurements. **All such changes may be made without OCR's approval**, but details must be retained and made available to the Moderator when work is submitted.

Details of changes made must be notified to OCR by e-mail to **GCEscientasks@ocr.org.uk**. Remember to include the centre number on all e-mails.

We will acknowledge all e-mails but will only respond in detail where there are concerns over suggested modifications. OCR may update the materials on the Interchange website where this is appropriate. If there are any issues with any of the experiments **that cannot be satisfactorily resolved by the centre**, details should be provided to OCR using the same e-mail address.

### **Centres with more than one teaching group**

It is recognised that some centres are likely to have more than one group with lessons timetabled at different times. In these circumstances, centres are asked to ensure that a particular Task is carried out by all the groups in as short a period as possible.

### **Absence at the time of an assessment**

If a candidate is absent from a centre when an assessment is carried out, the Task may be set at an alternative time provided that the centre is satisfied that security has been maintained by keeping all materials secure.

### **Candidates with access arrangements**

Candidates who are eligible for access arrangements and need additional time for the Case Study may be given up to 25% extra time and their name should be recorded on the Interchange Access Arrangements site. Where other access arrangements are required, applications should be made to OCR at the beginning of the course using the standard forms and procedures in the Joint Council regulations and guidance document. However, it should be remembered that these Tasks are intended to assess practical skills. Credit is given to those skills which the candidate has performed independently. The Disability Discrimination Act lays no duty on awarding bodies to make reasonable adjustments with respect to the application of a competence standard or, in this case, the assessment objective being tested.

## Unexpected circumstances

If an unexpected problem (such as a fire alarm or other circumstance beyond the teacher's control) occurs while an assessed practical Task is taking place, the Task may be resumed subsequently provided the teacher ensures that no candidate is likely to have been advantaged or disadvantaged by doing so.

## Support allowed for candidates

All practical Tasks will be accompanied by appropriate instructions. Teachers may provide additional safety instructions (including written advice) if this is felt to be necessary.

**Candidates will not be permitted to refer to their class notes or to books during the Task except where specifically indicated on the Task cover sheet and Instructions.**

If it becomes necessary for a teacher to provide a candidate with assistance during the course of a practical Task, the work may still be marked alongside the work of other candidates but the Task sheet must be annotated to indicate the assistance given. The teacher should use their professional judgement to award marks appropriately.

## Supervision

All Tasks must be carried out under the direct supervision of the teacher. However, they are not practical examinations and there is no requirement for 'examination conditions' to be imposed. Candidates may need to interact as they collect materials or use particular pieces of apparatus, but the teacher should set up the Tasks so that this interaction is kept to a minimum. The teacher must ensure that candidates do not copy from, or assist, each other so that s/he can with confidence authenticate the work of each candidate.

## Authentication

It is the responsibility of the centre to ensure that the work submitted for assessment is that of the candidate involved.

## Group work

Candidates must work individually to collect their own data. However, where a Task requires the collection of a large data set, instructions may include the pooling of data from a number of candidates and each candidate will then work with the same large data set. It will always be expected that each candidate contributes his/her data to the pool. In some cases candidates may need to share equipment or apparatus and the centre must make arrangements for this to take place without disadvantaging any candidates.

## Time allowed for Tasks

Practical Tasks are not time restricted: most have been designed to be conducted in a single practical session lasting about an hour. However, there may be a number of circumstances in which it is not possible to complete the work in the time available; for example, there may be difficulties with the experiment, a fire alarm or shortage of equipments. In such cases, students' work should be collected in and issued to them again at the start of the next lesson. They must **not** take the work away with them or complete it without supervision.

The writing up of the Case Study should be completed in about 1 hour. Reports should be less than 1000 words.

Some Practical Tasks may require the use of two practical sessions. Where this is the case, the Task may be divided to allow a convenient point at which the experiment can be set aside for

completion in the second session. In such cases the student Task sheets may be provided in two sections.

### **Submission date for work**

Candidates' marks must be despatched to the Moderator and to OCR to arrive by 15 May in the year of the examination.

