Qualifications and Curriculum Authority

Review of standards in GCSE science (double award)

2000–5

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1. General introduction

QCA conducted an enquiry into standards over time in GCSE science (double award) in 2001. The results were published in a report, which is available on the QCA website at www.qca.org.uk/6905.html. The key issues identified by the enquiry were considered as part of work on this review.

The GCSE syllabuses in this study attracted about 80 per cent of the 450,000 candidates who took GCSE science (double award) in 2005.

GCSE science (double award) syllabuses in 2000 and 2005 conformed to the 1995 and 2000 criteria, respectively.

The following awarding bodies offered syllabuses in the subject: the Assessment and Qualifications Alliance (AQA); the Council for Curriculum, Examinations and Assessment (CCEA); Edexcel; Oxford, Cambridge and RSA Examinations (OCR) and the Welsh Joint Education Committee (WJEC).

2. Examination demand in GCSE science (double award)

2.1 Introduction

There were few significant changes over the period of the review in GCSE science syllabuses.

The most significant changes for GCSE science (double award) between 2000 and 2005 were:

- all awarding bodies adopted a uniform approach to assessment objectives, in line with the revised national criteria for GCSE science
- changes to the allocation of syllabus material to higher and/or foundation tiers
- some changes to the structure of modular courses.

2.2 Key issues identified in previous review of standards in GCSE science (double award)

Changes made in the national curriculum resulted in an overall reduction in the knowledge and understanding content of syllabuses and a simplification of the coursework requirements from all awarding bodies between 1995 and 2000. Reviewers judged that the level of demand in 1995 syllabuses had been too high and the knowledge and understanding required were excessive. The level of demand of the 2000 syllabuses was considered to be more appropriate.

In 2000, the structure of some examination papers did not give candidates sufficient opportunity to demonstrate some aspects of performance. CCEA and WJEC examination papers, in particular, did not provide sufficient opportunity for candidates to show higher-level skills.

Candidates often received a significant number of marks on foundation papers for general knowledge rather than for science. Some foundation-tier papers in 2000 did not have sufficient suitably demanding material to allow candidates to demonstrate performance at grade C.

In both 1995 and 2000 the selection of coursework investigations/experiments appeared to be made from tried-and-tested experimental procedures, which gave something of a ‘set-piece’ feel to this component.

2.3 Materials available

Reviewers considered the syllabus documents, examiners' reports and question papers with associated mark schemes from each of the awarding bodies in 2000 and 2005. Details of the syllabuses included in the review are provided in Appendix A.

2.4 Assessment objectives

There were few changes to assessment objectives over the period of the review.

In 2000, there was some variation between awarding bodies but by 2005 a uniform approach had been adopted, with all awarding bodies using three overarching assessment objectives. These were AO1 (knowledge and understanding), AO2 (application of knowledge and understanding, analysis and evaluation) and AO3 (investigative skills).

In 2000 the assessment of communication was often an explicit assessment objective, for example in the CCEA syllabus, where communication carried a weighting of 7.5 per cent, or in the WJEC syllabus, where communication and evaluation together carried a weighting of 15 per cent. By 2005 the assessment of communication had been subsumed into AO1.

The relative weightings of assessment objectives changed slightly. With the exception of CCEA, coursework decreased from 25 per cent of the total assessment to 20 per cent. However investigative skills still carried 25 per cent of the assessment, with the remainder assessed through written papers. The 5 per cent of marks based on investigative skills that were assessed through written papers in 2005 was more difficult for candidates to acquire, so there was a small increase in demand.

2.5 Syllabus content

Reviewers found that there was a small increase in demand due to changes in syllabus content between 2000 and 2005. This had a more significant effect at foundation tier than at higher.

The increase in demand was largely due to the fact that material specified as being higher tier only in 2000 was reclassified as suitable for higher and foundation in 2005. In this transfer of material from higher to foundation, some of the content was made less demanding. For example, in the Edexcel 2000 syllabus, students at higher tier were expected to know how to investigate the change in resistance of a thermistor with temperature, and to know what the results of such an experiment would be. In 2005 the outcome of the thermistor experiment

was required knowledge for both the foundation and higher tiers of entry, though reference to the experimental details had been dropped. Similar examples were found in other syllabuses, for example in WJEC, where in 2000 candidates at higher tier were expected to 'understand the meaning of … genotype, phenotype, dominant, recessive, heterozygote and homozygote', whereas in 2005 this content was required for higher and foundation.

