

Practical Skills Handbook

GCE Geology

OCR Advanced Subsidiary GCE in Geology H087

OCR Advanced GCE in Geology H487

This Practical Skills Handbook is designed to accompany the OCR Advanced Subsidiary GCE and Advanced GCE specifications in Geology 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 1.4

The only changes made between version 1.3 and 1.4 are

1. the addition of information about the mark schemes being released on Dec 1st.
2. additional information about fieldwork tasks
3. Helpful guide to Practical Skills addition to assist with clarification of graphical skills.

The only change made between version 1.2 and 1.3 is an update to the Health Safety information in Section 8. No other changes have been made.

The only changes made between version 1.1 and 1.2 were the incorporation of updated screenshots on pp. 8 and 9, the inclusion of an Interchange Help Sheet and the removal of FAQs, which are now available as a separate document.

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1 Introduction

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

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

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

2 The assessment model

Summary of the model

Practical and investigative skills developed within contexts encountered during Advanced Subsidiary GCE Geology (for Unit F793) or Advanced GCE Geology (for Unit F796) are assessed by means of **two** tasks at AS and **two** tasks at A2.

Learners are required to carry out one of each task type:

1. Centre-based or Fieldwork task [20 marks]
2. Evaluative task [20 marks]

Tasks are chosen from those provided by OCR via the secure Interchange website. Initially, a choice of **three** Tasks of each type will be offered. All Tasks will be refreshed or replaced each year and additional tasks may be made available. **Following new guidance from our regulator Ofqual, the Mark Schemes for all GCE Practical Tasks will not be released until 1st December 2014. A Notice to Centres was sent out to all centres in February 2014 regarding these changes to the Practical Tasks.**

1. The **Centre-based** or the alternative **Fieldwork task** is practically based and learners carry out this task under controlled conditions in the laboratory/classroom **or** in the field. The same skills are assessed whether learners complete one of the OCR centre-based set tasks based on geological maps, photographs and data **or** carry out a field exercise devised by the centre that uses the same skills of **measurement, observation and recording** of data. This task requires both **qualitative** and **quantitative** data.

Centres wishing to use an alternative **Fieldwork task** must ensure that it conforms to the requirements of task type 1. A sample task is on the OCR website. The proposed task/s and mark scheme/s must be submitted to OCR for approval at least 6 weeks before being presented to learners. If centres wish to provide learners with more than one opportunity to carry out a Fieldwork task then they will need to submit separate task proposal forms for each task that they devise.

2. The **Evaluative task** is provided by OCR in a context that extends geological skills. Learners are required to evaluate results based on field or practical data. The Evaluative task will test the ability to **analyse** and **evaluate** a range of geological data from both the laboratory and field. This may include:

- geological maps,
- cross sections of geological maps,
- analysis of field data,
- thin section drawing,
- fossil drawing,
- photographs,
- graphic logs,
- rose diagrams.

All data and resources required will be supplied within the Evaluative task. There is no additional practical work for learners to carry out.

Learners 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.

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

For each learner, centres will supply OCR with a single mark out of 40.

Each practical skills unit is teacher assessed and externally moderated by OCR.

Although practical tasks can be used throughout the year, entry for the AS and the A2 practical skills units is available only in the June session of each year. Marks must be sent to OCR by the 15 May.

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

Assessable learning outcomes	
1. Centre-based or field-based Task <ul style="list-style-type: none">• Candidates carry out a practical task using instructions supplied by OCR. OR• Candidates carry out a field-based task devised by centre and agreed by OCR.	Candidates should be able to: (a) demonstrate skilful and safe practical techniques using suitable qualitative methods; (b) make and record valid observations and organise results suitably; (c) demonstrate skilful and safe practical techniques using suitable quantitative methods; (d) make and record accurate measurements to an appropriate precision; (e) analyse, interpret and evaluate experimentally derived results quantitatively to reach valid conclusions.
2. Evaluative Task <ul style="list-style-type: none">• This task may extend one of the centre-based tasks.• Candidates may evaluate the quality of the data and procedures or geological resources such as maps, photos, logs.• Evaluative tasks will not require additional data collection.	Candidates should be able to: (a) analyse and interpret data, identify anomalies and reach valid conclusions; (b) assess the reliability and accuracy of an experimental or field-based task; identify significant weaknesses in experimental or field-based procedures and measurements; (c) understand and propose simple improvements to experimental or field-based procedures and measurements.

Downloading Practical Skills tasks

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

Copies of the Geology *Practical Skills Handbook* and fieldwork forms are also available via Interchange and also via OCR's public website (www.ocr.org.uk).

OCR agreed field tasks devised by centres will be uploaded onto Interchange for use by any centre. If a centre wishes to alter an uploaded task or mark scheme then the amended task and mark scheme must be submitted to OCR for approval.

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

How to use OCR Interchange

OCR Interchange is a secure extranet enabling registered users to administer qualifications on-line. Your Examinations Officer is probably using OCR Interchange to administer qualifications already. If this is not the case, then your centre will need to register.

Your Examinations Officer will be able to:

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

The website address for Interchange is:

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

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

Distribution of the Practical Tasks is limited to those learners who are currently undertaking that Task. Task sheets should be photocopied and issued to learners 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 learners' scripts must be collected after the assessment and stored securely or destroyed.

Other than the Fieldwork Tasks, 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).

You are here: Home > Science co-ordinator materials

Science coordinator materials

Qualification level

The GCE stimulus materials are **confidential** and should only be made available to students as hard copy for a limited period of time. Under no circumstances should these materials be posted to a website where they can be accessed by the public.

Before undertaking assessment of Practical Skills it is recommended that teachers familiarise themselves with the Practical Skills Handbook.

General GCE information

Biology More detail ▾

Chemistry A More detail ▾

Chemistry B (Salters) More detail ▾

Geology More detail ▾

Human Biology More detail ▾

Physics A More detail ▾

Subject (click to view)

