

# **GCSE subject criteria for science**

*Consultation report*

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# Introduction

The GCSE science criteria are the final subject criteria to be reviewed in the GCSE suite. New specifications for GCSEs in science subjects will be available in centres by September 2010 for first teaching in September 2011.

GCSE criteria for science, additional science, additional applied science, chemistry, physics and biology were developed during 2009 in association with key stakeholders including subject associations and learned societies, teachers, academics, awarding bodies and employers to enable the development of new GCSEs for first teaching in 2011. The revisions to the GCSE science criteria are designed to support the development of specifications that:

- support the government STEM agenda
- incorporate key elements of 14–19 curriculum developments
- meet the requirements of the GCSE qualification criteria
- update the content of GCSEs in science subjects
- encourage innovative teaching, learning and assessment
- ensure that GCSEs complement the new Diplomas
- ensure that standards are maintained
- address issues about current GCSE science specifications raised by Ofqual.

The Qualifications and Curriculum Development Agency (QCDA) has ensured that the criteria comply with equalities legislation.

QCDA's online consultation on the draft GCSE subject criteria involved a questionnaire placed on the QCDA website beginning in June 2009 and closing on 11 September 2009 in England and Wales. The consultation in Northern Ireland closed on the 25 September 2009. The consultation reports for Wales and Northern Ireland can be found on the DCELLS and CCEA websites respectively.

Respondents were asked to review criteria for the following six subjects:

- science
- additional science
- additional applied science
- biology
- physics
- chemistry.

In addition to the online consultation QCDA received separate written responses from a range of scientific organisations, subject associations, awarding bodies, higher education representatives and teachers. QCDA also held focus group meetings with teachers and higher education representatives. Responses from these stakeholders were also taken into account. They do not appear in the quantitative data but are referenced in the qualitative analysis.

The current GCSE science criteria will be replaced by a set of six new criteria. A summary of the changes from the current to the new criteria can be found in the annex.

The Ofqual report *The new GCSE science examinations – Findings from the monitoring of the new GCSE science specifications: 2007 to 2008* raised concerns about the assessment of current GCSE science specifications. These issues have been addressed through the qualification criteria, which set out rules on the structure of GCSEs and their assessment and grading. In developing new GCSE science specifications awarding bodies must meet the requirements of the common criteria and both the GCSE qualification criteria and the relevant GCSE subject criteria.

The six sets of final criteria can be found at [www.ofqual.gov.uk](http://www.ofqual.gov.uk)

This paper gives the quantitative analysis of responses to the online consultation and reports the main qualitative points from the respondents' comments.

Each question invited the respondent to answer 'yes', 'no' or 'no comment' and to clarify his/her answer in a comment box. Most questions invited comment only if the respondent answered 'no'. Respondents could also skip the question.

Percentages given in the quantitative analysis are based on the number of respondents who answered the question (that is chose 'yes', 'no' or 'no comment') and ignore those who skipped the question altogether. The number of respondents answering 'yes' or 'no' is also given (in brackets). The total percentages of respondents does not add to 100 per cent in each question because of 'no comment' responses.

The consultation drafts of the subject criteria were revised in line with the outcomes of the consultation. Some of the issues raised were not directly related to the criteria and will be dealt with in other ways through controlled assessment regulations and the development of guidance materials.

QCDA is very grateful to everyone who took the time to comment. All comments were helpful; many directly or indirectly influenced the final criteria.

This report summarises the feedback for each set of criteria. However, in line with feedback received and to enable all learners to have a shared experience of the subject, any content additional to those specified for the science and additional science criteria has been removed from the criteria for biology, chemistry and physics. Therefore the physics content is identical to that specified in the criteria for science plus that specified in the criteria for additional science. The same model has been adopted for biology and chemistry.

## Analysis of responses to consultation questions on GCSE science

Of the six subject criteria on which QCDA consulted in summer 2009 the consultation on the draft revised criteria for science attracted the largest response, with 397 respondents.

### Respondents by type

#### 1a) In what capacity are you responding to this questionnaire?

	% of respondents	No. of respondents
Teacher of science – secondary non-selective	60.2	203
Teacher of science – secondary selective	5.9	20
Teacher of science – independent	4.5	15
Teacher of science – other	1.8	6
Lecturer of science – Further education college	1.8	6
Lecturer of science – sixth-form college	2.7	9
Lecturer of science – tertiary college	0.0	0
Lecturer of science – university	3.0	10
Lecturer of science – other	0.6	2
School/college leadership team member	8.0	27
Subject association	1.8	6
Professional body	1.8	6
Teacher association	0.3	1

Teacher union	2.4	8
Local authority	5.0	17
Awarding organisation	2.1	7
Organisation or group specialising in any of the equality strands of disability, age, race, gender, sexual orientation, religion or belief	0.0	0
Employer	1.2	4
Sector skills council	0.0	0
Student	3.6	12
Other (please specify)	11.3	38
Total		<b>397*</b>

\*Total does not equal 337 as some respondents selected more than one type.

**1b) Are you responding to this consultation as an individual or on behalf of a named group?**

90.2 per cent (304) responded to the questionnaire as an individual as opposed to on behalf of a group (33).

**Responses, question by question**

**Aims and learning outcomes**

**2a) Do you think that the proposed aims and learning outcomes for GCSE science are appropriate? If not, please explain briefly what you think should be changed or added.**

70.4 per cent (152) of those answering the question felt that the proposed aims and learning outcomes for GCSE science are appropriate. 24.5 per cent (59) felt that they are not.

Six of those who provided explanations for their view that the proposed aims and learning outcomes for GCSE science are not appropriate expressed concerns about the perceived lack of emphasis on practical work and fieldwork in the criteria. The British Ecological Society (BES) and Society for Experimental Biology (SEB) noted the huge industries of plant science and environmental science in the UK and wished to see an explicit reference to fieldwork.

*QCDA response:* Although fieldwork was already included in the proposed content, in consultation with the BES and other interested parties QCDA has increased the emphasis on fieldwork and out of classroom learning in both the learning outcomes and the content of science, additional science and biology criteria.

Four respondents indicated that the aims and learning outcomes for science and additional science are insufficiently distinct.

*QCDA response:* QCDA reviewed the aims and learning outcomes with a group of academics from higher education institutions and subject associations including the University of Warwick, Kings College London, the National Network of Science Learning Centres and the Association for Science Education (ASE). A number of changes were made to ensure that the 'scientific literacy' focus of GCSE science and the more academic approach required by GCSE additional science are more explicit in the criteria. In science learners are required to 'develop their understanding of interrelationships between science and society' whereas in additional science they are required to 'develop their understanding of the effects of science on technology'.

Two respondents indicated that the aims should include the ethical implications of science. QCDA agrees and notes that this is explicit in the content.

**2b) Do the aims and learning outcomes reflect the key stage 4 programme of study? If not, please indicate briefly what you think should be changed or added.**

78.1 per cent (168) of those answering the question felt that the proposed aims and learning outcomes reflect the key stage 4 programme of study. 11.2 per cent (24) felt that they do not.

*QCDA response:* The science criteria requirements have been reordered to ensure that they appropriately reflect how science works. QCDA reviewed the aims and learning outcomes to ensure that the relationship between the programme(s) of study and the aims and learning outcomes is explicit.

## Content

**3a) Do you think that the content for GCSE science is up to date? If not, please explain briefly why, including examples.**

73.9 per cent (153) of those answering the question felt that the content for GCSE science is up to date. 20.3 per cent (24 respondents) disagreed.

Three respondents added comments in support of their view that the content for GCSE science is up to date; for example that 'the processes and concepts are well selected in view of the ever-changing nature of science'.

Among those who felt the content is not up to date, respondents (seven) felt that there should be an increased emphasis on the development and nature of risk in contexts such as reporting of health and environmental issues in the media.

*QCDA response:* In association with higher education representatives QCDA reviewed the statement on risk and amended the learning outcome to read 'specifications . . . must enable learners to: . . . develop their awareness of risk and the ability to assess potential risk in the context of potential benefit'. This learning outcome is reflected in the content.

A second concern (six respondents) was the inclusion of too much 'earth science'. Respondents felt the study of this would be more appropriate in the context of geography.

*QCDA response:* The earth science requirements are specified in the programme of study and supported by the Earth Science Teachers Association. As a result the requirements have been retained.

Two respondents indicated that there should be an increased emphasis on engagement with scientific ideas in GCSE science, rather than on the 'absorption' of a body of established content.

*QCDA response:* Advice from the wider scientific community and higher education indicated that the scientific literacy requirements of GCSE science can only be addressed in a meaningful way by candidates if they understand and engage with scientific knowledge. An increased emphasis on engagement with ideas without supporting knowledge requirements could result in the assessment of opinion rather than scientifically based reasoned argument; hence prescribed content has been retained.

The recommendation from the Biotechnology and Biological Sciences Research Council (BBSRC), supported by the higher education focus group, to include 'variation within species and the effect of both genotype and environment' was added to the science criteria.

**3b) Do you think that the content for GCSE science provides a secure grounding in science? If not, please explain briefly why.**

43.5 per cent (91) of those answering the question felt that the content for GCSE science provides a secure grounding in science. However 49.3 per cent (103) of those answering the question felt that the content for GCSE science does not provide a secure grounding in science.

*QCDA response:* GCSE science is intended to support candidates' scientific literacy and to encourage them to continue their studies in science. It is not intended to directly support progression to level 3 science courses. Candidates planning to study science subjects at level 3 are recommended to study science plus additional science or biology, chemistry and physics to secure progression. QCDA is confident that the content for GCSE science is appropriate for the purpose of the qualification and QCDA plans to work with awarding bodies to ensure that the purposes and rationale for GCSE science are clear in all specifications.

QCDA, the Department for Children, Education, Lifelong Learning and Skills (DCELLS) and the Council for the Curriculum Examinations and Assessment (CCEA; regulator) received suggestions in the online consultation (21) and a number of written responses from subject associations including the Institute of Physics for the redistribution of content between science and additional science and some rewording of content.

*QCDA response:* QCDA supported the proposed amendments and all six subject criteria were modified in line with the suggestions received and subsequent discussion with subject associations, academics and teachers.

QCDA is planning to set up meetings between higher education representatives and awarding bodies to explore innovative ways of addressing the content requirements, including the possibilities offered by increasing the emphasis on technology and practical work.

A number of respondents (seven) and the Royal Society, the Institute of Physics, the Royal Society of Chemistry and the Science, Technology, Engineering and Mathematics (STEM) programme called for an increased emphasis on mathematics skills.

*QCDA response:* QCDA has revised the criteria to reflect an increased emphasis on mathematical skills.

In addition work is in hand with awarding bodies' technical staff, with the Science Community Representing Education (SCORE) and with higher education to set out mathematical requirements by tier of entry. Research has been undertaken to ensure that the mathematical requirements of GCSE science subjects will support the mathematical requirements of first year undergraduate programmes in the biological and biomedical sciences. The mathematical requirements will be set out in an appendix to the criteria.

### **Assessment objectives**

**4a) Do the assessment objectives indicate clearly what is to be assessed? If not, please indicate briefly why.**

72.4 per cent (131) of those answering the question felt that the assessment objectives indicate clearly what is to be assessed. 18.8 per cent (34) disagreed.

Among those who gave supporting explanations of why they considered the assessment objectives unclear, the most common response (12) was that the objectives are 'too broad', 'lacking detail', 'vague' or 'generalised'.

*QCDA response:* Assessment objectives in current GCSE science criteria restate the content and the regulators do not view that as appropriate. Therefore all content descriptions have been removed from the assessment objectives. This brings science into line with all other subject criteria; therefore no change has been made.

Six respondents questioned the need for the direct assessment of knowledge and proposed a reduced weighting for assessment objective 1 (AO1).

*QCDA response:* AO1 states ' . . . candidates . . . demonstrate their ability to recall, select and communicate their knowledge and understanding of science'. The requirements of AO1 are therefore much broader than simple recall. QCDA believes that a reduction in weighting would negatively impact on the opportunities to create meaningful assessment and could undermine attempts to create assessments that address the issues raised in the Ofqual report on GCSE science. Following considerable discussions with higher education and other representative bodies, and recognising that science is a knowledge-based subject, it was decided to retain the current weighting.

**4b) Do the assessment objectives collectively cover all that is essential to the assessment of science at GCSE? If not, which requirements do you think should be added?**

67.9 per cent (125) of those answering the question felt that the assessment objectives collectively cover all that is essential to the assessment of science at GCSE. 21.7 per cent (40) felt that they do not.

There were 40 comments in response to this question, six of which expressed broad satisfaction with the assessment objectives but said that it would never be possible to assess all the content specified.

The other replies put forward numerous suggestions for additional assessment objectives, with no consensus. Suggestions included scientific reasoning, argumentation, handling of data, experimental methods, interpersonal skills and transferable skills.

*QCDA response:* QCDA believes that all the topics listed above can be addressed by the assessment objectives.

QCDA has reviewed the assessment objectives and, in association with higher education representatives, has determined that no change is necessary. However a minor change to the wording of AO3 was made to clarify requirements. AO3 now reads 'analyse and evaluate evidence, make reasoned judgements and draw conclusions **based on evidence**' (additional text in bold).

**4c) Are the relative weightings of the assessment objectives appropriate? If not, please explain briefly why not.**

58 per cent (105) of those answering the question felt that the relative weightings of the assessment objectives are appropriate. 27.1 per cent (49 respondents) felt that they are not.

*QCDA response:* In line with regulatory requirements the weightings allocated to assessment objectives must be specific or within a 10 per cent range. Assessment objectives have been streamlined to ensure consistent interpretation. This is a maintenance of standards issue and is consistent with all other subject criteria.

A minority of respondents suggested a reduction in the weighting of AO1. However AO1 involves recalling, selecting and communicating scientific knowledge. Focus groups, particularly those with higher education representation, supported the weighting allocated to AO1 and the assessment objectives, which have therefore not been amended.

**4d) Are the assessment objectives sufficiently distinctive? If not, please explain briefly why not.**

67.2 per cent (121) of those answering the question felt that the assessment objectives are distinct and appropriate. 16.7 per cent (30 respondents) felt that they are not.

*QCDA response:* In association with higher education representatives QCDA has reviewed the assessment objectives and made a minor change to the wording of AO3. The assessment objectives are in line with the assessment objectives for all other GCSE subjects and are therefore distinctive. No additional changes were deemed necessary.

### **Tiering arrangements**

**5a) Are the proposed tiering arrangements appropriate? If not, please explain briefly why not.**

65.6 per cent (118) of those answering the question felt that the proposed tiering arrangements are appropriate. 20 per cent (36 respondents) felt that they are not.

The majority of comments in response to this question fell into one of three categories:

- those who favoured a single tier, mainly because it avoids the need for difficult decisions about entry and rewards those who did better than expected (nine respondents)
- those who favoured an intermediate tier, because it makes it easier for teachers to make decisions about a marginal candidate (eight respondents)
- those who had failed to find any information about tiering in the criteria (three respondents).

