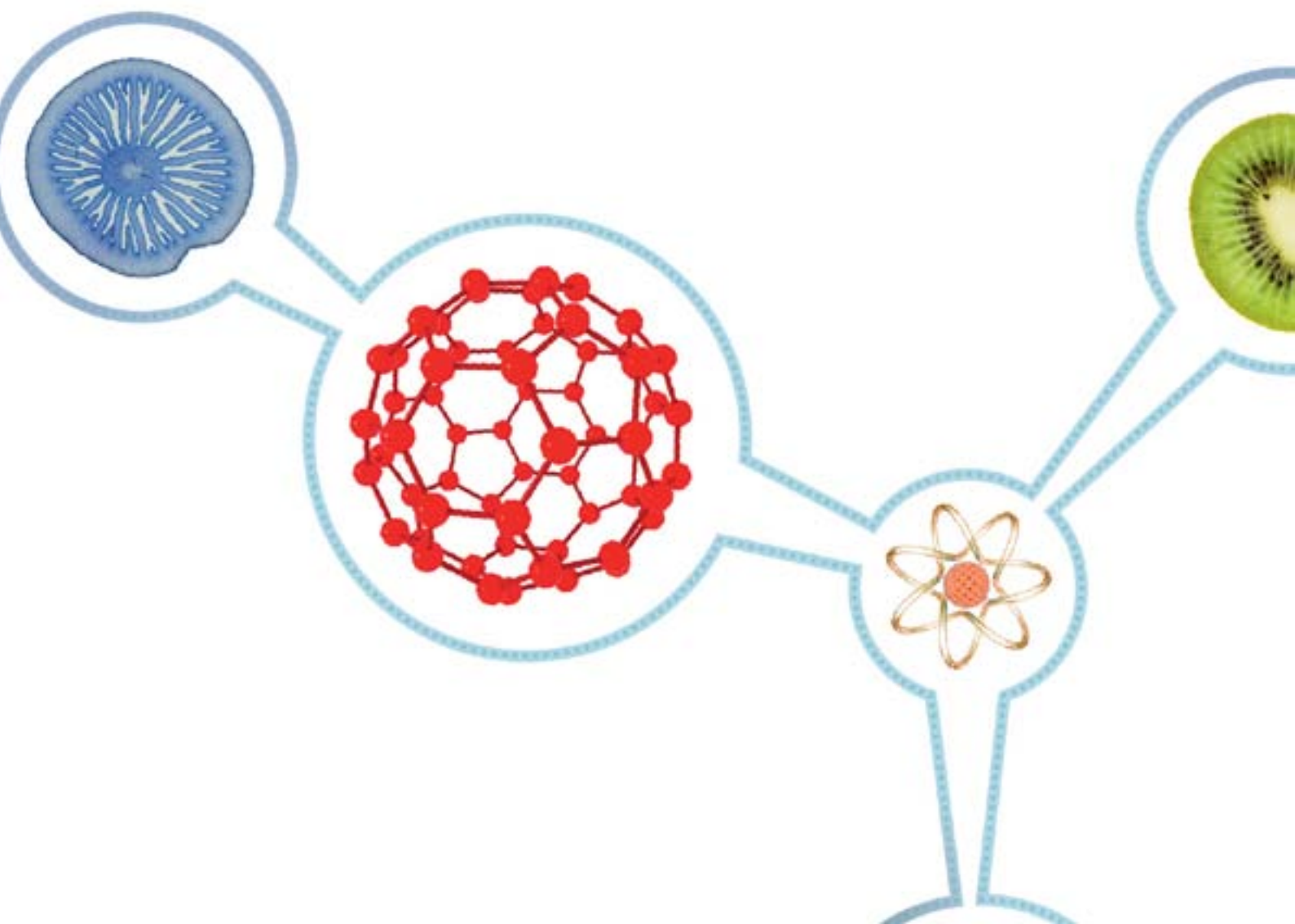


ENVIRONMENTAL AND LAND-BASED SCIENCE  
**TEACHERS' HANDBOOK**

VERSION 1 FEBRUARY 2012

This handbook is designed to accompany the OCR GCSE Environmental and Land-Based Science 2011 specifications for centres teaching the new Environmental and Land-based Science.

We may update this document from time to time, to reflect teachers' needs. Please check our GCSE sciences support website [www.gcse-science.com](http://www.gcse-science.com) at the start of each academic year to ensure that you are using the latest version.



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# GCSE ENVIRONMENTAL AND LAND-BASED SCIENCE: REFRESHED FOR 2011

OCR is offering new GCSE science specifications for first teaching in September 2011.

We've taken this opportunity to improve the quality of our GCSEs for teachers and students alike.

We want to make the introduction of these new GCSEs as easy for you to manage as possible.

The main changes are:

- the course content has been brought up-to-date to maintain its relevance to students, with a focus on developing students' personal, learning and thinking skills
- external assessment question papers provide more opportunities for students to demonstrate their skills in extended writing, mathematics and evaluation of evidence
- Controlled Assessment is introduced (to replace coursework).

## A MOVE TO LINEAR (100% TERMINAL) ASSESSMENT?

This handbook has been written to accompany the specifications accredited by Ofqual, the examinations regulator, in Spring 2011 for first teaching in September 2011. As such it reflects the fact that the specifications were designed in a unitised format, allowing flexibility for units to be assessed either throughout the course or all together at the end.

It is now known that all GCSEs will be assessed in a linear (100% terminal) manner from June 2014. This means that the last certification for GCSEs taken in a unitised manner will be June 2013.

Also for Environmental and Land-Based Science GCSE, as with other science GCSEs, from 2014 there will no longer be a January series.

## THE PURPOSE OF THIS HANDBOOK

This handbook accompanies the new OCR GCSE Environmental and Land-Based Science specifications for teaching from September 2011.

It is important to understand that this handbook plays a secondary role to the specifications themselves. The GCSE Environmental and Land-Based Science specifications are the documents upon which assessment is based; they specify the content to be studied and the skills that students need to develop. At all times, therefore, the Teachers' Handbook should be read in conjunction with the specifications.

This Teachers' Handbook aims to:

- summarise what has changed, for the benefit of centres who taught the legacy (2006) Environmental and Land-Based Science specifications
- present an overview of assessment routes and the availability of the assessments
- discuss the format of the external assessment written papers
- highlight useful resources for Environmental and Land-Based Science teachers.

Controlled Assessment is covered in a separate publication, the Guide to Controlled Assessment for GCSE Environmental and Land-Based Science, available to download for free from our specification web pages at [www.ocr.org.uk/qualifications/subjects/elbs/index.html](http://www.ocr.org.uk/qualifications/subjects/elbs/index.html)

We may update this handbook from time to time, to reflect teachers' needs. Please check our GCSE sciences support website [www.gcse-science.com](http://www.gcse-science.com) at the start of each academic year to ensure that you are using the latest version.

# OVERVIEW OF CHANGES

The 2011 specifications for the Environmental and Land-Based Science suite are revised and updated versions of the 2006 specifications.

GCSE Environmental and Land-Based Science can be taught equally well alongside either Twenty First Century Science GCSE Science A or Gateway Science GCSE Science B.