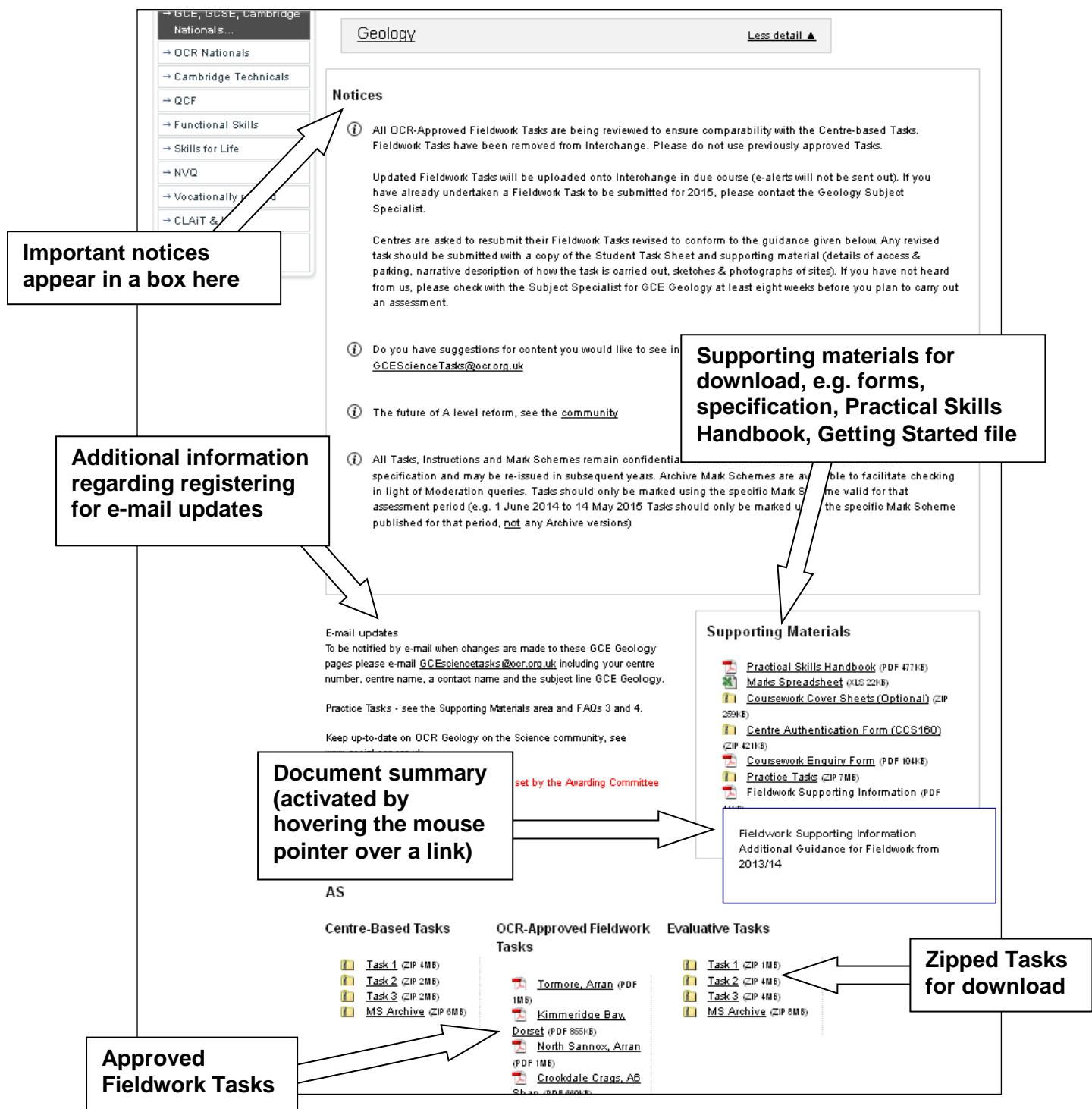
GCSE, Principal

Nationals

- Functional Skills
- Skills for Life
- NVQ
- Vocationally related
- CLAIT and iPro

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 (Centre-based, Approved Fieldwork and Evaluative, see below). Hovering the mouse pointer over a Task or document link generates a summary of the file.

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



E-mail updates

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

Also see Section 9 – Interchange Help Sheet

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.

Following new guidance from our regulator Ofqual, the Mark Schemes for all GCE Practical Tasks will not be released until 1st December 2014. A Notice to Centres was sent out to all centres in February 2014 regarding these changes to the Practical Tasks.

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

Level	Unit & Task	First Tasks on Interchange by	Coursework submission date
AS	F793 Centre-based Task (x3) Evaluative Task (x3)	June 2008	15 May each year from 2009
A2	F796 Centre-based Task (x3) Evaluative Task (x3)	June 2009	15 May each year from 2010

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 should be reported to OCR as soon as possible by submitting a written report from the Head of Centre to the Geology Subject Specialist detailing the circumstances, the learners concerned and any action taken (GCEsciencetasks@ocr.org.uk). A blank report form is available on Interchange.

The instructions for each assessed Task contain information to allow teachers to check the availability of the necessary equipment and materials.

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

Candidates' scripts (including field notebook pages for Fieldwork) 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.

In order to ensure consistency across each year of the specification, the old Tasks cannot be used for practice. It is also possible that there will be a legacy opportunity for this unit, which also means that Tasks should remain confidential.

How to use the Tasks

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

A learner 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.

Centre-Based Task

The practical activities used in the Tasks have been trialled. The Instructions provided should ensure that the learners 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 learners to ensure that:

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

On some occasions it may be necessary for the teacher to carry out the task in order to provide a data set against which learners' results can be marked. 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 activity. Other changes can be made to, for example, volumes, concentrations and amounts in order to make the experiment work as intended and to ensure that learners are able to make appropriate observations and/or 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. Please remember to include the centre number on all e-mails.

Maps, images and photographs may vary in size when reproduced using different printers and photocopiers. It is vital to check the dimensions of the images in the printed tasks given to candidates, and adjust the mark scheme if necessary. The adjustment should follow the tolerance guidelines in the mark scheme and applied to the teachers calculated measurements. The value must lie within the tolerance stated in the mark scheme (e.g. 10%, 5°, 10 m etc.). Please enclose details when sending the sample to the moderator if outside the range stated in the mark scheme.

Maps, images and photographs may vary in colour, density and shade when reproduced using different printers and photocopiers. Ensure that your sample sent to the moderator includes copies of the printed images used. If a colour printed copy of an image differs markedly from the original, it may be helpful to project the original image using a projector in the classroom. Where projected images vary, please include an explanation of the colour seen by candidates when sending your sample to the moderator.

Field-Based Task

Each field activity will be written by an individual teacher to fit their field locality so will need to be trialled by each centre. Changes may be made to an activity after it has been approved if they have no impact on the outcome of the activity. Changes can be made to, for example, the exact locality within an area if dependent on tide or weather conditions in order to collect data as intended and to ensure that learners are able to make appropriate observations and/or 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. Please remember to include the centre number on all e-mails.

As the moderator will not have detailed familiarity with the fieldwork sites it is essential for the teacher to carry out the task and provide an outline of the expected results (including rock descriptions) and their own labelled sketches and/or photographs. The teacher's field notes, sketches, photographic evidence, learner instruction sheets and copies of base maps (and any other resources given to the candidates) should be made available to the Moderator when work is submitted and will play the same role as the teacher trial data in the Centre-based tasks; to create a benchmark for comparison.

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. Remember to include the centre number on all e-mails.

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 learner 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 Evaluative Task may be given up to 25% extra time and their name should be recorded on the Interchange Access Arrangements site without further reference to OCR. 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. It should be remembered, however, 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 adjustments with respect to the application of a competence standard, or, in this case, the assessment objective being tested.

Unexpected circumstances

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

Support allowed for learners

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.

Learners will not be permitted to refer to their class/field notes or to books during the Task except where specifically indicated on the Task cover sheet and Instructions. Use of standard Grain Size Cards (such as University of Leicester or GEO Supplies) is allowed.

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

Supervision

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

Authentication

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

Group work

Learners 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 learners and each learner 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 learners 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

Centre-based 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.

Some Centre-based Tasks may require the use of two practical sessions. Where this is the case, the Task may be divided to allow a convenient point at which the experiment can be set aside for completion in the second session. In such cases the learner Task sheets may be provided in two sections.

Fieldwork Tasks are devised by centres and it is envisaged that they should be completed within half a day. Candidates work (field notes) must be collected by the supervising teacher before leaving the work site and should not be added to in any way. However where field notes are damaged and better clarity is required (for instance water damaged), field notes may be transcribed (written out in neat without changing the original wording), under direct supervision. **Both the original field notes and the transcribed fair copy should be submitted.**

Evaluative Tasks should be completed within 1 hour.

There may, however, be a number of circumstances in which it is not possible to complete the work in the time available; for example, there may be a shortage of equipment, difficulties with the experiment, or a fire alarm. In such cases, learners' 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.

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:

- 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;

An interactive Marks Spreadsheet is also available on Interchange for recording marks; if this is used it will help the Moderator if a copy is included with the submitted marks.

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. Fieldwork Task / Instructions sheet used by learners for Fieldwork tasks should be included with the sample of work. Teachers' should also include written observations of any candidate practical problems encountered while carrying out both Centre-based and Fieldwork tasks.

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 an experienced 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

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

Marking advice for teachers

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; i.e. the awarding of marks is not dependent on the candidate gaining marks for earlier parts of the task. 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 learner to be assessed on another occasion using a different Task and that the best mark achieved for each Task-type should be submitted. It is appropriate for the teacher to provide feedback to explain how the work could have been improved although details of the mark scheme must not be directly communicated to the learner.

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

Useful annotations consist of:

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

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

3 General requirements for AS and A2 practical work

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

Skill development

There are generic skills which should be developed during the study of AS and A2 Geology. The sophistication required of learners should increase throughout the course, partly as their practical experience grows but also through the extra demands expected by more complex experiments and observational techniques.

General

At both levels, the course aims to provide learners with the opportunity to:

- develop good laboratory / field techniques;
- make and record accurate measurements and observations;
- interpret the results of experiments to form theories or conclusions;
- establish whether data collected from experiments and fieldwork is valid and reliable;
- evaluate experimental technique, field technique and scientific method in the light of practical experience;
- gain a knowledge of laboratory and fieldwork safety.

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

In carrying out practical / field Tasks, learners should acquire the necessary experience to be able to carry out the Centre-based / Field-based and Evaluative Tasks that will be tested by the assessed Tasks.