*QCDA response:* The GCSE qualification criteria permit only two tiering models:

- question papers are targeted at a single tier covering grades A\* to G
- question papers are targeted at two tiers of grades A\* to D, with an allowed grade E, and C to G.

QCDA believes that there is no evidence to support a move to a single tier of entry, a view supported by the awarding bodies. QCDA will work with the Joint Council for Qualifications (JCQ) to ensure that centres have clear information to support entry decisions.

## **Scheme of assessment**

**6a) Will these criteria allow awarding bodies to develop high quality, stimulating assessments that will engage candidates in their subject as well as adequately assess the curriculum for which they have been prepared? If not, please briefly explain your response.**

51.7 per cent (92) of those answering the question felt that the criteria allow awarding bodies to develop high quality, stimulating assessments that will engage candidates in their subject as well as adequately assess the curriculum for which they have been prepared. 33.1 per cent (59 respondents) felt that they will not.

Among those who added comments 12 respondents said that it will be difficult for awarding bodies to develop high quality, stimulating assessments because of the prescriptive nature of the criteria and the constraints on the type of assessment that can be used for each content area.

Eight respondents said it was difficult to give an answer and five said that the regulation of the criteria is key to ensuring consistency across assessments.

*QCDA response:* QCDA has reviewed the learning outcomes and content distribution and these are strongly supported by higher education and awarding bodies. The level of prescription is consistent with all other subject criteria and is intended to ensure comparability of demand. However, this reflects a change in approach from the current science criteria, where content requirements are indicative rather than prescribed.

All GCSE science qualifications will need to meet the requirements of the GCSE qualification criteria and the relevant subject criteria. The changes to the GCSE qualification criteria require awarding bodies to use a range of question types including extended writing. This will provide stretch and challenge for all learners, including the most able.

QCDA plans to work with stakeholders – for example NowGen, the National History Museum, Royal Botanical Gardens, Kew and SCORE – to provide awarding bodies with direct access to new and exciting developments in science, including current research. Meetings are scheduled to take place before the end of 2009.

## **Controlled assessment**

The draft criteria proposed that the following skills are best assessed by controlled assessment:

- plan and carry out investigation(s)
- devise methods and assess risks for the collection of numerical and other data
- manage risks when carrying out practical work
- collect primary data
- process primary and secondary data
- evaluate effectiveness of methods of data collection and processing, and the quality of data collected
- analyse and interpret primary and secondary data
- draw conclusions.

**7a) Do you agree that these skills are best assessed by controlled assessment? If not, please explain briefly why not.**

77 per cent (124) of those answering the question felt that the skills described above are best assessed by controlled assessment. 18 per cent (29 respondents) felt that they are not.

Of those respondents who disagreed with this statement most expressed concerns about controlled assessment as a concept. Six respondents and two subject associations were concerned that fieldwork and practical activities may narrow in scope and teacher flexibility for completing these will be reduced as a result of controlled assessment. Two subject associations wished to see 'plan and carry out investigations' removed from the science criteria and added to the additional science criteria. Others (four respondents) were concerned that the list of skills is too extensive and will require too much teaching time.

*QCDA response:* QCDA has reviewed and rationalised the list of skills to be assessed by controlled assessment in line with the responses. In addition, references to 'investigation' in both science and additional science have been modified in line with feedback from ASE and the National Network of Science Learning Centres.

**7b) Is the weighting allocated to controlled assessment appropriate? If not, please explain briefly why not.**

65.8 per cent (106) of those answering the question felt that the weighting allocated to controlled assessment is appropriate. 19.3 per cent (31) disagreed with this.

Of those respondents who disagreed with the weighting allocated to controlled assessment and explained why, six said that it is too low and should be higher in view of the time and effort that will be needed for controlled assessment and the type of work being assessed.

Five respondents had an opposing view: that the controlled assessment takes up a small proportion of teaching time but has a disproportionately high weighting.

*QCDA response:* QCDA believes that the weighting allocated to controlled assessment is commensurate with the requirements specified in the content of the criteria. This view was supported by awarding bodies and subject associations.

**7c) Do you think that controlled assessment will have an impact on centres in terms of manageability and workload? If yes, please explain briefly why.**

65.8 per cent (106) of those answering the question felt that controlled assessment will have an impact on centres in terms of manageability and workload. 19.3 per cent (31 respondents) felt that it will not.

This question elicited more explanatory comments than any other in the science questionnaire. The concerns most frequently mentioned were:

- the increase in teacher workload, even though the controlled assessment will account for only 25 per cent of the assessment (29 respondents)
- the increased burden on school resources, finances and timetabling (28 respondents)

Some respondents (nine) commented that controlled assessments will make the process of setting and marking internal assessment more manageable and streamlined and will improve on the current coursework arrangements.

*QCDA response:* Controlled assessment was developed to replace coursework in GCSE qualifications. The subject criteria will be supported by controlled assessment regulations that set out the skills to be assessed and the prescribed level of control for task setting, task taking and task marking. The regulations will require awarding bodies to produce controlled assessments that:

- stimulate good teaching and learning by ensuring that controlled assessments are based on candidates' practical work
- provide the most appropriate way of assessing a particular set of skills

- support teachers in ensuring that the work submitted is the candidates' own.

QCDA is working to ensure that examinations officers are fully aware of the implications of the changes to assessment requirements. QCDA will commission guidance for centres in managing controlled assessment at centre level and will broker meetings between science experts and awarding bodies to share expertise. This will include opportunities for out of classroom learning.

### **Meeting the learning outcomes of the subject criteria**

**8a) Having had an opportunity to review the content, assessment objectives and the scheme of assessment, do you agree that the stated learning outcomes of the qualification are met by these subject criteria?**

68.2 per cent (107) of those answering the question agreed that the stated learning outcomes of the qualification are met by these subject criteria. 16.6 per cent (26) felt that they are not.

*QCDA response:* In association with higher education representatives QCDA has reviewed the learning outcomes and content sections of the criteria to ensure that the revised learning outcomes are fully reflected in the revised content.

### **Maximising accessibility and equality**

**9a) Do you agree that the criteria will enable awarding bodies to develop specifications that take into account the needs of all learners? If you disagree, please explain briefly why and please specify what type of learner you believe may be excluded by the criteria.**

61.4 per cent (94) of those answering the question agreed that the criteria will enable awarding bodies to develop specifications that take into account the needs of all learners. 24.8 per cent (38) disagreed.

Those who disagreed variously suggested that the qualification will be too demanding for those with learning difficulties (four), English for speakers of other languages (ESOL) learners (three) and those candidates of lower ability (two) because of the weighting of the external assessment and the language used by awarding bodies in some questions. Some respondents thought the criteria to be unsuitable for those of higher ability (11) as they are not sufficiently challenging.

*QCDA response:* The GCSE qualification criteria set out explicit assessment requirements that include additional stretch and challenge. New science GCSEs will be required to have a range of question types, include extended writing and assess quality of written communication. New science GCSEs will have increased mathematical demands including mathematical modelling and will require candidates to make appropriate use of technology.

QCDA will work with awarding bodies to ensure that the language of the assessment does not pose an additional demand for candidates.

**9b) Do you agree that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately? If you disagree, please explain why.**

68 per cent (102) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately. 10.7 per cent (16) disagreed.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9c) Do you agree that the criteria enable awarding bodies to develop specifications that promote good relations between racial groups? If you disagree, please explain why.**

54.3 per cent (82) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote good relations between racial groups. 11.3 per cent (17) disagreed.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9d) Do you agree that the criteria enable awarding bodies to develop specifications that promote positive attitudes towards disabled people? If you disagree, please explain why.**

53 per cent (79) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote positive attitudes towards disabled people. 10.7 per cent (16) disagreed.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9e) Do you see any requirements in these criteria that you believe might restrict any disabled candidates' access to the qualification? If yes, please indicate the requirement restricting access, the disability group(s) likely to be restricted and whether you believe the requirement to be essential, desirable or not needed in the assessment of this subject.**

51.7 per cent (77) of those answering the question did not see any requirements in these criteria that they believed might restrict any disabled candidates' access to the qualification. 23.5 per cent (35) disagreed.

The majority of comments (22) in response to this question identified practical work as a key requirement of science that will restrict disabled candidates' access to the qualification.

*QCDA response:* All six sets of science criteria, and almost all respondents to the consultation, recognise that practical work is intrinsic to the study of science. However the criteria do not require the direct assessment of candidates' practical skills, although controlled assessment will be based directly on practical work. This will ensure that all learners have direct and consistent experience of practical work while ensuring that those who require a practical assistant may have one without disadvantage.

QCDA is committed to building a world-class education and training framework that is inclusive and relevant to all learners. Undertaking equality impact assessments is standard practice for all qualifications. QCDA has produced an impact assessment for each set of GCSE criteria and awarding bodies will have procedures in place to enable reasonable adjustments for candidates. Information on reasonable adjustments can be found at [www.jcq.org.uk](http://www.jcq.org.uk).

**9f) Centres may have to make reasonable adjustments for certain candidates. For example practical assistants or readers may be allowed to support learners. The criteria will enable awarding bodies to develop specifications that allow reasonable adjustments. Agree, disagree or no comment.**

71.2 per cent (109) of those answering the question agreed with the statement above – that the criteria will enable awarding bodies to develop specifications that allow reasonable adjustments. 7.8 per cent (12) felt that they will not.

*QCDA response:* QCDA and the regulators will work with the Joint Council for Qualifications (JCQ) to ensure that guidance on reasonable adjustments is appropriate.

### **Curriculum opportunities within the GCSE subject criteria**

QCDA received a very low number of responses to this section on each of the six questionnaires. A number of respondents did not specifically address the questions or suggested changes to the key stage 4 programme of study, which was outside of the scope of this review. However the development groups worked hard to ensure that the curriculum aims were met by the criteria.

**10a) Do the revised criteria make clear the ways in which the subject complements and reflects the revisions to the overall objectives of key stage 4 curriculum? If not, please briefly explain your response.**

53 per cent (80) of those answering the question agreed that the revised criteria make clear the ways in which the subject complements and reflects the revisions to the overall objectives of key stage 4 curriculum. 22.5 per cent (34) disagreed.

### **Curriculum aims**

The aims of the curriculum are to enable young people to become:

- successful learners who enjoy learning, make progress and achieve
- confident individuals who are able to live safe, healthy and fulfilling lives
- responsible citizens who make a positive contribution to society.

*QCDA response:* QCDA reviewed the criteria proposals and is confident that all six criteria support the overall objectives of the key stage 4 curriculum.

**10b) Do you think that the criteria support these aims sufficiently? If not, please briefly explain your response.**

53.6 per cent (81) of those answering the question agreed that the criteria support these aims sufficiently. 28.5 per cent (43) felt that they do not. There was no consensus view.

*QCDA response:* A number of respondents commented on emphases in the programme of study rather than the criteria and other respondents commented that the curriculum requirements are best delivered through teaching and learning rather than criteria. QCDA supports this view.

**10c) Do the criteria support the development of personal, learning and thinking skills? If yes, please suggest how; if not, please briefly explain why not.**

63.3 per cent (109) of those answering the question agreed that the criteria support the development of personal, learning and thinking skills. 21.3 per cent (32) felt that they do not.

*QCDA response:* QCDA believes that personal, learning and thinking skills are intrinsic to science and is confident that the skills are embedded in the revised criteria.

**10d) Do the revised subject criteria give sufficient flexibility for awarding bodies to develop specifications that reflect subject and curriculum initiatives and developments? If not, please briefly explain your response.**

62.1 per cent (109) of those answering the question agreed that the revised subject criteria provide sufficient flexibility for awarding bodies to develop specifications that reflect subject and curriculum initiatives and developments. 17 per cent (26) felt that they do not. There was no consensus view.

*QCDA response:* QCDA believes that the revised criteria proposals will strongly support subject and curriculum initiatives. In addition QCDA is working with senior examiners, learned societies and wider stakeholder groups to support awarding bodies in ensuring that new developments in scientific research are embedded in new specifications.

## Analysis of responses to consultation questions on GCSE additional science

Of the six subject criteria on which QCDA consulted in summer 2009 the consultation on the draft revised criteria for additional science attracted the fifth largest response, with 55 respondents

### Respondents by type

#### 1a) In what capacity are you responding to this questionnaire?

	% of respondents	No. of respondents
Teacher of science – secondary non-selective	32.7	18
Teacher of science – secondary selective	12.7	7
Teacher of science – independent	7.3	4
Teacher of science – other	3.6	2
Lecturer of science – further education college	1.8	1
Lecturer of science – sixth-form college	3.6	2
Lecturer of science – tertiary college	0.0	0
Lecturer of science – university	3.6	2
Lecturer of science – other	1.8	1
School/college leadership team member	7.3	4

Subject association	1.8	1
Professional body	3.6	2
Teacher association	0.0	0
Teacher union	0.0	0
Local authority	10.9	6
Awarding organisation	3.6	2
Organisation or group specialising in any of the equality strands of disability, age, race, gender, sexual orientation, religion or belief	0.0	0
Employer	1.8	1
Sector skills council	0.0	0
Student	3.6	2
Other (please specify)	12.7	7
Total answered		62*

\*Total does not equal 55 as some respondents selected more than one type.

**1b) Are you responding to this consultation as an individual or on behalf of a named group?**

80 per cent (44) of respondents responded to the questionnaire as an individual as opposed to on behalf of a group (11).

**Responses, question by question**

**Aims and learning outcomes**

**2a) Do you think that the proposed aims and learning outcomes for GCSE additional science are appropriate? If not, please explain briefly what you think should be changed or added.**

60.5 per cent (23) of those answering the question felt that the proposed aims and learning outcomes for GCSE additional science are appropriate. 39.5 per cent (15 respondents) felt that they are not.

Among respondents who gave comments in support of their view that the aims and learning outcomes are not appropriate, five respondents commented that the aims and learning outcomes need to indicate how they build on those for science, are distinct from them and provide progression opportunities. Two respondents indicated that they wished to see the impact of science on global society included in the aims.

*QCDA response:* The aims and learning outcomes of science and additional science were revised by QCDA with higher education advisers to ensure that they appropriately reflect the ethos of both subjects. References to future career options, for example, have been clarified in both sets of criteria to ensure that they are appropriately distinct.

**2b) Do the aims and learning outcomes reflect and build on the aims and learning outcomes for GCSE science? If not, please indicate briefly what you think should be changed or added.**

76.9 per cent (30) of those answering the question felt that the proposed aims and learning outcomes reflect and build on the aims and learning outcomes for GCSE science. 20.5 per cent (eight respondents) felt that they do not.

The most common reason given for disagreement was an insufficient difference between the two sets of aims and learning outcomes (four respondents) and concerns that the aims and learning outcomes are not appearing to build on those in GCSE science (two respondents).

*QCDA response:* In association with higher education representatives and a number of subject associations QCDA reviewed and revised the aims and learning outcomes for both criteria to ensure that the different requirements are clear and transparent.

