

Review of Standards in GCSE Biology

2003 and 2008



April 2012

Ofqual/12/5151

Contents

Executive summary	3
Findings	3
Section 1: Introduction	4
Context	4
Methodology	4
Provision of assessment materials and student work	5
The review team	5
Analysis of the specifications and assessment materials	6
Analysis of student performance	6
Section 2: Subject demand in GCSE biology	7
Overview	7
Findings	7
Assessment objectives	7
Specification content	8
Schemes of assessment	9
Options	9
Question papers	9
Overall demand of question papers	11
Section 3: Standards of performance	12
Process	12
Findings	12
At the A-grade boundary	12
At the C-grade boundary on higher tier	12

At the C-grade boundary on foundation tier	12
At the F-grade boundary	13
Conclusions.....	14
Appendix A: Provision of assessment materials and student work at GCSE and GCE levels for Ofqual's archive (annual inclusion and standards reviews)	16
Section 1: Specification of requirements.....	16
Section 2: Student work.....	17
Appendix B: GCSE specifications reviewed	19
Appendix C: GCSE scripts reviewed	20
Appendix D: Availability of specification materials for the purposes of this review	21
Appendix E: Student achievement by grade	22
Appendix F: Review team	23

Executive summary

The Office of Qualifications and Examinations Regulation (Ofqual) undertakes a rolling programme of reviews across high-profile GCSE and GCE A-level subjects to monitor whether standards in assessment and student performance have been maintained over time.

This report details the findings for GCSE biology for the years 2003 and 2008.

The review compared subject specifications, assessment materials and student work from the five organisations awarding this qualification (AQA, CCEA, Edexcel, OCR and WJEC) by collecting the views of a number of subject specialists. The analysis was carried out in 2009, alongside other reviews examining the effectiveness of new specifications, and its findings were fed into changes made to address the problems identified.

Findings

- The introduction of How Science Works resulted in significant changes in content, with more stress on methodology, applications, implications and issues, and less coverage of content in other areas. However, this change did not affect the demand of the qualification overall.
- The increased use of short papers containing multiple-choice and short-answer questions reduced the demand of written assessments in 2008 when compared with 2003. This also led to discrimination between students becoming more difficult and in particular more limited opportunities for A-grade students to demonstrate their abilities in relation to higher-order skills such as organising information and analysing and interpreting complex data.

Section 1: Introduction

Context

We undertake regular reviews into the standards of qualifications in different years to monitor whether standards have been maintained over time.

These reviews inform future developments in qualification and subject criteria and help us to compare standards across awarding organisations. In our reviews we:

- analyse the nature of the requirements that different assessments make on students
- compare the levels of performance required for a particular grade in different assessments
- consider how these two elements relate to each other.

Our immediate predecessor, the Qualifications and Curriculum Authority (QCA), most recently conducted a standards review in GCSE biology, using materials from 1998 and 2003. The findings were published in a report in 2005, which is available on our website at www.ofqual.gov.uk/files/12891_biologyreport.pdf . In 2003, 36,117 students completed GCSE biology and in 2008, 43,602.

Methodology

Standards reviews examine different specifications within a qualification, the associated assessment instruments and samples of student work by collating and analysing the views of a number of subject specialists. The following sections of this report detail how we collect and process this information. In these reviews, demand is measured against that of the other specifications under review and includes consideration of:

- specification-level factors such as assessment objectives (AOs), content and structure
- assessment-level factors such as what content is assessed, the weighting of each component and how the assessments are marked
- student performance-level factors, including how the students responded to the assessments and the grades they received as a result.

The demand of an assessment or qualification can be defined in a variety of ways and is linked to the purpose of the qualification. It is related to the:

- amount and type of subject knowledge required to be assimilated
- complexity or number of processes required of the students, the extent to which the students have to generate responses to questions from their own knowledge or the extent to which resources are provided
- level of abstract thinking involved
- extent to which the students must devise a strategy for responding to the questions.