Centre-based and Fieldwork Tasks

Learners should be able to:

- identify any hazards in the chemicals to be used or made, noting down appropriate control measures (eg, eye protection, protective gloves, extinguishing naked flames);
- handle harmful materials safely;
- use appropriate techniques, reagents and apparatus to complete suitable activities;
- manipulate standard laboratory / fieldwork apparatus safely and with confidence to produce accurate data (eg compass clinometer, hand lens);
- record all suitable observations and data in an appropriate format and to an appropriate degree of accuracy, taking into consideration the apparatus used;
- make and record measurements reliably and accurately;

- use and record the correct units for all measurements taken;
- perform calculations based on their practical work;
- construct and interpret annotated field sketches from field observations or photographs;
- construct and interpret appropriate graphic logs and graphs from data collected or provided;
- reach a valid conclusion based on the observations made or data collected;
- Interpret and construct geological maps to provide simple conclusions based on their interpretation (eg 3D structures, geochronology).

Evaluative Tasks

Learners should be able to:

- recognise anomalous results on the basis of measurements provided;
- identify the limitations of accuracy in experimental / field procedures;
- recognise that some errors may be inherent in the equipment used;
- construct and interpret appropriate graphs from data collected or provided;
- reach a valid conclusion based upon the data provided.
- evaluate both the procedural and measurement errors associated with a particular task and comment on the most significant errors;
- suggest sensible improvements to experimental procedures and the taking of measurements based on their laboratory experience.

4 Practical work for AS Unit F793

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

F793 Global Tectonics

(a)

- Use scale models or graphs of planets in the solar system to illustrate the difference in size between the two groups of planets.
- Use models to show the different relative depth of Earth layers.
- Use a light source and beaker of water to illustrate refraction of seismic waves by the liquid outer core to form shadow zones.
- Partial melting can be illustrated by the melting of chocolate in some chocolate chip cookies.
- DIY “potty putty” made from sodium tetraborate (borax) and PVA glue as an analogue for the plastic asthenosphere.
- Use a bar magnet, iron filings and plotting compasses as an analogy of the Earth’s magnetic field.

(b)

- Use Slinkies™ to demonstrate P, S and L wave motion.
- Plot data to calculate earthquake isoseismals and earthquake epicentres.
- Simulate liquefaction by vibrating sand.
- Carry out research on the effects of individual earthquakes.
- Simulate base isolation systems.
- Use web based software such as ‘Virtual Earthquake’ to calculate magnitude and epicentre.

(c)

- Devise and plan an activity to produce convection cells using water, a heat source and potassium permanganate. Observe and record rates of convection.
- Plot the distribution of earthquakes to demonstrate plate margins.
- Research specific plate boundaries to identify the type of plate margin.
- Use computer simulations or paper models to reconstruct the continents before continental drift occurred.

(d)

- Use modelling clay and dough to make models of stress and strain, dipping beds, joints and folds.
- Use photos, sketches and maps to interpret folds and faults.
- Illustrate cleavage using match sticks or spaghetti with compressive stress applied to show the rotation of particles at right angles to the maximum stress.
- Plot rose diagrams to illustrate joint patterns.

F792 Rocks – Processes and Products

(a)

- Use strips of paper / till rolls to appreciate the extent of geological time.
- Use flow charts and hand specimens to distinguish broad classes of rocks.
- Use hand specimens and photographs to aid identification of igneous, sedimentary and metamorphic rocks.

(b)

- Investigate crystal size and rate of cooling using salol and microscope slides at different temperatures.
- Use a lava lamp to simulate rising magma.
- Simulate lava flows of different viscosities using jelly, sand and water mixtures, treacle or wallpaper paste.
- Simulate partial melting using chocolate chip cookies.
- Use liquids of different densities to show differentiation.
- Use hand specimens and photographs for recognition of rock types and texture.

(c)

- Carry out weathering experiments using nails and test tubes (oxidation), and wetting and freezing rock samples (frost shattering).
- Use a tennis ball to demonstrate traction, saltation and suspension.
- Use a fish tank and sediment to produce turbidity currents.
- Investigate changes in grain shape using rock fragments or sugar cubes shaken in a tube.
- Make graded bedding in a jar containing water and poorly sorted sediment mixture.
- Make cross bedding using sand and sugar.
- Make desiccation cracks by evaporation of clay slurry.
- Carry out grain size analysis of sands by sieving.
- Make asymmetrical ripples in a circular tank of sand and water and symmetrical ripples in a rectangular tank.
- Use hand specimens and photographs for recognition of rock types, textures and sedimentary structures.

(d)

- Use dry spaghetti and rulers to demonstrate alignment of crystals in relation to stress.
- Measure and record temperatures of sand around a buried container of hot water to model the size of a metamorphic aureole.
- Use hand specimens and photographs for recognition of rock types and texture.

5 Practical work for A2 Unit F796

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

It should be noted that the practical experience acquired at AS may be tested at A2.

F794 Environmental Geology

(a)

- Carry out porosity experiments – finding the porosity of rocks by finding their dry and wet mass; use marbles in a beaker to model porosity.
- Carry out permeability experiments – attaching tubes to rocks with silicone sealant and timing rate of flow of water into rocks; using sediment with different degrees of sorting in filter paper to model permeability.
- Model hydrostatic pressure and hydraulic head – use a large plastic tube or measuring cylinder with holes drilled up one side, fill with water and measure how far jets of water come out.
- Model a confined aquifer and artesian conditions – use a U tube with bung at one end filled with water; when bung is removed the water level on that side will rise up.

(b)

- Model oil in a trap using a beaker of water with coloured cooking oil on top and tilting beaker to show layer of oil is always horizontal.
- Model an oil trap and gusher – use an inverted funnel with bung in the end held by a clamp in a beaker full of water: Add oil by squirting under water with pipette and add gas by introducing methane or blowing air under water: Remove bung and see what happens. Note that this requires use of safety glasses.
- Carry out a computer simulation of oil and natural gas exploration programme.
- Study hand specimens of types of coal to show the physical properties of lignite, bituminous coal and anthracite.

(c)

- Study hand specimens of ore minerals to indicate suitable properties for gravity-settling (magnetite) or placer deposition (cassiterite). Find the density of ore minerals.
- Investigate gravity-settling using minerals of different densities and a measuring cylinder filled with liquid wallpaper paste.
- Plot and interpret rose diagrams of mineral vein information.
- Carry out a computer simulation of a metals exploration programme.

(d)

- Test rocks for roadstone – experiments to find hardness, impact strength, porosity/permeability, resistance to abrasion, resistance to freeze-thaw action, resistance to chemical corrosion.

F795 Evolution of Life, Earth and Climate

(a)

- Use the internet to research the different types of exceptional preservation.
- Use sea shells and plaster of Paris to make internal and external moulds. Refill the plaster of Paris moulds with another substance (eg. jelly or plasticine®) to make a cast.
- Use a tray filled with wet sand and move objects across the surface and study their impressions. Notice the difference in shapes when the objects are moving at different speeds, or at rest. Add

more water and finer sand to compare the effect of softer substrates. Use a digital camera to record data for analysis.

- Study assemblages of fossils to investigate palaeoenvironments.

(b)

- Use the internet to research the different types of fossil group (e.g. morphology, mode of life, evolution etc.)
- Use modern shells and masses directed at a fixed point to assess relative damage to shells of different thicknesses or with different types of ornament. Relative strength can be determined using quantitative methods.
- Study and draw real fossils in the laboratory.
- Make model bivalves and brachiopods to explain how they opened and closed their valves.
- Make rose diagrams of fossil orientation.

(c)

- Use the internet to research the different types of fossil group (e.g. dinosaurs and evolution, etc).
- Carry out an investigation to compare the relative strengths of differently folded paper or thin card. Apply masses and measure distortion. This simulates the types of sutures in cephalopods.

(d)

- Use the internet to research the main extinction events.
- Use geological maps, photographs and cross sections to write a geological history.

(e)

- Use the internet to research the main changes in climate events. Analyse data to investigate changes throughout geological time.

6 Apparatus list for Units F793 and F796

Access to basic laboratory equipment will usually be required, but the Tasks available will use different equipment so that a centre should not be at a disadvantage

Unit F793

For each learner, the following apparatus *may* be required to complete the assessed Tasks:

- Sieve stacks with a minimum of 6 ideally ranging from phi 2 to phi -4. Variations from this range will be possible as teachers will be marking for the sieve sets used.
- Sand samples. The exact type will not be specified as teachers will trial the experiment and mark on the basis of the sample used.
- Samples of common rock types
- Hand lens
- Grain size card
- Compass/clinometer
- Tape measure
- Microscope slides
- Microscopes
- Filter funnels and filter papers
- Measuring cylinders
- Thermometer (-10 to +110 °C) or equivalent
- Stop clocks/watches reading to 1 s or better.
- Pipeclay triangle
- Test-tubes and boiling tubes
- Test-tube holders
- Dropping pipettes
- Bunsen burner
- electronic balance to 1 dp

Unit F796

In addition to the apparatus indicated in Unit F793 above, the following may also be required.