The 2011 specifications have been developed with the principle of minimum change wherever possible. However, where changes have been made this is due to:

- implementation of recommendations of the Ofqual March 2009 report '*The new GCSE science examinations: findings from the monitoring of the new GCSE science specifications 2007 to 2008*'
- the QCDA fundamental review of the GCSE criteria and the bringing of the sciences' criteria into line with other GCSEs
- the issue by QCDA of new subject criteria for GCSE Science, Additional Science, Biology, Chemistry and Physics, Additional Applied Science
- the introduction of the 40% terminal requirement, the new limit to the number of re-sit opportunities, and the new Controlled Assessment regulations
- the need to bring the 2006 specification content up-to-date, in order to maintain its relevance to students in the second decade of the 21st century, and to address issues raised by teachers about particular areas of the specifications and the clarity of the requirements.

Updating the specifications has also provided us with the opportunity to:

- increase the provision of practical opportunities
- ensure continuity from KS3 to KS4, and from KS4 to KS5.

## THE NEW GCSE SCIENCES SUBJECT CRITERIA

The new subject criteria for GCSE Environmental and Land-Based Science were published by QCDA in 2009. They prescribe the content, skills, assessment objectives and assessment weightings for the new science GCSEs to be taught from September 2011.

The specifications comprise prescribed and additional content as follows:

- For GCSE Environmental and Land-Based Science none of the content was prescribed by subject criteria but in order to keep the standard of the qualification, we have aligned the specification with the Additional Applied Science criteria.

## WHAT HAS STAYED THE SAME?

Existing teachers of Environmental and Land-Based Science will find that the new specifications are very similar to the 2006 specifications they replace.

- The content of the new specification includes some of the popular parts of the old Environmental and Land-Based course
- External assessment question papers are still offered in Foundation and Higher tiers, and retain a mixture of objective and free-response questions.
- GCSE Environmental and Land-Based Science retains the Practical 'Scientific Skills, Scientific Investigation' and Work-related Report.
- GCSE Environmental and Land-Based Science can be taken as the second science to any GCSE Science qualification or as a stand alone qualification, although it still builds on the knowledge candidates have learnt in GCSE Science.

Fundamentally, the ethos of the Environmental and Land-Based Science and its modern and relevant approach to science teaching and learning remain unchanged.

## WHAT HAS CHANGED?

### Terminal and re-sit rules

All new GCSEs, including Environmental and Land-Based Science, are now subject to the 40% terminal rule and the re-sit rule. These are discussed in the next chapter ('Teaching and assessment').






**Assessment units and weightings**

GCSE Environmental and Land-Based Science now consist of four units, comprising three external assessment (written paper) units and one internal assessment (Controlled Assessment) unit.

There is now limited choice of topics. Candidates are required to take one mandatory unit, unit B681, and then take one of either unit B682 or unit B683.



Internal assessment is now worth 60% of each GCSE – up from 50% in the 2006 specifications.

**External assessment – increased challenge**

All question papers in Environmental and Land-Based Science are now:

- worth 20% of the GCSE
- marked out of a total of 50 marks
- 1 hour in duration.


Ofqual has instructed all assessment organisations to increase the 'challenge' of external assessment papers in the GCSE sciences, but this does not mean simply increasing the difficulty of the questions in the new specification papers. The balance of different question types within the papers has been changed and candidates will be provided with greater opportunity to demonstrate what they know and can do.

Question papers for the 2011 specifications in Environmental and Land-Based Science will:

- include fewer objective questions
- include fewer 1-mark questions
- include more continuous writing questions (worth 2-5 marks)
- include more extended writing questions (worth 6 marks)
- include more assessment of mathematics skills, and ensure that mathematical work is developed towards a scientific end point
- provide a greater variety of question types
- provide less 'scaffolding', particularly in Higher Tier papers
- include more assessment of Assessment Objectives 2 and 3 (AO2 and AO3)

- assess plenty of Higher Tier material in the Higher Tier papers
- include 'stretch and challenge' in the Foundation Tier papers, by assessing material at the C-grade level that is not found on the Higher Tier paper (does not overlap).

In addition, Quality of Written Communication (QWC) will now be assessed in all question papers within Environmental and Land-Based Science.



Longer papers, more marks, more extended writing, more maths, and marks for QWC in every paper

**CONTROLLED ASSESSMENT**

Coursework has been replaced by Controlled Assessment, a form of internal assessment that adheres to the new Controlled Assessment regulations.

However, we have retained the familiar feel of Environmental and Land-Based Science internal assessment tasks; the Practical Scientific Skills, Scientific Investigation and Work-related. Report have been adapted to fit the Controlled Assessment regulations, will be based upon tasks issued by OCR

For full details, see chapter 5 of the specification and also the Guide to Controlled Assessment for GCSE Environmental and Land-Based Science available to download for free from our specification web pages at [www.ocr.org.uk/qualifications/type/gcse\\_2011/science/elbs/index.html](http://www.ocr.org.uk/qualifications/type/gcse_2011/science/elbs/index.html)

## SUMMARY OF SPECIFICATION CONTENT CHANGES

Presented here is an overview of the changes in content and emphasis within each module. Note, however, that prior to teaching it is essential that you work through the specifications closely to check the fine detail of the changes.

### Unit B681, Management of the Natural Environment

This covers the material in the old B493: Management of the Natural Environment, with updated content. All candidates must take this unit as with B493.

Units B682 and B683 are optional units. Candidates are required to take at least one of them.

### Unit B682, Plant Cultivation and Small Animal Care

Topic 1: Plant cultivation	This contains some of the content from the old unit, B491: Plant Cultivation, updated
Topic 2: Small Animal Care	This contains some of the content from the old unit B494: Care of Animals, updated

### Unit B683, Commercial Horticulture, Agriculture and Livestock Husbandry

Topic 1: Commercial Horticulture and Agriculture	This contains some of the content from the old unit, B492: Amenity Horticulture, updated
Topic 2: Livestock Husbandry	This contains some of the content from the old unit B494: Livestock Husbandry, updated

## APPLIED ALTERNATIVES TO GCSE ENVIRONMENTAL AND LAND-BASED SCIENCE



OCR offers another applied science GCSE, which can be taught with GCSE Science A as an alternative to (or in addition to) GCSE Environmental and Land-Based Science.

This is:

- *GCSE Additional Applied Science*

For more information, go to:

[www.ocr.org.uk/qualifications/type/gcse\\_2011/science/add\\_app/index.html](http://www.ocr.org.uk/qualifications/type/gcse_2011/science/add_app/index.html)



# TRANSITION

Information in this chapter is correct at the time of writing (July 2011), but dates may be subject to change. Check [www.gcse-science.com](http://www.gcse-science.com) for the latest announcements.

## FINAL ASSESSMENT AND CERTIFICATION FOR THE 2006 SPECIFICATIONS

The final assessment opportunity will be **June 2012** for the 2006 specifications in:

- GCSE Science A
- GCSE Science B
- GCSE Additional Science A
- GCSE Additional Science B
- GCSE Additional Applied Science A
- GCSE Environmental and Land-Based Science

A re-sit opportunity of examination papers only (not coursework) will be provided in January 2013. The final opportunity to certificate for any of the 2006 specifications will follow the re-sit session in 2013.

## TEACHING TRANSITION STRATEGY

### In September 2011:

- Students commencing a one-year programme in GCSE Science A should follow the 2011 specification to complete their assessment in June 2012.
- Students who have completed the 2006 specification for GCSE Science A and are commencing a **one-year** programme in GCSE Environmental and Land-Based Science are advised to follow the 2006 specifications to complete their assessment in June 2012.
- Students commencing a **two-year or three-year** programme must follow the 2011 specifications.

### In September 2012:

- All students must follow the 2011 specifications.



