# AS/A Level GCE

# Practical Skills Handbook

## GCE Chemistry B (Salters)

OCR Advanced Subsidiary GCE in Chemistry H035

OCR Advanced GCE in Chemistry H435

This Practical Skills Handbook is designed to accompany the OCR Advanced Subsidiary GCE and Advanced GCE specifications in Chemistry B (Salters) for teaching from September 2008.

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

**Version 1.7**
The only changes made between version 1.1 and 1.2 were the incorporation of updated screenshots on pp. 11 and 12, the inclusion of an Interchange Help Sheet and the removal of FAQs for F333, these are available as a separate document.

The only changes made between version 1.2 and 1.3 were the updating of the mark descriptors for F336 and the addition of a FAQ on page 47.

The only change made between version 1.3 and 1.4 was the deletion of duplicate information from Section 5.

The only change made between version 1.4 and 1.5 is an update to the Health and Safety information in Section 8. No other changes have been made.

The only change made between version 1.5 and 1.6 is an update to the date of mark scheme release.

The only changes made between version 1.6 and 1.7 are
- Clarification that mark scheme release date is 1 December of each year.
- Removal of extraneous content in mark descriptor for F336 Skill H, 1 mark.
- Removal of reference to INSET materials.
- Update to CLEAPSS website URL.

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# Contents

# 1 Introduction

The new structure of assessment at Advanced level has been introduced for teaching from September 2008. This Practical Skills Handbook has been written to assist teachers in preparing candidates for and assessing candidates' practical skills. The Handbook should be read in conjunction with 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.

In keeping with its innovative approach to teaching and learning, Chemistry B (Salters) has developed a scheme for the assessment of candidates' practical skills which emphasises the coherent progression from separate practical skills in AS to their application in the context of a whole investigation at A2. At AS level, practical skills are assessed in the context of separate practical exercises and by assessment of the candidate's overall practical performance throughout the AS year. At A2 level, candidates are assessed in the context of a single Individual Investigation in which each candidate pursues his or her own assignment.

While this Handbook is concerned with the assessment of coursework, it cannot be emphasised too strongly that before candidates are assessed on their experimental and investigative skills, these skills must be taught and candidates must have opportunities to practise and to develop their abilities.

The skills are assessed in Unit F333 at AS and in Unit F336 at A2.
Unit F336, *Chemistry Individual Investigation*, also contains synoptic assessment.

Synoptic assessment involves the explicit drawing together of knowledge, understanding and skills learned in different parts of the Advanced GCE course. The emphasis of synoptic assessment is to encourage the development of the understanding of the subject as a discipline.

Synoptic assessment requires candidates to make and use connections within and between different areas of Chemistry at AS and A2 by:

- applying knowledge and understanding of more than one area to a particular situation or context;
- using knowledge and understanding of principles and concepts in planning experimental and investigative work and in the analysis and evaluation of data;
- bringing together scientific knowledge and understanding from different areas of the subject and applying them.

# 2 The Assessment model

## Summary of the model

### AS Unit F333: *Chemistry in Practice*

20% of the total AS GCE marks; 10% of the total Advanced GCE marks.

60 marks

Five skills are assessed by the teacher. One skill requires the wide-ranging assessment of the candidate's ability to work competently in a range of different practical contexts. The other skills are focused on practical tasks set by OCR, completed by the candidates under controlled conditions and marked by teachers (and moderated by OCR) against mark schemes set by OCR.

### A2 Unit F336: *Chemistry Individual Investigation*

15% of the total Advanced GCE marks.

45 marks

Candidates work on a chemical investigation of their choice. The reports will be marked and authenticated by the teacher and moderated by OCR.


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# 3 AS Unit F333 Chemistry in Practice

**Introduction**

This unit assesses candidates' practical skills. Candidates should acquire, practice and develop their skills by undertaking activities which are an integral part of the Chemistry B (Salters) course. Centres may assess candidates at any time after they have acquired the skills required for a particular assessment task. This may often be as a normal part of the Salters course.

Candidates are assessed in **five** skill areas. Teachers assess the ability of candidates to:

- **Skill I (Competence)** – carry out practical work competently and safely using a range of techniques;
- **Skill II (Measurement)** – carry out quantitative experiments accurately and make and record reliable and valid measurements with appropriate accuracy and precision;
- **Skill III (Analysis and evaluation)** – apply chemical knowledge and processes to unfamiliar situations to analyse and evaluate their own quantitative experiments;
- **Skill IV (Observation)** – make and record valid qualitative observations with appropriate accuracy and detail;
- **Skill V (Interpretation)** – recognise, recall and show understanding of chemical knowledge to interpret and explain their own qualitative experiments, with due regard to spelling, punctuation and grammar and correct use of technical terms.

Skill I is assessed over a period of time using a minimum of **six** different practical activities. Its assessment is designed to recognise a candidate's overall practical ability without being onerous either to the candidates or to the teacher.

Skills II, III, IV and V may be assessed in separate tasks or they may be assessed together in **two** linked tasks as follows: Skills II and III; Skills IV and V. These tasks are provided by OCR via the Interchange website.

**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. Mark schemes become available on 1 December of each year.

**Candidates may attempt more than one task from each skill area (II–V) with the best mark from each skill area being used to make up the overall mark. A candidate is only permitted one attempt at each task.**

For each candidate, centres supply OCR with a single mark out of 60.

*(Activity sheets from the course material should not be used for assessment.)*

## Skill I

Candidates carry out a range of practical work over time as a normal and integral part of their study of Chemistry. Opportunities for candidates to meet these requirements are provided several times in the activities devised to accompany the Chemistry B (Salters) course as illustrated by the references to activities in Salters modules below. The practical activities **must** provide opportunities for the candidate to:

- carry out a titration (e.g. **EL1.2**, **ES4.1**, **ES5.1**, **A3.2**);
- make thermochemical measurements (e.g. **DF2.1**, **DF2.2**);
- carry out qualitative experiments using test-tubes (e.g. **EL4.1**, **ES2.2**, **ES4.4**, **ES6.2**, **A9.1**, **PR2.1**);
- carry out an experiment involving ICT (e.g. **EL1.3**, **DF2.2**, **ES4.4**, **A6.2**);
- prepare an organic compound (e.g. **DF4.4**, **ES6.3**, **PR4.3**);
- collaborate with other students in solving a problem (e.g. **ES4.1**, **A3.3**).

Teachers should assess the ability of candidates to carry out practical work competently and safely by direct observation and by matching achievement against the following descriptors:

| Marks | Descriptors |
|---|---|
| **1** | Works safely some of the time.<br>Demonstrates competent manipulative skills only in basic practical procedures (e.g. heating, transferring solids and liquids) and does not resolve problems without help.<br>Demonstrates a haphazard and disorganised approach to practical work, takes little care when making measurements or observations and pays little attention to detail. |
| **2** | |
| **3** | Works safely for much of the time.<br>Demonstrates competent manipulative skills in some of the more demanding practical procedures (e.g. weighing, use of pipette or burette) and resolves some minor problems without help.<br>Demonstrates a reasonable degree of organisation in approach to practical work and makes many measurements and observations carefully and pays attention to some of the detail. |
| **4** | Works safely most of the time.<br>Demonstrates competent manipulative skills in most of the more demanding practical procedures (e.g. weighing, use of pipette or burette) and resolves most minor problems without help.<br>Demonstrates a good degree of organisation in approach to practical work and makes most measurements and observations carefully and pays attention to much of the detail. |
| **5** | |
| **6** | Works safely all of the time.<br>Demonstrates well developed manipulative skills in all practical procedures and resolves most problems without help.<br>Demonstrates a highly organised approach to practical work and makes all measurements and observations with great care and attention to detail. |


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The descriptors should be applied in a 'best fit' manner to choose a mark between 0 and 6 which **best** describes the work of the candidate **over the whole range of practical activities** and takes account, if appropriate, of a higher level of achievement in some of the characteristics within the descriptors and a lower level of achievement in other characteristics. A mark of 0 should be awarded if the descriptors are not met in any way.

It is expected that there will be a **broad** match between the mark awarded for skill I and the evidence available from the assessment of skills II and IV and Moderators will check for this match.

Teachers should record notes about candidates' achievement over time on a competence record card. Teachers should use this document to note features of candidates' performance which will help them award an appropriate overall mark at the end of the year. It is not expected that a separate mark will be awarded for each separate experiment. There is also no requirement for teachers to comment on all candidates for a particular experiment or all experiments for a particular candidate. The competence record cards should be included with the sample of candidates' work sent for external moderation. **No other evidence** is required for this skill area.

## Skills II–V

The assessment of skills II, III, IV and V is made using OCR set Tasks and **specific mark schemes provided by OCR (via the Interchange website)**. These Tasks must be carried out **individually under controlled conditions supervised by the teacher**.