## **Content**

**3a) Do you think that the content for GCSE additional science is up to date? If not, please explain briefly why, including examples.**

63.2 per cent (24) of those answering the question felt that the content for GCSE additional science is up to date. 28.9 per cent (11 respondents) felt that it is not up to date.

Ten respondents added comments in support of their view that the content for GCSE additional science is up to date, with three saying that it is 'as up to date as it can be in view of the nature of science'.

Among those who felt the content is not up to date five respondents and four subject associations and awarding bodies suggested amendments to the content to ensure consistency across the criteria.

*QCDA response:* QCDA reviewed and revised the content proposals in association with higher education representatives to ensure that all content is up to date.

Three respondents suggested that it is more important to lay a firm foundation of basic science than to keep up to date with every new development in science.

*QCDA response:* QCDA reviewed the content requirements to ensure that specifications based on the criteria enable learners to gain a firm foundation in scientific knowledge, understanding and skills.

**3b) Do you think that the content combined with GCSE science is an appropriate basis for progression to further study in science? If not, please explain briefly why.**

65.8 per cent (25) of those answering the question felt that the content combined with GCSE science is an appropriate basis for progression to further study in science. 31.6 per cent (12 respondents) disagreed with this.

Among those who felt that the content is not an appropriate basis for progression to further study in science, three respondents suggested that there needs to be a greater emphasis on how science works to aid progression. Three other respondents suggested that there is too much content in the additional science compared to the content in the science criteria.

*QCDA response:* There will always be those who believe that the study of physics, chemistry and biology provide a more appropriate basis for progression to A level science study. However three subject associations requested that the criteria for additional science make it clear that additional science is a route to further study in physics, chemistry and biology. QCDA strongly supports this view and has amended the criteria to make the requirements clearer.

In association with higher education representatives QCDA reviewed and redistributed content distribution between science and additional science in line with the feedback

received, where that feedback was consistent with the requirements of the programme(s) of study.

### **Assessment objectives**

**4a) Do the assessment objectives indicate clearly what is to be assessed? If not, please indicate briefly why.**

80 per cent (28) of those answering the question felt that the assessment objectives indicate clearly what is to be assessed. 11.4 per cent (four respondents) disagreed.

The four respondents who felt that the assessment objectives do not indicate clearly what is to be assessed all commented that they are 'vague', 'imprecise' or 'need more detail'.

*QCDA response:* Focus groups, particularly those with higher education representation, supported the weighting allocated to the assessment objectives, which therefore, with the exception of a minor addition to AO3, have not been amended.

**4b) Do the assessment objectives collectively cover all that is essential to the assessment of additional science at GCSE? If not, which requirements do you think should be added?**

72.2 per cent (26) of those answering the question felt that the assessment objectives collectively cover all that is essential to the assessment of additional science at GCSE. 16.7 per cent (six respondents) felt that they do not.

*QCDA response:* Following further review with higher education representatives it was agreed that the assessment objectives with the minor amendment to AO3 cover all the requirements for additional science.

**4c) Are the relative weightings of the assessment objectives appropriate? If not, please explain briefly why not.**

58.3 per cent (105) of those answering the question felt that the relative weightings of the assessment objectives are appropriate. 25 per cent (nine respondents) felt that they are not.

*QCDA response:* QCDA believes that a change in weighting could negatively impact the opportunities to create meaningful assessment and could undermine attempts to create assessments that address the issues raised in the Ofqual report on GCSE science.

Following considerable discussions with higher education and other representative bodies it was decided to retain the current weighting.

**4d) Are the assessment objectives sufficiently distinctive? If not, please briefly explain why not.**

71.4 per cent (25) of those answering the question felt that the relative weightings of the assessment objectives are appropriate. 20 per cent (seven) felt that they are not.

*QCDA response:* In line with regulatory requirements and to support comparability, all content descriptions have been removed from the assessment objectives. This is intended to bring science into line with all other subject criteria.

In association with higher education representatives QCDA has reviewed the assessment objectives and made a minor change to the wording of AO3. The assessment objectives are in line with the assessment objectives for all other GCSE subjects and are therefore distinctive. No additional changes were deemed necessary.

## **Tiering**

**5a) Are the proposed tiering arrangements appropriate? If not, please briefly explain why not.**

76.5 per cent (26) of those answering the question felt that the proposed tiering arrangements are appropriate. 11.8 per cent (four) felt that they are not.

Of the comments, there was support for keeping two tiers (two) and a lack of understanding of what the proposed tiering arrangements were (two).

*QCDA response:* QCDA will work with JCQ to ensure that centres have clear information to support entry decisions.

## **Scheme of assessment**

**6a) Will these criteria allow awarding bodies to develop high quality, stimulating assessments that will engage candidates in their subject as well as adequately assess the curriculum for which they have been prepared? If not, please briefly explain your response.**

58.8 per cent (20) of those answering the question felt that these criteria will allow awarding bodies to develop high quality, stimulating assessments that will engage candidates in their subject as well as adequately assess the curriculum for which they have been prepared.

38.2 per cent (13 respondents) felt that they will not.

Among those who added comments, six respondents said that the monitoring of the criteria by Ofqual is key to ensuring that high quality assessments are provided. A number of others made comments on specific aspects of the content that had been mentioned previously in response to question three of the Science questionnaire, but there was no consensus.

A minority of respondents raised issues and/or commented on current specifications rather than criteria proposals.

*QCDA response:* QCDA has reviewed the learning outcomes and content distribution and the revised proposals are strongly supported by higher education representatives.

All GCSE science qualifications will need to meet the requirements of the GCSE qualification criteria and the relevant subject criteria. The changes to the GCSE qualification criteria require awarding bodies to use a range of question types including extended writing. This will provide stretch and challenge for all learners, including the most able.

QCDA plans to work with stakeholders – for example NowGen, the National History Museum, Royal Botanical Gardens, Kew and SCORE – to provide awarding bodies with direct access to new and exciting development in science, including current research. Meetings are scheduled to take place before the end of the year.

### **Controlled assessment**

It is proposed that the following skills are best assessed by controlled assessment:

- plan and carry out investigation(s) to test scientific hypotheses
- devise methods and assess risks for the collection of numerical and other data
- manage risks when carrying out investigation(s)
- collect primary data
- process primary and secondary data
- analyse and interpret primary and secondary data
- evaluate methods used and draw conclusions
- assess the validity of investigation(s).

**7a) Do you agree that these skills are best assessed by controlled assessment? If not, please explain briefly why not.**

88.2 per cent (30) of those answering the question felt that the skills described above are best assessed by controlled assessment. 5.9 per cent (two) felt that they are not.

*QCDA response:* QCDA has revised and rationalised the list of skills to be assessed by controlled assessment in line with the responses received and in association with ASE and higher education representatives. All controlled assessments will need to be based on candidates' practical work to support a positive impact on teaching and learning. In addition, references to 'investigation' in both science and additional science have been modified in line with feedback from ASE and the National Network of Science Learning Centres.

**7b) Is the weighting allocated to controlled assessment appropriate? If not, please explain briefly why not.**

67.6 per cent (23) of those answering the question felt that the weighting allocated to controlled assessment is appropriate. 23.5 per cent (eight respondents) disagreed with this.

Of those respondents who disagreed with the weighting allocated to controlled assessment and explained why, three respondents said that it is too high a weighting considering the amount of marks controlled assessment is allocated. Two said that the weighting is too low.

*QCDA response:* In line with regulatory requirements 25 per cent is the minimum weighting for controlled assessment. QCDA believes that the weighting allocated to controlled assessment is commensurate with the requirements specified in the content of the criteria. This view is supported by awarding bodies and by higher education representatives. It was also supported by focus groups with teachers.

**7c) Do you think that controlled assessment will have an impact on centres in terms of manageability and workload? If yes, please explain briefly why.**

56.8 per cent (20) of those answering the question felt that controlled assessment will have an impact on centres in terms of manageability and workload. 29.4 per cent (10 respondents) felt that it will not.

This question elicited more explanatory comments than any other in the additional science questionnaire. The concerns most frequently mentioned were:

- the increased burden on school resources and equipment (five)

- the increase in teacher workload (four).

Some respondents (four) commented that controlled assessments are already in operation and that they will reduce teacher workload.

*QCDA response:* Controlled assessment was developed to replace coursework. The criteria will be supported by controlled assessment regulations. The regulations will require awarding bodies to produce controlled assessments that:

- stimulate good teaching and learning by ensuring that controlled assessments are based on candidates' practical work
- provide the most appropriate way of assessing a particular set of skills
- support teachers in ensuring that the work submitted is the candidates' own.

QCDA is working to ensure that examinations officers are fully aware of the implications of the changes to assessment requirements. QCDA will commission guidance for centres in managing controlled assessment at centre level and will broker meetings between science experts and awarding bodies to share expertise. This will include opportunities for out of classroom learning.

### **Meeting the learning outcomes of the subject criteria**

**8a) Having had an opportunity to review the content, assessment objectives and the scheme of assessment, do you agree that the stated learning outcomes of the qualification are met by these subject criteria?**

67.6 per cent (23) of those answering the question agreed that the stated learning outcomes of the qualification are met by these subject criteria. 17.6 per cent (six) felt that they are not.

*QCDA response:* In association with higher education representatives DCELLS and CCEA (regulator) QCDA has reviewed and clarified the relationship between learning outcomes and content requirements.

### **Maximising accessibility and equality**

**9a) Do you agree that the criteria will enable awarding bodies to develop specifications that take into account the needs of all learners? If you disagree, please explain briefly why and please specify what type of learner you believe may be excluded by the criteria.**

75.8 per cent (25) of those answering the question agreed that the criteria will enable awarding bodies to develop specifications that take into account the needs of all learners. 9.1 per cent (three) disagreed.

Of the four respondents who commented two suggested that the criteria might not fully meet the needs of the more able learners.

*QCDA response:* QCDA believes that, in combination with the GCSE qualification criteria requirements, specifications based on these criteria will ensure that all learners, including the most able, will be appropriately challenged.

**9b) Do you agree that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately? If you disagree, please explain why.**

58.8 per cent (20) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately. 11.8 per cent (four respondents) disagreed.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9c) Do you agree that the criteria enable awarding bodies to develop specifications that promote good relations between racial groups? If you disagree, please explain why.**

54.5 per cent (18) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote good relations between racial groups. 12.1 per cent (four respondents) disagreed.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9d) Do you agree that the criteria enable awarding bodies to develop specifications that promote positive attitudes towards disabled people? If you disagree, please explain why.**

55.9 per cent (19) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote positive attitudes towards disabled people. 8.8 per cent (three respondents) disagreed.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9e) Do you see any requirements in these criteria that you believe might restrict any disabled candidates' access to the qualification? If yes, please indicate the requirement restricting access, the disability group(s) likely to be restricted and whether you believe the requirement to be essential, desirable or not needed in the assessment of this subject.**

58.8 per cent (20) of those answering the question could not see any requirements in these criteria that they believe might restrict any disabled candidates' access to the qualification. 17.6 per cent (six respondents) felt that they could see restrictions.

Respondents who said that they could see restrictions highlighted practical work as a potential barrier for those who have disabilities that restrict their ability to physically manipulate (two respondents).

*QCDA response:* All six sets of science criteria, and almost all respondents to the consultation, recognise that practical work is intrinsic to the study of science. However the criteria do not require the direct assessment of candidates' practical skills, although controlled assessment will be based directly on practical work. This will ensure that all learners have direct and consistent experience of practical work while ensuring that those who require a practical assistant may have one without disadvantage.

QCDA is committed to building a world-class education and training framework that is inclusive and relevant to all learners. Undertaking equality impact assessments is standard practice for all qualifications. QCDA has produced an impact assessment for each set of GCSE criteria and awarding bodies will have procedures in place to enable reasonable adjustments for candidates. Information on reasonable adjustments can be found at [www.jcq.org.uk](http://www.jcq.org.uk).

**9f) Centres may have to make reasonable adjustments for certain candidates. For example practical assistants or readers may be allowed to support learners. The criteria will enable awarding bodies to develop specifications that allow reasonable adjustments. If you disagree, please explain why.**

79.4 per cent (27) of those answering the question agreed with the statement above – that the criteria will enable awarding bodies to develop specifications that allow reasonable adjustments. 7.8 per cent (12 respondents) felt that they will not.

*QCDA response:* QCDA and the regulators will work with JCQ to ensure that guidance on reasonable adjustments is appropriate.

### **Curriculum opportunities within the GCSE criteria**

**10a) Do the revised criteria make clear the ways in which the subject complements and reflects the revisions to the overall objectives of key stage 4 curriculum? If not, please briefly explain your response.**

55.9 per cent (19) of those answering the question agreed that the revised criteria make clear the ways in which the subject complements and reflects the revisions to the overall objectives of key stage 4 curriculum. 26.5 per cent (nine) disagreed.

*QCDA response:* QCDA reviewed the criteria proposals and is confident that all six criteria support the overall objectives of the key stage 4 curriculum.

### **Curriculum aims**

The aims of the curriculum are to enable young people to become:

- successful learners who enjoy learning, make progress and achieve
- confident individuals who are able to live safe, healthy and fulfilling lives
- responsible citizens who make a positive contribution to society.

**10b) Do you think that the criteria support these aims sufficiently? If not, please briefly explain your response.**

56.3 per cent (18) of those answering the question agreed that the criteria support these aims sufficiently. 28.1 per cent (nine) felt that they do not.

*QCDA response:* A number of respondents commented on emphases in the programme of study rather than the criteria and other respondents commented that the curriculum requirements are best delivered through teaching and learning rather than criteria. QCDA supports this view.

**10c) Do the criteria support the development of personal, learning and thinking skills? If yes, please suggest how; if not, please briefly explain why not.**

63.6 per cent (21) of those answering the question agreed that the criteria support the development of personal, learning and thinking skills. 15.2 per cent (five respondents) felt that they do not.

*QCDA response:* QCDA believes that personal, learning and thinking skills are intrinsic to science and is confident that the skills are embedded in the revised criteria.

**10d) Do the revised subject criteria give sufficient flexibility for awarding bodies to develop specifications that reflect subject and curriculum initiatives and developments? If not, please briefly explain your response.**

61.8 per cent (21) of those answering the question agreed that the revised subject criteria provide sufficient flexibility for awarding bodies to develop specifications that reflect subject and curriculum initiatives and developments. 20.6 per cent (seven respondents) felt that they do not. There was no consensus view.

*QCDA response:* QCDA believes that the revised criteria proposals will strongly support subject and curriculum initiatives. In addition QCDA is working with senior examiners, learned societies and wider stakeholder groups to support awarding bodies in ensuring that new developments in scientific research are embedded in new specifications.

## Analysis of responses to consultation questions on GCSE additional applied science

Of the six subject criteria on which QCDA consulted in summer 2009 the consultation on the draft revised criteria for additional applied science attracted the lowest response, with 34 respondents.