The mathematical demands placed on candidates followed a similar pattern, for example foundation-tier candidates were required to 'manipulate formula' in 2005 but not in 2000 (Edexcel).

There were small variations in the content specified by each awarding body. In particular, CCEA included material that was not present in other syllabuses, such as hardness of water. However in the 2005 CCEA syllabus some of the more difficult abstract topics were lightly treated, such as electromagnetic induction, for which candidates were required to 'describe how transformers are used', rather than 'explain how transformers work', an example from the AQA modular 2005 syllabus. Despite this, the overall demand due to content was judged to be slightly higher for CCEA than for other awarding bodies.

Reviewers expressed concern that modularity had led to a rather fragmented collection of subject content. This was true for all modular syllabuses, but to varying degrees. For example, the Edexcel syllabus module 12 contained static electricity, the wave equation ($v=f\lambda$) and Boyle's law. This could make it difficult for teachers to construct a coherent scheme of work. It also meant that assessment of connected ideas would be curtailed, for example in the 2000 Edexcel syllabus the use of a fuse was specified knowledge in module 8, but electric power ($P= IV$) was in module 9. This meant that candidates could not be asked in module 8 to calculate the correct current rating for a fuse.

2.6 Scheme of assessment

The overall effect of changes to schemes of assessment was to reduce demand slightly between 2000 and 2005 for those schemes with increased modularity.

For AQA, Edexcel, OCR and WJEC, the proportion of marks allocated to coursework dropped from 25 per cent of the total assessment to 20 per cent without the requirements actually changing. This had the effect of increasing demand. However for several awarding bodies this was more than offset by changes to examination structure, which placed more emphasis on shorter, staged assessments or module tests and less on longer terminal papers.

For example, in 2000, candidates with Edexcel sat 2 x 2 hr terminal papers at higher level or 2 x 1hr 30m exams at foundation level. These were based on the whole syllabus. By 2005 these papers had changed to 6 x 30m papers, each based on only two modules. The total examining time decreased slightly (from 7hr 20m for higher-tier students in 2000 to 7hrs in 2005), with more time for the multiple choice module tests. Edexcel had tiered module tests available in 2000 but not in 2005. This was judged to have lowered demand at the higher tier and raised demand at foundation tier. Similar changes occurred in other awarding bodies. For example OCR offered staged assessment (with some papers designed to be taken in year 10) as an option in 2005 but not in 2000. A notable exception to this was WJEC, which extended the length of the terminal examination paper although the weightings were reduced (see Tables 1 and 2).

The overall demand of modular courses was also affected by the rules on re-sitting module tests. For example, AQA in 2000 allowed candidates to ‘take a test on each module once’, whereas in 2005 one re-sit of each module test was allowed. The weighting of module tests also changed for AQA from 25 per cent in 2000 to 30 per cent in 2005. Both of these changes reduced overall demand.

Table 1: Comparison of schemes of assessment in 2000

Awarding Body	Components	Weighting	Time per component	Total exam time
AQA modular	2 x written papers	2 x 25%	2 x 1h 30m (h)	
			2 x 1h 30m (f)	
	6 x module tests	25% (total)	6 x 30m (h)	6h (h)
			6 x 30m (f)	6h (f)
	coursework	25%		
CCEA linear	3 terminal written papers	3 x 25%	3 x 1h 45m (h)	5h 15m (h)
			3 x 1h 30m (f)	4h 30m (f)
	coursework	25%		
Edexcel modular	2 x written papers	2 x 25%	2 x 2h (h)	
			2 x 1h 30m (f)	
	10 module tests	25% (total)	10 x 20m (h)	7h 20m (h)
			10 x 20m (f)	6h 20m (f)
	coursework	25%		
OCR linear	2 x written papers	2 x 37.5%	2h 15m (h)	4h 30m (h)
			2h (f)	4h (f)
	coursework	25%		
WJEC linear	3 x written papers	3 x 25%	1h 40m (h)	5h (h)
			1h 20m (f)	4h (f)
	coursework	25%		