- Displacement cans
- Mineral specimens of different density

Alternative apparatus for learners eligible for access arrangements

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

7 Resources

General resources

OCR Geology: Frances Stratton Ed. Debbie Armstrong, Malcolm Fry, Frank Mugglestone and Ruth Richards, published by Heinemann, May 2008 is written by members of the senior examiner team.

The OCR website – www.ocr.org.uk – has;

- Examples of: Centre-based Tasks, alternative Fieldwork Tasks, Evaluative Tasks
- a Scheme of Work
- some suggested lesson plans.

INSET

OCR runs INSET courses every year, primarily in the autumn term, and these include sessions partly to support internally assessed Tasks. More details about INSET provision are available at www.cpduhub.ocr.org.uk.

Coursework consultancy

OCR offers a coursework consultancy service whereby centres can send up to four photocopies of marked work for each task type 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 of 15 May i.e. before 20 March.

The coursework enquiry form to request this service is available at www.ocr.org.uk and on Interchange.

8 Health & Safety

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 learners 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 (www.cleapss.org.uk). Note that CLEAPSS® publications are only available to members. In Scotland, SSERC (www.sserc.org.uk) has a similar role to CLEAPSS®.

A code for geological fieldwork

This code is based on the Geologists Association's [Geological Fieldwork Code](#) first published in 1975. Geologists must be seen to be using the countryside responsibly and observing the following rules:

General

1. Obey the [Country Code](#) and local bylaws.
2. Leave gates and property as you find them and take your litter home.
3. Don't litter fields or roads with rock fragments that could cause injury to livestock or be a hazard to vehicles or pedestrians.
4. Always seek permission before entering private land.
5. Do not disturb wildlife or plant life.
6. On coastal sections, check tides or local hazards such as unstable cliffs.
7. Make yourself familiar with any conservation rules that may be in force before visiting geological localities in statutory and local conservation sites.
8. Avoid using a hammer.

Collecting

1. Only collect when it is permissible to do so.
2. Do not leave exposures untidy or dangerous.
3. Learners should be encouraged to observe and record and not to hammer indiscriminately. Keep collecting to a minimum.
4. Avoid removing in-situ fossils, rocks or minerals unless they are genuinely needed for serious study. The collecting of actual specimens should be restricted to those localities where there is a plentiful supply, or scree, fallen blocks and waste tips.
5. Never collect from walls or buildings.

Safety

1. Always wear a hard hat when working under any cliff face or in any quarry etc.
2. Always wear goggles when hammering.
3. Boots or other suitable footwear should be worn when the Leader requires them.
4. Keep clear of plant or machinery.
5. Beware of rock falls.
6. Beware of sludge lagoons or settling ponds in quarries etc.
7. Do not dislodge rocks or throw things over cliffs etc - someone may be below.
8. Keep a look out for dangers not only to yourself but for all members of your party.

- 9.** If you go onto the fells, moors or mountains, let someone know your route and return time.
- 10.** Always carry a first aid kit.
- 11.** Never go onto the fells, moors or mountains without suitable clothing and equipment.
- 12.** DO NOT ENTER a working quarry etc without permission.
- 13.** Do not take risks on cliffs or rock faces.

The Health and Safety at Work Act requires that safety measures are strictly enforced, especially in quarries or other excavations. Protective clothing, particularly safety helmets, must be worn at all times by employees, and visitors are also expected to observe the same precautions, generally as a condition of entry to the site. In quarries, helmets must be worn at all times.

Suitable helmets are readily available and cheap to buy, and they should be part of the standard equipment of every geologist and worn wherever there is a danger of rock falls.

Leaders of a field party should ensure that the spirit of this code is followed, and remind learners of the need for care and consideration at all times.

Laboratory based coursework

Useful information can be found at www.cleapss.org.uk.

Learners 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 learners will recognise *and* understand. Labels could also include additional information (eg “use a fume cupboard” or “avoid inhalation”) if the risk assessment supported the view that this information would contribute to the safety of learners carrying out the activity.

	Oxidising		Toxic	‘CHIP’ system (being phased out)
	Highly Flammable		Harmful or Irritant	
	Corrosive			
	Oxidising		Toxic	‘CLP’ system (being phased in) CLP pictograms are also accompanied by a ‘signal word’ to indicate the severity of the hazard.
	Highly Flammable		Indicates that the chemical could cause serious long term health effects.	
	Corrosive		Indicates less serious health hazards (e.g. skin irritants).	

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>

9 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, together with any additional files pertinent to the Task. You will need to extract the compressed PDF files before you can use them.

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

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

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

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

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

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

We used do fieldwork but the Fieldwork Task we used is not on Interchange?

All Fieldwork tasks available prior to September 2013 were removed from Interchange and centres were asked to resubmit their Fieldwork Tasks to conform to the new guidance given in the document *Fieldwork Supporting Information* which is available on Interchange. The approved versions of Fieldwork Tasks are available to download from the Interchange. You may submit a revised version of a pre-2013 task for approval even where it was originally written by another centre.

For all queries relating to current or pre-2013 Fieldwork Tasks contact the Geology Subject Specialist by emailing GCEsciencetasks@ocr.org.uk.

Is there a Fieldwork Task close to my centre?

We would like there to be at least one Fieldwork Task within reasonable travelling distance of every centre which offers OCR Geology. It may take time to achieve this as we rely on individual centres submitting new tasks or adopting orphaned tasks for revision. There are other Fieldwork Tasks which are being revised by centres or have recently been submitted for approval. For more information contact the Geology Subject Specialist by emailing GCEsciencetasks@ocr.org.uk.

1

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

Welcome

You can use interchange to access centre information and online services for all OCR qualifications, 24 hours a day.

Enter Centre number,
username and
password

Login

Login ID: the centre code
and student
number

Username:

Password: use lowercase
letters, numbers and symbols

I accept the [Terms and Conditions](#)

Click 'Login'

Log in

New User

To register please complete and return the [OCR Interchange Assessment Form](#) to receive user login details.

2

The screenshot shows the OCR Interchange homepage. A callout box highlights the 'Coursework and tests' link in the main navigation menu. The page title is 'Welcome to Interchange'. Below the title, there's a section titled 'What's new?' with a list of recent updates. A large red arrow points from the 'Coursework and tests' link to the text 'Hover mouse cursor over "Coursework and tests"'.

Welcome to Interchange

What's new?

- Interchange
- Edexcel
- Coursework details
- Edexcel assessment
- Coursework resources
- Results
- Print tests
- Accessories
- Centre information
- Feedback
- Resources
- Games

Coursework and tests

Hover mouse cursor over "Coursework and tests"

What's new?

Interchange has been updated for 100% relevance. This is a free resource available online to help teachers review the performance of individual candidates in written exams. [Edexcel 2009 GCSE English Resources](#)

Looking for past papers or mark schemes?

You will need to log in under Resources in the left hand menu. If you can't see this menu item, you need to check you have the 'Virtual Only' and 'Public' user permission Centre Administration and the teacher will help you with this.

Tell us what you think

An audit of our products and services are undertaken annually and we appreciate any comments that you might have. [Send us your feedback to \[interchange@ocr.org.uk\]\(mailto:interchange@ocr.org.uk\)](#)

OCR Interchange

- OCR, OCR, GCSE, Pre-16 Learning
- OCR National
- Fundamental Skills
- Skills for Life
- NVQ
- Vocational Awards
- GCSE and IGCSE

3

Welcome to Interchange

You are here Home > Science > Science co-ordinator materials

What's new?

Request material

Science co-ordinator materials

Events

My role in science

Modifications

OCR Resources

Links to past papers of major examinations

Log in

Logout

Help

Impact

Print page

Science co-ordinator materials

Click 'Science co-ordinator materials'

Tell us what you think

As with all of our products and services, we value your feedback and would appreciate any comments that you might have. Email us at feedback@interchange.org.uk.

4

The screenshot shows the OCR Interchange website interface. A yellow callout box highlights the 'GCE AS/A2' link under the 'Materials' section of the main menu. The URL in the address bar is 'http://www.ocr.org.uk/interchange'. The page content includes sections for 'Science in the News', 'Research Study', 'Data Tasks', and 'Can Do Tasks', each with a 'View details' button.