Each year there will be available via the OCR Interchange site:

- Three tasks which can be used to assess skills II with three linked tasks to assess skill III;
- Three tasks which can be used to assess skills IV with three linked tasks to assess skill V.

Skills II and III may be assessed using a pair of linked tasks in which the candidate makes, records, analyses and evaluates quantitative measurements.

In assessing skill III, candidates will be provided with the data from OCR rather than using data they have recorded themselves in the assessment of skill II. This is to avoid penalising candidates who may have recorded an incomplete or inaccurate set of data.

Alternatively, the task for skill II may be done without proceeding to the skill III task, or the task for skill III may be done without previously having done the skill II task.

Skills IV and V may be assessed using a pair of linked tasks in which the candidate makes, records, interprets and explains qualitative observations. In assessing skill V, candidates will be provided with the data from OCR rather than using data they have recorded themselves in the assessment of skill IV. This is to avoid penalising candidates who may have recorded an incomplete or inaccurate set of data.

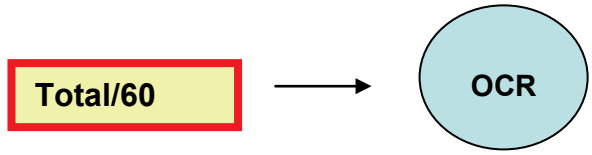
Alternatively, the task for skill IV may be done without proceeding to the skill III task, or the task for skill V may be done without previously having done the skill IV task.

A specific mark scheme is provided for each task by OCR (via the Interchange website) for use by the teacher. This enables a mark out of 12 to be awarded for each Task.

Where a skill is assessed on more than one occasion, only the best mark should be reported. A candidate may take a particular assessment task only once.

**Summary of marks submitted to OCR**

- **Skill I – Competence /12**
- **Skill II – Measurement /12**
- **Skill III – Analysis and evaluation /12**
- **Skill IV – Observation /12**
- **Skill V – Interpretation /12**





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# Downloading Practical Skills tasks

For skills II, III, IV and V, tasks, 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). Mark schemes for the Tasks are provided separately on Interchange from 1 December of each year.

**(PDF files require the use of adobe acrobat reader. Free copies of acrobat reader are available from https://get.adobe.com/uk/reader; 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.)**

Copies of the *Chemistry B (Salters) Data Sheet*, the Practical Skills Handbook and coursework forms are also available via Interchange and via OCR's public website (www.ocr.org.uk).

## 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 Chemistry B (Salters) 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 any pages labelled **confidential** are stored securely so that candidates do not have the opportunity to access them.

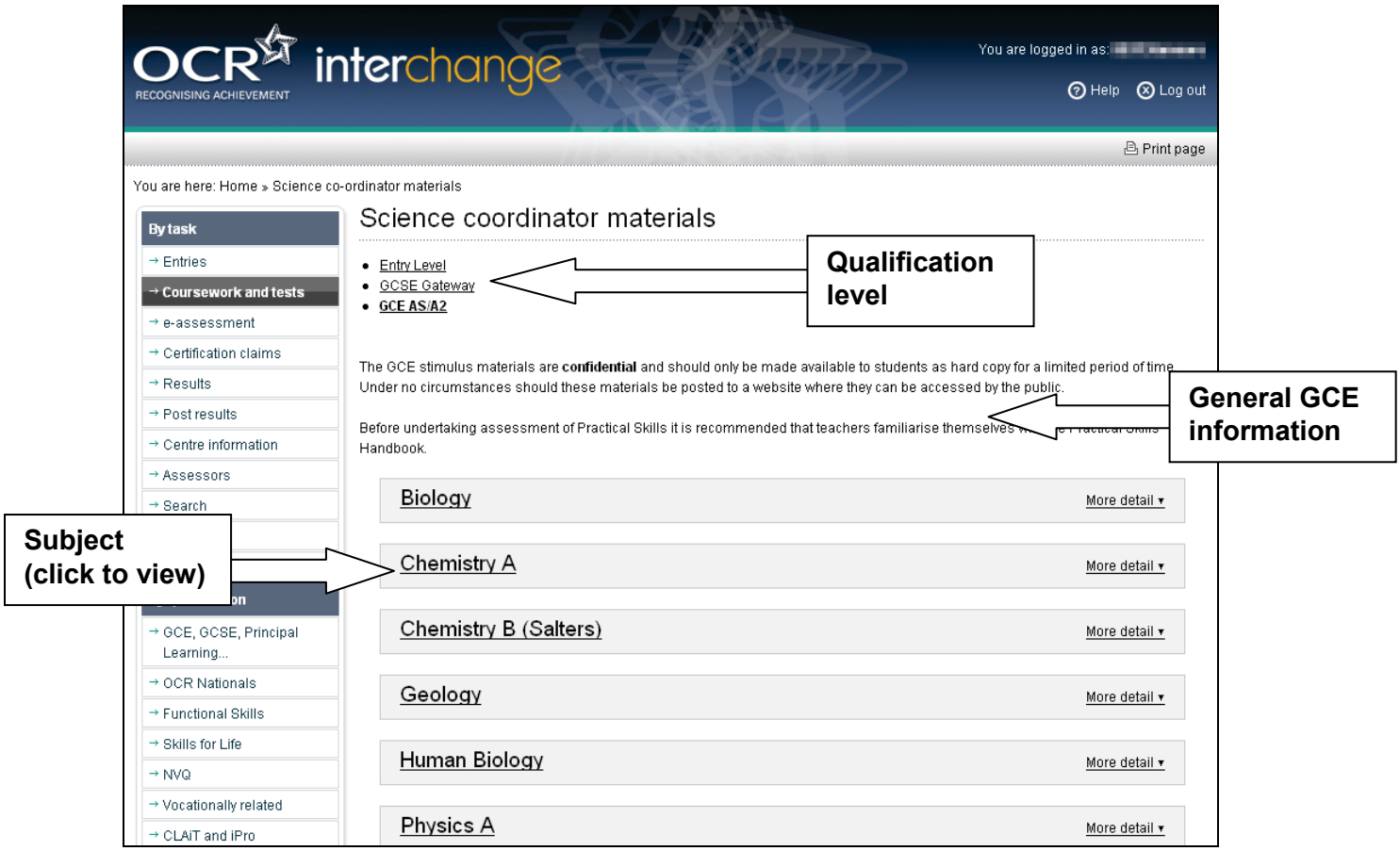
Distribution of the Practical Skills tasks is limited to those candidates who are currently undertaking that Task. Task sheets should be photocopied and issued to candidates at the start of the Task. They must be counted out and in; numbering the documents may help to keep track of them.

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 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 (Skills II and III, Skills IV and V, 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.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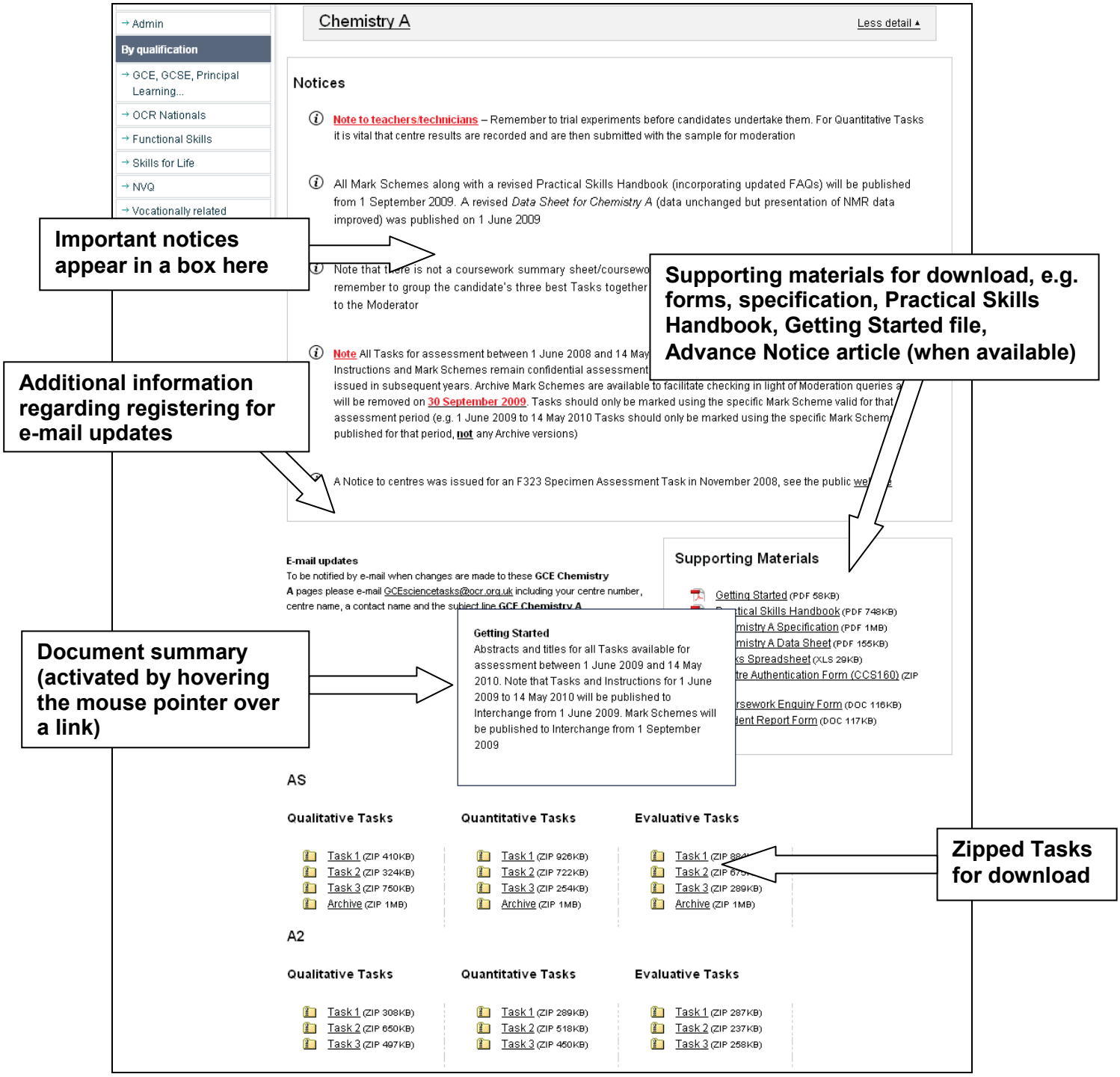