The following forms (available both from Interchange and [www.ocr.org.uk](http://www.ocr.org.uk)) must be included with the submitted marks:

- Centre authentication sheet (CCS160);
- Details of any changes made to the experiments. (Changes can be marked up on a blank copy of the Task or Instruction sheet). Please attach a copy of any correspondence with OCR;

The Moderator will ask for a sample of work. If there are ten or fewer candidates at the centre, all work submitted should be sent to the Moderator to arrive by 15 May.

### **Internal standardisation**

A centre **must** set up an internal standardisation procedure to ensure that all teachers at the centre are applying the mark schemes in the same way. This procedure could include double marking of a sample of candidates, or the remarking of work by a senior member of staff.

### **Coursework consultancy**

OCR offers a coursework consultancy service whereby centres can send up to four photocopies of marked work to OCR for commentary by a senior Moderator. If a centre wishes to make use of this service, work should be submitted to OCR no less than 8 weeks before the coursework submission date (15 May). The coursework enquiry forms are available at [www.ocr.org.uk](http://www.ocr.org.uk)

### **Repeating Tasks**

Candidates can only attempt a Task once. However, if they score poorly on a Task they may take another Task from within that Task-type.

## Marking advice for teachers

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The marking schemes provided to centres have been made as explicit and as easy to apply as possible. Teachers should note that the mark schemes are not hierarchical. A measure of professional judgement may sometimes be necessary.

Once the work has been collected in, it must be marked by the teacher as it stands. **Under no circumstances can a candidate be allowed to change or elaborate on an answer.**

Teachers are reminded that it is possible for a candidate to be assessed on another occasion using a different Task and that the best mark achieved for each Task type should be submitted. It is appropriate for the teacher to provide feedback to explain how the work could have been improved although details of the mark scheme must not be directly communicated to the candidate.

Tasks should be marked clearly, in red ink, and in accordance with the Task-specific mark scheme. Annotation can help the Moderator and staff in the centre who are checking the marking as part of internal standardisation.

### **Useful annotations consist of:**

- ticks and crosses against responses to show where marks have been earned or not earned;
- specific words or phrases to confirm why a mark has been earned or indicate why a mark has not been earned (e.g. indicate an omission).

Where a candidate has given an answer not covered by the mark scheme, the teacher should use his/her professional judgement to decide whether the answer is worthy of credit. If it is, then the script should be annotated accordingly and the mark(s) awarded.

# 3 General requirements for AS practical work

Suggested practical activities have been included within the specification at the end of each module. Whilst carrying out these practice experiments during the course is not a requirement, their purpose is to ensure that the skills required for assessment will have been covered. Alternative experiments may be chosen but centres should be careful to consider whether sufficient experience will have been provided for candidates prior to the use of the assessed Tasks.

## Skill development

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There are generic skills which should be developed during the study of AS Science. The sophistication required of students should increase throughout the course, partly as their practical experience grows but also through the extra demands expected by more complex experiments.

### Practical task

The course aims to provide candidates with the opportunity to:

- develop good laboratory technique;
- make and record accurate measurements and observations;
- interpret the results of experiments to form theories or conclusions;
- establish whether data collected from experiments is valid and reliable;
- evaluate experimental technique and scientific method in light of practical experience;
- gain a knowledge of laboratory safety and the safe use of chemicals;
- learn the importance of careful waste chemical disposal and the potentially harmful effects of chemicals on the environment.

In teaching, teachers should focus on the key areas above whilst developing the candidates' skills through a coherent practical programme.

In carrying out Practical Tasks, candidates should acquire the skills list below.

Candidates should be able to:

- identify any hazards in the chemicals and apparatus to be used or made, noting down appropriate control measures (e.g. fume cupboard, eye protection, protective gloves, extinguishing naked flames);
- handle safely flammable, corrosive, toxic and harmful materials, including solids, liquids and gases;
- use appropriate techniques, reagents and apparatus to complete suitable activities;
- manipulate standard laboratory apparatus safely and with confidence to produce accurate data;
- record all suitable observations and data in an appropriate format and to an appropriate degree of accuracy, taking into consideration the apparatus used;
- use and record the correct units for all measurements taken;

- provide simple conclusions based on the observations made.
- carry out quantitative experiments with appropriate care and precision;
- make and record measurements reliably and accurately;
- perform calculations, based on their practical work;
- use units accurately;
- use appropriate numbers of significant figures consistent with their least accurate measurement;
- construct and interpret appropriate graphs from data collected or provided;
- reach a valid conclusion based upon the data obtained from experiments.
- recognise anomalous results on the basis of measurements taken or provided;
- identify the limitations of accuracy in experimental procedures;
- recognise that some errors may be inherent in the apparatus used;
- calculate percentage errors involved in measurements
- evaluate both the procedural and measurement errors associated with a particular experiment and comment on the most significant errors;
- suggest sensible improvements to experimental procedures and the taking of measurements based on their laboratory experience.