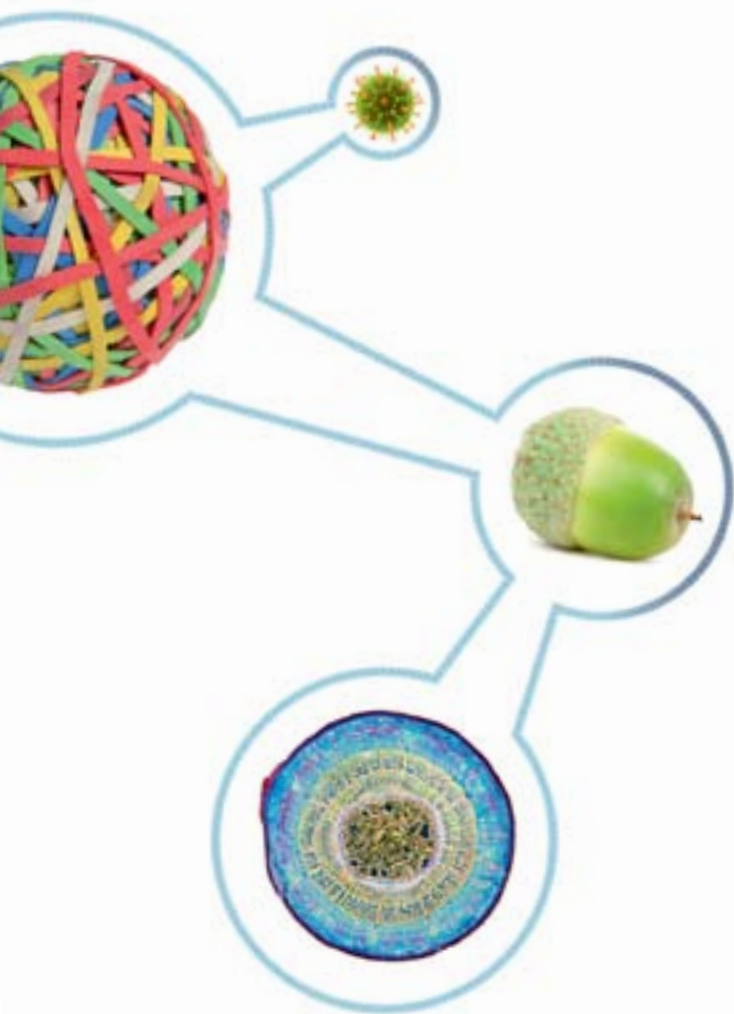


## FIRST ASSESSMENT AND CERTIFICATION FOR THE 2011 SPECIFICATIONS

First assessment and certification dates for the Environmental and Land-Based Science 2011 specifications are as follows:

Specification name	Unit	First assessment*	First certification
GCSE Environmental and Land-Based Science (J271)	Unit B681 (Management of the Natural Environment)	June 2012	June 2013
	Unit B682 (Plant Cultivation and Small Animal Care)	January 2013	
	Unit B683 (Commercial Horticulture, Agriculture and Livestock Husbandry)	January 2013	
	Unit A144 (Controlled Assessment)	June 2013	

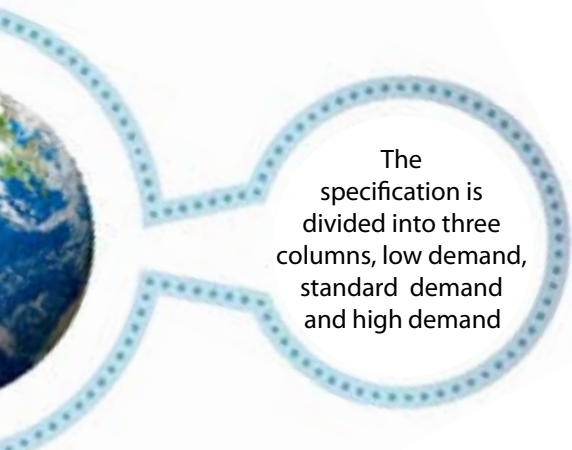
\* The external assessment (question paper) units of each specification will be assessed in each January and June series starting from the series given in the 'First assessment' column of the table. Controlled Assessment units can be submitted in each June series starting from the series given in the table.



# TEACHING AND ASSESSMENT

## USING THE SPECIFICATIONS

In this specification chapter 3 sets out the content that will be assessed.

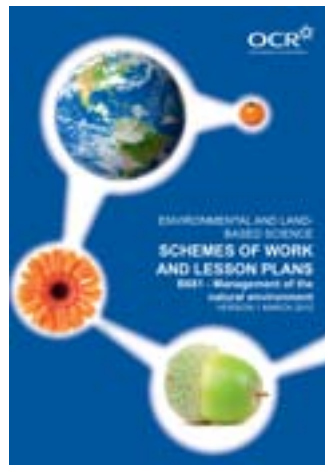


The specification is divided into three columns, low demand, standard demand and high demand

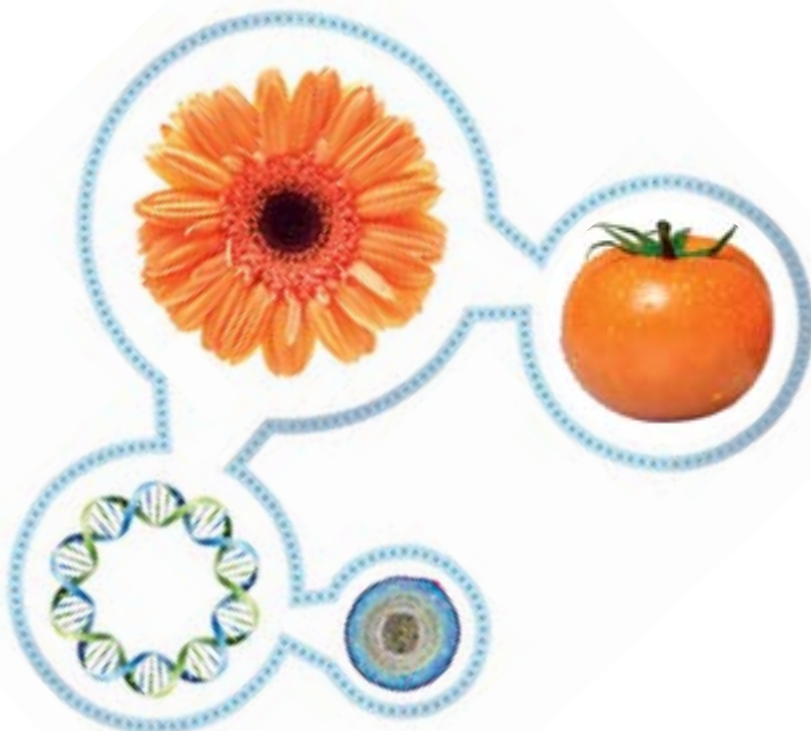
Each unit is divided into one or more topics, comprising content focussed on a particular theme or area of science.

## HELP WITH SCHEMES OF WORK AND LESSON PLANS

Each module has been designed to tell a logical story and thus provides an outline scheme of work that can be used to develop lesson plans. However, it is not essential to teach the modules in ascending numerical order; with some care, you can change the order to suit your centre's scheme of work and teaching arrangements.



Sample schemes of work and lesson plans are available to download for free from our specification web pages at [www.ocr.org.uk/qualifications/type/gcse\\_2011/science/elbs/index.html](http://www.ocr.org.uk/qualifications/type/gcse_2011/science/elbs/index.html)



## TERMINAL AND RE-SIT RULES

### The 40% terminal rule

For each GCSE, at least **40%** of the assessment must be taken in the examination series in which the qualification is **certificated**.