### Respondents by type

#### 1a) In what capacity are you responding to this questionnaire?

	% of respondents	No. of respondents
Teacher of science – secondary non-selective	41.2	14
Teacher of science – secondary selective	2.9	1
Teacher of science – independent	5.9	2
Teacher of science – other	0.0	0
Lecturer of science – further education college	0.0	0
Lecturer of science – sixth-form college	0.0	0
Lecturer of science – tertiary college	0.0	0
Lecturer of science – university	2.9	1
Lecturer of science – other	2.9	1
School/college leadership team member	8.8	3
Subject association	5.9	2
Professional body	2.9	1

Teacher association	0.0	0
Teacher union	0.0	0
Local authority	5.9	2
Awarding organisation	0.0	0
Organisation or group specialising in any of the equality strands of disability, age, race, gender, sexual orientation, religion or belief	0.0	0
Employer	2.9	1
Sector skills council	0.0	0
Student	5.9	2
Other (please specify)	26.5	9
Total answered		39*

\*Total does not equal 34 as some respondents selected more than one type.

**1b) Are you responding to this consultation as an individual or on behalf of a named group?**

76.5 per cent (26) of respondents responded to the questionnaire as an individual as opposed to on behalf of a group (eight).

**Responses, question by question**

**Aims and learning outcomes**

**2a) Do you think that the proposed aims and learning outcomes for GCSE additional applied science are appropriate? If not, please indicate briefly what you think should be changed or added.**

63 per cent (17) of those answering the question felt that the proposed aims and learning outcomes for GCSE additional applied science are appropriate. 33.3 per cent (nine respondents) felt that they are not appropriate.

Comments included

- need to identify the distinct role of additional applied science (two)
- insufficient evidence on the need to provide a basis for further study (one)
- global implications of science should be added (one).

*QCDA response:* In association with DCELLS and CCEA (regulator) QCDA reviewed and revised the aims and learning outcomes and ensured that they are appropriately distinctive and reflective of applied learning. Links to the world of work have also been made more explicit.

**2b) Do the aims and learning outcomes reflect the aims and learning outcomes for GCSE science? If not, please indicate briefly what you think should be changed or added.**

77.8 per cent (21) of those answering the question felt that the proposed aims and learning outcomes reflect the aims and learning outcomes for GCSE science. 14.8 per cent (four respondents) felt that they do not.

Of the four respondents who commented two said that they should not reflect the aims and learning outcomes of GCSE science as GCSE additional applied science is a distinctive and separate course with a different purpose and cohort.

*QCDA response:* The aims and learning outcomes have been reviewed and modified to ensure that they appropriately reflect the ethos of additional applied science.

## **Content**

**3a) Do you think that the content for GCSE additional applied science is up to date? If not, please explain briefly why.**

48 per cent (12) of those answering the question felt that the content for GCSE additional applied science is up to date. 44 per cent (11 respondents) felt that the content is not up to date.

This question received the largest number of comments in the additional applied science questionnaire, although there was a comparatively low number of responses. Three respondents had concerns that the content is biased towards material and chemical science and missing broad areas of biological content. Representatives from the Nuffield Curriculum

Centre sent QCDA extensive feedback on the content of the additional applied science criteria.

*QCDA response:* Working with DCELLS and CCEA (regulator) QCDA has reviewed and modified the content proposals in line with all feedback received to ensure that content is appropriate and reflects the ethos of the specification. For example human physiology and biomechanics in the context of health and fitness has been included in line with advice from the Nuffield Curriculum Centre and a statement on the importance of the quality, quantity and accuracy of the data collected has been incorporated into the content section following feedback from the University of York.

**3b) Do you think that the content combined with GCSE science is an appropriate basis for progression to further study in applied science? If not, please explain briefly why.**

64 per cent (16) of those answering the question felt that the content combined with GCSE science is an appropriate basis for progression to further study in applied science. 28 per cent (seven) felt that it is not.

Among those who explained why they do not consider the content to be an appropriate basis for progression to further study, three respondents suggested (similarly to question 3a) that the content focuses on chemical science at the expense of physics and biology content and as such could not be considered appropriate preparation for applied science. Two respondents suggested that the content needs to build on GCSE science more explicitly.

*QCDA response:* The content requirements have been reviewed and modified to ensure that they reflect a balance across biology, chemistry and physics. The revisions have increased the emphasis on work-related contexts and work-related learning.

### **Assessment objectives**

**4a) Do the assessment objectives indicate clearly what is to be assessed? If not, please explain briefly why not.**

70.8 per cent (17) of those answering the question felt that the assessment objectives indicate clearly what is to be assessed. 20.8 per cent (five respondents) disagreed.

Three respondents considered the assessment objectives too vague and felt that they needed to include the application of skills in practical contexts.

*QCDA response:* The consultation draft of the criteria states for AO2 ‘apply skills, knowledge and understanding in applied contexts’. This was agreed to be appropriate and consistent with the ethos and learning outcomes of the criteria and is therefore unchanged.

**4b) Do the assessment objectives collectively cover all that is essential to the assessment of additional applied science at GCSE? If no, which requirements do you think should be added?**

62.5 per cent (15) of those answering the question felt that the assessment objectives collectively cover all that is essential to the assessment of additional applied science at GCSE. 20.8 per cent (five respondents) felt that they do not.

Among those who explained why they disagreed there was little consensus. Different respondents highlighted the lack of reference to career development (in an applied subject); the similarity of the assessment objectives to those in science; and that ‘completing practical work safely’ should be an assessment objective as aspiring technicians will do this course.

*QCDA response:* GCSE qualifications, including additional applied science, are intended to form part of a broad and balanced curriculum. They are intended to support career choices but are not designed for any particular career. QCDA has reviewed and modified references to career development across all six criteria to ensure that they are appropriate.

QCDA notes that candidates will be required to assess and manage risks but cannot realistically be assessed on ‘working safely’ in the context of GCSE science.

**4c) Are the relative weightings of the assessment objectives appropriate? If not, please explain briefly why not.**

45.8 per cent (11) of those answering the question felt that the relative weightings of the assessment objectives are appropriate. 33.3 per cent (eight) felt that they are not.

Among those who explained why they disagreed there was little consensus. Comments included:

- weightings have too broad a range
- should be less emphasis on recall in an applied subject
- AO2 and AO3 should reflect 60 per cent of the course.

*QCDA response:* In line with regulatory requirements assessment objectives have been streamlined to ensure consistent interpretation. This is a maintenance of standards issue and is consistent with all other subjects. Focus groups support the assessment objectives and weightings, which have not been amended.

**4d) Are the assessment objectives sufficiently distinctive? If not, please briefly explain why not.**

79.2 per cent (19) of those answering the question felt that the relative weightings of the assessment objectives are appropriate. 16.7 per cent (four) felt that they are not.

*QCDA response:* In line with regulatory requirements and to support comparability all content descriptions have been removed from the assessment objectives. This is intended to bring the criteria for the sciences into line with all other subject criteria.

In association with higher education representatives QCDA has reviewed the assessment objectives and made a minor change to the wording of AO3. The assessment objectives are in line with the assessment objectives for all other GCSE subjects and no additional changes were deemed necessary.

### **Tiering arrangements**

**5a) Are the proposed tiering arrangements appropriate? If not, please briefly explain why not.**

73.9 per cent (17) of those answering the question felt that the proposed tiering arrangements are appropriate. 8.7 per cent (two respondents) felt that they are not.

*QCDA response:* GCSE subjects with 60 per cent controlled assessment are not normally tiered. However subject associations, teachers and awarding bodies support the view that additional applied science should be tiered. Therefore QCDA decided to retain two tiers in GCSE additional applied science.

### **Scheme of assessment**

**6a) Will these criteria allow awarding bodies to develop high quality, stimulating assessments that will engage candidates in their subject as well as adequately assess the curriculum for which they have been prepared? If not, please briefly explain your response**

50 per cent (12) of those answering the question felt that these criteria allow awarding bodies to develop high quality, stimulating assessments that will engage candidates in their subject as well as adequately assess the curriculum for which they have been prepared. 50 per cent (12 respondents) felt that they will not.

Among those who added comments, six respondents said that the monitoring of the criteria by the regulators is key to ensuring that high quality assessments are provided. A number of others made comments on specific aspects of the content that had been mentioned previously in response to question three of the Science questionnaire, but there was no consensus.

*QCDA response:* QCDA has reviewed the learning outcomes and content distribution and the revised proposals are strongly supported by higher education representatives.

All GCSE science qualifications will need to meet the requirements of the GCSE qualification criteria and the relevant subject criteria. The changes to the GCSE qualification criteria require awarding bodies to use a range of question types including extended writing. This will provide stretch and challenge for all learners, including the most able.

QCDA plans to work with stakeholders – for example NowGen, the National History Museum, Royal Botanical Gardens, Kew and SCORE – to provide awarding bodies with direct access to new and exciting development in science, including current research. Meetings are scheduled to take place before the end of the year.

### **Controlled assessment**

It is proposed that the following skills are best assessed by controlled assessment:

- following practical instructions, procedures and protocols
- risk assessment and management
- data collection, processing and presentation
- review, analysis and evaluation of approaches, methods, protocols and procedures
- analysis and interpretation of data
- produce reports.

**7a) Do you agree that these skills are best assessed by controlled assessment? If not, please explain briefly why not.**

79.2 per cent (19) of those answering the question felt that the skills described above are best assessed by controlled assessment. 20.8 per cent (five respondents) felt that they are not.

*QCDA response:* QCDA has reviewed and modified the skills required for controlled assessment to ensure that they are consistent with the applied approach required for the study of additional applied science.

**7b) Is the weighting allocated to controlled assessment appropriate? If not, please explain briefly why not.**

45.8 per cent (11) of those answering the question felt that the weighting allocated to controlled assessment is appropriate. 41.7 per cent (10 respondents) disagreed.

Of those respondents who disagreed with the weighting allocated to controlled assessment and chose to comment, four said that it is too low without providing a reason. Four different respondents said that it is too high a weighting with two of these saying that controlled assessment does not assess higher level thinking and problem-solving skills and should therefore have a lower weighting.

*QCDA response:* In line with regulatory requirements 60 per cent is the maximum weighting that can be allocated to controlled assessment. QCDA and members of the criteria development groups, including the Nuffield Foundation and Diploma development partnership representatives, support this weighting.

**7c) Do you think that controlled assessment will have an impact on centres in terms of manageability and workload? If yes, please explain briefly why.**

54.2 per cent (13) of those answering the question felt that controlled assessment will have an impact on centres in terms of manageability and workload. 25 per cent (six respondents) felt that it will not.

*QCDA response:* Controlled assessment was developed to replace coursework. The criteria will be supported by controlled assessment regulations. The regulations will require awarding bodies to produce controlled assessments that:

- stimulate good teaching and learning by ensuring that controlled assessments are based on candidates' practical work
- provide the most appropriate way of assessing a particular set of skills
- support teachers in ensuring that the work submitted is the candidates' own.

QCDA is working to ensure that examinations officers are fully aware of the implications of the changes to assessment requirements. QCDA will commission guidance for centres in managing controlled assessment at centre level and will broker meetings between science experts and awarding bodies to share expertise. This will include opportunities for out of classroom learning.

### **Meeting the learning outcomes of the subject criteria**

**8a) Having had an opportunity to review the content, assessment objectives and the scheme of assessment, do you agree that the stated learning outcomes of the qualification are met by these subject criteria? If no, please explain briefly why.**

71.4 per cent (15) of those answering the question agreed that the stated learning outcomes of the qualification are met by these subject criteria. 14.3 per cent (three respondents) felt that they are not.

*QCDA response:* QCDA has reviewed and modified the proposals to ensure that the learning outcomes are fully reflected in the criteria requirements.

### **Maximising accessibility and equality**

**9a) Do you agree that the criteria will enable awarding bodies to develop specifications that take into account the needs of all learners? If you disagree, please explain briefly why and please specify what type of learner you believe may be excluded by the criteria.**

75 per cent (15) of those answering the question agreed that the criteria will enable awarding bodies to develop specifications that take into account the needs of all learners. 10 per cent (two respondents) disagreed.

*QCDA response:* QCDA believes that, in combination with the GCSE qualification criteria requirements, specifications based on the criteria will ensure that all learners, including the most able, will be appropriately challenged.

**9b) Do you agree that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately? If you disagree, please explain why.**

61.1 per cent (11) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately. 11.1 per cent (two respondents) disagreed.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9c) Do you agree that the criteria enable awarding bodies to develop specifications that promote good relations between racial groups? If you disagree, please explain why.**

60 per cent (12) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote good relations between racial groups. 15 per cent (three respondents) disagreed.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9d) Do you agree that the criteria enable awarding bodies to develop specifications that promote positive attitudes towards disabled people? If you disagree, please explain why.**

65 per cent (13) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote positive attitudes towards disabled people. 5 per cent (one) disagreed.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9e) Do you see any requirements in these criteria that you believe might restrict any disabled candidates' access to the qualification? If yes, please indicate the requirement restricting access, the disability group(s) likely to be restricted and whether you believe the requirement to be essential, desirable or not needed in the assessment of this subject.**

65 per cent (13) of those answering the question do not see any requirements in these criteria that they believe might restrict any disabled candidates' access to the qualification. 20 per cent (four respondents) felt that they could see restrictions.

Respondents who said that they could see restrictions highlighted practical work as a potential barrier for those who have disabilities that restrict their ability to physically manipulate (three).

*QCDA response:* All six sets of science criteria recognise that practical work is intrinsic to the study of science but none require the direct assessment of candidates' practical skills. However awarding bodies will be required to develop controlled assessments that are based directly on candidates' practical work.

QCDA is committed to building a world-class education and training framework that is inclusive and relevant to all learners. Undertaking equality impact assessments is standard practice for all qualifications. QCDA has produced an impact assessment for each set of GCSE criteria and awarding bodies will have procedures in place to enable reasonable adjustments for candidates. Information on reasonable adjustments can be found at [www.jcq.org.uk](http://www.jcq.org.uk).

**9f) Centres may have to make reasonable adjustments for certain candidates. For example practical assistants or readers may be allowed to support learners. The criteria will enable awarding bodies to develop specifications that allow reasonable adjustments. If you disagree, please explain why.**

70 per cent (14) of those answering the question agreed with the statement above – that the criteria will enable awarding bodies to develop specifications that allow reasonable adjustments. 5 per cent (one respondent) felt that they will not.

*QCDA response:* QCDA and the regulators will work with JCQ to ensure that guidance on reasonable adjustments is appropriate.

### **Curriculum opportunities within the GCSE subject criteria**

**10a) Do the revised criteria make clear the ways in which the subject complements and reflects the revisions to the overall objectives of key stage 4 curriculum? If not, please briefly explain your response.**

50 per cent (10) of those answering the question agreed that the revised criteria make clear the ways in which the subject complements and reflects the revisions to the overall objectives of key stage 4 curriculum. 25 per cent (five respondents) disagreed.

*QCDA response:* QCDA has revised and modified the learning outcomes and content to ensure that they support the aims of the revised secondary curriculum.