### **Case Study**

In carrying out Case Study, candidates should acquire the skills list below.

Candidates should be able to:

- research a variety of suitable secondary sources (e.g. books, Internet etc);
- reference sources used with sufficient detail that they could be checked;
- select and use appropriate material from sources;
- explain the underlying science used by other scientists including ethical issues;
- process and analyse data;
- identify trends and main conclusions in the research of other scientists;
- consider the reliability and validity of the data.

## 4 Practical work for AS Unit G641

This section provides a summary of the practical experience and skills that will be acquired by the use of the experiments suggested in the modules or by the use of equivalent Tasks devised by the centre.

This section provides a summary of the practical experience and skills that will be acquired by the use of the experiments suggested in the modules or by the use of equivalent Tasks devised by the centre. **The practical tasks set may be from this list but other tasks related to the specification may be used.**

### G641 Remote Sensing and the Natural Environment

- Use ripple tanks to investigate wave phenomena.
- Carry out experiments using infrared sensors to show the effect of vegetation and wet soil on near infrared.
- The use of temperature probes to investigate the reflectance and absorbance of thermal infrared from different surfaces.
- Use of Elodea to measure the rate of photosynthesis in varying conditions of light or temperature.
- Investigation of effects of temperature, dissolved oxygen and chemical environment on water movement in a rooted cut stem, and hence on the role of respiration.
- Investigation of plant growth with and without added nutrients.
- Exploration of methods of detecting nutrient traces in water and soil.
- Use measurements and extrapolation techniques to estimate biomass levels in different ecosystems.

# 5 Practical work for AS Unit G642

This section provides a summary of the practical experience and skills that will be acquired by the use of the experiments suggested in the modules or by the use of equivalent Tasks devised by the centre.

## G642 Science and Human Activity

- Measurement of the specific heat capacity of water.
- Measurement of the heat of vaporisation of water.
- Experiments to find the relationships between pressure and volume (Boyle's law) and pressure and temperature (Charles' law).
- Observation of the deflection of jets of liquids in electric fields to illustrate the presence of molecular dipoles.
- Carry out some simple redox reactions.
- Carry out acid-base titrations.
- Measure pH values of soil and water.
- Carry out experiments to explore how enzyme activity depends on substrate concentration, temperature and pH.
- Carry out experiments on enzyme specificity (e.g. comparing the metabolism of glucose and sodium hexanoate by yeast)
- Extract DNA from plant material.
- Measure the energy released by burning fuels.
- Demonstrate the properties of emissions.
- Carry out experiments to illustrate the presence of magnetic fields around permanent magnets and current carrying wires.

# 6 Resources

## General resources

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There are many resources available to help teachers provide support to candidates. These include both books and websites.

The OCR website – [www.ocr.org.uk](http://www.ocr.org.uk) – contains marked exemplar material from trials held in a number of centres.

Other useful websites are:

- the Royal Society of Chemistry at [www.rsc.org](http://www.rsc.org)
- the ASE at [www.schoolscience.co.uk](http://www.schoolscience.co.uk)
- Chemguide at [www.chemguide.co.uk](http://www.chemguide.co.uk)
- [www.practicalchemistry.org/](http://www.practicalchemistry.org/)
- [www.practicalchemistry.org/experiments/advanced/acid-base-reactions/topic-index.html](http://www.practicalchemistry.org/experiments/advanced/acid-base-reactions/topic-index.html)
- [www.creative-chemistry.org.uk/alevel/](http://www.creative-chemistry.org.uk/alevel/)
- [www.chemistry-videos.org.uk/chem%20clips/home.html](http://www.chemistry-videos.org.uk/chem%20clips/home.html)
- [www.avogadro.co.uk/chemist.htm](http://www.avogadro.co.uk/chemist.htm)
- [www.chem.iastate.edu/group/Greenbowe/sections/projectfolder/flashfiles/redoxNaw/redox.html](http://www.chem.iastate.edu/group/Greenbowe/sections/projectfolder/flashfiles/redoxNaw/redox.html)
- <http://www.biozone.co.uk>
- <http://saps1.plantsci.cam.ac.uk>
- <http://www.ncbe.reading.ac.uk>
- the Institute of Physics at [www.physics.org](http://www.physics.org)