Note:

- The 40% can comprise any combination of assessment units, including written papers and Controlled Assessment.
- In Environmental and Land-Based Science each external assessment is weighted at 20% and the Controlled Assessment is weighted at 60%.

### The re-sit rule

Candidates may re-sit each unit only **once** before certification.

Note:

- The better result counts towards the final grade; however, if a re-sit result forms part of the 40% terminal requirement then this result will be used in the final certification even if it is a lower mark than the original attempt.
- A tiered unit may be re-sat only once, though the re-sit may be at either tier (it does not have to be the same tier as the original attempt).

### Re-taking a qualification

A qualification may be taken more than once – either by re-sitting all the units, or by re-sitting some units and reusing previous results for others, subject to the terminal requirement being satisfied.

When a qualification is re-taken (i.e. after first certification), a candidate may have up to two further attempts at each unit. However, only the better of the last two results will count towards the final grade, or the last if it is used to satisfy the terminal requirement.



Use our interactive Assessment Planner to help you ensure your students will meet the 40% terminal and re-sit rules.

[www.scienceplanner.ocr.org.uk](http://www.scienceplanner.ocr.org.uk)

A guide to using the planner is available at  
[www.ocr.org.uk/download/sm/ocr\\_59341\\_sm\\_gcse\\_assess\\_planner.pdf](http://www.ocr.org.uk/download/sm/ocr_59341_sm_gcse_assess_planner.pdf)

## FREQUENTLY ASKED QUESTIONS

*When are candidates eligible for a qualification?*

Candidates become eligible to certificate for a qualification in the session in which they:

- have been entered for a valid combination of units, and
- have been entered for certification, and
- have satisfied the 40% terminal rule.

*What happens if a certification entry is not made in the final series?*

Certification entries must be made. Without a certification entry, the candidate will not receive their subject award. However, you have until the post-results series deadline to make a late certification entry.

*What if a candidate is absent?*

It is the result of, not the entry for, an assessment unit that counts when considering the re-sit rule. A candidate who enters for a unit but is absent from the examination has not used up one of his/her two possible attempts. However, for award purposes, absence from an assessment unit will be treated as a result of zero marks for that unit.

*Will my candidates get the best results?*

Yes. We will generate the best possible grade for each candidate from their available results, including where, for example:

- they have taken more units than they need to
- there is more than one valid combination of results
- there are results from different tiers.

Of course, the terminal requirement and the re-sit rule must apply and there must also be a certification entry in the final series.

*How long will the individual unit results be valid?*

Unit results remain valid for the life of the specification.

*Can candidates wait and certificate when they have their best results?*

Yes, it is possible to make late certification entries (until the post-results service deadline) although a candidate must have met the terminal requirement in that examination series.

*Can a GCSE grade be declined?*

No. It is not possible to decline certification of GCSE awards after the results are published. However, certification does not 'use up' unit results; a candidate can re-use results in a later certification (provided that the terminal requirement is met).



## THE EXTERNAL ASSESSMENT QUESTION PAPERS

### Anatomy of a question paper

Each question paper for each specification in Environmental and Land-Based Science is marked out of a total of 50 marks.

There is a choice of paper or Computer Based Test (CBT) for each unit, see Appendix C for details.

All candidates take unit B681 and then one of unit B682 or unit B683. There are no optional questions; all questions on each paper or CBT must be attempted. The marks in each paper will be allocated approximately as follows:

Assessment Objective	Proportion of each paper
AO1	approx. 44%
AO2	approx. 50%
AO3	approx. 6%

Type of question	Proportion of each paper
objective-style questions	approx. 20 - 30% depending on the tier
1-mark questions	
continuous writing questions (2-5 marks each)	approx. 24 - 44% depending on the tier
extended writing questions (6 marks each)	3 x 6-mark questions (36%)

Skill being assessed	Proportion of each paper
mathematics skills	20%
quality of written communication	5%

### Assessment Objectives (AOs)

Three Assessment Objectives (AOs), defined by the examinations regulators, require students to be able to demonstrate their abilities as follows:

AO1	Recall, select and communicate knowledge and understanding of science.
AO2	Apply skills, knowledge and understanding of science in practical and other contexts.
AO3	Analyse and evaluate evidence, make reasoned judgements and draw conclusions based on evidence.

**AO1** requires only direct **recall** and communication of knowledge gained by studying the specification.

**AO2** requires the **application** of skills learnt from the specification to an **unfamiliar** context. The need for an unfamiliar context in which students can apply their skills and knowledge means that the question may appear, at first glance, to be off-specification. However, the question stem will furnish the student with all the additional information they need to be able to answer the question when they apply what they have learnt in other contexts to the situation described in the question.

To answer certain questions, students will need to **apply** what they have learnt to an **unfamiliar** situation.

If a student thinks the context described in a question looks unfamiliar, they should:

- think about how it is **similar** to something they have learnt
- look for clues in the question that suggest how they can **relate** the situation to what they know
- and, most of all, **don't panic!**

Note that the command word "describe" does not necessarily mean that an AO1 answer is required, and the command word "explain" does not necessarily require an AO2 answer. For example, if a specification statement requires students to explain something, then any 'explain' question on this learning objective will require an AO1-style (recall) answer.

**AO3** requires the student to:

- look at evidence or data
- do more than simply describe evidence
- do more than simply process data
- synthesise their own judgement or conclusion.

An AO3 question will go beyond just "processing for processing's sake", and will require the student to work to an end point that relates to the scientific context given in the question via some sort of conclusion or judgement.

Some questions will ask the student to explain whether they agree or disagree with a statement or conclusion.

No marks will be given for saying "yes/no" or "agree/disagree"; rather, the marks will be awarded for **explaining or justifying** this judgement.



### Objective-style questions

Objective-style questions are those that require candidates to choose from a selection of possible answers.

Styles of objective question used in Environmental and Land-Based Science question papers include:

- ticking items in a list to identify correct answers, or to distinguish true from false answers
- drawing a ring around correct answers
- selecting a word or phrase to complete a sentence
- ordering statements into the correct sequence
- drag and drop questions
- joining items by drawings lines from one list to another.

### Continuous writing questions

Questions worth 2-5 marks in which students must synthesise their own answer (rather than choose from a selection of possible answers) are classed as 'continuous writing' questions.

- The *breadth* of answer required (i.e. how much of the topic to cover in the answer) will be indicated by the question stem, particularly by the command word used and the amount of information given in the stem.
- The *depth* of answer required (i.e. the amount of detail needed) can be judged from the number of answer lines provided and the number of marks allocated to the question.

Guidance on command words is given at the end of this section.

The information given in the question stem will help students to decide how much of the topic they need to cover in their answer, but the examiner will have been careful not to provide too much 'scaffolding'.

For example, consider the following construction:

**(b)** Explain why a certain thing works the way it does.

In your answer you should write about

- this
- and this
- and also this.

.....

.....

.....

**[3]**

This construction gives the student a lot of guidance about what to include in their answer, and will not be used in questions targeted at grade D or above. It may be seen very occasionally on questions targeted at grades G, F or E.

Tick-box questions will **not** always indicate how many ticks are required.

Students should **not** assume that the number of marks available indicates the number of ticks required.

Students must evaluate each of the possible answers on its own merit, and then tick each one they think is correct.



However, now consider the following construction:

(c) Here are some things Gertrude could do when she repeats her experiment

- repeat the reaction five times at each concentration
- measure the temperature to three decimal places
- add dilute acid to the reaction mixture.

Explain which of these would increase the confidence in her conclusion.

.....

.....

.....