5

You are logged in as: [User Name] Help Logout

Science coordinator materials

- Electronics
- GCSE Chemistry
- GCE AS/A2

The OCR stimulus materials are confidential and should only be made available to students to have access to a limited period of time. Under no circumstances should these materials be passed to a website where they can be accessed by the public.

Before undertaking assessment of students:

Biology ← Click specification name or click 'More detail' → **Chemistry A** **Mathematics** **Materials**

Chemistry B (Gates) **More detail**

Geology **More detail**

Human Biology **More detail**

Physics A **More detail**

GCSE Chemistry Materials

- GCSE Chemistry
- Skills for Life
- AS/A2
- Vocational related
- GCE AS/A2

6

The screenshot shows the 'Biology' module interface. On the left, a sidebar lists 'My Notifications' (including a 'New Task' from 'Sally, Principal Learning') and 'My Resources'. The main area displays a 'Notices' section with two items: a note about the 'Getting Started' document and an 'Updated Practical Skills Handbook' link. Below this is an 'Email updates' section with a link to 'Get notified when changes are made to this module'. The right side features a 'Available Tasks' section with three columns: 'Qualitative Tasks' (A5, A2), 'Quantitative Tasks' (A5, A2), and 'Evaluative Tasks' (A5, A2). Each task has a small preview icon. A yellow callout box on the left says 'Sign up to receive email updates whenever Tasks are uploaded or updated'. Another yellow callout box on the right says 'Available Tasks appear here' with an arrow pointing to the 'Available Tasks' section. A third yellow callout box at the bottom right says 'Click a Task to download it' with an arrow pointing to one of the task cards.

10 Helpful Guide on Practical Skills

This guide is designed to provide helpful tips on the centre-based, fieldwork and evaluative tasks for the AS and A2 Practical Skills. It is envisaged that the guide will promote a better understanding of what examiners expect from the learners. There is particular focus on useful terms, measurements and graphical work.

Useful terms

Accuracy is a measure of the closeness of agreement between an individual test result and the accepted reference value. If a test result is **accurate**, it is in close agreement with the accepted reference value.

Error (of measurement) is the difference between an individual measurement and the **true** value (or accepted reference value) of the quantity being measured.

Precision is the closeness of agreement between independent measurements obtained under the same conditions. It depends only on the distribution of random errors (*i.e.* the spread of measurements) and does not relate to the true value. A measurement is ‘precise’ if values cluster closely.

Uncertainty is an estimate attached to a measurement which characterises the range of values within which the true value is asserted to lie. This is normally expressed as a range of values such as 44.0 ± 0.4 .

Repeatability in quality when repetition under the same conditions gives the same or similar results e.g. when comparing results from the same pupil or group, using the same method and equipment.

Reproducibility is precision obtained when measurement results are produced by different laboratories (and therefore by different operators using different pieces of equipment). A measurement is ‘reproducible’ in quality when reproducing under equivalent (but not identical) conditions gives the same or similar results e.g. when comparing results from different pupil groups, methods or equipment – a harder test of the quality of data.

All of these definitions are taken from *Language of scientific measurements and investigations. The Language of Measurement, Terminology used in school science investigations. The Association for Science Education. ASE Publications, 2010.*

Measurements

How accurate are measurements?

When using a digital measuring device (such as a modern top pan balance),

- record *all* the digits shown.

When using a non-digital device (such as a compass clinometer),

- record all the figures that are known for certain plus one that is estimated.

As a general rule, the uncertainty is often taken to be half a division on either side of the smallest unit on the scale you are using. However, the accuracy of measurements does also depend on the quality of the apparatus used, such as a balance, thermometer or glassware.

How many significant figures should be used?

The result of a calculation that involves measured quantities cannot be more certain than the *least* certain of the information that is used. So the result should contain the same number of significant figures as the measurement that has the *smallest* number of significant figures.

A common mistake by learners is to simply copy down the final answer from the display of a calculator. This often has far more significant figures than the measurements justify.

Rounding off

When rounding off a number that has more significant figures than are justified (as in the example above), if the last figure is between 5 and 9 inclusive round up; if it is between 0 and 4 inclusive round down.

For example, the number 350.99 rounded to:

- 4 sig fig is 351.0
- 3 sig fig is 351
- 2 sig fig is 350
- 1 sig fig is 400

Notice that when rounding you only look at the one figure beyond the number of figures to which you are rounding, *i.e.* to round to three sig fig you only look at the fourth figure.

How do we know the number of significant figures?

In the example above, 351 has been rounded to the 2 sig fig value of 350. However, if seen in isolation, it would be impossible to know whether the final zero in 350 is significant (and the value to 3 sig figs) or insignificant (and the value to 2 sig figs). In such cases, standard form should be used and is unambiguous:

- 3.5×10^2 is to 2 sig figs
- 3.50×10^2 is to 3 sig figs

When to round off

It is important to be careful when rounding off in a calculation with two or more steps.

- Rounding off should be left until the very end of the calculation.
- Rounding off after each step, and using this rounded figure as the starting figure for the next step, is likely to make a difference to the final answer. This introduces a **rounding error**.

Learners often introduce rounding errors in multi-step calculations.

Example

When 6.074 g of a carbonate is reacted with 50.0 cm³ of 2.0 mol dm⁻³ HCl(aq) (which is an excess), a temperature rise of 5.5 °C is obtained. The specific heat capacity of the solution is 4.18 J g⁻¹ K⁻¹,

The heat produced = $50.0 \times 4.18 \times 5.5$ for which a calculator gives 1149.5 J = 1.1495 kJ

Since the least certain measurement (the temperature rise) is only to 2 significant figures the answer should also be quoted to 2 significant figures.

Therefore, the heat produced = 1.1 kJ

- *It should be noted however, that if this figure is to be used subsequently to calculate the enthalpy change per mole then the rounding off should **not** be applied until the final answer has been obtained.*

For example, if the carbonate has a molar mass of 84.3 g mol⁻¹, the enthalpy change per mole of carbonate can be calculated from the value above.

Using the calculator value of 1.1495 kJ for the heat produced,

- enthalpy per mole = 15.95371255 kJ mol⁻¹.
- rounding to 2 sig figs gives 16 kJ mol⁻¹

Using the rounded value of 1.1 kJ for the heat produced,

- enthalpy per mole = 15.26671057 kJ mol⁻¹.
- rounding to 2 sig figs gives 15 kJ mol⁻¹ and we have a 'rounding error'.

Errors in procedure

The accuracy of a final result also depends on the procedure used. For example, in an enthalpy experiment, the measurement of a temperature change may be precise but there may be large heat losses to the surroundings which affect the accuracy of overall result.

Anomalous readings

Where an experiment uses repeated measurements of the same quantity, anomalous readings should be identified. If an observed reading is clearly outside the range of all other readings, it can be judged as being anomalous and should be ignored when the mean value is calculated.

Similarly, if a plotted graph reveals that a value is anomalous, then it should be ignored.

References

The Royal Society of Chemistry has produced several very helpful documents on measurements and errors, see:

www.rsc.org/education/teachers/learnnet/pdf/learnnet/RSCmeasurements_teacher.pdf

www.rsc.org/pdf/amc/brief13.pdf

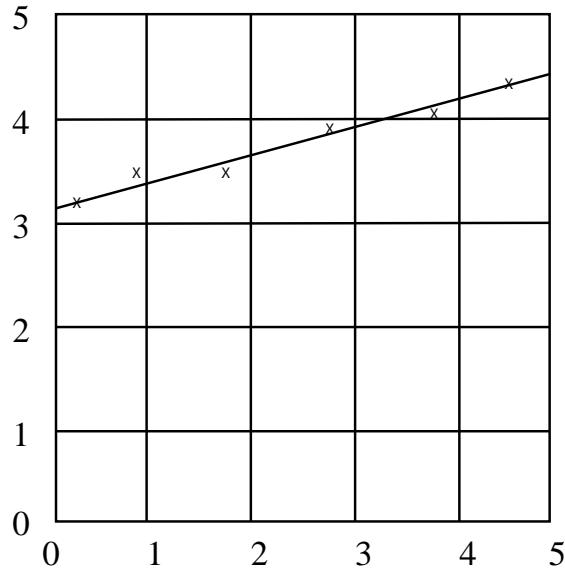
Graphical work

Credit for graphical work usually may often fall into three categories:

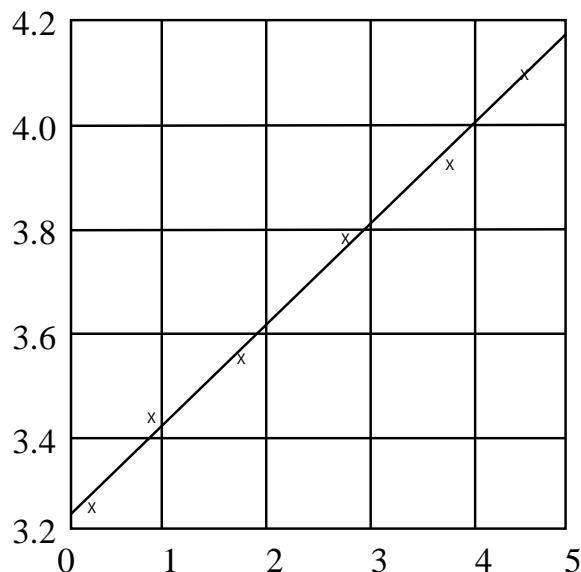
- Choice of scale
- Plotting of points
- Line of best fit

1. Choice of scales

- a. Scales should be chosen so that the plotted points occupy at least half the graph grid in both the x and y directions.