Provision of assessment materials and student work

Each of the five awarding organisations offering the qualifications being reviewed (AQA, CCEA, Edexcel, OCR and WJEC) was asked to provide specification materials for GCSE biology (from the specification with its largest entry in summer 2008).

Our requirements for the provision of assessment materials and student work for review are given in [Appendix A](#) and, in summary, include:

- the current specification
- all associated question papers
- final mark schemes
- the reports from examiners and grade boundaries, overall and by unit (both raw and scaled)
- mark distributions, grade descriptors and assessment grids
- any other information that was routinely supplied to centres
- all the assessment work carried out by a sample of students whose final grade lay at or near the judgemental grade boundaries for the qualification being analysed.

The comparable materials that were collected and retained for the previous review were retrieved from our archive of assessment materials and student work.

Full details of the materials supplied by awarding organisations can be found in [Appendix C](#) and [Appendix D](#).

The review team

We contracted 13 experts in GCSE biology to undertake the review. These reviewers were sourced through:

- a subject-expert recruitment exercise carried out by us in November 2008 advertised via the Times Educational Supplement and the QCA website
- nominations made by the regulators in Wales and Northern Ireland
- nominations made by awarding organisations involved in the review
- nominations made by subject associations and other learned organisations invited to participate in the review.

A full list of reviewers can be found in [Appendix F](#).

We contracted a lead reviewer, specification reviewers and script reviewers. (All nominees from awarding organisations and subject associations were script reviewers.)

Analysis of the specifications and assessment materials

The lead reviewer and specification reviewers (specification review team) analysed the awarding organisations' materials, using a series of forms which can be found via the comparability page on our website at www.ofqual.gov.uk/standards/research-reports/92-articles/23-%20comparability

These analyses are designed to describe how demanding the specification is. Each reviewer analysed a subset of the specifications available, so that there were at least three different views on each specification. The lead reviewer then produced a report which brought together the views of the reviewers on each of the awarding organisations' specifications. The specification review team was given the opportunity to discuss the lead reviewer's conclusions at a follow-up meeting. These findings are presented in Section 2 of this report.

Analysis of student performance

To assess student performance, all reviewers were brought together for a two-day meeting to analyse student scripts (pieces of student work supplied by the awarding organisations). This process is referred to as a script review. The meeting started with a briefing session to make sure that all the reviewers had a common understanding of the methodology and the judgement criteria.

The student scripts that the reviewers analysed were graded at or near the following grade boundaries: A/B, C/D and F/G. The scripts were organised into packs for consideration during the review. Packs were organised by grade: A/B, C/D and F/G for GCSE. (Other grades are calculated arithmetically after the above grade-boundary marks have been set during the awarding process carried out by awarding organisations.)

Section 2: Subject demand in GCSE biology

Overview

Specification reviewers considered the amount and type of knowledge about biology required by each awarding organisation's specifications. They did this by analysing specification documents, reports from the examiners and question papers with associated mark schemes from each of the awarding organisations from 2003 and 2008. Details of the specifications included in the review are given in [Appendix B](#).

Findings

Assessment objectives

In 2003 the AOs were identical for all awarding organisations. For CCEA the AOs were unchanged in 2008, but for other awarding organisations there were substantial amendments as a result of the redrafting of the GCSE criteria for England and Wales in 2004. Although the three broad areas remained the same (essentially knowledge and understanding, application and investigative skills) there were material changes to the wording, subsections and weightings. A major factor was the incorporation of How Science Works strands, for example "understanding how scientific evidence is collected".

The prescribed weightings of the three main areas were amended. This increased the permitted ranges. The weighting for knowledge and understanding (AO1) was reduced from 45 to 55 per cent in 2003 to 20 to 40 per cent in 2008, and the weightings for application (AO2) and investigative skills (AO3) correspondingly increased. One effect of these changes was markedly increased variation between awarding organisations in the structure of the schemes of assessment and the emphases given to different aspects.