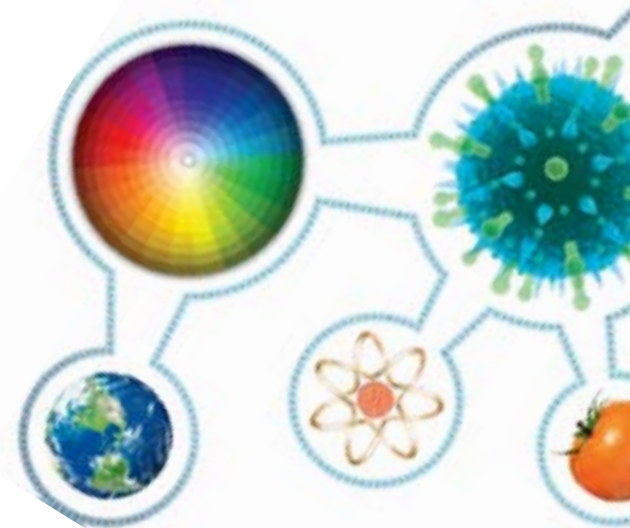
[3]

This construction may be used in any question, because the bullet points present information to be analysed; the student must select what information to include in their answer.

Bullets used in this way increase accessibility of the question when there is a lot of information for the student to read, which may be the case in questions assessing AO2 and AO3 skills.

In continuous writing questions, the examiner will be looking to see that the student has presented a **cohesive argument** in their answer, rather than simply writing several unlinked points.

Students should use conjunctive words and phrases such as "because", "so that" and "however" to link related statements in their answer in a logical way.



### Extended writing questions and quality of written communication

Each question paper in Environmental and Land-Based Science will contain **three** extended writing questions.

Each of these questions will:

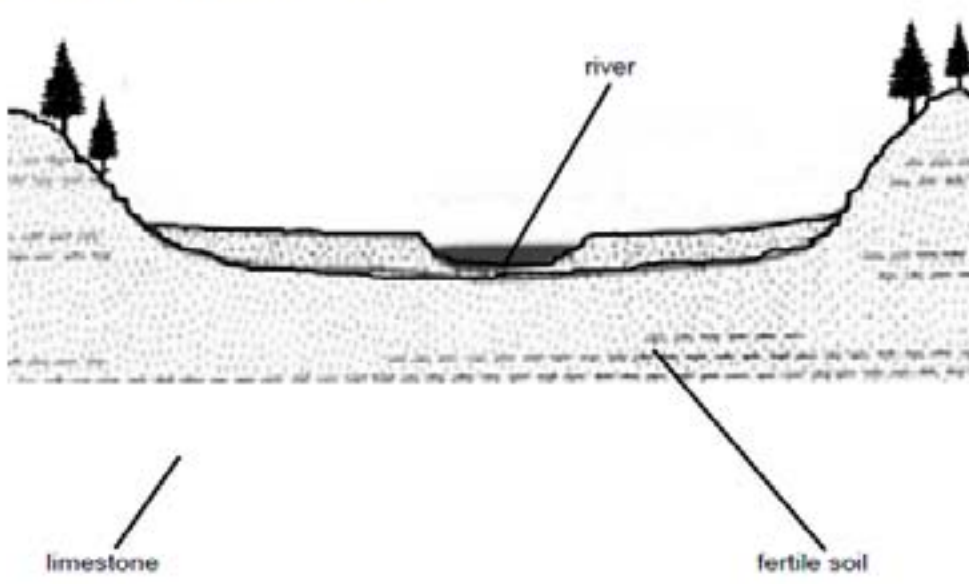
- be worth 6 marks
- assess the student's Quality of Written Communication (QWC)
- be marked using a 'levels of response' mark scheme.

A pencil icon and a rubric will inform students that their quality of written communication will be assessed in their answer to this type of question.

For example, the following question has been reproduced from the accredited Specimen Assessment Material for GCSE Environmental and Land-Based Science Unit B681 (Higher Tier):

**15** Landscapes can take millions of years to develop.

Look at the diagram of a landscape below.



Suggest how the landscape in the diagram could have formed.

✓ The quality of written communication will be assessed in your answer to this question.

.....

.....

QWC skills that may be assessed in extended writing questions include:

- spelling, punctuation and grammar
- appropriate use of correct scientific terms
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

All six-mark extended writing questions will be marked using a 'levels of response' mark scheme. The assessment of QWC is embedded into the levels described in the mark scheme – it is not a standalone mark, hence the total number of marks available for the question is expressed as **[6]**, rather than as **[5+1]**.

The levels of response mark scheme for a six-mark extended writing question will always be divided into columns.

The column entitled "Additional guidance" gives a list of relevant points that a student might be expected to make if they are performing at Level 3. The "relevant points" are not to be taken as marking points, but as a summary of points that will allow examiners to judge how well the candidate has grasped the relevant science and skills of the topic area.

For the example question given on the previous page, the "Additional guidance" column contains the following list of relevant points:

Relevant points include:

- Limestone is a soft rock / dissolves in water / rainfall
- chemical and physical weathering on the sides of the valley due to water / ice / wind
- river flows creates a channel / v-shaped valley
- deposition / particles desposited from river in the base of the valley / where water moves more slowly
- creates soil when mixed with organic matter / humus
- plants and animals die and decay, adding organic matter making soil productive / fertile
- trees and other vegetation on valley sides help to stabilise the ground / prevent further erosion

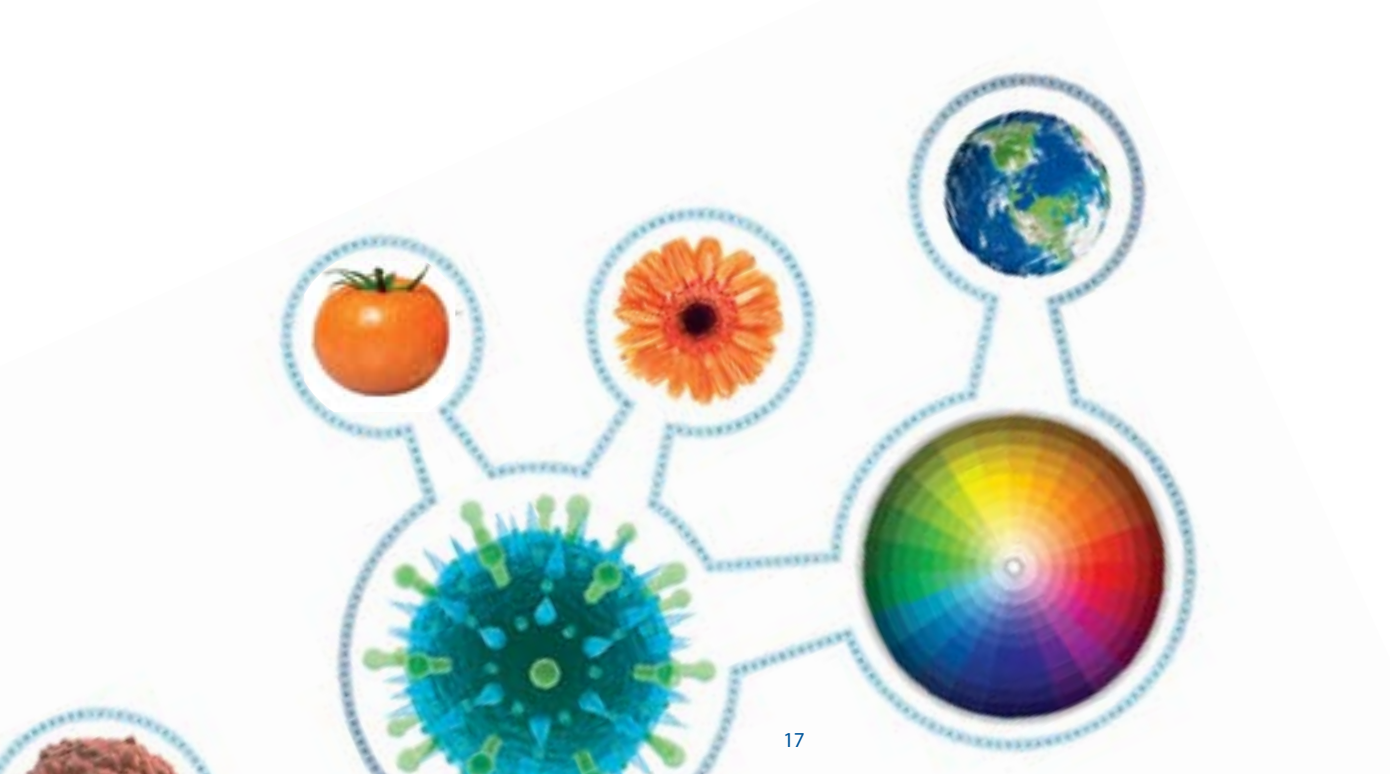
The column entitled "Expected answers" contains descriptors for four levels, numbered from level 3 down to level 0.