## E-mail updates

To be notified by e-mail when changes are made to the **GCE Chemistry B (Salters)** page on Interchange please e-mail GCEsciencetasks@ocr.org.uk including your centre number, a contact name and the subject line **GCE Chemistry B (Salters)**. 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 Chemistry B (Salters) 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

## Availability of Tasks

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. Mark schemes will be released on 1 December each year.

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.

| Unit | Task | First Tasks on Interchange by | Coursework submission date |
|---|---|---|---|
| F333 | Skill II (×3)<br>Skill III (×3)<br>Skill IV (×3)<br>Skill V (×3) | June 2008 | 15 May each year from 2009 |

## 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 (once available) as long as they are kept secure. The instructions summarise the information that may be given to


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candidates regarding assessed Tasks; no other 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 for each skill area (II–V). These may be used in a variety of ways. For example, candidates may complete all three of the skill II Tasks and the teacher can then submit the best mark. Alternatively, the teacher may use the first skill II 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 GCEsciencetasks@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 Skills III and V 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.

### Alternative apparatus for candidates eligible for access arrangements

Advice about specialist equipment that may be suitable for candidates eligible for access arrangements (e.g. talking thermometers, talking scales, notched syringes) can be obtained from the RNIB (www.rnib.org.uk) and other specialist disability organisations. Before using such equipment for an assessed task the awarding body should be contacted to ensure that it does not interfere with the competence standards being assessed.

### 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. Use of the *Chemistry B (Salters) Data Sheet* (available from Interchange and www.ocr.org.uk ) is allowed.**

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.


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## 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.

## 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

Skill II and IV 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 a shortage of equipment. In such cases, candidates' 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.**

Skill III and V Tasks should be completed within 1 hour.

## 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) must be included with the submitted marks:

- For Skill I (Competence) – A competence record card to describe the activities on which the mark for Skill I is based and to record marks in this skill area. The mark awarded out of six is multiplied by two to give a mark out of twelve;
- 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 for skills II, III, IV and V 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 and on Interchange.

### Repeating Tasks

Candidates can only attempt a Task once. However, if they score poorly on a Task they may take another Task for that skill.

## Marking advice for teachers

**Following guidance from our regulator Ofqual, the Mark Schemes for all GCE Practical Tasks will not be released until 1 December of each year.**

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 skill area 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.


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# 4 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 (after December 1st), 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.


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**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 **1 December** each year.

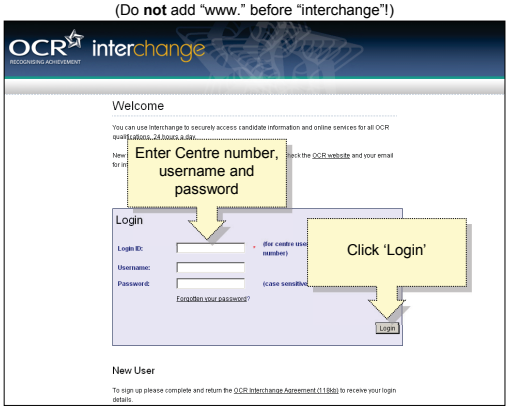
**Do I have to keep logging in to Interchange to check for updates?**
No. Just above the Tasks for each specification is a notice about 'e-mail updates'. To be notified by e-mail when changes are made to the Task pages, send an e-mail to GCEsciencetasks@ocr.org.uk including your name, Centre number and 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"!)

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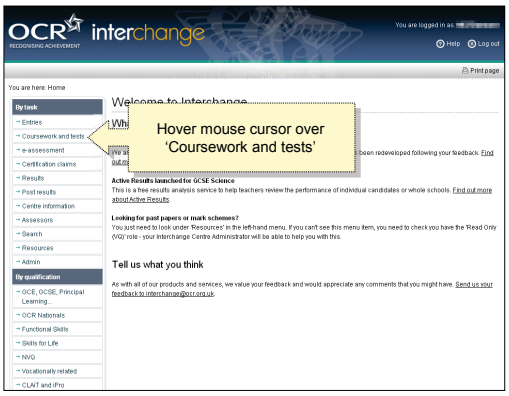


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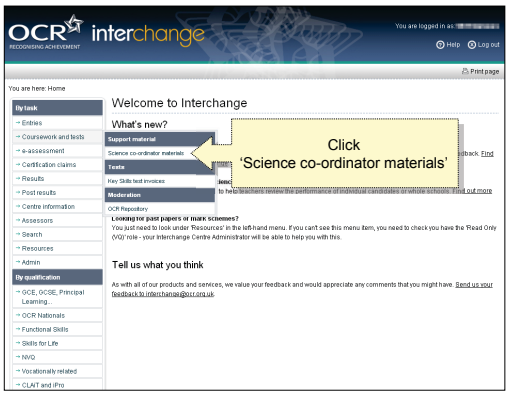


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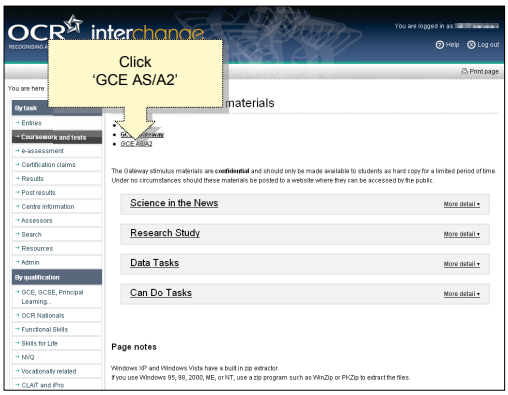


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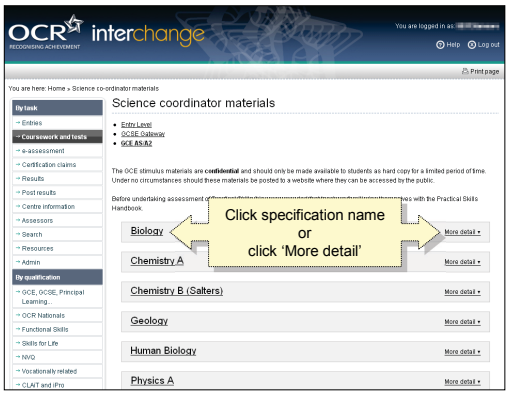


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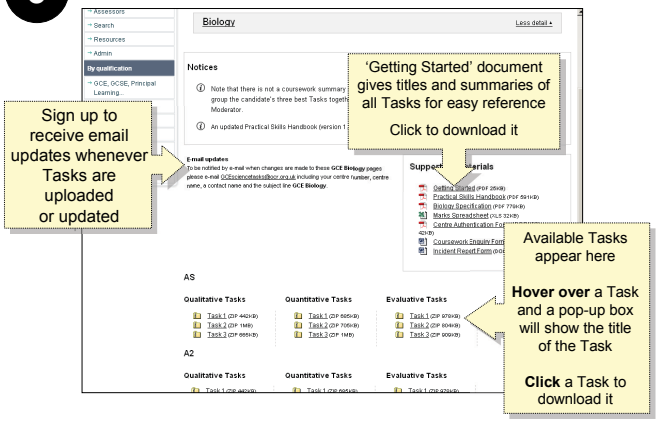




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# 5 A2 Unit F336 Chemistry Individual Investigation

**Introduction**

This unit is teacher assessed and externally moderated by OCR.