Table 2: Comparison of schemes of assessment in 2005

Awarding Body	Components	Weighting	Time per component	Total exam time
AQA Spec A modular	2 x written papers	2 x 25%	2 x 1h 30m (h)	
			2 x 1h 30m (f)	
	6 x module tests	30% (total)	6 x 30m (h)	6h (h)
			6 x 30m (h)	6h (f)
	coursework	20%		
AQA Spec B linear	3 x written papers	3 x 26.7%	3 x 1h 30m (h)	4h 30m (h)
			3 x 1h 30m (h)	4h 30m (f)
	coursework	20%		
CCEA linear	3 terminal written papers	3 x 25%	3 x 1h 45m (h)	5h 15m (h)
			3 x 1h 30m (f)	4h 30m (f)
	coursework	25%		
Edexcel modular	terminal written papers	50%	6 x 30m (h & f)	
	12 multiple choice module tests	30%	12 x 20m (no tiering)	7h (h & f)
	coursework	20%		
OCR modular	staged assessment (one examination paper)	25%	1x 1h 30m (h)	
			1 x 1h 30m (f)	
	3 x written papers	3 x 18 .3%	3 x 1h 10m (h)	5h (h)
			3 x 1h 10 m (f)	5h (f)
	coursework	20%		
WJEC modular	staged assessment 6 x module tests	25%	6 x 40m (h)	
			6 x 30m (f)	
	3 x written papers	55%	3 x 1h 45m (h)	9h 15m (h)
			3 x 1h 25m (f)	7h 15m (f)
	coursework	20%		

There were no optional routes available in any of the GCSE science (double award) syllabuses in either year, except for choices of tiers.

2.7 Question papers

Reviewers found that the overall demand of the question papers had increased slightly both at foundation and at higher tier in 2005 as compared to 2000, though there were variations between awarding bodies. Changes within awarding bodies between 2000 and 2005 were as follows.

AQA foundation papers were significantly more demanding in 2005, with questions set on more challenging content, for example a genetics question on alleles (3462/1F Q6). Reviewers also felt that AQA was more demanding at higher tier than other awarding bodies, especially in 2005.

There was a good balance of questions, requiring graphical work, calculations and extended responses.

There were significantly more opportunities for extended answers on the AQA linear scheme than on the modular scheme. These factors resulted in the linear papers being more demanding than the modular papers. The terminal papers for the AQA modular scheme were organised by module content. Because of this, it was not possible to have a uniform 'ramping' of demand across the paper and so demand fluctuated throughout the papers.

Reviewers found that **CCEA** higher-tier papers presented a high demand in 2005, but a relatively low demand in 2000. In 2000 both higher and foundation tiers relied on short, highly structured questions with little opportunity to produce more complex answers that linked ideas. As in the 1995–2000 review (see Section 2.2), all papers in 2000 were judged to be undemanding. Biology in particular had no graphical questions, calculations or questions that required extended answers, although a significant amount of recall was necessary with little cueing in the questions. In 2005 demand was increased in physics and chemistry papers by the inclusion of more challenging calculations, such as higher-tier chemistry paper 2 Q6 (c) and Q8. Indeed, calculations made up about 45 per cent of the total mark for the physics paper. Thus the concern raised in the previous review had been addressed. Demand also increased in 2005 due to changes in the time allowed per question. For example, the higher-tier paper in 2000 had 100 marks in 105 minutes, whereas this had increased to 120 marks in 105 minutes in 2005. This was mitigated somewhat by the generous nature of the mark scheme, for example a simple calculation could gain four marks (Q7 paper 3H 2005). In both 2000 and 2005 a high level of technical language was used. This was particularly the case at foundation tier in 2005, for example a question referred to 'genotypes of heterozygous tasters'. Questions at foundation tier relied heavily on one-mark responses, especially in 2000, so that there was little need for candidates to organise their answers.