The first sentence or two of each level descriptor describes the indicative scientific content of answers in this level; the following sentences describe the indicative quality of written communication.

The expected quality of written communication is different in the three levels, and it will always be considered at the same time as looking at the scientific information in the answer.

When marking, the examiner will first decide which of these levels best describes a student's answer. The student will then be awarded the higher or lower mark within the level depending on the quality of the science and the quality of the written communication in their answer.

For the example question given on the previous page, the "Expected answers" column contains the following level descriptors:



**[Level 3]**

Thorough answer applying knowledge of weathering, deposition and importance of plants and animals to explain the formation of the landscape. Quality of written communication does not impede communication of the science at this level.

(5 – 6 marks)

**[Level 2]**

Partial answer applying limited knowledge of weathering deposition and importance of plants and animals to explain the formation of the landscape. Quality of written communication partly impedes communication of the science at this level.

(3 – 4 marks)

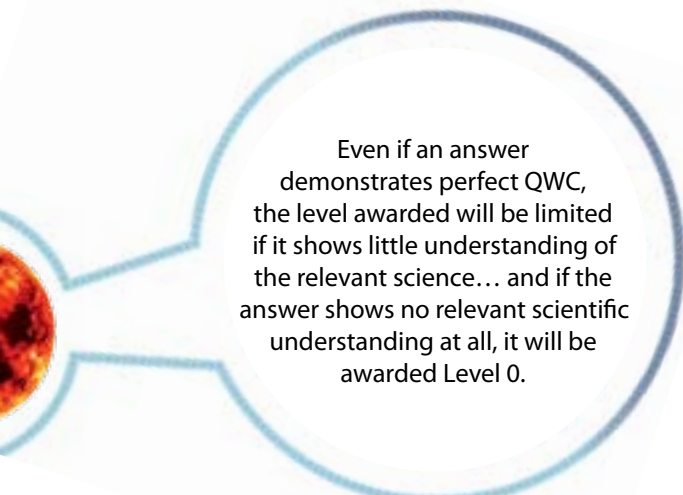
**[Level 1]**

Identifies the roles of weathering, deposition and living organisms in the formation of the landscape. Quality of written communication impedes communication of the science at this level.

(1 – 2 marks)

**[Level 0]**

Insufficient or irrelevant science. Answer not worthy of credit.



Even if an answer demonstrates perfect QWC, the level awarded will be limited if it shows little understanding of the relevant science... and if the answer shows no relevant scientific understanding at all, it will be awarded Level 0.





“Mathematics skills” does not just mean doing calculations – it includes all of the quantitative, processing, graphical and interrogative skills listed in the subject criteria for GCSE sciences. These mathematics skills are listed in **Appendix B** in the specification for Environmental and Land-Based Science.

Within question papers, candidates will need to be able to demonstrate competence in all of the mathematical skills listed in Appendix C of the specification. These skills will be assessed within a scientific context, and will often require candidates to develop their mathematical answers towards a scientific conclusion or judgement.

It may be helpful to understand how certain mathematics skills can be classified as AO1, AO2 or AO3-type skills. The following may be used as a guide:

#### **AO1 – Recall, select and communicate knowledge and understanding**

- recall of a unit
- selection of an appropriate formula

#### **AO2 – Apply skills, knowledge and understanding in practical and other contexts**

- calculating a value from data
- substitution of numbers into a formula and calculating the answer
- reading or calculating a number from a graph
- description of trends in data or the shape of a graph (i.e. *what* is happening and *when*?)
- explanation of trends in data or the shape of a graph (i.e. *why* is it happening?)
- comparing the data to other data sets
- commenting on how repeatable or reproducible the data are

#### **AO3 – Analyse and evaluate evidence, make reasoned judgements and draw conclusions based on evidence**

- analysing data or a graph and making a judgement or giving a conclusion, based upon evidence in the data or graph (*Note: reaching a conclusion involves more than just picking out numbers – there should be synthesis of an idea that is based upon the data but is not simply picked out from them*)
- commenting on the implication(s) of the data or experiment (including how it could be useful)
- evaluation – e.g. critique of the method used, commenting on how much confidence can be placed in the conclusion, etc.

**Command words**

It is important that candidates are able to recognise the command words used in questions in external assessment papers, and understand what kind of response is required by each command word.

This list sets out some of the commonly used command words and provides guidance on the meanings of these words. The list is not intended to be exhaustive or exclusive, but is intended as a guide to the most commonly used command words.

The exact requirements of a command word must always be interpreted within the context of the question in which it appears.

**Calculate** Work out a numerical answer. The question will indicate whether or not working must be shown. Appropriate units may be given on the answer line, but if the units are not given they should be included in the answer. *Compare with **Estimate and Predict**.*

**Compare Complete** Identify similarities and differences. Add words, numbers, labels or plots to complete a sentence, table, diagram or graph.

**Describe** Set out the facts or characteristics. The answer should address *what* happens, and *when* and/or *where* it happens. *Compare with **Explain**.*

**Discuss** Give a detailed account that addresses a range of ideas and arguments. It may be necessary to consider opposing sides of a debate, and/or to include ideas, opinions and facts.

**Draw** Produce a diagram with sufficient detail and labels to illustrate the answer. *Compare with **Sketch**.*

**Estimate** Suggest an approximate value, without necessarily performing an accurate calculation or measurement. Appropriate units may be given on the answer line, but if the units are not given they should be included in the answer. *Compare with **Calculate and Predict**.*

**Explain** Set out reasons and/or mechanisms to address *why* and/or *how* something happens. *Compare with **Describe**.*

**Evaluate** Comment on given facts, data or information, and give a judgement, conclusion or opinion if appropriate.

**Justify** Provide evidence or explanation that supports an answer, to explain why the answer was given.

**Label** Add names or other identifying words to a diagram (using a straight line from the word to the appropriate feature on the diagram).