Candidates carry out a single individual investigation. The investigation should be carried out in laboratories at the centre and be supervised by the teacher.

The topic for the investigation may be taken from any aspect of chemistry. Candidates are expected to spend **about 18 hours** in the laboratory carrying out practical work as part of their investigation, and an **appropriate amount of time both before and after** this period preparing for and using the results of their investigation.

Candidates are assessed in **eight** skill areas (A–H). Teachers assess the ability of candidates to:

- **Skill Area A (Chemical ideas)** – apply scientific knowledge and processes to unfamiliar situations (6 marks);
- **Skill Area B (Methods)** – select and describe appropriate qualitative and quantitative methods (6 marks);
- **Skill Area C (Communication)** – select, organise and communicate relevant information with due regard to spelling, punctuation and grammar and the accurate use of specialist vocabulary (5 marks);
- **Skill Area D (Observations and measurements)** – make, record and communicate reliable and valid observations and measurements with appropriate precision and accuracy (6 marks);
- **Skill Area E (Analysis and interpretation)** – analyse and interpret the results of investigative activities (6 marks);
- **Skill Area F (Evaluation)** – explain and evaluate the methodology and results of investigative activities (6 marks);
- **Skill Area G (Manipulation)** – demonstrate safe and skilful practical techniques and processes (5 marks);
- **Skill Area H (Demand)** – develop and apply familiar and new chemical knowledge and processes in demanding situations (5 marks).

The marks for the eight skill areas are added together to provide a mark out of 45 for this unit which is submitted to OCR.

**Authentication and marking of candidates' work**

Candidates must complete and hand in their investigation report in **three separate sections**. Teachers must verify that, to the best of their knowledge, **each section is the work of the candidate concerned.**

**Section 1 of the investigation report (teacher marks skills A–C)**

Candidates must complete and hand in a first draft of section 1 of their investigation report **before they begin** any practical work. **This draft should be authenticated by the teacher** and returned to the candidate so that it can be revisited and modified as the investigation proceeds.

The final draft of this section should be taken in by the teacher for final marking as soon as practical work has been completed. In this section candidates should:

- identify and describe the aims of the investigation;
- describe the chemical knowledge which they have researched in order to help them devise their plan;
- describe the equipment, materials and experimental procedures they use to achieve the investigation aims;
- include a risk assessment;
- include a list of references to sources they have consulted to help them devise their plan.

In all of these, candidates should be careful to use technical terms correctly and pay careful attention to spelling, punctuation and grammar.

**Award of marks**

Teachers award marks using generic criteria in three skill areas (A, B and C). In each area the marks are awarded by applying a 'best fit' approach to match the candidate's work against criteria.

**Section 2 of the investigation report (teacher marks skill D)**

Candidates must complete and hand in section 2 of their investigation report as soon as they have completed their practical work. This section should be authenticated by the teacher.

Candidates are expected to retain a copy of this section to allow them to interpret and evaluate the results of their investigation. In this section candidates should:

- Record the observations and measurements made during the investigation, taking care that there are a sufficient number of good quality measurements and/or observations that are presented clearly.

Teachers award marks using generic criteria in one skill area (D). In this area the marks are awarded by applying a 'best fit' approach to match the candidates' work against criteria.

**Section 3 of the investigation report (teacher marks skills E and F)**

Candidates must complete and hand in section 3 of their investigation report after they have been given time to analyse, interpret and evaluate their investigation. **This section should be authenticated by the teacher.** In this section candidates should:

- describe the outcomes of their investigation;
- draw together observations and/or manipulate raw data using calculations and graphs;
- interpret observations and measurements;
- draw conclusions from raw and/or manipulated data and observations using underlying chemical knowledge;


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- comment on the limitations of practical procedures;
- calculate, where appropriate, the experimental uncertainty associated with measurements;
- evaluate the choices of equipment, materials and practical procedures used in the investigation.

Teachers award marks using generic criteria in two skill areas (E and F). In each skill area the marks are awarded by applying a 'best fit' approach to match the candidates' work against the criteria.

**Additional skill areas (G and H)**

In addition to the six skill areas described above, teachers award marks in two further skill areas (G and H) using generic criteria. In both skill areas, marks are awarded by applying a 'best fit' approach to match the candidates' work against the criteria.

Marks for these two skill areas must be awarded soon after the completion of practical work. The practical work undertaken by the candidate must be supervised by the teacher who will assess skill area G. In addition, teachers must keep a record as a working document of their observation of the candidates' ability to carry out practical work safely and skillfully.

The teacher will assess the ability of the candidate to:

- work safely;
- manipulate equipment and materials;
- make observations and take measurements in an organised way.

In skill area H teachers assess the demand of the investigation undertaken by the candidate.

Teachers take account of the demand arising from the candidate:

- using unfamiliar equipment and chemical ideas;
- using experimental procedures in unfamiliar situations;
- using chemical ideas in unfamiliar situations;
- devising innovative experimental procedures;
- solving emerging problems.

**'Best fit' mark schemes**

For each skill shown in the tables that follow, the descriptors should be applied in a '**best fit'** manner to choose a mark between 1 and 5 or 6 (depending on the skill) which **best** describes the work of the candidate and takes account, if appropriate, of a higher level of achievement in some of the characteristics within the descriptors and a lower level of achievement in other characteristics. This should be achieved by selecting the descriptors at each level which provide the best match with different aspects of the candidates' work. A mark of 0 should be awarded if the descriptors are not met in any way.

**Moderation of candidates' work**

Where candidates are assessed by different teachers in a centre, a system of internal moderation must be devised and used to ensure that exactly the same standards are used in the award of marks for all candidates. A recommended method would involve all teachers in the centre marking the work of a selection of candidates at the start of the moderation process to establish the standards to be applied to the work of all candidates. The work of candidates will also be subject to external moderation by OCR. Teachers must supply the following documentation for external moderation purposes:

- a completed F336 mark sheet showing the marks awarded in each skill area for each candidate;
- a working document used by teachers to help award an appropriate mark in skill area G;
- sections 1, 2 and 3 of the candidates' final investigation report on which the award of marks is based for those candidates in the moderation sample;
- centre authentication sheet (CCS160).

*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.*


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## Detailed mark schemes

| Marks | **Descriptors for Skill A (Chemical ideas) (6 marks)** | **Descriptors for Skill B (Methods) (6 marks)** |
|---|---|---|
| | Apply chemical knowledge and processes to unfamiliar situations.<br>(range, depth, accuracy) | Select and describe appropriate qualitative and quantitative methods.<br>(aims, choices, descriptions) |
| 1 | Describes a small range of basic chemical knowledge in support of the investigation.<br>Describes chemical knowledge superficially and includes few details.<br>Makes errors in using chemical knowledge and describes chemical knowledge which is not relevant to the actual investigation undertaken. | Identifies and defines the aims of the investigation in a vague or unclear manner.<br>Selects equipment and materials and devises experimental procedures that are sometimes inappropriate to achieve the aims of the investigation.<br>Describes in limited detail the experimental procedures used. |
| 3 | Describes a wide range of chemical knowledge in support of the investigation.<br>Describes chemical knowledge in some depth and includes many details.<br>Makes a few errors when describing chemical knowledge and describes chemical knowledge which is generally relevant to the actual investigation undertaken. | Identifies and defines the aims of the investigation in a generally precise and clear manner.<br>Selects equipment and materials and devises experimental procedures that are generally appropriate to achieve the aims of the investigation.<br>Describes, including most appropriate detail, experimental procedures used. |
| 6 | Describes a comprehensive range of chemical knowledge in support of the investigation.<br>Describes chemical knowledge in great depth and includes all appropriate details.<br>Describes chemical knowledge without errors and describes chemical knowledge which is fully relevant to the actual investigation undertaken. | Identifies and defines the aims of the investigation in a very precise and clear manner.<br>Selects equipment and materials and devises experimental procedures that are fully appropriate to achieve the aims of the investigation.<br>Describes in fine detail the experimental procedures used. |
| **Intermediate marks should be awarded to provide the best match between a candidate's performance and the descriptors.** | | |