### **Curriculum aims**

The aims of the curriculum are to enable young people to become:

- successful learners who enjoy learning, make progress and achieve
- confident individuals who are able to live safe, healthy and fulfilling lives
- responsible citizens who make a positive contribution to society.

**10b) Do you think that the criteria support these aims sufficiently? If not, please briefly explain your response.**

55 per cent (11) of those answering the question agreed that the criteria support these aims sufficiently. 35 per cent (seven respondents) felt that they do not.

*QCDA response:* A number of respondents commented on emphases in the programme of study rather than the criteria and other respondents commented that the curriculum requirements are best delivered through teaching and learning rather than criteria. QCDA supports this view.

**10c) Do the criteria support the development of personal, learning and thinking skills? If yes, please suggest how; if not, please briefly explain why not.**

75 per cent (15) of those answering the question agreed that the criteria support the development of personal, learning and thinking skills. 15 per cent (three respondents) felt that they do not.

*QCDA response:* QCDA has considered the criteria carefully and believes that personal, learning and thinking skills are intrinsic to all science subjects and are included within criteria requirements.

**10d) Do the revised subject criteria give sufficient flexibility for awarding bodies to develop specifications that reflect subject and curriculum initiatives and developments? If not, please briefly explain your response.**

70 per cent (14) of those answering the question agreed that the revised subject criteria give sufficient flexibility for awarding bodies to develop specifications that reflect subject and curriculum initiatives and developments. 15 per cent (three respondents) felt that they do not.

*QCDA response:* QCDA believes that the revised criteria proposals will strongly support subject and curriculum initiatives. In addition QCDA is working with senior examiners, learned societies and wider stakeholder groups to support awarding bodies in ensuring that new developments in scientific research are embedded in new specifications.

## Analysis of responses to consultation questions on GCSE biology

Of the six subject criteria on which QCDA consulted in summer 2009 the consultation on the draft revised criteria for biology attracted the fourth largest response with 57 respondents.

### Respondents by type

#### 1a) In what capacity are you responding to this questionnaire?

	% of respondents	No. of respondents
Teacher of science – secondary non-selective	35.1	20
Teacher of science – secondary selective	24.6	14
Teacher of science – independent	15.8	9
Teacher of science – other	1.8	1
Lecturer of science – further education college	3.5	2
Lecturer of science – sixth-form college	3.5	2
Lecturer of science – tertiary college	1.8	1
Lecturer of science – university	7.0	4
Lecturer of science – other	1.8	1
School/college leadership team member	3.5	2
Subject association	3.5	2
Professional body	1.8	1
Teacher association	0.0	0

Teacher union	0.0	0
Local authority	3.5	2
Awarding organisation	5.3	3
Organisation or group specialising in any of the equality strands of disability, age, race, gender, sexual orientation, religion or belief	0.0	0
Employer	0.0	0
Sector skills council	0.0	0
Student	3.5	2
Other (please specify)	15.8	9
Total answered		75*

\*Total does not equal 57 as some respondents selected more than one type.

**1b) Are you responding to this consultation as an individual or on behalf of a named group?**

82.5% per cent (47) of respondents responded to the questionnaire as an individual as opposed to on behalf of a group (10)

**Aims and learning outcomes**

**2a) Do you think that the proposed aims and learning outcomes for GCSE biology are appropriate? If not, please explain briefly what you think should be changed or added.**

63.2 per cent (24) of those answering the question felt that the proposed aims and learning outcomes for GCSE biology are appropriate. 36.8 per cent (14) felt that they are not.

Among respondents who gave comments in support of their view that the aims and learning outcomes are not appropriate, comments included:

- too little emphasis human physiology (three)

- too little coverage of fieldwork (three)
- no mention of impact of biology on global society (two).

*QCDA response:* Aims and learning outcomes were reviewed with higher education advisers to ensure that they appropriately reflect the ethos of the subject. Fieldwork requirements have been reviewed in association with the subject community including representatives of the BES, Royal Botanic Gardens, Kew and the Natural History Museum.

**2b) Do the aims and learning outcomes reflect the key stage 4 programme of study? If not, please explain briefly what you think should be changed or added.**

73 per cent (27) of those answering the question felt that the proposed aims and learning outcomes reflect the key stage 4 programme of study. 16.2 per cent (six) felt that they do not.

*QCDA response:* Aims and learning outcomes have been reviewed to ensure that they are consistent with statutory requirements in England, Wales and Northern Ireland.

**2c) Do the learning outcomes support progression to level 3 qualifications in biology?**

60 per cent (21) of those answering the question felt that the learning outcomes support progression to level 3 qualifications in biology. 25.7 per cent (nine) felt that they do not.

Comments included:

- more human physiology needs to be included in the learning outcomes as this is a key area of study at advanced level (four)
- more practical work opportunities would aid progression (three)
- needs more emphasis on mathematics (three).

Both of the last two points were supported by the Science and Plants for Schools (SAPS) programme's written response.

*QCDA response:* The aims and learning outcomes were reviewed with higher education advisers to ensure that they appropriately reflect the ethos of the subject. Greater emphasis has been given to the study of plants, the need for and development of specialised organ systems, and practical work. Mathematics requirements have been developed in association with higher education and SCORE and will form an appendix to the criteria.

### **3a) Do you think that the content for GCSE biology is up to date?**

71.4 per cent (25) of those answering the question felt that the content for GCSE biology is up to date. 25.7 per cent (nine) disagreed and felt that it is not up to date.

Of the nine respondents who felt the content is not up to date, the main cause for concern (for three respondents) was that there is insufficient coverage of genetic engineering, genetic modifications and the impact of human interventions on animals and plants. Of the other six who suggested additional content there was no consensus.

*QCDA response:* Content proposals were reviewed with higher education including representatives of the University of Warwick, University of Reading and King's College London. The recommendation from the BBSRC to include 'variation within species and the effect of both genotype and environment' was added to the science criteria. The criteria for biology will enable awarding bodies to include additional content in their specifications.

### **3b) Do you think that the content is an appropriate basis for progression to level 3 qualifications in biology?**

55.9 per cent (19) of those answering the question felt that the content is an appropriate basis for progression to level 3 qualifications in biology. 32.4 per cent (11) disagreed.

The most common reason given for disagreement was a lack of human physiology in the criteria (five respondents). There was also concern that the content does not contain an explicit statement regarding which mathematical skills learners should be developing in scientific contexts. The need for inclusion of mathematical competencies was also highlighted by the SAPS programme response.

*QCDA response:* QCDA supports this response. The proposals were reviewed with higher education representatives to ensure appropriateness and secure progression. As a result the mathematics requirements have been made more explicit.

## **Assessment objectives**

### **4a) Do the assessment objectives indicate clearly what is to be assessed?**

61.8 per cent (21) of those answering the question felt that the assessment objectives indicate clearly what is to be assessed. 29.4 per cent (10) disagreed.

Five of the people who felt that the assessment objectives do *not* indicate clearly what is to be assessed commented that they are 'vague', 'open to interpretation' or 'need more detail'.

Of the other comments made on specific aspects of the assessment objectives, there was no consensus.

*QCDA response:* In line with regulatory requirements assessment objectives have been streamlined to ensure consistent interpretation. This is a standards issue and is consistent with all other subjects. Focus groups, particularly higher education, support the assessment objectives and weightings, which have not been amended.

#### **4b) Do the assessment objectives collectively cover all that is essential to the assessment of biology at GCSE?**

67.6 per cent (23) of those answering the question felt that the assessment objectives collectively cover all that is essential to the assessment of biology at GCSE. 20.6 per cent (seven) felt that they do not.

*QCDA response:* In line with regulatory requirements and to ensure comparability, all content descriptions have been removed from assessment objectives. This brings biology into line with all other subject criteria; therefore no changes were made.

#### **4c) Are the relative weightings of the assessment objectives appropriate?**

52.9 per cent (18) of those answering the question felt that the relative weightings of the assessment objectives are appropriate. 32.4 per cent (11) felt that they are not.

*QCDA response:* The weightings allocated to the assessment objectives were reviewed in line with the proposed weightings for science and additional science to ensure that demands are comparable. It was agreed that the weightings should not be changed.

#### **4d) Are the assessment objectives sufficiently distinctive?**

69.7 per cent (23) of those answering the question felt that the assessment objectives are sufficiently distinctive. 21.2 per cent (seven) felt that they are not.

*QCDA response:* The assessment objectives were reviewed by focus groups of teachers and higher education representatives. It was agreed that, subject to a minor amendment to AO3, the assessment objectives are distinctive.

### **Tiering**

#### **5a) Are the proposed tiering arrangements appropriate?**

67.6 per cent (23) of those answering the question felt that the proposed tiering arrangements are appropriate. 17.6 per cent (six) felt that they are not.

Of the seven comments there was support for keeping two tiers (two) and a lack of understanding of what the proposed tiering arrangements are from others (three), similar to responses to the other criteria.

*QCDA response:* QCDA will work with JCQ to ensure that centres have clear information to support entry decisions.

**6a) Will these criteria allow awarding bodies to develop high quality, stimulating assessments that will engage candidates in their subject as well as adequately assess the curriculum for which they have been prepared?**

64.7 per cent (22) of those answering the question felt that these criteria will allow awarding bodies to develop high quality, stimulating assessments that will engage candidates in their subject as well as adequately assess the curriculum for which they have been prepared.

26.5 per cent (nine) felt that they will not.

Among those who added comments, four respondents said that the monitoring of the criteria by Ofqual is key to ensuring that high quality assessments provide stimulating assessments. Two other respondents suggested that more human physiology content is needed to help engage students at this level.

*QCDA response:* All GCSE science qualifications will need to meet the requirements of the GCSE qualification criteria and the relevant subject criteria. The changes to the GCSE qualification criteria require awarding bodies to use a range of question types including extended writing. This will provide stretch and challenge for all learners, including the most able.

QCDA is already in discussions with stakeholders – for example NowGen, the National History Museum and SCORE – to ensure that awarding bodies have access to new and exciting developments in the sciences.

**Controlled assessment**

It is proposed that the following skills are best assessed by controlled assessment:

- plan and carry out investigation(s) to test scientific hypotheses
- devise methods and assess risks for the collection of numerical and other data

- manage risks when carrying out investigation(s)
- collect primary data
- process primary and secondary data
- analyse and interpret primary and secondary data
- evaluate methods used and draw conclusions
- assess the validity of investigation(s).

**7a) Do you agree that these skills are best assessed by controlled assessment? If not, please explain briefly why not.**

74.3 per cent (26) of those answering the question agreed that these skills are best assessed by controlled assessment. 17.1 per cent (six) felt that they are not.

*QCDA response:* QCDA has reviewed and rationalised the proposed skill set to ensure consistency with the requirements for additional science and to support progression to A level.

**7b) Is the weighting allocated to controlled assessment appropriate? If not, please explain briefly why not.**

51.4 per cent (18) of those answering the question felt that the weighting allocated to controlled assessment is appropriate. 22.9 per cent (eight) disagreed with this.

Of those respondents who disagreed with the weighting allocated to controlled assessment and explained why, five said that it is too high a weighting with two of these saying that controlled assessment tests skills and should therefore have a lower weighting.

*QCDA response:* In line with regulatory requirements 25 per cent is the minimum permitted weighting for controlled assessment. QCDA, DCELLS and CCEA (regulator) and the science community represented at the criteria development group strongly support this weighting.

**7c) Do you think that controlled assessment will have an impact on centres in terms of manageability and workload? If yes, please explain briefly why.**

57.1 per cent (20) of those answering the question felt that controlled assessment will have an impact on centres in terms of manageability and workload. 28.6 per cent (10) felt that it will not.

Similarly to the other science criteria, respondents who commented were concerned that there will be an increase in teacher workload (six) although three respondents said that teacher workload will be reduced as the process is more streamlined and efficient. Five respondents suggested that the increased burden on school resources and equipment will have an impact for centres (five).

*QCDA response:* QCDA will work with the Society of Biology, awarding bodies and other stakeholders to ensure that practical work is integrated appropriately in specification content. QCDA will also ensure that appropriate guidance is available for centres in managing controlled assessment.

### **Meeting the learning outcomes of the subject criteria**

#### **8a) Having had an opportunity to review the content, assessment objectives and the scheme of assessment, do you agree that the stated learning outcomes of the qualification are met by these criteria?**

66.7 per cent (22) of those answering the question agreed that the stated learning outcomes of the qualification are met by these criteria. 12.1 per cent (four) felt that they are not.

*QCDA response:* QCDA has worked closely with higher education representatives to review the content and learning outcomes to ensure consistency and coherence.

#### **8b) Is the distribution of biology content between science and additional science appropriate?**

36.4 per cent (12) of those answering the question felt that the distribution of biology content between science and additional science is appropriate. 45.5 per cent (15) felt that it is not.

Of the small number of respondents who felt that the distribution of content is not appropriate and commented, all gave suggested amendments with little consensus, with most wishing to see the following content moved or added to the additional science criteria content:

- evolution, genetics and DNA-based topics
- protein synthesis
- fieldwork
- evolutionary mechanisms.

*QCDA response:* There has been some redistribution of content to ensure that topics are addressed in the most appropriate way. QCDA has worked closely with academics to ensure that the content distribution will lead to a coherent approach to all topics in the content. There were some concerns about the need for additional resources to support the change in approach. QCDA is working with subject associations to ensure that appropriate guidance materials are available.

## **Maximising accessibility and equality**

**9a) Do you agree that the criteria will enable awarding bodies to develop specifications that take into account the needs of all learners? If you disagree, please explain briefly why and please specify what type of learner you believe may be excluded by the criteria.**

67.6 per cent (23) of those answering the question agreed that the criteria will enable awarding bodies to develop specifications that take into account the needs of all learners. 20.6 per cent (seven) disagreed.

Of the seven respondents who commented, five suggested that the criteria might not fully meet the needs of the more able learners and appear to favour the less able.

*QCDA response:* QCDA is confident that the assessment requirements set out in the GCSE qualification criteria – a range of question types, extended writing and assessment of quality of written communication – will provide stretch and challenge for all learners, including the most able.

**9b) Do you agree that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately? If you disagree, please explain why.**

63.6 per cent (21) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately. 18.2 per cent (six) disagreed.

A number of respondents queried the relevance of the requirement, suggesting that it should be the responsibility of the teacher.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9c) Do you agree that the criteria enable awarding bodies to develop specifications that promote good relations between racial groups? If you disagree, please explain why.**

63.6 per cent (21) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately. 18.2 per cent (six) disagreed.

A number of respondents queried the relevance of the requirement, suggesting that it should be the responsibility of the teacher.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9d) Do you agree that the criteria enable awarding bodies to develop specifications that promote positive attitudes towards disabled people? If you disagree, please explain why.**

70.6 per cent (24) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote positive attitudes towards disabled people. 5.9 per cent (two) disagreed.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9e) Do you see any requirements in these criteria that you believe might restrict any disabled candidates' access to the qualification? If yes, please indicate the requirement restricting access, the disability group(s) likely to be restricted and whether you believe the requirement to be essential, desirable or not needed in the assessment of this subject.**

69.7 per cent (23) of those answering the question do not see any requirements in these criteria that they believe might restrict any disabled candidates' access to the qualification. 9.1 per cent (three) felt that they could see restrictions.