**Measure** Determine a numeric value (a quantity for a variable) using a suitable measuring instrument.

**Name** Provide appropriate word(s) or term(s).

**Outline** Set out only the key or essential facts, steps or characteristics.

**Plot** Translate data into a suitable graph or chart, with labelled axes.

**Predict** Write down a possible outcome or value, based on given or calculated information or data. *Compare with **Calculate and Estimate**.*

**Show** Write down details, steps or calculations to prove a fact or answer.

**Sketch** Produce a simple, freehand drawing to illustrate the general point being conveyed. Detail is not required. In the context of a graph, the general shape of the curve would be sufficient without plotting precise points. *Compare with **Draw**.*

**Suggest** Apply scientific knowledge and understanding from the specification to a novel situation or context.

**Write down** Provide a concise answer with no supporting argument.

“Student speak” definitions of common command words have been provided in Appendix B of this handbook, which can be used as a classroom handout.



## ADDITIONAL RESOURCES



OCR has been working closely with Collins, our publisher partner for OCR GCSE Environmental and Land-Based Science to help ensure their new resources are available when you need them and match the new specification.

Developed in consultation with examiners and teachers of the course, Collins' new Environmental and Land-Based resources will help you:

- Prepare for and deliver the course using detailed schemes of work and lesson plans
- Engage students with exciting practical activities
- Build key skills and track progress to achieve exam success.

Details of these publications are available at:  
[www.collinseducation.com/gcscscience2011](http://www.collinseducation.com/gcscscience2011)

### ESSENTIAL BOOKMARKS

- [www.gcse-science.com](http://www.gcse-science.com) – for the latest updates and free downloads of specifications and support materials
- [www.scienceplanner.ocr.org.uk](http://www.scienceplanner.ocr.org.uk) – our free interactive Assessment Planner to help you plan valid assessment routes
- [www.ocr.org.uk/training](http://www.ocr.org.uk/training) – for information and to book a place on our free INSET courses and new online training events
- [www.ocr.org.uk/campaigns/science/world\\_of\\_science](http://www.ocr.org.uk/campaigns/science/world_of_science) – our popular 'World of Science' interactive game, supporting the 2011 science specifications
- [www.social.ocr.org.uk](http://www.social.ocr.org.uk) – join our new science social community for teachers, where you can participate in discussions, ask questions, and upload & download teacher-made resources
- [answers.ocr.org.uk](http://answers.ocr.org.uk) – our new question & answer service, available for free 24 hours a day, where you can browse hot topics, FAQs and email us with specific questions
- [www.ocr.org.uk/interchange/active\\_results](http://www.ocr.org.uk/interchange/active_results) – our free results analysis service, which allows you to review the performance of individual students or your whole school on a unit or question-by-question basis and compare against national averages

### USEFUL WEB RESOURCES

The following list of websites has been compiled from suggestions by teachers, and may be useful in teaching of Environmental and Land-Based Science.

While these websites may be useful, OCR does not contribute to or regulate them in any way, and is not responsible for any of their content or the ways in which they are used. The list is not intended to be exclusive or comprehensive, and inclusion in the list does not constitute endorsement by OCR. Website addresses are correct at the time of printing.

#### General

- [www.nhs.uk/News/Pages/NewsIndex.aspx](http://www.nhs.uk/News/Pages/NewsIndex.aspx) – NHS 'Behind the Headlines', an analysis of the real science behind the science stories that hit the news (a useful training resource for 'Ideas about Science' and the Case Study Controlled Assessment tasks)
- [www.collinsnewgcscscience.co.uk/badscience](http://www.collinsnewgcscscience.co.uk/badscience) – web resources and lesson plans based on the 'Bad Science' book and newspaper column by Ben Goldacre, unpicking scientific claims, reports and news stories
- [www.tes.co.uk/secondary-teaching-resources](http://www.tes.co.uk/secondary-teaching-resources) – TES list of resources for secondary teaching, including lesson plans, worksheets, activities, revision, teaching ideas and classroom resources
- [www.abpischools.org.uk/page/resource/age/subject.cfm?age=Age%20Range%2014%2D16](http://www.abpischools.org.uk/page/resource/age/subject.cfm?age=Age%20Range%2014%2D16) – information and interactive activities on a range of topics relevant to GCSE science
- [www.explainthatstuff.com](http://www.explainthatstuff.com) – a large collection of articles, providing easy introductions to science concepts and technology
- [www.creative-science.org.uk](http://www.creative-science.org.uk) – ideas and resources to help students create experiments for themselves, from the Creative Science Centre at the University of Sussex
- [www.s-cool.co.uk/gcse](http://www.s-cool.co.uk/gcse) – a colourful revision site
- [www.wmnet.org.uk/resources/ELBS](http://www.wmnet.org.uk/resources/ELBS) – Resources created for the 2006 specification but still contains some useful information.
- [www.ELBS.info](http://www.ELBS.info) – A site created for the teaching of the new Environmental and Land-Based Science.

## APPENDIX A: HAZARD SYMBOLS

Specification statements C4.1.18 and C6.1.6 require students to recall the chemical hazard symbols for explosive, harmful, toxic, corrosive, oxidizing and highly flammable.

Teachers and technicians will be familiar with the square symbols with orange backgrounds, as defined in EEC Directive 67/548/EEC. However, this Directive will be repealed on 1 June 2015 and the symbols will no longer be used after that date.

A new set of diamond-shaped hazard symbols with white backgrounds is being introduced in Europe, in accordance with the *United Nations Globally Harmonized System of Classification and Labelling of Chemicals* (the "GHS"). The GHS has been adopted in Europe under the *Regulation on the Classification, Labelling and Packaging of Substances and Mixtures* (the "CLP").

### How does this affect teaching and assessment?

Guidance for teachers and technicians about using chemicals in school has been issued by CLEAPSS in the leaflet 'An introduction to GHS / CLP chemical hazard labelling', available to download for free from:

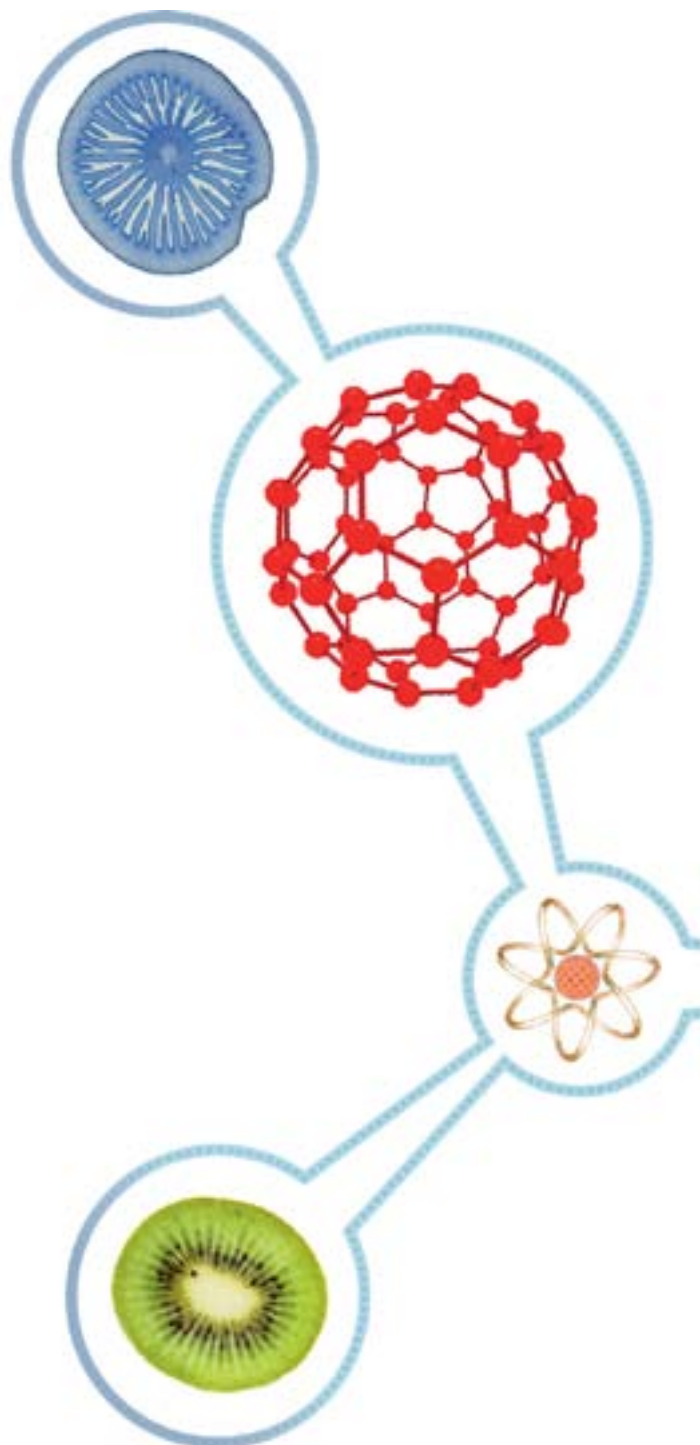
[www.cleapss.org.uk/attachments/article/0/GL%20101%20GHS%20CLP%20labelling.pdf?Secondary/Science/Guidance%20Leaflets](http://www.cleapss.org.uk/attachments/article/0/GL%20101%20GHS%20CLP%20labelling.pdf?Secondary/Science/Guidance%20Leaflets)