| Marks | **Descriptors for Skill D (Observation and measurements) (6 marks)** | **Descriptors for Skill E (Analysis and interpretation) (6 marks)** | **Descriptors for Skill F (Evaluation) (6 marks)** |
|---|---|---|---|
| | Make, record and communicate reliable and valid observations and measurements with appropriate precision and accuracy.<br>(results: number, range, quality, clarity) | Analyse and interpret the results of investigative activities.<br>(outcomes, calculations, graphs, interpretation of observations, conclusions) | Explain and evaluate the methodology and results of investigative activities.<br>(limitations of procedures, reliability and validity of observations, uncertainty associated with measurements, equipment and procedure choice) |
| 1 | Records significantly fewer observations and/or measurements than are appropriate for the particular investigation undertaken and records a limited range of observations and/or measurements.<br>Records observations that are vague, lack detail or are inappropriate and/or measurements that are imprecise, of poor quality or lack appropriate units.<br>Records observations and/or measurements in a haphazard, unclear or disorganised format which make it difficult to understand them. | Describes the outcomes of the investigation in basic terms only.<br>Makes little effective use of observations to support conclusions and/or makes little progress in calculations or draws poor quality or inappropriate graphs from measurements.<br>Makes little use of underlying chemical knowledge to interpret observations and/or measurements and draws basic or superficial conclusions from recorded observations and/or measurements. | Comments briefly and in simple terms on the limitations of practical procedures.<br>Comments briefly and in simple terms on the reliability and validity of observations and/or includes calculations of the uncertainty associated with measurements that are of limited range or inaccurate.<br>Comments briefly in descriptive rather than evaluative terms on the choices made of materials, equipment and practical procedures used in the investigation. |
| 3 | Records most appropriate observations and/or measurements for the particular investigation undertaken, and records a wider range of observations and/or measurements.<br>Records observations that are often precise, detailed and appropriate and/or measurements that are generally precise, of good quality and include appropriate units.<br>Records observations and/or measurements in a generally clear and organised format which make it possible to understand them with little difficulty. | Describes the outcomes of the investigation in reasonable detail.<br>Makes reasonably effective use of observations to support conclusions and/or generally uses calculations effectively and draws graphs from measurements which are generally of good quality and appropriate.<br>Makes quite good use of underlying chemical knowledge to interpret observations and/or measurements and draws conclusions from recorded observations and/or measurements which are in some detail and depth. | Comments on some of the key limitations of practical procedures.<br>Comments in reasonable detail on the reliability and validity of observations and/or includes calculations of the uncertainty associated with measurements that include a range of different types and are generally accurate.<br>Evaluates in reasonable detail the choices made of materials, equipment and practical procedures used in the investigation. |


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| Marks | Descriptors for Skill D<br>(Observation and measurements)<br>(6 marks) | Descriptors for Skill E<br>(Analysis and interpretation)<br>(6 marks) | Descriptors for Skill F<br>(Evaluation)<br>(6 marks) |
|---|---|---|---|
| | Make, record and communicate reliable and valid observations and measurements with appropriate precision and accuracy.<br>(results: number, range, quality, clarity) | Analyse and interpret the results of investigative activities.<br>(outcomes, calculations, graphs, interpretation of observations, conclusions) | Explain and evaluate the methodology and results of investigative activities.<br>(limitations of procedures, reliability and validity of observations, uncertainty associated with measurements, equipment and procedure choice) |
| 6 | Records all appropriate observations and/or measurements for the particular investigation undertaken and records a wide range of observations and/or measurements to investigate the chosen topic effectively.<br>Records observations that are precise, detailed and appropriate and/or measurements that are precise, of good quality and include appropriate units.<br>Records observations and/or measurements in a clear and organised format which make it easy to understand them. | Describes the outcomes of the investigation in full detail.<br>Makes very effective use of observations to support conclusions and/or uses calculations effectively and draws graphs from measurements which are all of good quality and appropriate.<br>Makes comprehensive and effective use of underlying chemical knowledge to interpret observations and/or measurements and draws conclusions from recorded observations and/or measurements which are in considerable detail and depth. | Comments on all of the expected limitations of practical procedures.<br>Comments in full detail on the reliability and validity of observations and/or includes accurate calculations of the uncertainty associated with all types of measurements recorded.<br>Fully evaluates the choices made of materials, equipment and practical procedures used in the investigation. |
| **Intermediate marks should be awarded to provide the best match between a candidate's performance and the descriptors.** | | | |

| Marks | **Descriptors for Skill C (Communication) (5 marks)** | **Descriptors for Skill G (Manipulation) (5 marks)** | **Descriptors for Skill H (Demand) (5 marks)** |
|---|---|---|---|
| | Select, organise and communicate relevant information.<br>(risk assessment, references, clarity, vocabulary, QWC) | Demonstrates safe and skilful techniques and processes.<br>(safety, manipulative skills, organisation) | Develop and apply familiar and new chemical knowledge and processes in demanding situations.<br>(procedures, chemical ideas, innovation/creativity) |
| 1 | Includes a risk assessment which covers only some of the hazards, contains much material which is not relevant to the investigation undertaken, is superficial and is inaccurate.<br>Includes a list of references which is linked to a narrow range of sources and which lacks detail about the sources.<br>Produces an account which is unclear and is difficult to understand, in which specialist vocabulary is used inappropriately and in which spelling of technical terms is frequently inaccurate. | Does not demonstrate appropriate safety procedures.<br>Demonstrates competent manipulative skills in basic practical procedures only and does not resolve problems without help.<br>Approach to practical work is haphazard and disorganised, takes little care when making observations and/or measurements and pays little attention to detail.<br>Works safely some of the time.<br>Demonstrates competent manipulative skills in basic practical procedures and resolves problems with help.<br>Some aspects of the approach to practical work are organised, takes some care when making observations and/or measurements and pays some attention to detail. | The level of demand in the investigation is low because:<br>Experimental procedures cover activities undertaken as a normal part of the chemistry course;<br>Chemical ideas which have been met before are used in familiar situations;<br>There is some limited evidence of innovation or creativity in devising experimental procedures and/or, if appropriate, in solving emerging problems. |
| 3 | Includes a risk assessment which covers most hazards, contains material which is generally relevant to the investigation undertaken, is in some detail and is generally accurate.<br>Includes a list of references which is linked to a fairly wide range of sources and which includes some detail about the sources.<br>Produces an account which is generally clear and is generally easy to understand, in which specialist vocabulary is used appropriately most of the time, and in which spelling of technical terms is generally accurate. | Works safely most of the time.<br>Demonstrates competent manipulative skills in a wide range of practical procedures and resolves minor problems without help.<br>Demonstrates a reasonable degree of organisation in approach to practical work, makes most observations and/or measurements carefully and pays attention to some of detail most of the time. | The level of demand in the investigation is intermediate because:<br>Experimental procedures extend beyond activities undertaken as a normal part of the chemistry course and are used in new situations;<br>Chemical ideas which have been met before are used in new situations;<br>There is some evidence of innovation or creativity in devising experimental procedures and/or, if appropriate, in solving emerging problems. |


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| Marks | **Descriptors for Skill C (Communication) (5 marks)** | **Descriptors for Skill G (Manipulation) (5 marks)** | **Descriptors for Skill H (Demand) (5 marks)** |
|---|---|---|---|
| | Select, organise and communicate relevant information.<br>(risk assessment, references, clarity, vocabulary, QWC) | Demonstrates safe and skilful techniques and processes.<br>(safety, manipulative skills, organisation) | Develop and apply familiar and new chemical knowledge and processes in demanding situations.<br>(procedures, chemical ideas, innovation/creativity) |
| 5 | Includes a risk assessment which covers all hazards, contains material all of which is relevant to the investigation undertaken, contains full details and is accurate.<br>Includes a list of references which is linked to a comprehensive and appropriate range of sources which includes detail about the sources linked effectively to specific parts of the written account.<br>Produces an account which is very clear and easy to understand, in which specialist vocabulary is used appropriately all of the time and in which spelling of technical terms is accurate. | Works safely all of the time.<br>Demonstrates highly developed manipulative skills in all practical procedures and resolves most problems without help.<br>Demonstrates a highly organised approach to practical work, makes all observations and/or measurements with great care and pays great attention to detail. | The level of demand in the investigation is high because:<br>Experimental procedures used in the investigation have not been previously met or are familiar procedures which are developed and used in new and unfamiliar situations;<br>Chemical ideas used in the investigation have not been previously met or are familiar ideas which are developed and used in new and unfamiliar situations;<br>There is clear evidence of innovation or creativity in devising experimental procedures and/or, if appropriate, in solving emerging problems. |
| **Intermediate marks should be awarded to provide the best match between a candidate's performance and the descriptors.** | | | |

**Choice of investigation topic**

The investigation topic may be taken from any aspect of chemistry. It may be based on an idea arising out of the Chemistry B (Salters) course or it may be completely unconnected.