In 2000 the **Edexcel** examination papers offered few opportunities for candidates to do any extended writing and there was limited assessment of the higher-order skills of analysis and evaluation. Edexcel's module tests were straightforward, certainly less complex than those from AQA. In 2005 the time available for each paper was reduced. This led to even less variety in the style of questions, for example in 2005 there were no questions which asked candidates to draw a graph in any of the six terminal papers, the number of calculations required was less and there were very limited opportunities for extended writing. Shorter papers led to shorter responses being required, especially at foundation tier. There was more prompting, for example in 2005 foundation-tier questions used matching-pair exercises to test recall. These were not used in 2000. More demanding questions were set in 2000, as in the physics paper Q16 part (i) and (ii) in which candidates had to explain the transient effect on current of including a thermistor in series with a bulb.

In 2005 **OCR** introduced staged assessments into year 10. It was not clear that any increase in demand in year 11 was sufficient to compensate for this, so that the overall effect was to reduce demand. In 2000 higher-tier papers were seen to present rather low demand, principally due to the high degree of structure in questions, which meant that little in the way of strategy was expected of the candidates. In 2000 some higher-tier questions would have been more appropriate on a foundation paper, for example questions where candidates had to ring the correct response such as P4 Q3 (a) and (e). There was little need to write more than a few words in answering any of the questions in the foundation tier in 2000, which reduced demand. Even in 2005 OCR papers were highly structured and frequently employed cueing. There was insufficient challenge in these papers and therefore less opportunity for able candidates to demonstrate their ability. Timing of the papers was generous, particularly so in 2000 (120 minutes for 108 marks at foundation and 135 minutes for 120 marks at higher). Reviewers remarked on how much the presentation and layout had improved, so that the examination paper design looked more professional in 2005.

As in the previous review (see Section 2.2), reviewers judged that WJEC papers in 2000 presented a relatively low demand for candidates, especially in terms of the strategy required to answer questions. This was principally due to highly structured questions in terminal papers. The 2000 higher-tier papers gave little opportunity for candidates to write any extended prose, for example the physics paper had no question worth more than two marks. The 2005 papers were more challenging in this respect, thus addressing the concern raised in the previous review. In addition, questions based on similar topics were considerably more demanding in 2005. For example, a question testing knowledge and understanding of the structure and role of the skin (DTU10 QF11/5H) had an identical opening item, but the 2005 question included more demanding content, specifically vasodilation and homeothermy. In

both years questions often provided a lot of the information necessary to answer them, so that recall tended to be a choice from a list of options, such as Q4 DTU12 and Q11 DTU12 (2005) 'Write down in words the equation connecting force, moment and perpendicular distance.' Reviewers found that questions were straightforward and predictable with little set in context, which tended to reduce demand.

All awarding bodies improved the layout and presentation of the question papers by 2005. This improved clarity may have eased demand slightly.

2.8 Tiering

Some material previously designated as suitable for higher tier only was reclassified as suitable for both higher and foundation tiers (see Section 2.5). The only significant change to the tiering arrangements between 2000 and 2005 was that Edexcel no longer has tiered module tests.

2.9 Coursework

There were no significant changes to the nature and assessment of coursework during this period. However inspection of candidates' work showed an increasing conformity to standard tasks. This issue was raised in the previous review (see Section 2.2) and reviewers judged that scientific coursework at GCSE had become even more predictable by 2005.

2.10 Summary

The main changes between 2000 and 2005 affecting demand were:

- a small increase in demand due to a reduction in the proportion of marks allocated to coursework
- a slight decrease in demand where there has been a change towards a more modular scheme
- a slight increase in demand due to changes in syllabus content between 2000 and 2005, notably at the foundation tier
- an increase in demand of the question papers of most awarding bodies (particularly CCEA and WJEC), though there were some variations between awarding bodies.

Overall, this meant that there was a slight increase in the demand attributable to the design of syllabuses and question papers.