The wording of the 2008 AOs was general and resulted in differing interpretations among awarding organisations. The absence of direction about the coverage of the subsections resulted in some aspects being only minimally addressed or ignored altogether in some schemes. The allocation of specific questions to a particular AO also varied. For example, AQA assumed that reference to data interpretation in AO3 related only to practical coursework (as in the 2003 scheme) and credited all data-based questions to AO2, whereas other awarding organisations generally allocated such questions to AO3. There was also considerable variation in what examiners interpreted as being application of knowledge and understanding. This often resulted in those questions testing understanding being ascribed to AO2 rather than AO1.

Year introduced	Assessment objective		Weighting
2000	AO1	Knowledge and Understanding	45-55%*
2005	AO1	Knowledge and understanding of science and how science works	20–40%
2000	AO2	Application of knowledge and understanding, analysis and evaluation	25-35%
2005	AO2	Application of skills, knowledge and understanding	30–55%
2000	AO3	Investigative skills	20-25%
2005	AO3	Practical enquiry and data-handling skills	20–40%

*about one-third of which must be allocated to recall

Specification content

Specifications (with the exception of CCEA's) showed a shift from an essentially traditional framework found in 2003 to one in which there was greater emphasis on contemporary issues, reflecting the new criteria in place. Opportunities for discussion – for example of ethical issues or evaluation and interpretation of data relevant to a particular situation – were made more explicit in 2008, but the basic biology has been retained. And content was updated, for example with the incorporation of new biotechnology and a strand of work on How Science Works.

Where specifications were tiered, content for the foundation tier had large volumes of content to take in, which reduced the space both to develop and show higher-order skills. In 2003 there were a large number of learning outcomes (notably in OCR's specification) with implied content, and with "peripheral" content such as locomotion and feeding patterns (notably in AQA's). The removal of such implied and peripheral content has been balanced by the incorporation of more "common" content and as a consequence the specification content remains highly demanding (in terms of content requirements) for less able foundation-tier students.

Schemes of assessment

There were some major changes and divergence of practice, as allowed in the criteria in relation to schemes of assessment, between 2003 and 2008. These contributed to reduced demand, comparability and reliability amongst AQA, OCR, Edexcel and WJEC. This was not the case for CCEA as the criteria had not changed.

In 2003 the written assessments for biology were all end-of-course. AQA and WJEC had just one paper for each tier; the others had core and extension papers on different days. All were relatively demanding in that students were expected to be able to recall all relevant specification content, there were few objective questions and a sizeable number of questions required “extended-prose” answers and used unfamiliar data.

The CCEA questions were rather less demanding than those of the other awarding organisations in both 2003 and 2008 in that they had a high proportion of short-answer questions and tended to concentrate more on recall and understanding than application.

In 2008 only CCEA and WJEC retained the terminal assessments. The others introduced modular assessments based on three units, of which units 1 and 2 were common to other science awards. The short modular papers also featured a high proportion of objective and highly structured items, which will have increased the reliability of marking but reduced the demand on students.

Options

Options are different areas of content or assessments which students (or centres) can choose from within a specification.

In 2003 there were limited options available, and in 2008 there was no optional content in any of these specifications.

As stated above, however, there were considerable options in terms of assessment. This made the qualification less demanding. The comparability between performances at each grade boundary was also adversely affected by this variability. In some cases it is difficult to see how awarding organisations can be sure that individual students have a balanced coverage of the specification given the amount of choice in assessment routes. This is particularly true for students within the Edexcel scheme. In addition, for students with WJEC there is an option of a practical investigation or an extended report.

Question papers

The layout and presentation of papers was of a high and comparable standard in both years and caused no change in the demand of the qualification.

There was an increased use of objective testing (usually in the form of multiple-choice questions) particularly in Edexcel and OCR Units 1 and 2, which significantly reduced demand in 2008. An increase in multiple-choice single-mark items and highly structured (“scaffolded”) short-response questions reduced demand in that students were not required to demonstrate skills such as synthesis and analysis, which can only be tested with more complex questions where students have to marshal their knowledge and understanding and apply it in unfamiliar contexts. Less complex questions also reduced demand by presenting students with fewer opportunities in 2008 to develop their own strategies for answering questions. This reduction in demand was critical for more able or higher-achieving students aiming to demonstrate A-grade performance. In particular, students often had limited or no opportunities to organise information for an answer or to show their skills of communication, analysis and interpretation of complex data (qualitative and quantitative).