Candidates will need considerable help in choosing an appropriate topic which will allow them to demonstrate their ability in all skill areas when assessed using the marking descriptors. In particular, investigations should be chosen which:

- involve methods that are known to work effectively;
- provide opportunities for 18 hours of practical work;
- provide opportunities for recording relevant quantitative and/or qualitative data;
- can be carried out at the centre;
- can be carried out safely.

The Chemistry B (Salters) coursework marking descriptors have been devised to allow a wide variety of types of investigation. Many investigations will produce quantitative data that can be manipulated via calculations or graphs. Other investigations will produce less quantitative data and candidates should ensure that they record sufficient precise and detailed observations which can be used to draw appropriate conclusions to meet the aims of the project.

Ideas for investigations are to be found in a number of different places. These include:

- past copies of *Chemistry Review* (www.york.ac.uk/depts/chem/chemrev )
- Salters Advanced Chemistry website www.york.ac.uk/org/seg/salters/chemistry
- The *School Science Review* (Association for Science Education)

One way of ensuring that candidates choose an appropriate investigation is for centres to provide a bank of suggested investigation titles. These should include sufficient detail so that candidates are directed towards fruitful research into the background chemical knowledge and experimental methods that they will need to use. The detail might include a 'starter sheet' which is designed to help the candidate focus on the first stages of their investigation.


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An example of an investigation information sheet is given below.

| **Title** | **Possible aims**<br>*(These suggestions provide some alternative approaches to the same topic)* | **Resources**<br>*(These are starter materials which you will need to modify)* | **Comments** |
|---|---|---|---|
| **Kinetics of the Harcourt–Essen reaction** | **First** Find order of reaction with respect to hydrogen peroxide, iodide and acid using a 'clock' reaction. Therefore find rate equation, rate constant and possible mechanism.<br>**Then** Find the order of reaction with respect to catalyst.<br>**OR** Look at the effect of catalyst on order of reaction of hydrogen peroxide.<br>**OR** Find the activation enthalpy with and without catalyst. | **Starter Page 1**<br>*Chem. Rev.*, Nov. 1996 | Straightforward practical method. Lots of different approaches. |
| **Kinetics of the reaction between bromide, bromate and hydrogen ions** | **First** Find order with respect to bromate, bromide and hydrogen ions using a 'clock' reaction. Therefore find rate equation, rate constant and possible mechanism.<br>**Then** Find the activation enthalpy.<br>**OR** Look at the effect of ionic strength.<br>**OR** Explore the catalytic effect of ethanoate ions. | **Starter Page 2**<br>*Chem. Rev.*, Nov. 1996 | Straightforward practical method.<br>Opportunity to explore little developed areas. |
| **Kinetics of the reaction between iodide and persulfate ions** | **First** Find order with respect to iodide and persulfate using a 'clock' reaction. Therefore find rate equation, rate constant and possible mechanism.<br>**Then** Find the activation enthalpy.<br>**OR** Look at the effect of ionic strength.<br>**OR** Explore the effect of d block ion catalysts. | **Starter Page 3**<br>Salters Activity EP 6.4<br>*Chem. Rev.*, Nov. 1996 | Straightforward practical method. Opportunity for creativity in extending the investigation. |
| **Kinetics of the reaction between propanone and iodine in acid solution** | **First** Use a colorimeter to find the order of reaction with respect to propanone, iodine and acid. Therefore find rate equation, rate constant and possible mechanism.<br>**Then** Use a titration to find the activation enthalpy.<br>**OR** Find the equilibrium constant for this reaction. | **Starter Page 4**<br>ILPAC 9, pp. 77–78 | More demanding practical methods. |

| | | | |
|---|---|---|---|
| **Enthalpies of solution and hydration enthalpies of salts** | **First** Find hydration enthalpy of anhydrous and hydrated magnesium sulfate by measuring the temperature change using an insulated container. Use a coffee cup method and a vacuum flask method and choose the most effective. Then<br>**Then** Extend to a range of other salts to provide data for comparison and explanation in terms of the size and charge on ions. | **Starter Page 5**<br>ILPAC 2,<br>pp. 24 – 25, 116–119, | Straightforward practical investigation builds on AS work on energetics. |
| **Kinetics of the reaction between magnesium and acids** | Explore reactions (using a data logger) of magnesium with hydrochloric, sulfuric and nitric acid.<br>**First** Find order of reaction with respect to acids. Therefore find rate equation, rate constant and possible mechanism.<br>**Then** Find the activation enthalpy.<br>**OR** Explore the effect of added spectator ions. | **Starter Page 6**<br>*Chem. Rev.*, Jan. 1996 | Straightforward practical investigation which can be used to explore unusual aspects of the topic. |
| **Kinetics of the catalytic decomposition of hydrogen peroxide** | **First** Compare the effects of amount of catalyst solid catalysts such as manganese(IV) oxide and lead(II) oxide on the rate of reaction by collecting the oxygen evolved in a gas syringe or using a data logger.<br>**Then** Find the activation enthalpies with different catalysts.<br>**OR** Compare the catalytic effect of metal hydroxides produced from sodium hydroxide or ammonia solution. | **Starter Page 7** | Need to be able to use ICT if you use a data logger. More demanding practical methods.<br>Opportunity to explore little developed areas. |
| **Analysis and decomposition of bleach** | **First** Compare two methods of analysis of bleach such as iodine titration and decomposition using hydrogen peroxide.<br>**Then** Choose one method to explore the decomposition of bleach due to the effects of light, heat, and metal ion catalysts. | **Starter Page 8**<br>*School Sci. Rev.*, 219, Dec. 1997<br>*Chem. Rev.*, Jan. 2007 | More demanding practical methods.<br>Need to be creative in devising the methods. |
| **Purity of aspirin** | **First** Compare different methods for analysing a made up mixture of aspirin and salicylic acid such as a titration, and colorimetry.<br>**Then** Make your own samples of aspirin using a traditional method and a 'green' microwave method and recrystallise them. Analyse samples.<br>**OR** Explore the hydrolysis of aspirin in warm, moist conditions. | **Starter Page 9**<br>Salters activity WM6<br>*School Sci. Rev.*, 201 Jun. 1976<br>*Chem. Rev.*, Jan. 1997 | Lots of different practical work.<br>Opportunity for creativity in extending the investigation. |


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| | | | |
|---|---|---|---|
| **Vitamin C content of green peppers** | **First** Compare two methods for finding the vitamin C content of a solution taken from titrations with DCPIP, iodine and NBS.<br>**Then** Use one method to explore the effect of different methods of cooking on the vitamin C content of green peppers.<br>**OR** Explore the decomposition of vitamin C due to heat, oxygen, and metal ions. | **Starter Page 10**<br>*Chem. Rev.*, May 1996 | Quite demanding practical work.<br>Opportunity for creativity in extending the investigation. |

A typical starter page might be:

**Chemistry Individual Investigation**

**Starter Page 9**

**Purity of aspirin**

When you make aspirin (2-ethanoyloxybenzoic acid or acetylsalicylic acid) or when aspirin hydrolyses it is contaminated by 2-hydroxybenzoic acid (salicylic acid). You can find the purity of the aspirin by titrating it with sodium hydroxide solution or by using a colorimeter to measure the intensity of the violet coloured complex formed between salicylic acid and iron(III) chloride solution.

Your first task is to carry out some preliminary experiments to work out what are suitable amounts of materials to use in the titration method.

**Requirements**

Salicylic acid

Acetylsalicylic acid

Sodium hydroxide solution, 0.1 mol $dm^{-3}$

**Getting started**

Look at the instructions in the Salters activity '*What's in a medicine?*' where you titrate about 0.3 g of aspirin with 0.1 mol $dm^{-3}$ sodium hydroxide solution using phenolphthalein indicator. This method only allows you to do one titration at a time. You could make up 100 $cm^3$ of a solution of aspirin and this would let you use a number of 10 $cm^3$ portions to titrate the same solution. Try weighing out and dissolving about 1.2 g aspirin in 100 $cm^3$ of a 50/50 mix of ethanol and water and titrating portions of this solution.

Are the amounts of materials that you used appropriate?

Make up another solution containing about 1 g of salicylic acid in 100 $cm^3$ of a 50/50 mix of ethanol and water and titrating portions of this solution.

Next you could make up a solution that is a mixture of aspirin and salicylic acid and titrate this mixture to calculate the purity of the aspirin in your mixture and to compare with the known composition.

Next you can move on to use the colorimetric method to find the purity in the mixture. You first need to construct a calibration curve using a range of dilutions of a solution of sodium salicylate (sodium 2-hydroxybenzoate) as described in *School Science Review,* no. 201, June 1976. How accurate is the curve if you make up a known solution of salicylic acid? You can use a colorimeter to find the absorbance due to the salicylic acid impurity in your mixture and the absorbance after a sample has been heated in a boiling water bath for 15 minutes to hydrolyse the aspirin in the mixture to salicylic acid.