*QCDA response:* All six sets of science criteria recognise that practical work is intrinsic to the study of science. However none require the direct assessment of candidates' practical skills. Awarding bodies will be required to develop controlled assessments that are based directly on candidates' practical work.

QCDA is committed to building a world-class education and training framework that is inclusive and relevant to all learners. Undertaking equality impact assessments is standard practice for all qualifications. QCDA has produced an impact assessment for each set of GCSE criteria and awarding bodies will have procedures in place to enable reasonable adjustments for candidates. Information on reasonable adjustments can be found at [www.jcq.org.uk](http://www.jcq.org.uk).

**9f) Centres may have to make reasonable adjustments for certain candidates. For example practical assistants or readers may be allowed to support learners. Do you agree that the criteria will enable awarding bodies to develop specifications that allow reasonable adjustments? If you disagree, please explain why.**

79.4 per cent (27) of those answering the question agreed with the statement above – that the criteria will enable awarding bodies to develop specifications that allow reasonable adjustments. All other respondents did not comment.

*QCDA response:* QCDA and the regulators will work with JCQ to ensure that guidance on reasonable adjustments is appropriate.

### **Curriculum opportunities within the GCSE subject criteria**

**10a) Do the revised criteria make clear the ways in which the subject complements and reflects the revisions to the overall objectives of key stage 4 curriculum? If not, please briefly explain your response.**

58.8 per cent (20) of those answering the question agreed that the revised criteria make clear the ways in which the subject complements and reflects the revisions to the overall objectives of key stage 4 curriculum. 20.6 per cent (seven) disagreed.

*QCDA response:* In reviewing the learning outcomes and content proposals QCDA has ensured that the overall objectives of the secondary curriculum are reflected in the biology criteria.

### **Curriculum aims**

The aims of the curriculum are to enable young people to become:

- successful learners who enjoy learning, make progress and achieve
- confident individuals who are able to live safe, healthy and fulfilling lives

- responsible citizens who make a positive contribution to society.

**10b) Do you think that the criteria support these aims sufficiently? If not, please briefly explain your response.**

58.8 per cent (20) of those answering the question agreed that the criteria support these aims sufficiently. 20.6 per cent (seven) felt that they do not.

*QCDA response:* In reviewing the learning outcomes and content proposals QCDA has ensured that the aims of the secondary curriculum are reflected in the biology criteria.

**10c) Do you think that schools could use this subject to develop learning in contexts beyond the school? If not, please briefly explain your response.**

73.5 per cent (25) of those answering the question agreed that the criteria support the development of personal, learning and thinking skills. 5.9 per cent (two) felt that they do not.

*QCDA response:* In association with BES, ASE and other key stakeholders, QCDA has reviewed and strengthened the references to fieldwork and out of classroom learning.

**10d) Do the criteria support the development of personal, learning and thinking skills? If not, please briefly explain your response.**

78.8 per cent (26) of those answering the question agreed that the revised subject criteria support the development of personal, learning and thinking skills. 6.1 per cent (two) felt that they do not.

*QCDA response:* QCDA has considered the criteria carefully and believes that personal, learning and thinking skills are intrinsic to all science subjects and are included within criteria requirements.

**10e) Do the revised subject criteria give sufficient flexibility for awarding bodies to develop specifications that reflect subject and curriculum initiatives and developments? If not, please briefly explain your response.**

81.8 per cent (27) of those answering the question agreed that the revised subject criteria give sufficient flexibility for awarding bodies to develop specifications that reflect subject and curriculum initiatives and developments. 6.1 per cent (two) felt that they do not.

*QCDA response:* QCDA believes that the revised criteria proposals will strongly support subject and curriculum initiatives. In addition QCDA is working with senior examiners,

learned societies and wider stakeholder groups to support awarding bodies in ensuring that new developments in scientific research are embedded in new specifications.

## Analysis of responses to consultation questions on GCSE chemistry

Of the six subject criteria on which QCDA consulted in summer 2009 the consultation on the draft revised criteria for chemistry attracted the second largest response, with 80 respondents.

### Respondents by type

#### 1a) In what capacity are you responding to this questionnaire?

	% of respondents	No. of respondents
Teacher of science – secondary non-selective	45.0	36
Teacher of science – secondary selective	21.3	17
Teacher of science – independent	13.8	11
Teacher of science – other	0.0	0
Lecturer of science – further education college	1.3	1
Lecturer of science – sixth-form college	1.3	1
Lecturer of science – tertiary college	0.0	0
Lecturer of science – university	3.8	3
Lecturer of science – other	1.3	1
School/college leadership team member	10.0	8
Subject association	1.3	1
Professional body	1.3	1

Teacher association	0.0	0
Teacher union	0.0	0
Local authority	2.5	2
Awarding organisation	3.8	3
Organisation or group specialising in any of the equality strands of disability, age, race, gender, sexual orientation, religion or belief	0.0	0
Employer	0.0	0
Sector skills council	0.0	0
Student	2.5	2
Other (please specify)	8.8	7
Total answered		94*

\*Total does not equal 80 as some respondents selected more than one type.

**1b) Are you responding to this consultation as an individual or on behalf of a named group?**

90 per cent (72) of respondents responded to the questionnaire as an individual as opposed to on behalf of a group (eight).

**Aims and learning outcomes**

**2a) Do you think that the proposed aims and learning outcomes for GCSE chemistry are appropriate?**

69.1 per cent (38) of those answering the question felt that the proposed aims and learning outcomes for GCSE chemistry are appropriate. 29.1 per cent (16) felt that they are not.

Among respondents who gave comments in support of their view that the aims and learning outcomes are not appropriate, three respondents commented that the aims and learning

outcomes should include how chemistry and its applications can affect society at local and global levels. Three other respondents indicated that they wished to see the removal of the study of the earth's atmosphere from the aims and learning outcomes as they felt this overlaps with geography and moves the focus away from fundamental areas of chemistry.

*QCDA response:* The aims and learning outcomes were reviewed with higher education advisers to ensure that they appropriately reflect the ethos of the subject and are consistent with science and additional science criteria requirements.

## **2b) Do the aims and learning outcomes reflect the key stage 4 programme of study?**

81.5 per cent (44) of those answering the question felt that the proposed aims and learning outcomes reflect the key stage 4 programme of study. 13 per cent (seven) felt that they do not.

*QCDA response:* Aims and learning outcomes have been reviewed to ensure that they are consistent with statutory requirements in England, Wales and Northern Ireland.

## **2c) Do the learning outcomes support progression to level 3 qualifications in chemistry?**

64.8 per cent (35) of those answering the question felt that the learning outcomes support progression to level 3 qualifications in chemistry. 20.4 per cent (11) felt that they do not.

A number of respondents reported that the mathematical requirements are insufficient to support progression. A minority of respondents believed that 'how science works' is over-emphasised in the content.

*QCDA response:* QCDA has worked with awarding bodies, SCORE and higher education representatives to ensure that the mathematical requirements are clearly specified and appropriate. The requirements will be published as an appendix to the criteria.

'How science works' is a key requirement of the programme of study for science and must be included in the chemistry criteria.

The learning outcomes and content were reviewed to secure progression to A level and other level 3 qualifications by specifying an appropriate balance of knowledge, understanding and skills.

## Content

### 3a) Do you think that the content for GCSE chemistry is up to date?

73.1 per cent (25) of those answering the question felt that the content for GCSE chemistry is up to date. 21.2 per cent (11) felt that it is not up to date.

Three respondents had concerns that the content focuses on teaching up to date chemistry and as a result does not focus on basic chemical concepts. Suggestions for content additions included:

- climate change and the earth's atmosphere (two)
- pharmaceutical and process industries (three)
- more organic chemistry (two).

*QCDA response:* QCDA has reviewed the content proposals with higher education representatives and other stakeholders to ensure that content is up to date and sufficient to support progression to A level chemistry.

### 3b) Do you think that the content provides an appropriate basis for progression to level 3 qualifications in chemistry?

64.2 per cent (34) of those answering the question felt that the content is an appropriate basis for progression to level 3 qualifications in chemistry. 28.3 per cent (15) felt that it is not.

Among those who felt that the content is not an appropriate basis for progression to level 3 qualifications in chemistry, four respondents said that there is a gulf in demand between current GCSE chemistry and A level chemistry.

Five respondents suggested that there needs to be more organic chemistry in the content to allow for progression. Three other respondents suggested that there is not enough focus on the mathematical skills required for progression in chemistry. This was consistent with feedback from the Royal Society of Chemistry.

*QCDA response:* QCDA reviewed the content proposals with higher education representatives to ensure appropriateness and secure progression. QCDA, DCELLS and CCEA (regulator) have reworded some of the content requirements to ensure that organic chemistry is explicit. QCDA also worked with awarding bodies, SCORE and higher education

representatives to ensure that the mathematical requirements are clearly specified and appropriate.

## **Assessment objectives**

### **4a) Do the assessment objectives indicate clearly what is to be assessed?**

62.5 per cent (30) of those answering the question felt that the assessment objectives indicate clearly what is to be assessed. 27.1 per cent (13) disagreed.

Of those who felt that the assessment objectives do *not* indicate clearly what is to be assessed seven commented that they 'need more detail'.

*QCDA response:* In line with regulatory requirements assessment objectives have been streamlined to ensure consistent interpretation. This is a standards issue and is consistent with all other subjects. Focus groups, particularly higher education, support the assessment objectives and weightings, which have not been amended.

### **4b) Do the assessment objectives collectively cover all that is essential to the assessment of chemistry at GCSE?**

67.4 per cent (31) of those answering the question felt that the assessment objectives collectively cover all that is essential to the assessment of chemistry at GCSE. 23.9 per cent (11) felt that they do not.

*QCDA response:* In line with regulatory requirements and to ensure comparability all content descriptions have been removed from assessment objectives. This brings chemistry into line with all other subject criteria; therefore no changes were made.

### **4c) Are the relative weightings of the assessment objectives appropriate?**

53.2 per cent (25) of those answering the question felt that the relative weightings of the assessment objectives are appropriate. 25.5 per cent (12) felt that they are not. A minority of respondents proposed increasing the weighting of AO1 and reducing the weighting of AO3.

*QCDA response:* The weightings allocated to the assessment objectives were reviewed in line with the proposed weightings for science and additional science to ensure that demands are comparable. It was agreed that the weightings should not be changed.

### **4d) Are the assessment objectives sufficiently distinctive?**

68.9 per cent (31) of those answering the question felt that the assessment objectives are sufficiently distinctive. 15.6 per cent (seven) felt that they are not.

*QCDA response:* The assessment objectives were reviewed by focus groups of teachers and higher education representatives. It was agreed that, subject to a minor amendment to AO3, the assessment objectives are distinctive.

## **Tiering**

### **5a) Are the proposed tiering arrangements appropriate?**

70.2 per cent (33) of those answering the question felt that the proposed tiering arrangements are appropriate. 19.1 per cent (nine) felt that they are not.

Of those who commented there was support for an intermediate tier (three), a lack of understanding of what the proposed tiering arrangements are (three) and calls for no tiering arrangements (two).

*QCDA response:*

The GCSE qualification criteria permit only two tiering models:

- question papers are targeted at a single tier covering grades A\* to G
- question papers are targeted at two tiers of grades A\* to D, with an allowed grade E, and C to G.

QCDA does not believe that there is sufficient evidence to warrant the development of a unique tiering arrangement for GCSE chemistry. QCDA will work with JCQ to ensure that centres have clear information to support entry decisions.

## **Scheme of assessment**

### **6a) Will these criteria allow awarding bodies to develop high quality, stimulating assessments that will engage candidates in their subject as well as adequately assess the curriculum for which they have been prepared?**

62.2 per cent (28) of those answering the question felt that these criteria will allow awarding bodies to develop high quality, stimulating assessments that will engage candidates in their subject as well as adequately assess the curriculum for which they have been prepared. 22.2 per cent (10) felt that they will not.

Among those who added comments in response to this question six said that the criteria allows awarding bodies to develop such assessments. Four respondents said that it is important that the assessments provided by awarding bodies are monitored and regulated.

*QCDA response:* All GCSE science qualifications will need to meet the requirements of the GCSE qualification criteria and the relevant subject criteria. The changes to the GCSE qualification criteria require awarding bodies to use a range of question types including extended writing. This will provide stretch and challenge for all learners, including the most able.

QCDA is already in discussions with stakeholders – for example NowGen, the National History Museum and SCORE – to ensure that awarding bodies have access to new and exciting developments in the sciences.

### **Controlled assessment**

It is proposed that the following skills are best assessed by controlled assessment:

- plan and carry out investigation(s) to test scientific hypotheses
- devise methods and assess risks for the collection of numerical and other data
- manage risks when carrying out investigation(s)
- collect primary data
- process primary and secondary data
- analyse and interpret primary and secondary data
- evaluate methods used and draw conclusions
- assess the validity of investigation(s).

**7a) Do you agree that these skills are best assessed by controlled assessment? If not, please explain briefly why not.**

73.8 per cent (31) of those answering the question agreed that these skills are best assessed by controlled assessment. 16.7 per cent (seven) felt that they are not.

*QCDA response:* QCDA has reviewed and rationalised the proposed skill set to ensure consistency with the requirements for additional science and to support progression to A level.

**7b) Is the weighting allocated to controlled assessment appropriate? If not, please explain briefly why not.**

59.5 per cent (25) of those answering the question felt that the weighting allocated to controlled assessment is appropriate. 21.4 per cent (nine) disagreed with this.

*QCDA response:* In line with regulatory requirements 25 per cent is the minimum permitted weighting for controlled assessment. QCDA, DCELLS, CCEA (regulator) and the science community represented at the criteria development meetings strongly support this weighting.

**7c) Do you think that controlled assessment will have an impact on centres in terms of manageability and workload? If yes, please explain briefly why.**

65.1 per cent (28) of those answering the question felt that controlled assessment will have an impact on centres in terms of manageability and workload. 23.3 per cent (10) felt that it will not.

This question elicited more explanatory comments than any other in the chemistry questionnaire. The concerns most frequently mentioned were:

- an increased burden on school resources and equipment (seven)
- an increase in teacher workload (five).

In contrast five respondents commented that controlled assessments will reduce teacher workload and three said that controlled assessment is a much more reliable tool than coursework.

*QCDA response:* QCDA will work with stakeholders to ensure that appropriate guidance on managing controlled assessment is available to centres.

### **Meeting the learning outcomes of the subject criteria**

**8a) Having had an opportunity to review the content, assessment objectives and the scheme of assessment, do you agree that the stated learning outcomes of the qualification are met by these criteria?**

58.5 per cent (24) of those answering the question agreed that the stated learning outcomes of the qualification are met by these criteria. 14.6 per cent (six) felt that they are not.