3. Standards of performance

3.1 Introduction

Reviewers considered candidates' work from all of the awarding bodies in 2005, with the exception of CCEA grade F. There was a range of work from 2000 at all grade boundaries. Where work from a modular syllabus had been supplied, only candidate work from the terminal modules was available. This makes it more difficult to draw firm conclusions where comparisons are being made between modular and non-modular syllabuses. Further details of the materials used are provided in Appendix B.

Reviewers were asked to identify key features of candidate performance in 2005, based on the work seen at each of the key grades. Performance descriptions for each grade boundary were drawn up, focusing on the assessment objectives, as well as allowing for additional features of performance.

3.2 GCSE grade A boundary performance description

Assessment objective 1 – knowledge and understanding

Candidates were able to demonstrate understanding across a broad range of the syllabus content. Candidates could explain some ideas, such as respiration and adaptation, clearly and fully. On some occasions they were able to explain more abstract ideas such as red shift or electromagnetic induction, but these explanations were rarely as complete. Candidates frequently used scientific terminology appropriately, for example homozygous and heterozygous. When given the opportunity candidates showed some ability to select, organise and present relevant information. Candidates were consistently able to recall facts from across the syllabus, for example standard formulae and units.

Assessment objective 2 – application of knowledge and understanding, analysis and evaluation

Candidates could draw accurate line graphs and often constructed best-fit lines. Candidates could interpret graphical information and use it in calculations, for example to find the gradient of a speed-time graph or the half-life of a radioisotope from a decay curve. Candidates could use graphs to explain behaviour, such as rates of reaction or the behaviour of materials under tension. Candidates used standard formulae almost flawlessly to calculate quantities and could often complete more complex calculations, for example empirical formula in chemistry. Candidates used specialist diagrams well, for example wave diagrams to explain refraction or diffraction, Punnett squares to explain inheritance or dot-and-cross diagrams to show atomic

structure and bonding. Candidates did not always use diagrams to communicate experimental methods clearly.

Assessment objective 3 – investigative skills

Candidates could identify factors which had an impact on practical investigations. They could explain the effect of these factors scientifically, often using abstract ideas such as the collision of electrons and ions in resistivity experiments or kinetic theory to explain relevant phenomena or rates of reaction. Candidates' work showed some evidence of preliminary research work but this was not always used to inform further investigation. Candidates used standard experimental apparatus well and were able to collect reliable and precise data. Candidates organised experimental data logically, constructed useful tables and paid due attention to significant figures and units. Their graphical work was usually competent. Candidates were able to draw relevant conclusions from their results, often supporting this with a scientific explanation. Candidates could evaluate their work, identify anomalous results and sometimes suggest plausible reasons for the anomaly. On occasions, candidates could identify specific sources of error in their experiments and suggest appropriate improvements to their chosen method or propose relevant further work.

3.3 Performance at the GCSE grade A boundary

There were no major differences in the standards of performance across the awarding bodies, although CCEA candidates were often found to be stronger at calculations and to provide better and more detailed explanations. Reviewers noted that while Edexcel candidates were able to demonstrate reasonable overall knowledge, their explanations tended to be more limited and less detailed. Reviewers felt that the 30-minute terminal question papers from Edexcel did not give grade A candidates sufficient opportunity to develop in-depth explanations or to demonstrate higher-order skills.

3.4 GCSE grade C boundary performance description

Assessment objective 1 – knowledge and understanding

Candidates could recall information from some areas of the syllabus. Standard formulae were often recalled, although they were sometimes used inappropriately. Candidates used scientific vocabulary in their explanations but often confused similar terms, such as mitosis and meiosis, or refraction and diffraction. Candidates could recall standard units for scientific

quantities but made errors with some derived units, for example m/s for acceleration. They could construct charts, graphs and tables of data and showed some ability to balance chemical equations. They showed some understanding of simple scientific ideas, concepts and terminology, though they found it difficult to structure longer explanations. For example, while the basic laws of electrostatics were well known, candidates found it difficult to structure an explanation of how these were applied in photocopying.

Assessment objective 2 – application of knowledge and understanding, analysis and evaluation

Candidates could carry out some calculations, though this was often limited to simple substitution. They could use diagrams, charts, graphs and tables of data to extract information and make simple deductions, such as calculating the speed of an object from a distance time graph. They were able to make some progress in describing or explaining facts, phenomena and observations using some scientific and technical vocabulary. They showed some ability to apply knowledge and understanding in familiar situations.