This approach should not, however, preclude the opportunity for candidates to suggest their own ideas. Teachers will need to discuss such ideas to confirm that they satisfy the criteria described above. They should check particularly that the proposed investigation can be carried out safely.


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**Planning the investigation**

Candidates need to spend an appropriate time planning their investigation before beginning their practical work in the laboratory. This is an extremely important feature of the individual investigation and it has a significant effect on the outcome of the whole project.

The first draft of the investigation plan must be handed in by the candidate before practical work begins so that it can be authenticated by the teacher as being the candidate's own work. This plan is handed back to the candidate and can be modified as the investigation proceeds. It must be finally handed in for marking as soon as all practical work is completed.

It is important that there is a dialogue between teacher and candidate during this planning process so that candidates are clear what they have to do and receive the necessary support to enable them to do it. One way of achieving this is to plan and carry out a series of teacher interventions over a period of time. An example of a timetable of teacher interventions as part of the individual investigation planning process is as follows:

| Stage | What happens | Resources needed | Date |
|---|---|---|---|
| 1 | **Teacher** introduces the nature of the assessment | PowerPoint (Introduction to the individual investigation)<br>Copies of PowerPoint hand out (one per candidate)<br>Investigation information sheets summarising bank of suggested topic titles (one per candidate) | |
| 2 | **Candidate** looks through investigation information packs and/or discusses own ideas with the teacher | Access to investigation packs for suggested topic titles including starter sheets and supporting stimulus material | |
| 3 | **Candidate** decides on their investigation topic | Individual copy of investigation pack for chosen investigation where appropriate | |
| 4 | **Teacher** provides details about risk assessments, references and experimental methods to help candidates to devise their plan | PowerPoint (References and risk assessments)<br>Copies of PowerPoint hand out (one per candidate) | |
| 5 | **Candidate** researches information topic and devises outline plan including a risk assessment | Relevant books and access to the internet<br>Hazcards and other sources of hazard information | |
| 6 | **Candidate** discusses outline plan with teacher | Timetable of candidate appointments | |

| | | | |
|---|---|---|---|
| **7** | **Candidate** devises detailed plan for first week of practical work | Relevant books and access to the internet | |
| **8** | **Candidate** hands in draft plan for authentication | | |
| **9** | **Teacher** provides detail about recording data, carrying out calculations and drawing graphs | PowerPoint (recording and manipulating data)<br>Copies of PowerPoint hand out (one per candidate) | |
| **10** | **Candidate** begins practical work | | |

Points that teachers may wish to make in an introductory Power Point presentation include:

| Question | Response |
|---|---|
| **What is the Individual Investigation?** | • This is the way your practical skill are assessed at A2;<br>• It is a unique experience;<br>• It is an opportunity for you to spend all of your chemistry classes for four weeks carrying out experiments. |
| **What experiments will I do?** | • You will choose a topic that interests you and explore it in great depth;<br>• You will become an expert on this topic. |
| **Why am I spending so long on this coursework?** | • The Individual Investigation is worth 15% of your full A level mark;<br>• This is the same as Unit F334 which tests the work in four different teaching modules;<br>• All the work that you do on your project is taken into account when awarding it marks. |
| **How do I get started?** | • There is much to do before you even begin your practical work<br>The sequence of events is:<br>You choose your investigation topic,<br>You devise an overall plan,<br>You devise a detailed plan for the first week of practical work.<br>Then you can begin your experiments. |
| **How will I know what topic to choose?** | • You will be given information about a number of possible investigation topics;<br>• You will have access to information packs on each topic which provide more detail;<br>• If you want to choose something different you can discuss it with your teacher. |
| **How will my work be assessed?** | • You will produce a written report;<br>• The report is assessed using descriptors which indicate what is required to get marks at different levels;<br>• You will be given a copy of these descriptors;<br>• Your report will contain:<br>Background theory that you have looked up to help you devise your plan,<br>Details of all the experimental methods you have used, |


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| | |
|---|---|
| | The results that you have obtained,<br>Manipulation of data using calculations and/or graphs,<br>Conclusions based on your results,<br>An evaluation of what you have done. |
| **When do I write up my report?** | • You need to write up your report as you go along:<br>You will hand in your report in three different sections at different stages of your investigation,<br>You will hand your initial plan in before you start practical work,<br>It is best to word process it,<br>It will be a sizable document in the end,<br>You will spend a long time on it to ensure that you do justice to all the practical work you have done and to get the best mark possible. |
| **What will I get out of it?** | • It is a unique experience;<br>• You will become an expert on your topic which will help in written exam papers;<br>• Your practical skills will improve dramatically;<br>• You will get a mark which will contribute to your overall Chemistry A level grade. |

## The Individual Investigation Report – Further Detail

### Authentication of individual investigation reports

Teachers should sign and date each of the three sections of candidates' written investigation reports to signify that to the best of their knowledge the work is that of the candidate concerned.

### Risk assessments

Section 1 of the report must include a risk assessment.

- It should cover all of the chemicals that are to be used, any chemical produced during the investigation that has a significant hazard associated with it and any process undertaken during the investigation that has a significant hazard associated with it;

- Risk assessments should be selective and not just a copy of general risk information. They should focus on the chemical in the form it is to be used and in the context in which it is to be used. For example: 1 mol $dm^{-3}$ sulfuric acid should be identified as irritant rather than corrosive; ethanol should be identified as being highly flammable which is why it should be kept away from naked flames; methanol is highly flammable and toxic which is why prolonged use should be undertaken in a fume cupboard. It should be noted that providing a list of materials with which a chemical reacts violently is not relevant if these materials are not to be used in the candidate's investigation;

- A good first place to look up risk assessment information is in the CLEAPSS® Hazcards. Information about less common chemicals may be found in a chemical supplier catalogue;

- An increasingly comprehensive, relevant and precise risk assessment will be expected to move to the higher mark levels in skill C.

**References**

Section 1 must include appropriate references to information consulted and used in writing up the investigation report.

- Candidates should make a note of references whenever they make use of resources so they can say where the information came from;
- References should be precise and be linked by a simple numbering system to the parts of the text of the investigation report in which the information from the resource is used;
- When citing references the following formats are recommended:

**(i) Books**

A. N. Author and A. N. Author, *Title*, Publisher name, Publisher location, x edition, year, pp. x–y.

OR

A. N. Author and A. N. Author, in *Title*, ed. A. N. Editor, Publisher name, Publisher location, x edition, year, pp. x–y.

**(ii) Magazines, journals *etc*.**

A. N. Author and A. N. Author, *Title of magazine/journal*, year, **volume**, (issue no.), pp. x–y.

**(iii) Websites**

Actual web link, description of content, date accessed.

*e.g.* www.york.ac.uk/depts/chemrev/project.htm, article on decomposing hydrogen peroxide, accessed 23 October 2007.

- Candidates' should include references to both written and electronic material;
- An increasing number and range of references will be expected to move to the higher mark levels in skill C.

**Experimental methods**

Candidates should devise their initial plan which is authenticated by their teacher before they start practical work. They should expect to expand and sometimes modify this section as the investigation proceeds.

- All of the fine detail of experimental methods used in the investigation should be included such as the amounts and concentrations of materials used and the equipment used in chemical processes;
- The experimental methods planned by the candidate and included should reflect the attention to accuracy and detail expected in an A2 assessment;
- Pipettes or burettes rather than measuring cylinders should be used for accurate measurement of volumes of liquid, for example, in serial dilutions;


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- In kinetics investigations involving the collection of a gas, measurements should be made continually over time rather than by measuring the total volume evolved in a set time. It is often more effective to record the time at which particular volumes are evolved rather than trying to measure the volume at particular times;

- In investigations which set out to analyse the content of materials such as vitamin C or aspirin it is helpful to be able to compare recorded data to reliable data such as an internal standard of pure material or to external information;

- Where organic or inorganic synthesis is planned candidates should include quantitative data such as percentage yield and should plan appropriate tests on the identity of the materials they have made;

- Investigations into electrochemical cells can be very superficial. Candidates need to change concentration on a logarithmic scale to study the effect on cell potential.

**Chemical knowledge**

Candidates should include in section 1 of their report chemical ideas which they have researched in order to help them devise their investigation plan.

- The chemical knowledge should cover all aspects of the proposed investigation;

- It should be comprehensive and detailed;

- It will not be unusual for candidates to have referred to ideas which are not included in the Chemistry B (Salters) course. For example, it would be expected that investigations into the effect of temperature on the rate of a reaction will refer to the Arrhenius equation and investigations into electrochemical cells will refer to the Nernst equation.