Note that under the new GHS/CLP system, the familiar 'X' symbol for 'harmful' will no longer be used. Hazards previously classified as harmful will be covered by the other symbols in the new system, according to the nature of the hazard.

The period up to 1 June 2015 is considered to be a transitional period in which both sets of symbols will be in use. Hence, students are likely to see both sets of symbols on chemical bottles and chemical safety data sheets during the lifetime of the 2011 specifications.

Students should be familiar with both sets of symbols, and should be able to recall both sets during assessment.

The following page shows both sets of symbols (limited to those required by specification statements C4.1.18 and C6.1.6), and can be used as a classroom handout.



# HAZARD SYMBOLS

Many chemicals you use in school and at home will be labelled with hazard symbols.

The symbols used in Europe are changing, and between 2010 and 2015 two sets of symbols will be in use.

**The 'old' symbols are square and have an orange background.**



Explosive



Toxic



Corrosive



Oxidizing



Highly flammable



Harmful

**The 'new' symbols are diamond-shaped and have a white background.**



Explosive



Toxic



Corrosive



Oxidizing



Highly flammable

There is not a symbol for 'harmful' in the new system.



# APPENDIX B: COMMAND WORDS

This page explains some of the command words you will see used in exam questions.

Remember that you may see other command words used in questions, and the exact way you answer a question will always depend on the information given in the question itself.

## **Calculate**

Work out a number. You can use your calculator to help you. You may need to use an equation. The question will say if your working must be shown. (Hint: don't confuse with 'Estimate' or 'Predict')

## **Justify**

Give some evidence or write down an explanation to tell the examiner why you gave an answer.

## **Compare**

Write about the similarities and differences between two things.

## **Outline**

Give only the key facts of the topic. You may need to set out the steps of a procedure or process – make sure you write down the steps in the correct order.

## **Describe**

Write a detailed answer that covers *what* happens, *when* it happens and *where* it happens. Talk about facts and characteristics. (Hint: don't confuse with 'Explain')

## **Predict**

Look at some data and suggest a realistic value or outcome. You may use a calculation to help. Don't guess – look at trends in the data and use your knowledge of science. (Hint: don't confuse with 'Calculate' or 'Estimate')

## **Discuss**

Write about the issues related to a topic. You may need to talk about the opposing sides of a debate, and you may need to show the difference between ideas, opinions, and facts.

## **Show**

Write down the details, steps or calculations needed to prove an answer that you have given.

## **Estimate**

Suggest an approximate (rough) value, without performing a full calculation or an accurate measurement. Don't just guess – use your knowledge of science to suggest a realistic value. (Hint: don't confuse with 'Calculate' and 'Predict')

## **Suggest**

Think about what you've learnt and apply it to a new situation or context. Use what you have learnt to suggest sensible answers to the question.

## **Explain**

Write a detailed answer that covers *how* and *why* a thing happens. Talk about mechanisms and reasons. (Hint: don't confuse with 'Describe')

## **Write down**

Give a short answer, without a supporting argument.

## **Evaluate**

You will be given some facts, data or other kind of information. Write about the data or facts and provide your own conclusion or opinion on them.

# APPENDIX C: CENTRE AUDIT FOR RUNNING COMPUTER-BASED TESTS

Please use this information to ensure that the centre has the technical capability to administer the computer-based tests required for this specification. **Please note it is the responsibility of the Head of Centre to ensure that the centre is appropriately equipped to administer the tests in terms of system requirements and venue requirements.** The Examinations Officer within the centre is responsible for the conduct of the computer-based tests within the bounds of the Instructions for the Conduct of Examinations issued by the Joint Council for Qualifications.

If there are any difficulties in completing the audit, please contact [etest@ocr.org.uk](mailto:etest@ocr.org.uk).

*Requirements for OCR Computer-based Tests:*

- *Ensure that the Head of Centre, Examinations Officer, Systems Manager/Technician, subject teacher and SENCo (if appropriate) are clear about what is involved*
- *Check that the centre can meet the technical and venue requirements.*

**It is essential that all stakeholders within the Examination Centre plan the process for running computer-based tests carefully and methodically. The technical set up of the hardware and software is likely to take a little time and application and so should be carried out well in advance to allow for any technical issues to be resolved in good time.**

## **Before starting teaching the specification – planning and approval**

1. Agree who is to be the Test Administrator, responsible for making sure that the tests are conducted properly. The Examinations Officer may fulfil this role or may delegate it to a colleague.
2. Audit the centre against the Centre Checklist. This checks that the centre is able to meet the technical eligibility requirements. The school or college Systems Manager/Technician must be part of this process.
3. Ensure that the member of staff responsible for the Centre Network is aware of the plan to use computer-based testing. Consider the implications of using computer-based testing carefully.

## **Before entries are made for a computer-based test – setting up**

1. The Technician must ensure that the necessary hardware and software has been set up before entries are made. The set up must be done according to the instructions provided with the software.
2. The Technician installs the software according to instructions and runs all necessary diagnostic tests.
3. The Technician checks that the programs are running correctly and communicating properly with each other and the outside world.
4. The Technician checks that the software is running properly on the machines to be used for the live computer-based tests. It is important that an early decision is made on which room and equipment is to be used for the live tests.
5. Entries are made following the usual procedure, ahead of the entries deadline.

## **At least one month before the test date**

The subject teacher and Test Administrator run a practice test for candidates so that they are familiar with the format and look of computer-based tests.

## **Prior to the live test**

1. The Test Administrator and Technician ensure that all hardware and software is running appropriately in the room where the tests are to take place.
2. The Test Administrator and Technician ensure that they understand the process for downloading and accessing the live tests.
3. The Test Administrator checks the mouse, keyboard, screen and headphones (if required) on each candidate workstation.

## **On the day of the test**

1. The Test Administrator runs the tests according to the instructions and within the bounds of the Instructions on the Conduct of Examinations document provided by Joint Council for Qualifications.
2. The Test Administrator uploads candidates' responses according to the instructions.

## **GENERAL QUALIFICATIONS**

Telephone 01223 553998

Facsimile 01223 552627

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