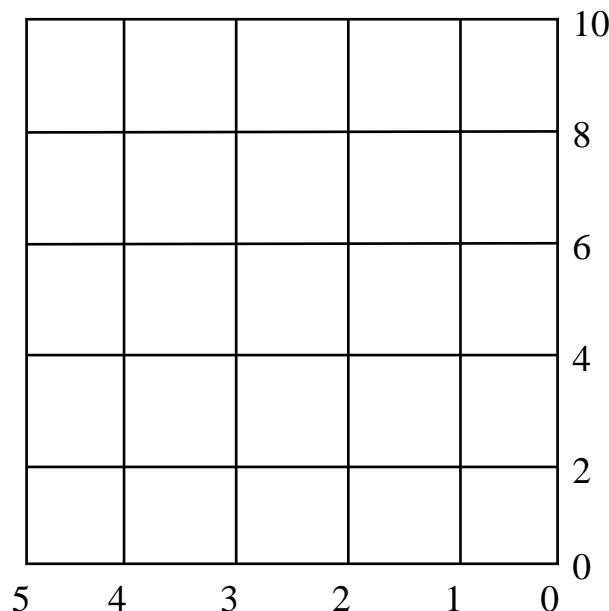


Not acceptable - scale in the y-direction is compressed

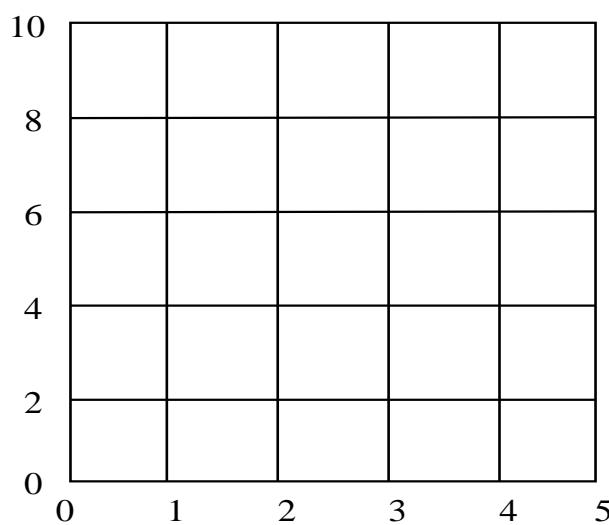


Acceptable - points fill more than half the graph grid in both the x and y directions

- b. It is expected that each axis will be labelled with the quantity which is being plotted.
- c. The scale direction must be conventional (i.e. increasing from left to right).



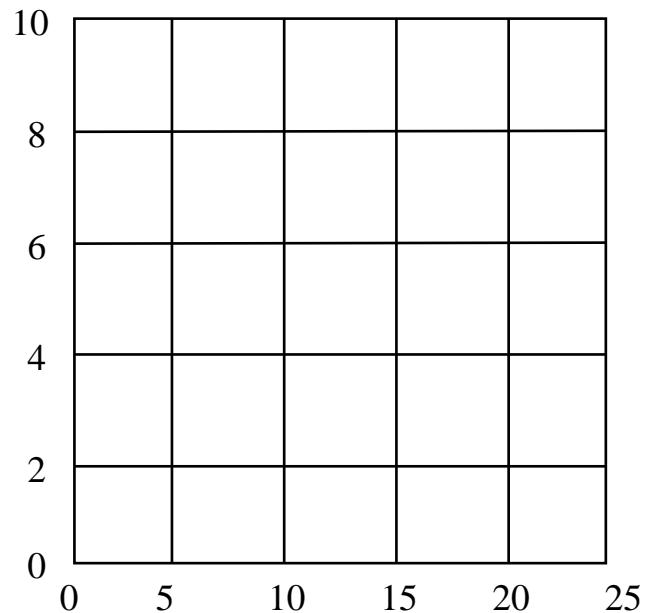
Not acceptable - unconventional scale direction



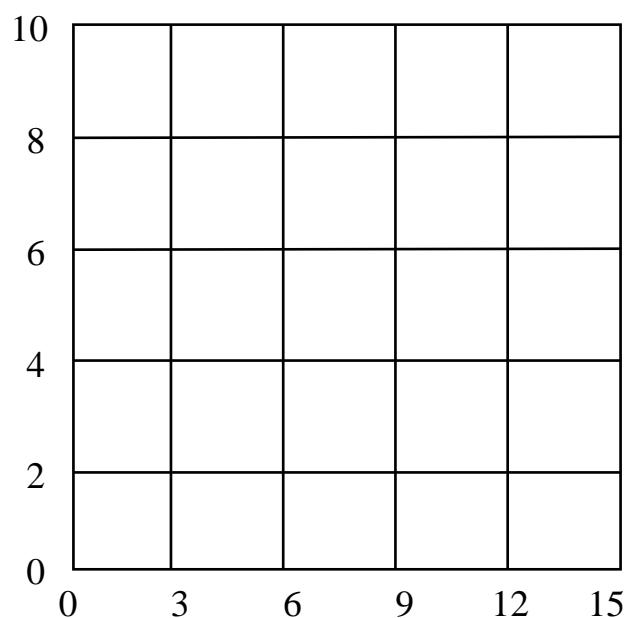
Acceptable - conventional scale direction

This problem often occurs when scales are used with negative numbers.

- d. Learners should be encouraged to choose scales that are easy to work with.



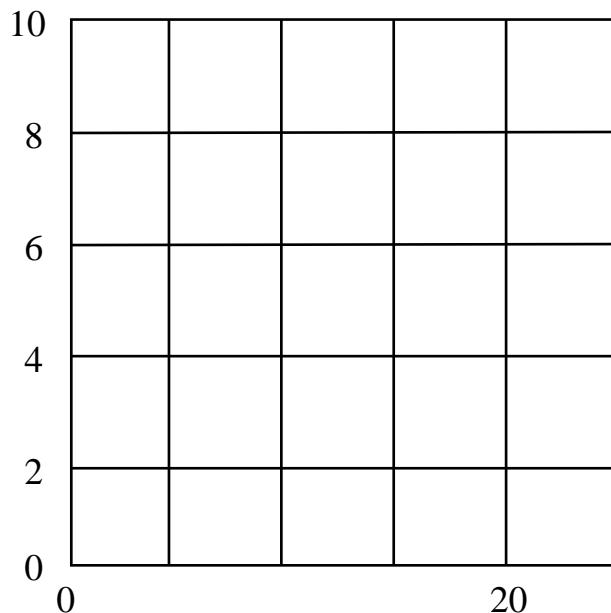
Acceptable scale divisions



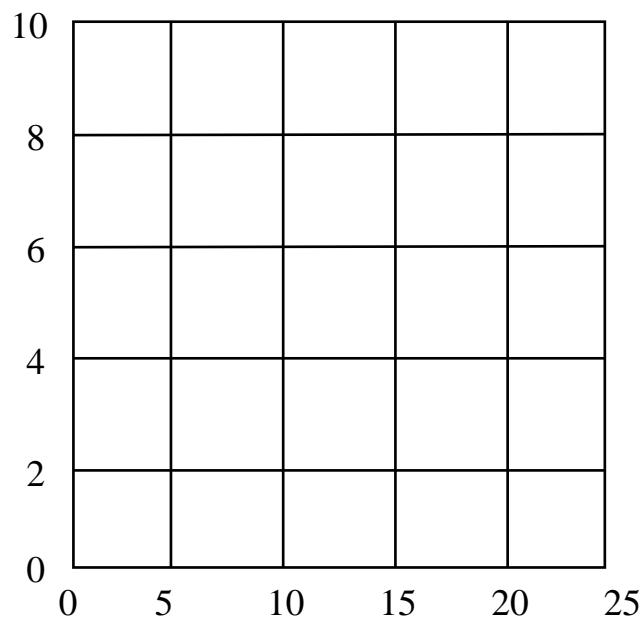
Not acceptable - awkward scale on the x-axis

Learners who choose awkward scales often lose marks for plotting points (as they cannot read the scales correctly) and calculation of gradient (Δx and Δy often misread - again because of poor choice of scale).

