



General Certificate of Education

Applied Science

8771/8773/8776/8779

**SC07 Planning and Carrying out a
Scientific Investigation**

Report on the Examination

2008 examination - June series

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General Comments

The award has continued to grow in terms of number of candidates entered and centres have continued to guide candidates to achieve well at AS level. The A2 award has generated much high quality work from centres. Due credit should be given to both teachers and candidates in making every effort to meet the requirements of the award, producing portfolios, in many areas, of a commendable standard of content, approach and presentation. Centre administration overall has been good. The centre accreditation scheme has allowed 94 centres for AS and 26 centres for A2 the opportunity to be freed from external moderation. Random sampling of these centres overall confirmed the value of and, unfortunately, in a very small number of cases, the necessity for, the process.

Portfolio issues

A number of centres were found to have marked candidates work too leniently and marks had to be reduced. There were a number of reasons for this inflated mark allocation, these are listed below (and explained throughout the report):

- misinterpretation of the requirements of unit
- too much work on non-essential areas and/or too little on required aspects
- failure to fully complete aspects of the unit as required in the “Banner”
- over-lenient interpretation of the assessment grids
- failure to appreciate that high scores are likely to equate to “A” grade which means very good work in all areas of a unit
- lack of rigour in marking/assessment of work – incorrect science accepted, incorrect calculations marked as correct, incorrect statements accepted, praise for work which is of poor quality, lack of evidence in portfolios yet marks still allocated
- the inclusion of materials down-loaded from the internet

It is very important that centres guide candidates on portfolio construction, leaving opportunity for candidate flair and individuality. Centres are advised to monitor portfolios during production to see how they are developing. Some centres are continuing to produce unreasonably large portfolios running to over 300 pages per unit. These are really too large and represent an unreasonable amount of candidate effort. It also shows some lack of skill on the part of the candidate in selecting the most appropriate material to include and inappropriate guidance by the centre in allowing the candidate to produce so much work. At the other end of the scale some candidates submitted work that was very poorly organised making moderation difficult and some portfolios were very short containing little of the unit requirements, thus gaining very few marks.

Centres need to consider the assessment and moderation of candidates work during portfolio construction. AQA do not set out any requirements for portfolio construction. In order for assessors and moderators to award marks, it is much easier if the portfolio is structured in such a way that they can work through it and the matching assessment grid simultaneously. It is therefore easier if portfolio structure clearly matches the structure of the unit. Candidates and assessors should ensure that there is evidence in the portfolio for all banner requirements and all areas in the assessment grids. The level of response and the level of understanding, degree of autonomy and practical capability and quality of descriptive accounts shown will allow candidates to be awarded marks from the higher mark bands.

In order to substantiate marks, especially from the higher mark bands, it would be very helpful if assessors could add explanatory comments to the Candidate Record Form, or on any other suitable document, to describe the candidate's level of practical skills, awareness of safety procedures and degree of autonomy, especially in the areas marked # in the assessment grids. Without supporting evidence from the centre, moderators have only the candidates' written responses on which to base a judgement, and it can sometimes prove difficult to justify the centre's marks based on this evidence alone.

Whilst guidance through units is important for candidates, too much guidance, exemplified by all candidates doing the same activity, obtaining the same results and doing the same calculations, suggests over guidance by the teacher.

Allowing candidates to show autonomy in their work does not mean leaving them to do it alone, there is a middle way - helping candidates where they need help, and allowing them freedom – whilst monitoring their work to allow them to gain the higher marks. It is important that tutors ensure unit delivery programmes cover unit specification requirements and that candidates are fully aware of what they should include in portfolios to gain marks.

There are still a significant number of candidates from particular centres who produce portfolios with content that does not match what is required, often including too much material, material that is outside the brief for the unit or targeted at too low a level. Some centres have led candidates through work, which is not required by the specification. This has sometimes been of a good standard and represents considerable candidate effort but it gained no marks. In other cases, candidates included several examples of the same type of activity when only one is required. Where the various examples are of differing quality, this can have the effect of diluting overall standards and reducing marks.

Centres that plan to use published course materials or materials available on the internet must ensure that material chosen for candidate activity matches the AQA GCE Applied Science specification. Centres that follow a course targeted at other specifications or use published materials should establish that they are appropriate, either by checking the AQA specification or by liaising with an AQA portfolio adviser, if there are any concerns. To discover work is inappropriate at moderation is distressing for all concerned and very unfair on hard-working candidates who deserve or who are expected to achieve well.