**Recording data**

- Recording data in a specially dedicated booklet rather than on loose pieces of paper can prevent loss of vital information and allow candidates to more easily see the development of their investigation. Dating entries is also helpful;

- All data collected during the investigation should be recorded, not just averages of several experiments;

- Data should be recorded in tables with clear headings so it is clear what experiment the information relates to;

- All data should have appropriate units;

- If an experiment results in poor data, candidates should consider the need to modify the experimental conditions to improve the data, e.g. low titres from a titration or where a gas is evolved too quickly or too slowly;

- Where observations form a key part of the recorded information they should be comprehensive, precise and detailed.

**Graphs**

- Candidates should plot and examine graphs as soon as they have collected the data;
- Graphs should use a full page of the investigation report;
- Graphs should include a suitable heading with clearly labelled axes including appropriate units;
- An electronic spreadsheet can be used to draw graphs but sometimes there is an advantage in plotting the points only and drawing in the curve by hand. It is often important to show the origin and consider it in relation to a straight line;
- In investigations into reaction kinetics candidates may use a range of types of graphs including a plot of rate against concentration squared for a second order reaction, graphs of log rate against log of concentration and a graph to find the activation enthalpy of a reaction using a plot based on the Arrhenius equation. A simple plot of rate against temperature would not normally be appropriate in the context of an A2 assessment.

**Drawing conclusions**

In section 3 of their report candidates should draw together observations and/or manipulate raw data using calculations and graphs.

- This will involve interpreting observations and measurements and drawing conclusions from raw and/or manipulated data and observations;
- The conclusions should be evaluative rather than descriptive and make use of chemical knowledge and ideas described in section 1 of the report;
- In some investigations candidates will be able to identify general trends in the data they have collected or pick out clear outcomes. They may be able to calculate differences within the data set or differences from expected behaviour. This quantitative approach should allow them to comment with authority on the fine detail of the results they have collected.

**Evaluating the investigation**

In section 3 of their report candidates should also evaluate their investigation.

- They should comment on the limitations of practical procedures, calculate, where appropriate, the experimental uncertainty associated with measurements and evaluate the choices of equipment, materials and practical procedures used in the investigation;
- Candidates should be able to identify those features of the investigation which are particularly important in ensuring the accuracy and reliability of the data collected.

**Manipulative skills**

The practical work undertaken by the candidate must be supervised by the teacher who will assess manipulative skills in skill area G. Teachers should use a working document to keep a record of their observation of each candidate's ability to carry out practical work safely and skillfully so that they can award an appropriate mark at the end of the practical work period.
The teacher should assess the ability of the candidate to work safely, manipulate equipment and materials and to make observations and take measurements.


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**Demand of the investigation**

In skill area H teachers assess the demand of the investigation undertaken by the candidate. Teachers take account of the demand arising from the candidate:

- using unfamiliar equipment and chemical ideas;
- using experimental procedures with which they are familiar in unfamiliar situations;
- using chemical ideas with which they are familiar in unfamiliar situations;
- devising innovative experimental procedures;
- solving emerging problems.

A candidate planning and implementing an investigation in which they take a kinetics experiment which they have carried out as part of the Chemistry B (Salters) course and expand this to explore additional concentration variables would probably merit a mark for demand of 3 out of 5. If the candidate also explores the effect of temperature using the Arrhenius equation or the relative effect of different catalysts this might increase the demand to a mark of 4 out of 5. If the candidate devises original experimental methods to follow the course of the reaction or manipulates data using complex calculations or graphs this might increase the demand to 5 out of 5. If the candidate does not extend their investigation much above what they encountered in the course experiment this might merit a mark of 1 or 2 out of 5.

Some candidates may devise investigations that involve chemical ideas which they have not met before. Other candidates may choose investigations where they use equipment that they have not met before or equipment which they have devised themselves. These types of investigation will merit a high demand mark.

Some candidates may devise investigations which have little more demand than might be expected at Key Stage 4. These types of investigation will merit a low demand mark.

It should be noted, however, that it is the approach to the investigation rather than the topic itself which will determine the demand. The reaction of magnesium with acids can, for example, be treated in a very superficial manner in which only the effect of acid concentration on rate of reaction is explored. The same topic can also be investigated in a much deeper approach where the effect of different acids (strong, weak and oxidising) are compared, the effect of temperature is considered and the effect of added cations and anions on the interactions taking place at the metal surface are investigated.

## 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

# 6 FAQs for A2 Unit F336

***When is the best time to do an individual investigation?***

This will depend on the centre. There is an advantage in leaving investigations until later in the course because students will have covered more chemistry. This must be weighed against the need for investigations to be completed and marked (and internally moderated where necessary) so that a sample can be sent to arrive with the external moderator by 15 May. Some centres use whole days or blocks of time when significant parts of the investigation are completed with students released from their normal timetable. This can help get round the problem of having only short sessions where getting out and putting away equipment can take up a significant proportion of the available time.

***What is the role of my technician?***

The technician is a very important part of the chemistry team who should be part of the planning discussions about investigations from the beginning. They will be responsible for getting materials and equipment ready for students and may offer guidance in the use of unfamiliar equipment. It will probably help if the technician makes up chemicals such as acids and alkalis which are likely to be in great demand in bulk so that students can use their time on other aspects of their investigation.

***How do I store students' equipment and materials?***

This can be a problem in centres with large numbers of students carrying out individual investigations at the same time. One approach is to give each student a stackable plastic box in which they can save their materials between sessions. Another strategy that can help is to transfer solutions into 500 $cm^3$ or 1 $dm^3$ plastic bottles once they have been made up to release volumetric flasks for other students to use.

***Can all students do the same investigation?***

**No.** This is an individual investigation not a class practical and choice of investigation topic is important. One of the motivating features of the investigation is that students can choose an investigation topic which is of interest to them. They gain ownership of the investigation as it proceeds and are, in a very real sense, experts in their topic by the end of the investigation. There are, however, limits to the number of investigations that are suitable and some centres will have many more students than there are different investigations available. It is therefore acceptable for different students to carry out similar investigations in a centre but each student must work on their own and should not share results. They should be encouraged to go off in different directions within the same topic area.

***How much help can I give my students?***

Teachers will need to be involved in a continuous dialogue with their students while they plan and carry out their practical work. Students may be using equipment that is unfamiliar to them or applying chemical ideas which they have not met before and will need teacher support to enable them to do this. Students should be encouraged to think carefully about their investigation both in the planning and implementing phases. Careful wording of questions to students should stimulate them to reflect on their results and consider the next step in their investigation and the conclusions they can draw from the recorded data.


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***Do students have to do preliminary experiments?***

This depends on the investigation. In some topics preliminary experiments are an excellent way of students confirming the amounts of materials and conditions needed for their investigation and they provide a clear focus for developing the initial plan.

***Where can I get help if projects don't work?***

The best answer to this question is to try not to get into this situation by ensuring that the core method to be used in the investigation does actually work. If there are doubts about this then it is probably better to choose a different investigation.

***Can I get guidance on my marking?***

**Yes.** OCR offers a coursework consultancy service and also runs regular INSET events where internal assessment will feature strongly.

***Will the marking of the Task be moderated?***

**Yes.** A Moderator, appointed by OCR, will moderate a sample of your students' work.

***If a candidate wants to re-take F336 does (s)he have to start afresh with a new topic?***

**No.** The candidate is permitted to re-take F336 by making improvements to, and re-working, their original investigation. The candidate can be given formative feedback on areas they can improve, but their original marked investigation should not be returned to them.
Re-submitted work will be moderated in the normal way, so you should provide a mark for each skill area, even if the mark is the same as for the first attempt for unmodified sections of the investigation report. Please note that any changes to centre marks recommended by the moderator will also apply to candidates who are re-taking the unit.

# 7 Resources

## General resources

Chemistry B (Salters) course is unique in the support available to teachers and candidates. This includes:

- *Chemical Storylines* for each module;
- A *Chemical Ideas* book for the whole course;
- Teachers' and technicians' guides for AS and A2;
- Direct support via a helpline from the University of York Science Education Group;
- Termly newsletter from the University of York Science Education Group;
- A dedicated website: www.york.ac.uk/org/seg/salters/chemistry
- An electronic forum for teachers (see website above);
- Annual teacher workshops;
- Regional teacher 'User Groups'.

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

### 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


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# 8 Health & Safety

Useful information can be found at http://science.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 (e.g. "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.

**Oxidising**

**Toxic**

**Highly Flammable**

**Harmful or Irritant**

**Corrosive**

**'CHIP' system (being phased out)**

**Oxidising**

**Toxic**

**Highly Flammable**

**Indicates that the chemical could cause serious *long term* health effects.**

**Corrosive**

**Indicates less serious health hazards (e.g. skin irritants).**

**'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 http://science.cleapss.org.uk. In Scotland, SSERC (www.sserc.org.uk) has a similar role to CLEAPSS®.


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