- e. Scales should be labelled reasonably frequently (i.e. there should not be more than three large squares between each scale label on either axis).

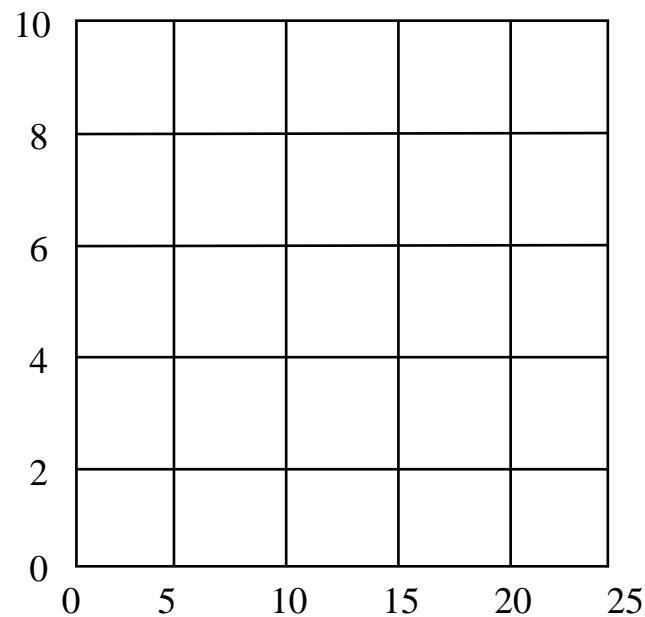


Not acceptable - too many large squares with no label

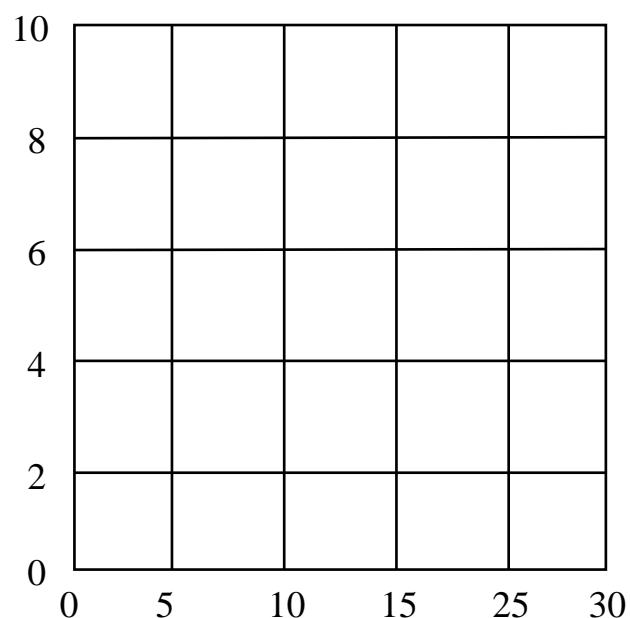


Acceptable - scales have regular labels

- f. There should be no 'holes' in the scale.



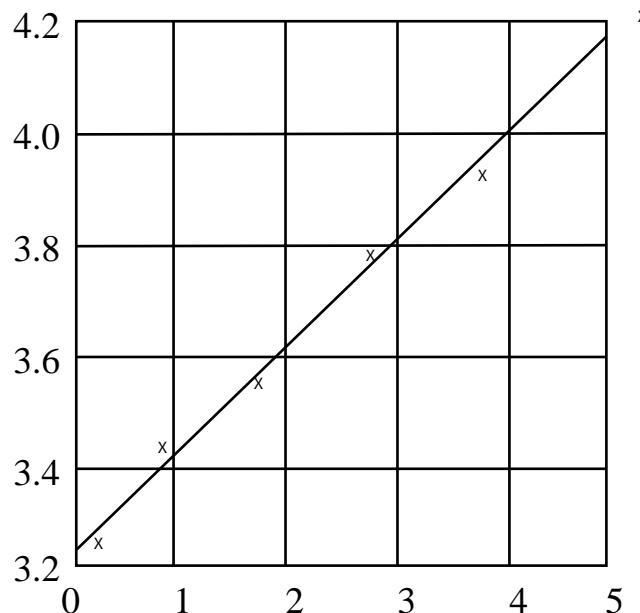
Acceptable - scale labelling is regular



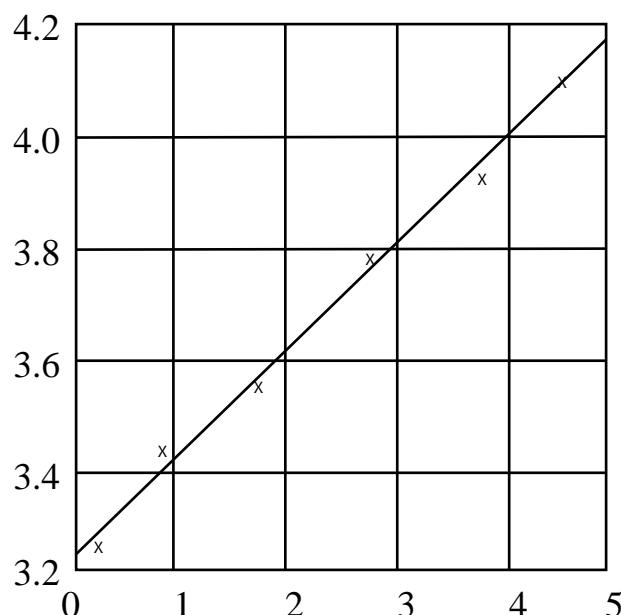
Not acceptable - non-linear scale on the x-axis

2. Plotting of points

- a. Plots in the margin area are not allowed. Learners would find it helpful to be told that any plots in the margin area will be ignored. Sometimes weaker learners (realising they have made a poor choice of scale) will attempt to draw a series of lines in the margin area so that they can plot the 'extra' point in the margin area. This is considered to be *bad practice* and will not be credited.