The Unit 3 papers of AQA, OCR and Edexcel were rather more challenging but had fewer extended items than appeared in the papers of 2003.

Reviewers were also struck by the poor quality of some of the objective questions. Distractors were occasionally trivial or irrelevant and included made-up words. Sometimes the answer could be deduced through an elementary knowledge of English language.

Other examples of poor practice in question setting included an occasion where the required answer the “iris reflex” is also widely known as the “pupil reflex”, which was an incorrect distractor. At least one GCSE textbook refers to this as the “iris-pupil reflex”, so some students would not have got credit for what is justifiably a correct response. On the same paper a question asked for “another function of white blood cells” but does not state one as a given.

On the AQA objective test papers there are some examples of very good practice. Complexity is generated by having a series of questions based on one topic, for example question 7 (a, b, c and d) on BLY1AP all explore students’ knowledge of the drug thalidomide. Question 8 (a, b, c and d) on the same paper allows, in an objective testing context, students to analyse graphically presented data whilst Question 4 (a to d) explore elements of How Science Works from a piece of stimulus material about Linus Pauling.

Some papers were judged to show imbalance in AO coverage, focusing on those that were easier to assess. Most notable was the CCEA papers (which often exceeded the weighting allocated for AO1 due to heavy emphases on recall and understanding), and Edexcel papers which seemed to have unbalanced coverage of the subsections within AOs, for example AO2c and d in 2008 and limited emphasis on How Science Works compared with the specification content.

Most foundation papers included questions that could be accessed by less able students although few were progressively more demanding. The 2008 OCR foundation papers had objective questions with simple ideas but rather complex language and style, making them more obscure. For less able students there were a number of challenging objective questions on the AQA papers. WJEC appeared to be the most successful at engaging foundation-tier students with structured questions that, with appropriate complexity, led students through knowledge recall and gave them a chance to employ higher-order skills such as analysis.

As stated, few of the higher-tier papers in 2008 had enough challenging questions to discriminate adequately within the A-grade range other than on range of knowledge recalled. There was limited requirement to analyse more complex and unfamiliar information or to generate and organise longer responses. In comparison with 2003, AQA and WJEC remained broadly appropriate for A-grade students, CCEA remained relatively undemanding, but Edexcel and OCR became notably less demanding for grade-A students, offering them less opportunity to demonstrate their knowledge, skills and/or understanding.

Overall demand of question papers

Overall, the Edexcel and OCR papers were less demanding in 2008 than in 2003. This was less pronounced for AQA and WJEC, which retained more of the previous question styles. Although there were rather fewer of the longer, more demanding interpretation questions in AQA in 2008, this was balanced by a more thorough incorporation of new-style How Science Works questions. WJEC maintained a similar style to 2003.

The differences in demand across awarding organisations in 2008, and inconsistencies within some awarding organisations, led to an increase in variation of demand and a marked reduction in comparability.

When papers were tiered, they failed to address access for E, F and G-grade students as well as for A* and A-grade students in 2008. There were a large number of marks pitched at the C/D boundary (a common target grade for both tiers), which reduced the amount of discrimination possible. In addition there was variability in the use of common questions, particularly in the use of whole or part questions and in the amount of marks allocated to common questions. These factors reduced discrimination between grades. Reviewers felt that these factors, combined with the shortened papers, also contributed to a reduction in demand in 2008 (particularly for OCR and Edexcel).

The weighting for AO3 increased from 25 per cent in 2003 to a possible maximum of 40 per cent in 2008. Even though coursework and other forms of internal assessment do not exclusively test AO3, these changes have effectively led to variability in the prominence of coursework within specifications.