*QCDA response:* QCDA has worked closely with higher education representatives to review the content and learning outcomes to ensure consistency.

### **8b) Is the distribution of chemistry content between science and additional science appropriate?**

47.5 per cent (19) of those answering the question felt that the distribution of chemistry content between science and additional science is appropriate. 22.5 per cent (nine) felt that it is not.

Of those who felt that the distribution of content is not appropriate and commented, all gave suggested amendments with some consensus:

- seven respondents felt that there is not enough chemistry in both science and additional science in comparison to other subjects.
- three respondents questioned why chemistry exists as a separate subject if all content in chemistry is covered by science and additional science.

*QCDA response:* QCDA has increased the amount of chemistry in additional science and chemistry criteria and has carried out some redistribution of content to ensure that topics are addressed in the most appropriate way.

## **Maximising accessibility and equality**

### **9a) Do you agree that the criteria will enable awarding bodies to develop specifications that take into account the needs of all learners?**

59 per cent (23) of those answering the question agreed that the criteria will enable awarding bodies to develop specifications that take into account the needs of all learners. 25.6 per cent (10) disagreed.

Of the 13 respondents who commented, four suggested that the criteria might not fully meet the needs of the more able learners and three said that the criteria appear to favour the less able.

*QCDA response:* QCDA is confident that the assessment requirements set out in the GCSE qualification criteria – a range of question types, extended writing and assessment of quality

of written communication – will provide stretch and challenge for all learners, including the most able.

**9b) Do you agree that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately?**

42.5 per cent (17) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately. 22.5 per cent (nine) disagreed.

A number of respondents (six) queried the relevance of the requirement, suggesting that this could only be achieved in the classroom.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9c) Do you agree that the criteria enable awarding bodies to develop specifications that promote good relations between racial groups?**

37.5 per cent (15) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately. 17.5 per cent (seven) disagreed.

A number of respondents queried the relevance of the requirement, suggesting that it should be the responsibility of the teacher.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9d) Do you agree that the criteria enable awarding bodies to develop specifications that promote positive attitudes towards disabled people?**

37.5 per cent (15) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote positive attitudes towards disabled people. 17.5 per cent (seven) disagreed.

A number of respondents (five) queried the relevance of the requirement, suggesting that this could only be achieved in the classroom.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9e) Do you see any requirements in these criteria that you believe might restrict any disabled candidates' access to the qualification?**

75.6 per cent (31) of those answering the question do not see any requirements in these criteria that they believe might restrict any disabled candidates' access to the qualification. 14.6 per cent (six) felt that they could see restrictions.

Respondents who said that they could see restrictions highlighted practical work as a potential barrier for those who have disabilities that restrict their ability to physically manipulate (four).

*QCDA response:* All six sets of science criteria recognise that practical work is intrinsic to the study of science but none require the direct assessment of candidates' practical skills. However awarding bodies will be required to develop controlled assessments that are based directly on candidates' practical work.

QCDA is committed to building a world-class education and training framework that is inclusive and relevant to all learners. Undertaking equality impact assessments is standard practice for all qualifications. QCDA has produced an impact assessment for each set of GCSE criteria and awarding bodies will have procedures in place to enable reasonable adjustments for candidates. Information on reasonable adjustments can be found at [www.jcq.org.uk](http://www.jcq.org.uk).

**9f) Centres may have to make reasonable adjustments for certain candidates. For example practical assistants or readers may be allowed to support learners. Do you agree that the criteria will enable awarding bodies to develop specifications that allow reasonable adjustments? If you disagree, please explain why.**

75 per cent (30) of those answering the question agreed with the statement above – that the criteria will enable awarding bodies to develop specifications that allow reasonable adjustments. 10 per cent (four) felt that they will not.

*QCDA response:* QCDA and the regulators will work with JCQ to ensure that guidance on reasonable adjustments is appropriate.

**Curriculum opportunities within the GCSE subject criteria**

**10a) Does the revised criteria make clear the ways in which the subject complements and reflects the revisions to the overall objectives of key stage 4 curriculum? If not, please briefly explain your response.**

58.5 per cent (24) of those answering the question agreed that the revised criteria make clear the ways in which the subject complements and reflects the revisions to the overall objectives of key stage 4 curriculum. 17.1 per cent (seven) disagreed.

*QCDA response:* In reviewing the learning outcomes and content proposals QCDA has ensured that the overall objectives of the secondary curriculum are reflected in the chemistry criteria.

### **Curriculum aims**

The aims of the curriculum are to enable young people to become:

- successful learners who enjoy learning, make progress and achieve
- confident individuals who are able to live safe, healthy and fulfilling lives
- responsible citizens who make a positive contribution to society.

In reviewing the learning outcomes and content proposals QCDA has ensured that the objectives of the secondary curriculum are reflected in the chemistry criteria.

**10b) Do you think that the criteria support these aims sufficiently? If not, please briefly explain your response.**

65 per cent (26) of those answering the question agreed that the criteria support these aims sufficiently. 22.5 per cent (nine) felt that they do not.

*QCDA response:* In reviewing the learning outcomes and content proposals QCDA has ensured that the aims of the secondary curriculum are reflected in the chemistry criteria.

**10c) Do you think that schools could use this subject to develop learning in contexts beyond the school? If not, please briefly explain your response.**

75.6 per cent (31) of those answering the question agreed that the criteria support the development of personal, learning and thinking skills. 4.9 per cent (two) felt that they do not.

*QCDA response:* In association with key stakeholders QCDA has reviewed and strengthened the references to fieldwork and out of classroom learning.

**10d) Do the criteria support the development of personal, learning and thinking skills? If not, please briefly explain your response.**

80 per cent (32) of those answering the question agreed that the revised subject criteria support the development of personal, learning and thinking skills. 7.5 per cent (three) felt that they do not.

*QCDA response:* QCDA has considered the criteria carefully and believes that personal, learning and thinking skills are intrinsic to all science subjects and are included within criteria requirements.

**10e) Does the revised subject criteria give sufficient flexibility for awarding bodies to develop specifications that reflect subject and curriculum initiatives and developments? If not, please briefly explain your response.**

65.9 per cent (27) of those answering the question agreed that the revised subject criteria give sufficient flexibility for awarding bodies to develop specifications that reflect subject and curriculum initiatives and developments. 19.5 per cent (eight) felt that they do not.

*QCDA response:* QCDA believes that the revised criteria proposals will strongly support subject and curriculum initiatives. In addition QCDA is working with senior examiners, learned societies and wider stakeholder groups to support awarding bodies in ensuring that new developments in scientific research are embedded in new specifications.

## Analysis of responses to consultation questions on GCSE physics

Of the six subject criteria on which QCDA consulted in summer 2009 the consultation on the draft revised criteria for physics attracted the third largest response, with 69 respondents.

### Respondents by type

#### 1a) In what capacity are you responding to this questionnaire?

	% of respondents	No. of respondents
Teacher of science – secondary non-selective	30.4	21
Teacher of science – secondary selective	29.0	20
Teacher of science – independent	18.8	13
Teacher of science – other	0.0	0
Lecturer of science – further education college	2.9	2
Lecturer of science – sixth-form college	2.9	2
Lecturer of science – tertiary college	0.0	0
Lecturer of science – university	1.4	1
Lecturer of science – other	0.0	0
School/college leadership team member	4.3	3
Subject association	5.8	4
Professional body	2.9	2
Teacher association	0.0	0

Teacher union	2.9	2
Local authority	4.3	3
Awarding organisation	1.4	1
Organisation or group specialising in any of the equality strands of disability, age, race, gender, sexual orientation, religion or belief	0.0	0
Employer	0.0	0
Sector skills council	0.0	0
Student	4.3	3
Other (please specify)	13.0	9
Total answered		86*

\*Total does not equal 69 as some respondents selected more than one type

**1b) Are you responding to this consultation as an individual or on behalf of a named group?**

94.2 per cent (65) of respondents responded to the questionnaire as an individual as opposed to on behalf of a group (four)

**Aims and learning outcomes**

**2a) Do you think that the proposed aims and learning outcomes for GCSE physics are appropriate?**

69.8 per cent (30) of those answering the question felt that the proposed aims and learning outcomes for GCSE physics are appropriate. 30.2 per cent (13) felt that they are not.

Among respondents who gave comments in support of their view that the aims and learning outcomes are not appropriate, four respondents commented that the aims and learning outcomes need to indicate how they build on key stage 3 'how science works'. Two

respondents indicated that they wished to see more emphasis on the mathematical requirements as these are critical to physics.

*QCDA response:* QCDA worked with higher education advisers to revise the aims and learning outcomes to ensure that they appropriately reflect the ethos of the subject. The mathematical requirements are separately specified as an appendix to the criteria.

### **2b) Do the aims and learning outcomes reflect the key stage 4 programme of study?**

79.1 per cent (34) of those answering the question felt that the proposed aims and learning outcomes reflect the key stage 4 programme of study. 9.3 per cent (four) felt that they do not.

*QCDA response:* The science criteria requirements have been reordered to ensure that 'how science works' is appropriately reflected. QCDA reviewed the aims and learning outcomes to ensure that the relationship between the programme(s) of study and the aims and learning outcomes is explicit.

### **2c) Do the learning outcomes support progression to level 3 qualifications in physics?**

62.8 per cent (27) of those answering the question felt that the learning outcomes support progression to level 3 qualifications in physics. 25.6 per cent (11) disagreed.

*QCDA response:* The learning outcomes and content were reviewed to secure progression to A level and other level 3 qualifications by specifying an appropriate balance of knowledge, understanding and skills.

## **Content**

### **3a) Do you think that the content for GCSE physics is up to date?**

70.7 per cent (29) of those answering the question felt that the content for GCSE physics is up to date. 22 per cent (nine) disagreed and felt that it is not up to date.

Of the nine respondents who felt the content is not up to date six suggested additional content but there was no consensus.

*QCDA response:* QCDA has reviewed the content proposals with higher education representatives and other stakeholders to ensure that content is up to date and sufficient to support progression to A level physics.

### **3b) Do you think that the content provides an appropriate basis for progression to level 3 qualifications in physics?**

61 per cent (25) of those answering the question felt that the content is an appropriate basis for progression to level 3 qualifications in physics. 31.7 per cent (13) disagreed.

This question received the largest number of comments in the physics questionnaire. The majority of comments (11) called for more mathematical content in terms of calculations and problem-solving. There were other suggestions for content additions but no consensus.

*QCDA response:* The proposals were reviewed with higher education representatives to ensure appropriateness and secure progression. As a result the mathematics requirements have been made more detailed and explicit. References to some content have been changed to make the requirements clearer; for example the reference to waves has been amended to:

- the wave equation and the transfer of energy and information by waves
- the relationship between the properties of electromagnetic waves and their uses.

### **Assessment objectives**

#### **4a) Do the assessment objectives indicate clearly what is to be assessed?**

68.4 per cent (26) of those answering the question felt that the assessment objectives indicate clearly what is to be assessed. 23.7 per cent (nine) disagreed.

Of those who disagreed and commented seven considered the assessment objectives too vague and 'open to interpretation'.

*QCDA response:* In line with regulatory requirements assessment objectives have been streamlined to ensure consistent interpretation. This is a standards issue and is consistent with all other subjects. Focus groups, particularly higher education, support the assessment objectives and weightings, which have not been amended.

#### **4b) Do the assessment objectives collectively cover all that is essential to the assessment of physics at GCSE?**

65.8 per cent (25) of those answering the question felt that the assessment objectives collectively cover all that is essential to the assessment of physics at GCSE. 23.7 per cent (nine) felt that they do not.

*QCDA response:* In line with regulatory requirements and to ensure comparability, all content descriptions have been removed from assessment objectives. This brings physics into line with all other subject criteria; therefore no changes were made.

**4c) Are the relative weightings of the assessment objectives appropriate?**

57.9 per cent (22) of those answering the question felt that the relative weightings of the assessment objectives are appropriate. 18.4 per cent (seven) felt that they are not.

*QCDA response:* The weightings allocated to the assessment objectives were reviewed in line with the proposed weightings for science and additional science to ensure that demands are comparable. It was agreed that the weightings should not be changed.

**4d) Are the assessment objectives sufficiently distinctive?**

68.4 per cent (26) of those answering the question felt that the assessment objectives are sufficiently distinctive. 13.2 per cent (five) felt that they are not.

*QCDA response:* The assessment objectives were reviewed by focus groups of teachers and higher education representatives. It was agreed that, subject to a minor amendment to AO3, the assessment objectives are distinctive.

## **Tiering**

**5a) Are the proposed tiering arrangements appropriate?**

73.7 per cent (28) of those answering the question felt that the proposed tiering arrangements are appropriate. 13.2 per cent (five) felt that they are not.

Of the four comments there was support for keeping two tiers (two) and a lack of understanding of what the proposed tiering arrangements are (two).

*QCDA response:* QCDA will work with JCQ to ensure that centres have clear information to support entry decisions.

**6a) Will these criteria allow awarding bodies to develop high quality, stimulating assessments that will engage candidates in their subject as well as adequately assess the curriculum for which they have been prepared?**

42.9 per cent (15) of those answering the question felt that these criteria will allow awarding bodies to develop high quality, stimulating assessments that will engage candidates in their

subject as well as adequately assess the curriculum for which they have been prepared. 28.6 per cent (10) felt that they will not.

Among those who added comments, five respondents said that the monitoring of the criteria by Ofqual is key to ensuring that high quality assessments provide stimulating assessments.

*QCDA response:* All GCSE science qualifications will need to meet the requirements of the GCSE qualification criteria and the relevant subject criteria. The changes to the GCSE qualification criteria require awarding bodies to use a range of question types including extended writing. This will provide stretch and challenge for all learners, including the most able.

QCDA is already in discussions with stakeholders – for example NowGen, the National History Museum and SCORE – to ensure that awarding bodies have access to new and exciting developments in the sciences.

### **Controlled assessment**

It is proposed that the following skills are best assessed by controlled assessment:

- plan and carry out investigation(s) to test scientific hypotheses
- devise methods and assess risks for the collection of numerical and other data
- manage risks when carrying out investigation(s)
- collect primary data
- process primary and secondary data
- analyse and interpret primary and secondary data
- evaluate methods used and draw conclusions
- assess the validity of investigation(s).

**7a) Do you agree that these skills are best assessed by controlled assessment? If not, please explain briefly why not.**

77.1 per cent (27) of those answering the question agreed that these skills are best assessed by controlled assessment. 22.9 per cent (eight) felt that they are not.

*QCDA response:* QCDA has reviewed and rationalised the proposed skill set to ensure consistency with the requirements for additional science and to support progression to A level.

**7b) Is the weighting allocated to controlled assessment appropriate? If not, please explain briefly why not.**

65.7 per cent (23) of those answering the question felt that the weighting allocated to controlled assessment is appropriate. 20 per cent (seven) disagreed with this.