Assessment objective 3 – investigative skills

Candidates showed some ability to plan the use of apparatus and to devise a suitable method to carry out experimental work to investigate a problem or question. Although candidates were able to identify control factors which might have affected their results, they found it difficult to give scientific explanations of why these factors were important. They were able to present evidence from investigative work in a systematic way using tables and graphs appropriately to communicate their results, though graphical work often lacked precision. They could identify trends or patterns which were consistent with the evidence. Candidates could make some progress in drawing conclusions from investigative work, though these were rarely supported by scientific explanations.

3.5 Performance at GCSE grade C boundary

Standards of performance at higher tier were broadly comparable across the awarding bodies, with the exception of Edexcel, in which candidates demonstrated a lower standard of performance. There was also some evidence that CCEA and AQA candidates (linear and modular) showed a broader range of knowledge and were able to provide better explanations. Their numerical skills were also stronger.

Reviewers commented that Edexcel candidates showed patchy knowledge and understanding, with little use of appropriate scientific terminology. Some reviewers also noted that the question papers contained a high proportion of simple recognition questions, which made it difficult for candidates to demonstrate application, analysis and evaluation effectively.

At foundation tier, standards of performance were broadly comparable across the awarding bodies, with the exception of AQA linear candidates, who tended to demonstrate a slightly higher standard of performance, and OCR candidates, who tended to show a slightly lower standard of performance.

Reviewers commented that AQA candidates tended to show broader knowledge across the syllabus and their use of terminology was better. Their coursework skills were also more refined, showing evidence of the ability to plan, analyse and evaluate more effectively.

OCR candidates' performance was found to be inconsistent across papers and their coursework was weaker than that of candidates from other awarding bodies.

3.6 Comparison across tiers

Overall, performance at grade C across foundation and higher tier was broadly comparable.

3.7 GCSE grade F boundary performance description

Assessment objective 1 – knowledge and understanding

Candidates could demonstrate basic scientific knowledge by recognising scientific facts when given appropriate prompts. Much of this knowledge was based on the key stages 2 and 3 programmes of study. For example, they could identify conductors and insulators from a list, match types of cells to function when given a list of options and match organs to their function when given a short list from which to choose. They were able to match circuit symbols with their meanings and recall some simple uses of different metals, as well as recognise some simple elemental symbols. They demonstrated simple recall, particularly in relation to familiar contexts such as 'the effects of alcohol', 'contraception' and 'stopping distances'.

Assessment objective 2 – application of knowledge and understanding, analysis and evaluation

Candidates could apply simple elements of knowledge related to environmental issues such as nuclear waste and biodegradation. They were able to extract simple facts from short prose and pictures and read values from simple line graphs. They could recognise simple patterns and trends, construct food chains and complete pyramids of numbers when given the key information. In general candidates at this threshold applied a limited understanding of scientific concepts to everyday contexts.

Assessment objective 3 – investigative skills

Candidates could construct simple bar charts, plot graphs with simple values (for example, whole numbers without any interpolation) and use selected apparatus sensibly. They could carry out simple experiments safely and collect simple data accurately when prompted. They were able to record data, present it in a simple fashion and recognise simple patterns in data. They could exhibit a simple understanding of the meaning of a fair test.

3.8 Performance at GCSE grade F boundary

Standards of performance at grade F were broadly comparable across the awarding bodies, with the exception of OCR candidates who tended to demonstrate slightly weaker performance. Reviewers found that OCR candidates showed more limited knowledge and understanding across the syllabus and that their coursework was sometimes weaker.

3.9 Additional comments on coursework performance

Candidates were confident in using information and communication technology as shown in the production of their experimental reports, especially at grade A. Word-processed reports were clearly laid out, though computer-produced graphical work was often less well done. There was little evidence of the use of spreadsheets for analysis or data-logging to capture results.

Many candidates showed evidence of using the internet successfully for preliminary research and showed signs of becoming selective in their choice of material. Occasionally candidates referenced their source material, but this was rare below grade A.