Section 3: Standards of performance

Process

Reviewers considered student work from all the awarding organisations in 2003 and 2008, and they made qualitative comments on the work they saw, particularly on that of 2008. The common themes and significant findings from this review are outlined below. Details of the materials used can be found in [Appendix C](#), and a table showing student performance can be found in [Appendix E](#).

Findings

At the A-grade boundary

- In 2008 AQA's examination papers tested more breadth and depth of specification content than the Edexcel papers.
- The reviewers thought that Edexcel's 2008 examination papers should be more demanding. Their students did not provide as much evidence of grade-A-type work as AQA's students, which was as a result of their examination papers. Edexcel's highly structured papers were thought to constrain students.
- For OCR in 2008, the reviewers thought that the examination papers provided better coverage of the specification than the Edexcel examination papers, although many of the questions required the students to select from a list (thus decreasing the demand on students).
- The reviewers thought that WJEC's 2008 practical assessments were very structured and offered more prompts than the CCEA examination papers..

At the C-grade boundary on higher tier

- For AQA in 2008, students appeared to have difficulty in accessing the material contained within the examination papers; evidenced by some questions receiving zero marks.

At the C-grade boundary on foundation tier

- For AQA in 2008, the structure of the examination paper appeared to be more demanding than that of WJEC. There was more technical language and a more academic feel to the paper. However, the progression of question demand was less obvious. But there was more application, complex data handling and novel situations in the AQA examination paper when compared with others.

- The reviewers thought that CCEA's 2008 examination papers were relatively straightforward, and there was a relatively low boundary mark for the grade. There appeared to be many gaps in students' knowledge and understanding of basic specification content. Some of the examination paper even appeared to cover Key Stage 3 work that was not demanding enough for GCSE biology.
- OCR's 2008 examination paper was judged to be fairly undemanding, with large numbers of questions providing prompts and simple outcomes. However, students did show a reasonable command of knowledge and understanding.

At the F-grade boundary

- For AQA in 2008, the reviewers noted that the foundation examination papers were very demanding in terms of technical language and data handling (processing and calculation). Students provided enough written evidence to secure the grade.
- For Edexcel in 2008, the examination papers had a relatively simple construction yet the students still failed to show performance at the grade boundary. There was a lot of questions and sections left unanswered that subsequently received zero marks, suggesting that there may have been a literacy problem with many, if not all, of the students at this grade boundary.
- For OCR in 2008, some of the questions required common sense without the need for knowledge of biology specifically.

Conclusions

This report has detailed our work in analysing the demand of qualifications across two different years within GCSE biology. The findings from this report have, at the time of publication, already been fed into revisions, as the 2008 specifications (based on subject criteria published in 2005) were also found to be less demanding through other regulatory activities.

Since this review was carried out, new subject criteria have been introduced for GCSEs biology, chemistry and physics (published in 2009 with first teaching September 2011). The aims and learning outcomes in the new criteria are written specifically for biology, rather than being generic across all GCSE science subjects, and the AOs have changed significantly:

Year introduced	Assessment objective		Weighting
2000	AO1	Knowledge and understanding	45-55%*
2005	AO1	Knowledge and understanding of science and how science works	20–40%
2009	AO1	Recall, select and communicate their knowledge and understanding of biology	30–40%
2000	AO2	Application of knowledge and understanding, analysis and evaluation	25-35%
2005	AO2	Application of skills, knowledge and understanding	30–55%
2009	AO2	Apply skills, knowledge and understanding of biology in practical and other contexts	30–40%
2000	AO3	Investigative skills	20-25%
2005	AO3	Practical enquiry and data-handling skills	20–40%
2009	AO3	And evaluate evidence, make reasoned judgements and draw conclusions based on evidence	25–35%

*about one-third of which must be allocated to recall

Requirements for the proportion of external assessment have also been changed. A weighting of 75 per cent must now be allocated to external assessment and a

weighting of 25 per cent to controlled assessment, whereas in 2008 a minimum weighting of 25 per cent for external assessment and 25 per cent for internal assessment applied.