### INSET

OCR runs INSET courses every year, primarily in the Autumn term, and these include sessions either wholly or partly to support internally assessed Tasks. More details about INSET provision are available at [www.ocr.org.uk](http://www.ocr.org.uk)

### Coursework consultancy

OCR offers a coursework consultancy service whereby centres can send up to four photocopies of marked work to OCR for commentary by a senior Moderator. If a centre wishes to make use of this service, work should be submitted to OCR no less than 8 weeks before the coursework submission date (15 May). The coursework enquiry forms are available at [www.ocr.org.uk](http://www.ocr.org.uk) and on Interchange.

# 7 Health & Safety

Useful information can be found at [www.cleapss.org.uk](http://www.cleapss.org.uk)

Candidates are expected to be familiar with one or both of the chemical hazard labelling systems illustrated below. Chemicals provided for assessment tasks should be labelled with the appropriate hazard symbol or pictogram and should take account of the labelling system that candidates will recognise *and* understand. Labels could also include additional information (eg “use a fume cupboard” or “avoid inhalation”) if the risk assessment supported the view that this information would contribute to the safety of candidates carrying out the activity.

	<b>Oxidising</b>		<b>Toxic</b>
	<b>Highly Flammable</b>		<b>Harmful or Irritant</b>
	<b>Corrosive</b>		

**‘CHIP’ system  
(being phased out)**

	<b>Oxidising</b>		<b>Toxic</b>
	<b>Highly Flammable</b>		<b>Indicates that the chemical could cause serious <i>long term</i> health effects.</b>
	<b>Corrosive</b>		<b>Indicates less serious health hazards (e.g. skin irritants).</b>

**‘CLP’ system  
(being phased in)**

**CLP pictograms are also accompanied by a ‘signal word’ to indicate the severity of the hazard.**

**‘DANGER’ for more severe;  
‘WARNING’ for less severe.**

In UK law, health and safety is the responsibility of the employer. Employees, i.e. teachers, lecturers, and technicians have a duty to cooperate with their employer on health and safety matters. Various regulations, but especially the COSHH Regulations 2002 and the Management of Health and Safety at Work Regulations 1999, require that before any activity involving a hazardous procedure or harmful micro-organisms is carried out, or hazardous chemicals are used or made, the employer must provide a risk assessment. A useful summary of the requirements for risk assessment in school or college science can be found at

<http://www.ase.org.uk/resources/health-and-safety-resources>

For members, the CLEAPSS® guide, *Managing Risk Assessment in Science*\* offers detailed advice. Most education employers have adopted a range of nationally available publications as the basis for their Model Risk Assessments. Those commonly used include:

- *Safety in Science Education*, DfEE, 1996, HMSO, ISBN 0 11 270915 X.

Now out of print but sections are available at

<http://www.ase.org.uk/resources/health-and-safety-resources>;

- *Topics in Safety*, 3rd edition, 2001, ASE ISBN 0 86357 316 9;
- *Safeguards in the School Laboratory*, 11th edition, 2006, ASE ISBN 978 0 86357 408 5;
- CLEAPSS® *Hazcards*, 2007 edition and later updates\*;
- CLEAPSS® *Laboratory Handbook*\*;
- *Hazardous Chemicals*, A Manual for Science Education, 1997, SSERC Limited  
ISBN 0 9531776 0 2.

Where an employer has adopted these or other publications as the basis of their model risk assessments, the teacher or lecturer responsible for overseeing the activity in the school or college then has to review them, to see if there is a need to modify or adapt them in some way to suit the particular conditions of the establishment.