*QCDA response:* In line with regulatory requirements 25 per cent is the minimum permitted weighting for controlled assessment. QCDA, DCELLS and CCEA (regulator) and the science community represented at the criteria development meetings strongly support this weighting.

**7c) Do you think that controlled assessment will have an impact on centres in terms of manageability and workload? If yes, please explain briefly why.**

74.3 per cent (26) of those answering the question felt that controlled assessment will have an impact on centres in terms of manageability and workload. 17.1 per cent (six) felt that it will not.

This question elicited more explanatory comments than any other in the physics questionnaire. The concerns most frequently mentioned were:

- the increased burden on school resources and timetabling (eight)
- the increase in teacher workload (five).

Three respondents commented that controlled assessments have already been in place for three years in other subjects and have been shown to reduce the burden of assessment for teachers.

*QCDA response:* QCDA will work with stakeholders to ensure that appropriate guidance is available to centres in managing controlled assessment.

### **Meeting the learning outcomes of the subject criteria**

**8a) Having had an opportunity to review the content, assessment objectives and the scheme of assessment, do you agree that the stated learning outcomes of the qualification are met by these criteria?**

68.6 per cent (24) of those answering the question agreed that the stated learning outcomes of the qualification are met by these criteria. 11.4 per cent (four) felt that they are not.

*QCDA response:* QCDA has worked closely with higher education representatives to review the content and learning outcomes to ensure consistency and coherence.

### **8b) Is the distribution of physics content between science and additional science appropriate?**

47.1 per cent (16) of those answering the question felt that the distribution of physics content between science and additional science is appropriate. 32.4 per cent (11) felt that it is not.

Of those who felt that the distribution of content is not appropriate and commented, all gave suggested amendments with little consensus, except for three respondents who commented that the physics content is low in comparison to biology and chemistry.

*QCDA response:* The Institute of Physics (IOP) proposed that ionising radiations should be included in the science criteria. The revisions to the criteria now include a requirement that learners must demonstrate a knowledge and understanding of ionising radiations, including that they are emitted all the time by radioactive materials and that they can transfer energy. In line with feedback from the IOP and others, the physics criteria do not specify any material additional to that for science and additional science to ensure that the core learning experience for students is the same whether they study science and additional science or the separate sciences.

QCDA has worked closely with academics to ensure that the content distribution will lead to a coherent approach to all topics in the content.

## **Maximising accessibility and equality**

### **9a) Do you agree that the criteria will enable awarding bodies to develop specifications that take into account the needs of all learners?**

68.6 per cent (24) of those answering the question agreed that the criteria will enable awarding bodies to develop specifications that take into account the needs of all learners. 14.3 per cent (five) disagreed.

*QCDA response:* QCDA is confident that the assessment requirements set out in the GCSE qualification criteria – a range of question types, extended writing and assessment of quality of written communication – will provide stretch and challenge for all learners, including the most able.

**9b) Do you agree that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately?**

60 per cent (21) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately. 17.1 per cent (six) disagreed.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9c) Do you agree that the criteria enable awarding bodies to develop specifications that promote good relations between racial groups?**

55.9 per cent (19) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote cultural understanding, diversity and gender equality appropriately. 20.6 per cent (seven) disagreed.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9d) Do you agree that the criteria enable awarding bodies to develop specifications that promote positive attitudes towards disabled people?**

61.8 per cent (21) of those answering the question agreed that the criteria enable awarding bodies to develop specifications that promote positive attitudes towards disabled people. 17.6 per cent (six) disagreed.

*QCDA response:* QCDA has carried out an impact assessment on the draft criteria to ensure that they comply with equalities legislation.

**9e) Do you see any requirements in these criteria that you believe might restrict any disabled candidates' access to the qualification?**

68.6 per cent (24) of those answering the question do not see any requirements in these criteria that they believe might restrict any disabled candidates' access to the qualification. 17.1 per cent (six) felt that they could see restrictions.

Although only three comments were made they all highlighted practical manipulation as a potential barrier to access.

*QCDA response:* All six sets of science criteria recognise that practical work is intrinsic to the study of science. However none require the direct assessment of candidates' practical skills. Awarding bodies will be required to develop controlled assessments that are based directly on candidates' practical work.

QCDA is committed to building a world-class education and training framework that is inclusive and relevant to all learners. Undertaking equality impact assessments is standard practice for all qualifications. QCDA has produced an impact assessment for each set of GCSE criteria and awarding bodies will have procedures in place to enable reasonable adjustments for candidates. Information on reasonable adjustments can be found at [www.jcq.org.uk](http://www.jcq.org.uk).

**9f) Centres may have to make reasonable adjustments for certain candidates. For example practical assistants or readers may be allowed to support learners. The criteria will enable awarding bodies to develop specifications that allow reasonable adjustments. If you disagree, please explain why.**

77.1 per cent (27) of those answering the question agreed with the statement above – that the criteria will enable awarding bodies to develop specifications that allow reasonable adjustments. 2.9 per cent (one) felt that they will not.

*QCDA response:* QCDA and the regulators will work with JCQ to ensure that guidance on reasonable adjustments is appropriate.

### **Curriculum opportunities within the GCSE subject criteria**

**10a) Do the revised criteria make clear the ways in which the subject complements and reflects the revisions to the overall objectives of key stage 4 curriculum? If not, please briefly explain your response.**

47.1 per cent (16) of those answering the question agreed that the revised criteria make clear the ways in which the subject complements and reflects the revisions to the overall objectives of key stage 4 curriculum. 26.5 per cent (nine) disagreed.

*QCDA response:* In reviewing the learning outcomes and content proposals QCDA has ensured that the overall objectives of the secondary curriculum are reflected in the physics criteria.

### **Curriculum aims**

The aims of the curriculum are to enable young people to become:

- successful learners who enjoy learning, make progress and achieve
- confident individuals who are able to live safe, healthy and fulfilling lives
- responsible citizens who make a positive contribution to society.

**10b) Do you think that the criteria support these aims sufficiently? If not, please briefly explain your response.**

61.8 per cent (21) of those answering the question agreed that the criteria support these aims sufficiently. 17.6 per cent (six) felt that they do not.

*QCDA response:* In reviewing the learning outcomes and content proposals QCDA has ensured that the aims of the secondary curriculum are reflected in the physics criteria.

**10c) Do you think that schools could use this subject to develop learning in contexts beyond the school? If not, please briefly explain your response.**

64.7 per cent (22) of those answering the question agreed that the criteria support the development of personal, learning and thinking skills. 5.9 per cent (two) felt that they do not.

*QCDA response:* In association with key stakeholders QCDA has reviewed and strengthened the references to fieldwork and out of classroom learning.

**10d) Do the criteria support the development of personal, learning and thinking skills? If not, please briefly explain your response.**

82.4 per cent (28) of those answering the question agreed that the revised subject criteria support the development of personal, learning and thinking skills. 11.8 per cent (four) felt that they do not.

*QCDA response:* QCDA has considered the criteria carefully and believes that personal, learning and thinking skills are intrinsic to all science subjects and are included within criteria requirements.

**10e) Do the revised subject criteria give sufficient flexibility for awarding bodies to develop specifications that reflect subject and curriculum initiatives and developments? If not, please briefly explain your response.**

73.5 per cent (25) of those answering the question agreed that the revised subject criteria give sufficient flexibility for awarding bodies to develop specifications that reflect subject and curriculum initiatives and developments. 8.8 per cent (three) felt that they do not.

*QCDA response:* QCDA believes that the revised criteria proposals will strongly support subject and curriculum initiatives. In addition QCDA is working with senior examiners, learned societies and wider stakeholder groups to support awarding bodies in ensuring that new developments in scientific research are embedded in new specifications.

## **Annex – A summary of the changes from the current to the new criteria**

The criteria review process enabled implementation of the changes required to meet the concerns raised in two reports:

- The new GCSE science examinations – Findings from the monitoring of the new GCSE science specifications: 2007 to 2008
- The review of standards in physics, 2005

This annex outlines how concerns with the current GCSEs in science in these reports were addressed in the revised criteria.

### **The new GCSE science examinations – Findings from the monitoring of the new GCSE science specifications: 2007 to 2008**

Current GCSEs in science were introduced for first teaching in September 2006. These qualifications represented a significant change in science teaching, learning and assessment. They are based on a streamlined programme of study with an emphasis on science in society and the development of skills, in particular they focus on ‘how science works’. The programme of study specifies a reduced emphasis on knowledge and understanding; this is reflected in the subject criteria (2004) for these qualifications.

Because of the nature of the changes to science introduced by the 2004 criteria – the focus on ‘how science works’ in both teaching and assessment, compulsory unitisation, the replacement of the double award science with two free-standing qualifications and flexible assessment models – QCA’s Regulation and Standards Division (later Ofqual) decided to monitor all new science and additional science qualifications.

The resulting Ofqual report, published in March 2009, raised a number of concerns with the current GCSEs in science and contained a number of recommendations.

**Action 1:** *Ofqual recommends revision of the GCSE criteria for science and the development of new specifications in these subjects to ensure that different routes to a subject grade are comparable in their requirements.*

**Response:** QCDA initiated a review of subject criteria for science in April 2009. First teaching on new specifications based on the revised criteria will be in September 2011.

Separate criteria have been developed for all six science titles to ensure requirements are clear and transparent. Controlled assessment regulations for science subjects mean that different forms of assessment for the same content will no longer be permitted.

The requirements for science do not overlap with those for additional science. All requirements for science are specified in full. About 75 per cent of the requirements for additional science are specified to ensure progression to A level and other level 3 qualifications is appropriate and to allow some flexibility for awarding bodies in developing specifications. Separate science requirements are specified to match the science plus additional science requirements. For example GCSE biology criteria specify the biology requirements set out in GCSE science and GCSE additional science to secure progression to A level. This model allows common units/components across the science suite of qualifications and reduces optional pathways. The criteria preclude the use of optional forms of assessments; content will be assessed externally unless identified as appropriate for controlled assessment.

**Action 2:** *Ofqual requires future specification development to ensure that individual assessments have sufficient scope to discriminate accurately across the full range of candidates' performance.*

**Response:** This issue is addressed through paragraphs 5 and 6 of the revised GCSE qualification criteria (2008). These criteria require that the assessment arrangements for all GCSEs must:

- *Require, across both controlled and external assessment components/units, a variety of question types and tasks, including extended writing*
- *Assess the candidates' quality of written communication.*

The requirements above will ensure that GCSE science can no longer be assessed primarily by a single or very narrow range of question type(s).

The requirements for controlled assessment are set out in paragraph 6 of the GCSE qualification criteria. Specifications must make clear how reliability and fairness are secured by setting out requirements that ensure the robustness of each stage of the controlled assessment. This paragraph states that:

*They must cover:*

- *The specific skills to be assessed*

- *The setting of tasks*
- *The extent of supervision in carrying out of tasks*
- *The conditions under which assessment takes place*
- *The marking of the assessment and internal standardising procedures*
- *Any moderation process.*

These requirements are supported by controlled assessment regulations for each science title.

**Action 3:** Ofqual recommended that *weightings allocated to different types of assessment are appropriate, so that candidates across the range are able to demonstrate what they know, understand and can do.*

**Response:** Revised assessment objectives (AOs) and their weightings and the scheme of assessment are identical across science, additional science, biology, chemistry and physics. AOs are streamlined to ensure requirements are clear and not open to interpretation.

Criteria for all science subjects allocate 75 per cent weighting to external assessment and 25 per cent to controlled assessment with the exception of additional applied science where the allocated weighting is 40 per cent external and 60 per cent controlled assessment to reflect the increased emphasis on skills development and in line with all other applied GCSE subjects.

**Action 4:** Ofqual recommended that *consideration of whether the broader aspects of ‘how science works’ could be more validly assessed through means different to those used currently.*

**Response:** Current specifications assess content in the context of ‘how science works’; this is not always appropriate in assessing knowledge and understanding and can lead to formulaic assessments that do not always provide sufficient stretch and challenge. ‘How science works’ remains a key part of the programme of study and therefore of the content of GCSE science. However knowledge, understanding and skills are now specified separately in the revised criteria, enabling assessment of knowledge and understanding alongside rather than in the context of ‘how science works’. This will enable awarding bodies to construct less predictable assessments and assess content in the most appropriate way. The skills element of ‘how science works’ will be assessed through controlled assessment.

Emphasis on 'how science works' has been reduced in additional science, which has a greater emphasis on the acquisition of a body of knowledge.

**Action 5:** Ofqual recommended that *different routes to a subject grade, both across and within specifications, are comparable.*

**Response:** Content requirements in revised criteria are more specified and the inter-relationships between the content of science, additional science and the separate sciences (biology, chemistry and physics) have been set out clearly to ensure that requirements across specifications in the same suite are identical. Optional routes will no longer be available.

**Action 6:** Ofqual recommended that *individual assessments have sufficient scope to discriminate accurately across the full range of candidate performance.*

**Response:** The requirement for compulsory unitisation of GCSE science specifications has been removed.

The generic regulations for controlled assessment require specifications to allocate a minimum weighting of 20 per cent to each controlled assessment component/unit.

All GCSE qualifications developed for first teaching in September 2009 and beyond have a minimum unit/component weighting of 20 per cent. This precludes 'atomistic' assessment.

In addition Ofqual identified a number of actions for awarding bodies to ensure that components/units of assessment have sufficient marks allocated to enable effective discrimination. These issues will be addressed by QCDA, the regulators and awarding bodies during specification development and accreditation.

## **The review of standards in physics**

In its review of standards in physics, QCA identified a number of issues for GCSE physics which have been addressed during the review of the science criteria.

**Issue 1:** the report noted a reduction in demand in the higher tier, in part due to the reclassification of some content as key stage 3 material.

**Response:** Additional content is specified, including some from key stage 3 to enable candidates to engage in depth with fundamental principles.

**Issue 2:** the report noted that over time some material was moved from the higher tier to the foundation tier precluding awarding bodies from asking more demanding questions.

**Response:** Content is not specified by tier of entry so that awarding bodies can assess more demanding topics in depth.

**Issue 3:** the report noted that over time there has been a reduction in the mathematical demands of specifications.

**Response:** Mathematical requirements are the basis of one of the learning outcomes and mathematical modelling is a key criteria requirement.

**Issue 4:** the report noted that over time there has been an increase in the amount of fragmented assessment.

**Response:** The requirement for unitisation has been removed. New specifications will have fewer units/components with a minimum weighting of 20 per cent to ensure a more holistic approach to teaching, learning and assessment.

The GCSE qualification criteria requires candidates to complete a minimum of 40 per cent of their assessment at the end of the course. This 'terminal rule' means that candidates will be required to complete a more holistic assessment of the subject(s).

**Issue 5:** the report noted that assessments are predictable and formulaic.

**Response:** Controlled assessment regulations, including the requirement to change tasks that are set by the awarding body each year, will help to ensure that controlled assessment is less predictable and is linked more directly to teaching and learning.

The requirements set out in the GCSE qualification criteria for the use of a range of question types, including extended writing, provide stretch and challenge for all learners, including the most able.