There is now a mathematics requirement within the criteria which did not appear in the previous Science subject criteria. Students are now required to demonstrate a greater degree of mathematical knowledge, understanding and skills than was typically used in past GCSE science examinations.

Specifications developed based on the new criteria will be subject to a further standards review in 2013/2014.

Appendix A: Provision of assessment materials and student work at GCSE and GCE levels for Ofqual's archive (annual inclusion and standards reviews)

Section 1: Specification of requirements

1.1 Each awarding organisation should draw the materials for each subject from the specification with their largest entry in summer 2008, unless that selection severely limits the range of examination components available. Where there are several entry options, materials should be drawn from the largest option only, unless Ofqual were exceptionally to agree other arrangements.

1.2 (With regards to GCSE) – where there are both modular and linear (non-modular) examinations in a subject, the awarding organisation operating the modular scheme with the greatest number of students (amongst all awarding organisations) should include that modular scheme, even if it is not a specification within the awarding organisation's largest entry. Similarly, the awarding organisation operating the linear scheme with the greatest number of students should include that linear scheme. If an awarding organisation runs both the largest entry linear examination and the largest entry modular examination in a subject, it will therefore provide two sets of materials, including student work, where required.

1.3 The following materials should be supplied:

a) Current specification: all associated question papers and final mark schemes. b) The 2008 chief examiners' report (CER) and details of awarding procedures particular to the specification supplied.

c) An indication of how the specification's content and assessment criteria and objectives have been met in each question paper supplied. This may take the form of a grid. For objective tests this should include faculty values, discrimination indices and a specification grid detailing what grade each question was targeted at, as well as an indication of what percentage of students got a particular question correct when it was targeted at the grade they got overall.

d) Unit or component mark distributions (with grade boundary marks shown). It should be clear whether the marks are on the raw or uniform mark scale.

e) Grade boundaries, overall and by unit (both raw and scaled). f) Student work as specified in Section 2.

g) Complete data record showing for each student selected the raw mark; final mark; weighted or uniform mark; grade for each component/unit (including any non-archived component/unit) and overall grade; and, where relevant, tier of entry.

Where appropriate, materials a)–e) may be supplied in electronic form.

Section 2: Student work

2.1 The work submitted should include the examination scripts, the internal assessment, and any oral/ aural examinations (with examiner mark sheet) where these are routinely recorded. In addition, for modular specifications, the examination papers of module tests should be supplied.

2.2 The sample should be of the original work of the students. Photocopies of work should only be used where it is impossible to send the originals and with agreement in advance by Ofqual. Student and centre names and numbers should be removed wherever they appear in a student's work, unless they form an integral part of the work, for example, within a letter.

2.3 Where an awarding organisation's specification has a relatively small entry or where, for some other reason, it is proving difficult to find sufficient students who fulfil the criteria, the awarding organisation should contact the Ofqual officer responsible to agree how best to finalise the sample.

2.4 All internal assessment submitted should be that of the particular students selected for the sample. If, for any reason, this proves to be impossible, the awarding organisation should contact the Ofqual officer responsible to agree appropriate alternative measures.

2.5 The sample of scripts retained for each specification (option) should be taken from students whose final mark lay at or near the subject grade boundaries for A/B, C/D and F/G for GCSE and A/B and E/U for GCE A level qualifications. At each boundary, each awarding organisation will supply the externally and internally set and marked assessments of fifteen students. Students selected should be those whose performance across units is not obviously and significantly unbalanced.

2.6 In tiered subjects, where the same grade boundary may feature in two tiers, separate sets of student work for the boundary should be provided from each tier.

In addition for AS/A level specifications:

2.7 Where awarding organisations have to supply student work for an A level specification, two samples are required: one for the AS and one for the A2 units.

2.8 For AS level, the work of 15 students whose mark for the AS is at or close to the UMS boundary for an AS grade A (240) or grade E (120) should be supplied. Students selected should be those whose performance across the three AS units is not obviously or significantly unbalanced. Students should have taken at least two of the three AS units in the June examination series.