Such adaptations might include a reduced scale of working, deciding that the fume cupboard provision is inadequate or the skills of the candidates are insufficient to attempt particular activities safely. The significant findings of such risk assessment should then be recorded, for example on schemes of work, published teachers' guides, work sheets, etc. There is no specific legal requirement that detailed risk assessment forms should be completed, although a few employers require this.

Where project work or individual investigations, sometimes linked to work-related activities, are included in specifications this may well lead to the use of novel procedures, chemicals or microorganisms, which are not covered by the employer's model risk assessments. The employer should have given guidance on how to proceed in such cases. Often, for members, it will involve contacting CLEAPSS® (or, in Scotland, SSERC).

\*These, and other CLEAPSS® publications, are on the CLEAPSS website. Note that CLEAPSS® publications are only available to members. For more information about CLEAPSS - go to [www.cleapss.org.uk](http://www.cleapss.org.uk). In Scotland, SSERC ([www.sserc.org.uk](http://www.sserc.org.uk)) has a similar role to CLEAPSS®.

# 8 Interchange Help Sheet

## Questions and answers

### Where can I get the Practical Skills Assessment Tasks?

The live Tasks must be downloaded from Interchange, OCR's secure web portal. Printed copies will not be sent to Centres. Do not confuse the live assessment Tasks on Interchange with the Specimen Assessment Materials (SAMs) on the public OCR website – the SAMs must not be used for live assessment.

### What is the web address for Interchange?

<https://interchange.ocr.org.uk> (Note: do not add 'www.' before the word 'interchange'.)

### How do I obtain a username and password to log in to Interchange?

If your Centre is not already registered to use Interchange, your Examinations Officer will need to follow the information about how to register given in the Appendices of the GCE specifications and in the subject specific Practical Skills Handbook. Once registered, your Examinations Officer (or whoever holds the role of 'Centre Administrator') must either set you up as a new user with the role of 'Science Coordinator' to allow you to download the Tasks, or (less preferably) assign the role of 'Science Coordinator' to themselves so that they can download the Tasks and pass them to you.

### How does my Examinations Officer set me up as a new user with the role of 'Science Coordinator'?

Your Examinations Officer (or whoever holds the role of 'Centre Administrator') should follow these steps in Interchange:

1. Hover the mouse cursor over 'Admin' in the left-hand menu, and then select 'Manage centre users' from the pop-up menu that appears. A list of all current users at your Centre will be loaded.
2. Click the 'Add New User' link (above the list of current users).
3. Enter user details.
4. Select the 'Roles' tab.
5. Select the role of 'Science Co-ordinator' on the left-hand side of the screen.
6. Click the '>' button. The 'Science Co-ordinator' role moves across to the right-hand side of the screen.
7. Click the 'User' tab.
8. Click 'Add'.

You will receive notification on screen of whether the 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 approximately 20 minutes for the new user to be able to access Interchange.*

### **After logging in to Interchange, where can I find the Tasks?**

Hover the mouse cursor over 'Coursework and tests' in the left-hand menu, and then select 'Science co-ordinator materials' from the pop-up menu that appears. Near the top of the new page that opens click the 'GCE AS/A2' link. Finally, select the appropriate specification name.

### **I don't have the 'Coursework and tests' and/or 'Science co-ordinator materials' options in the left-hand menu...**

You need to be given the role of 'Science Co-ordinator'. Your Examinations Officer (or whoever holds the role of 'Centre Administrator') must assign the role of 'Science Co-ordinator' to you, as follows: step 1 above, click on the relevant username, steps 4 – 7 above, then click 'Update'.

### **When I click on the specification name nothing happens / I get an error message / I get a warning about blocked content...**

When you click on a subject heading (or click on the 'More detail...' link to the right of the heading), the rest of the page should slide down to reveal the Tasks and other materials available to download for the specification you selected. This works using Javascript, so your browser may alert you to 'active content' or 'blocked content'. Please ensure that you select the appropriate option to allow all content to run. In Internet Explorer, the alert may appear as a pale yellow bar at the top of the page; you will need to click on the pale yellow bar and select 'Allow blocked content'.