Candidates' ability to show design skills or to apply scientific knowledge and understanding to novel contexts was severely restricted by the centres' choice of practical investigations, a concern expressed in the previous review (see Section 2.2). By 2005 investigations had become largely confined to a small number of standard tasks, for example investigating how the length of a wire affects its electrical resistance, investigating rates of reaction or investigating osmosis using potato chips.

3.10 Standards of performance over time

GCSE grade A

Overall, standards were judged to have improved slightly since 2000. Reviewers commented that candidates in 2005 showed more consistent knowledge and understanding across the syllabus. They were also better at using technical language and their numerical and investigative skills were often stronger.

GCSE grade C

Overall, standards were maintained at both foundation and higher tiers between 2000 and 2005, although there were variations within individual awarding bodies. At higher tier, CCEA candidates demonstrated stronger performance in 2005, while WJEC candidates tended to be stronger in 2000. Reviewers noted that CCEA candidates tended to show better and more consistent knowledge and understanding in 2005 and their numerical skills were often better. Reviewers found that WJEC candidates in 2000 tended to demonstrate stronger numerical skills.

At foundation tier, standards were maintained between 2000 and 2005, though this finding conceals marked differences between the two awarding bodies for which work was available. CCEA candidates were judged to be better in 2005 than in 2000 in terms of their knowledge and understanding and their skills of application, analysis and evaluation. Reviewers also found that their numerical and graphical skills were stronger. OCR candidates were judged to be better in 2000 than in 2005. Reviewers noted that candidates in 2000 showed greater knowledge and understanding and made better use of scientific terms. Their investigative skills were also stronger. Reviewers also commented that the design of the OCR paper in 2005 was very different from that in 2000.

GCSE grade F

Overall, standards of performance at grade F were maintained between 2000 and 2005, although there were variations within the three awarding bodies for which work was available. Edexcel candidates demonstrated very similar standards of performance in 2000 and 2005. WJEC candidates were judged to be stronger in 2005, while OCR candidates showed a higher standard of performance in 2000. For WJEC, reviewers found that candidates in 2005 attempted more questions and that their coursework tended to be better. For OCR, reviewers commented that candidates in 2000 were given more opportunity to demonstrate what they knew, understood and could do. In 2005, OCR candidates were unable to attempt many questions and consequently showed weaker knowledge and understanding. Reviewers also found that candidates' coursework was often better in 2000. It is worth noting that this finding is consistent with the finding in Section 3.8, which suggested that OCR candidates were out of line with those from other awarding bodies in 2005.

3.11 Standards of performance in modular syllabuses

Overall at each grade boundary, reviewers judged candidates taking linear syllabuses to have performed better than those taking modular syllabuses. However these judgements must be treated with caution. It must be remembered that script evidence for modular candidates was incomplete. Moreover, the two AQA syllabuses were very much in line with each other, suggesting there is nothing inherent in a modular approach which affects standards.

Appendix A: Details of GCSE syllabuses reviewed

Year	Awarding body and syllabus				
	AQA	CCEA	Edexcel	OCR	WJEC
2000	1206 modular	linear	1531 modular	1774 linear	linear
2005	Spec A modular 3468 Spec B linear 3462	650 linear	1536 modular	1977 modular	0008 modular

Appendix B: Number of candidates reviewed

Awarding body	AQA modular		AQA linear		CCEA		Edexcel		OCR		WJEC	
Years	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
A	10	10	10	10	10	10	10	10	10	10	0	10
C (H)	10	10	10	10	10	10	0	10	0	10	10	10
C (F)	0	10	0	10	10	8	0	10	10	7	0	10
F	0	10	0	10	0	0	10	10	10	5	10	10

Appendix C: List of reviewers

Review team	
Coordinator	Dave Kelly
Syllabus reviewers	Ian Hotchkiss Alan McMurdo Yvonne Walls
Script reviewers	Nicholas Cox Mike Bailey John Skevington Valerie Simpson Averil Macdonald Brian Dewell AQA Richard Shewry Edexcel Roy White CCEA David Reeves WJEC Ian Round ASE