2.9 For A level, the sample comprises the A2 work of 15 students who have gained c240 UMS marks at A or c120 UMS marks at E on their A2 units. Students selected should be those whose performance across the three A2 units is not obviously or significantly unbalanced. Students selected will ideally have also gained an overall A level mark which is at or close to the UMS boundary for an overall A level grade A (480) or grade E (240). Students should have taken at least two of the three A2 units in the June examination series.

2.10 The set of AS and A2 units provided should also be a valid combination for A level.

2.11 Where coursework forms a compulsory sub-component within a unit, that coursework should also be collected. Where a unit has optional sub-components, the highest entry option should be supplied. The students chosen for the sample should, as far as possible, have a performance across the components of the unit which is not obviously unbalanced.

Appendix B: GCSE specifications reviewed

GCSE 2003 and 2008					
Awarding organisation and specification codes					
Year	AQA	CCEA	Edexcel	OCR	WJEC
2003	3413	G09	1520	1980	011701–2
2008	4411	G09	2105	J633	023201

Appendix C: GCSE scripts reviewed

		Awarding organisation									
		AQA		CCEA		Edexcel		OCR		WJEC	
Year	Grade	2003	2008	2003	2008	2003	2008	2003	2008	2003	2008
		GCSE	A	8	8	7	8	8	8	8	N/A
C higher	8		8	7	4	8	8	8	8	N/A	4
C foundation	8		8	3	8	8	8	5	4	N/A	4
F	8		8	3	3	N/A	4	N/A	1	N/A	2

* Number of student scripts (student work) received from the awarding organisation

** Number of student scripts used in the script review

“N/A” indicates could not be located in our archive

Appendix D: Availability of specification materials for the purposes of this review

Materials	2003 Materials					2008 Materials				
	GCSE					GCSE				
	AQA	CCEA	Edexcel	OCR	WJEC	AQA	CCEA	Edexcel	OCR	WJEC
Specification	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Question paper	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mark scheme	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chief examiner's report	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
Mark distribution	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Grade boundaries	✗	✗	✗	✗	✗	✓	✓	✓	✓	✓
Assessment grids	✗	✓	✗	✗	✗	✓	✗	✗	✓	✗

✓ Material was available and was used in the review

✗ Material was not available and was not used in the review

Appendix E: Student achievement by grade

Cumulative percentage of GCSE biology grades achieved in 2003 and 2008

Awarding organisation and year	A*	A	B	C	D	E	F	G	U	Total student entries
AQA 2003	8%	28%	55%	80%	94%	97%	99%	99%	100%	6,608
AQA 2008	22%	51%	77%	91%	97%	98%	99%	100%	100%	47,933
CCEA 2003	0%	15%	45%	79%	95%	99%	100%	100%	100%	1,865
CCEA 2008	13%	40%	66%	91%	97%	98%	99%	99%	100%	3,189
Edexcel 2003	1%	16%	49%	75%	90%	97%	99%	99%	100%	5,596
Edexcel 2008	12%	41%	72%	90%	96%	98%	99%	100%	100%	10,149
OCR 2003	1%	25%	49%	70%	90%	98%	100%	100%	100%	10,348
OCR 2008	14%	50%	81%	94%	98%	99%	99%	100%	100%	11,755
WJEC 2003	0%	16%	39%	59%	87%	96%	99%	99%	100%	2,671
WJEC 2008	19%	44%	68%	92%	98%	99%	100%	100%	100%	2,848

Appendix F: Review team

Review team		Organisation
Lead Reviewer	Alan McMurdo	Ofqual reviewer
Specification reviewers	Erica Clark	Ofqual reviewer
	Mike Bailey	Ofqual reviewer
	Martin Brown	Ofqual reviewer
Script reviewers	John Gogarty	Ofqual reviewer
	Gail Black	Ofqual reviewer
	Keith Hirst	AQA
	Patrick McCann	CCEA
	Richard Shewry	Edexcel
	Paul Spencer	OCR
	Annette Love	WJEC
	Dr Stephen Yates	Association for Science Education
	Shaista Shariza	Institute of Biology

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