Check also that Javascript is enabled in your browser. In Internet Explorer, go to the 'Tools' menu and select 'Internet Options'; select the 'Advanced' tab on the far right; scroll down the list of check boxes to the coffee cup icon next to the heading 'Java (Sun)'; ensure that the 'Use Java for <applet>' check box (or similar) is ticked; click the 'OK' button; close Internet Explorer and then re-open it and log back in to Interchange. You should only ever have to do this once, unless you move to a different computer.

### **How do I download the Task 'zip' files?**

Click on the Task that you want to download. If you are prompted whether to 'Open' or 'Save' the file, select 'Save'. You will be prompted for a location to which to save the file - select an appropriate location on your hard drive or USB stick. It is your responsibility to keep the Tasks strictly confidential after download, so choose a location that only you have access to.

Remember that Tasks can only be used for assessment in the period stated on the Task cover (e.g. between 1 June 2009 and 14 May 2010). For future sessions, new Tasks need to be downloaded from Interchange.

### **What is a 'zip' file? / How to I get the Tasks from the 'zip' file?**

The 'zip' file for each Task is a single file that has several PDF documents compressed inside it, namely the candidates' Task sheet, the Instructions for Teachers and Technicians and the Mark Scheme, together with any additional files pertinent to the Task. You will need to extract the compressed PDF files before you can use them.

In Windows XP and Windows Vista you can look inside the 'zip' file by double-clicking it, or by right-clicking it and selecting 'Explore'; once inside the 'zip', click on the 'File' menu, and then select 'Extract all'. If you use an older version of Windows (e.g. 95, 98, 2000, ME, or NT) you will need to download and use third-party 'zip' extractor software such as WinZip or PKZip to extract the files.

Mac OS X version 10.3 ('Panther') and later releases have built-in support for 'zip' files. If you are using an older release, or if you experience difficulty extracting the PDF documents from the 'zip' file, try downloading and using third-party 'zip' extractor software such as StuffIt Expander to extract the files.

**I get an error message saying that the 'zip' file is corrupt...**

OCR has tested the files to ensure that they can all be downloaded successfully. If you are having problems with one of the files you have downloaded, delete the file and download it again or try downloading it on a different computer. Also check with your IT administrator to ensure that a virus scanner or firewall on your Centre's network is not disrupting the file.

**Some of the Tasks / Mark Schemes are missing...**

Tasks for all GCE science specifications will be uploaded from 1st June each year. The previous year's Tasks will have been taken down during May, and must not be used for assessment in the current session. If all of the Tasks are not available the first time you log in, check back in subsequent weeks for the latest additions, or register for e-mail updates to be alerted when new Tasks are uploaded (see below). Mark Schemes for all of the Tasks will be uploaded from 1st September each year.

**Do I have to keep logging in to Interchange to check for updates?**

No. Just above the Tasks for each specification is a notice about 'e-mail updates'. To be notified by e-mail when changes are made to the Task pages, send an e-mail to [GCEsciencetasks@ocr.org.uk](mailto:GCEsciencetasks@ocr.org.uk) including your name, Centre number and Centre name, and state the name of the specification(s) for which you wish to receive updates in the subject line.

**Is there a way to see titles/summaries the Tasks without downloading them all?**

The document called 'Getting Started' in the 'Support Materials' box on each specification page gives titles and summaries for all Tasks that are available for assessment in the current session. Click the 'Getting Started' link to download the document.

**1**

<https://interchange.ocr.org.uk>  
(Do not add "www." before "interchange!")

Welcome

You can use Interchange to securely access candidate information and online services for all OCR specifications. 24 hours a day.

Enter Centre number, username and password

Click 'Login'

New User

**2**

Welcome to Interchange

Hover mouse cursor over 'Coursework and tests'

**3**

Welcome to Interchange

Click 'Science co-ordinator materials'

**4**

Click 'GCE AS/A2'

**5**

Science co-ordinator materials

Click specification name or click 'More detail'

**6**

Sign up to receive email updates whenever Tasks are uploaded or updated

'Getting Started' document gives titles and summaries of all Tasks for easy reference. Click to download it

Available Tasks appear here

Hover over a Task and a pop-up box will show the title of the Task. Click a Task to download it