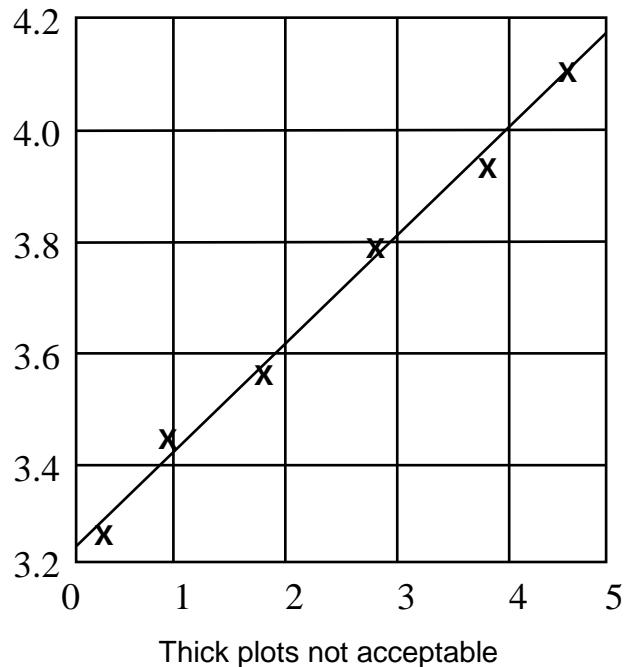


Not acceptable - the last point has been plotted in the margin area



Acceptable - all plotted points are on the graph grid

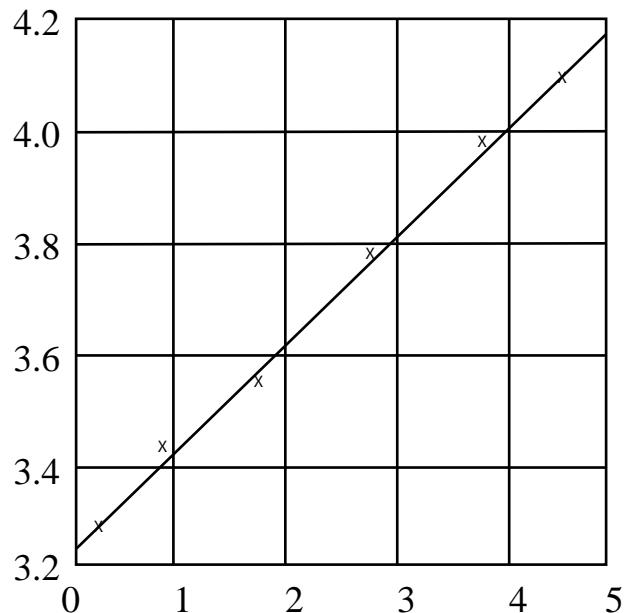
- b. It is expected that all observations will be plotted (e.g. if six observations have been made then it is expected that there will be six plots).
- c. Plotted points must be accurate to half a small square.
- d. Plots must be clear (and not obscured by the line of best fit or other working).
- e. Thick plots are not acceptable. If it cannot be judged whether a plot is accurate to half a small square (because the plot is too thick) then the plotting mark will not be awarded.



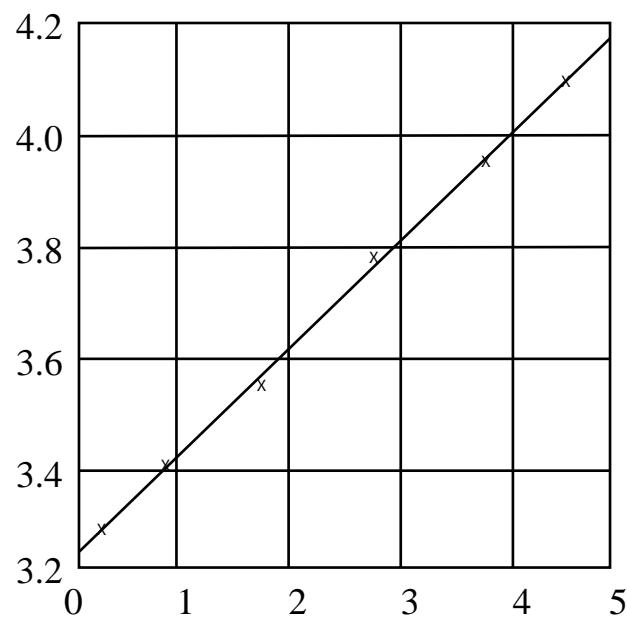
Thick plots not acceptable

3. Line (or curve) of best fit

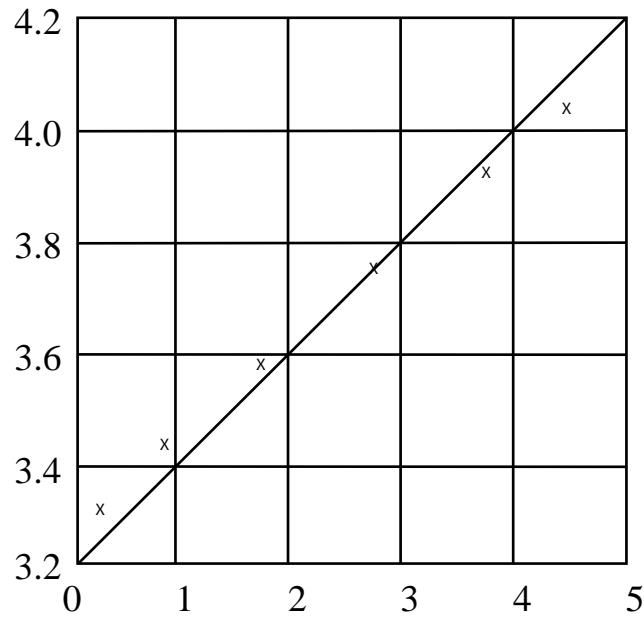
- a. There must be a reasonable balance of points about the line. It is often felt that learners would do better if they were able to use a clear plastic rule so that points can be seen which are on both sides of the line as it is being drawn.



Not acceptable - too many points above the line

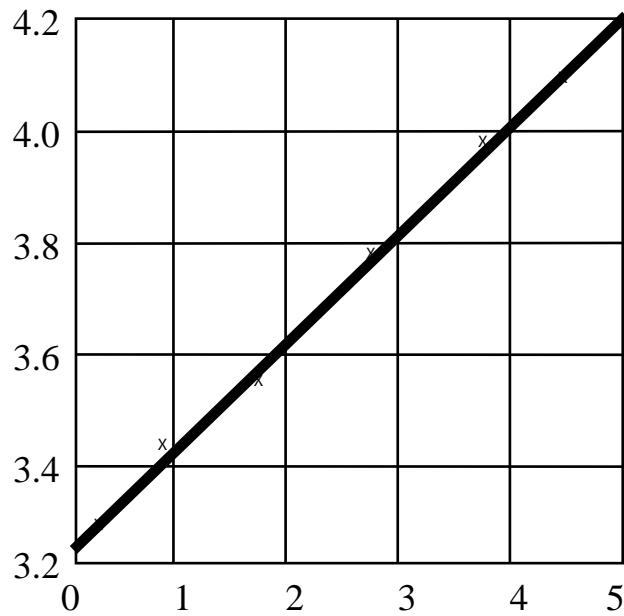


Acceptable balance of points about the line

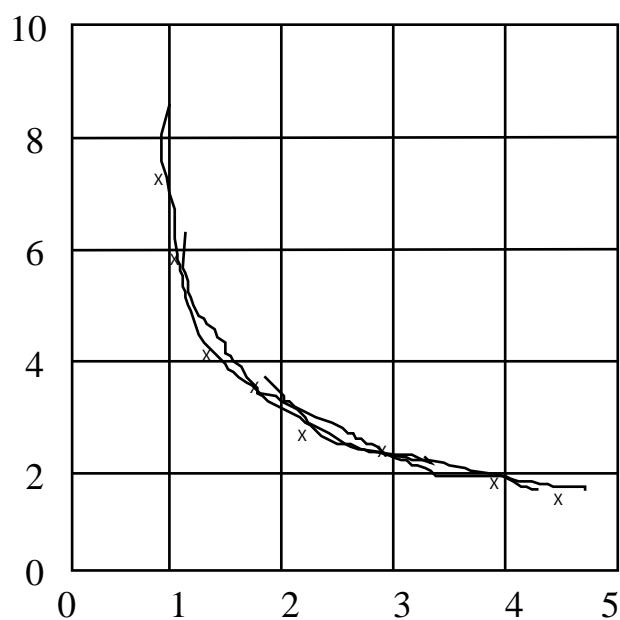


Not acceptable - forced line through the origin

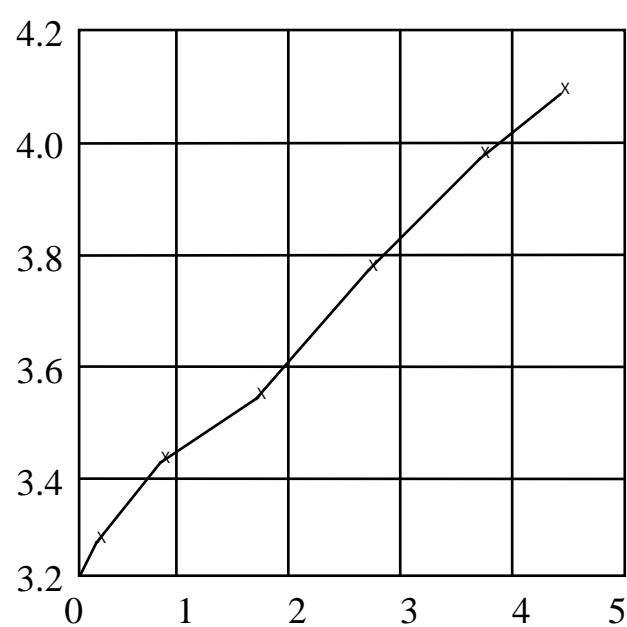
- b. The line must be thin and clear. Thick/hairy/point-to-point/kinked lines are not credited.



Not acceptable - thick line



Not acceptable - 'hairy' curve



Not acceptable – joining point-to-point