As stressed at AQA standardising meetings, in communications sent to centres and in last years report, it is imperative that centres make it very clear to candidates that the incorporation of text downloaded from the internet into portfolios is plagiarism and must not be tolerated. Candidates sign their CRF to verify that the work is their own. To include work other than their own will be judged to constitute cheating and action will be taken. The assembly of a portfolio by simply downloading material and cutting and pasting it together is not acceptable. It is expected that candidates will use the internet but they should use it as a resource from which they construct their own portfolios by reading, understanding and re-working what they have found to suit their purpose. Candidates may find it helpful to download and use in their portfolios sets of data, photographs, diagrams and other similar items to support their work and this is not a problem providing it is adequately referenced. The unedited use of downloaded text in portfolios, credited as candidate work, is unacceptable. If centres fail to identify this during monitoring and final assessment, their entry could possibly be referred to the AQA malpractice unit and could have marks significantly reduced or even discredited. Moderators are experienced teachers and read many portfolios; they are aware of web-sites and can recognise text content where changes in style of writing are at variance with candidates own.

It is easy for moderators to identify downloaded text in portfolios and find its source using internet search engines.

In a number of portfolios this year there was clear evidence of candidates copying each others work, this work was also penalised. Centre assessors must work with the same vigilance as a moderator and assume that such work will be identified. A few centres were warned this year that some work was very similar to downloaded material. Moderators next year will be alerted to these centres and if the issue arises again, the centre can expect to suffer significant mark reduction and referral to candidate services for malpractice. This year an increased number of centres were referred to the AQA malpractice unit by moderators and candidate marks were significantly reduced as a result.

It is also worth noting that simple “search and replace” options may change the text or non-key words in places, but where the scientific content remains the same and has clearly not been reworked and applied in candidates’ own words, this remains an issue.

Administratively most centres sent mark sheets off (or sets of portfolios if 10 candidates or fewer) in good time. However some centres were very late. A number of centres forgot to include Centre Declaration Sheets and a significant minority forgot to send Candidate Record Forms signed by the candidate; some of these also had the candidate name or number missing, which again makes finding work more difficult, as both are needed for checking.

Some centres still use plastic wallets or poly-pockets. When not secured these are very slippery and removing and replacing material from them is time consuming and frustrating. The best way to submit final portfolio work is to use double or single treasury tags to secure portfolio pages with the Candidate Record Form and any centre assessment documents at the front.

The A2 Units – 7, 9, 10, 12, 13, 15 and 16

There are still some centres that seem to have failed to appreciate that Units 7, 9, 10, 12, 13, 15, and 16 are targeted at A2 level and are using assignments that are insufficiently challenging for candidates. Activities set at a limited level of challenge can restrict marks from the higher mark bands because candidates find difficulty matching the work to the areas required in the assessment criteria. It is essential that when awarding marks using the assessment grids, in order to gain good marks, candidates should have addressed the area concerned in some detail, not just a mention of it. It should be remembered that when candidates gain marks in the upper 40’s and above, they will be very good candidates who are likely to be gaining at least “B” or even “A” grades for the unit.

A2 builds on the work students are likely to have completed at AS level. Candidates will be at different levels of competence and understanding and centres should aim to build on candidate knowledge, capabilities and interests. The most appropriate school and local facilities should be used to extend AS work to A2 level. As an A2 award, students need to be challenged. The level of demand of an activity affects the level of response from candidates. It is important to match tasks with candidates capabilities so that they can access work and gain marks in an appropriate mark band range. There is a balance to be struck between challenge sufficient to be interesting and too challenging which can create barriers to student progress. For some units, it appears that the expectation of the quality or level of outcomes students are able to produce is set too low. It should be remembered that in mark band 4 there are descriptors that are used such as *clear* and *comprehensive*, these are important and marks should not be awarded from these mark bands where this is not the case.

In higher mark bands, candidates will be expected to produce logical reports which demonstrate sound scientific understanding applied well. The whole portfolio will demonstrate a personal view, which is coherent showing the ability to see relevant links between different aspects of candidate work. The best candidates and centres get this right, knowing their students well, understanding what the specification requires, providing assignments which match both and setting appropriately high expectations of what their students are able to produce. They rigorously identify and take action to prevent the use of non-authentic candidate work in portfolios.

Unit 7 – Planning and Carrying out a Scientific Investigation

Whilst many centres produced good quality work in this unit, making use of local companies and realistic investigations, a significant number did not address this unit well. The chief problems identified in candidate and centre approaches are outlined below.

- Centres setting investigatory activities that are little beyond GCSE level work (and sometimes below) or which are just a slightly different version of an AS level practical.
- Investigations based on unrealistic client requests – such as the Food Standards Agency asking for research into the vitamin C content of oranges.
- Candidates carrying out practically based investigations using apparatus and techniques that do not produce precise, accurate and reliable results or which are not commensurate with this being an A2 unit.
- Little or no evidence of detailed research into the scientific background of the methodology to be used, the scientific basis of the investigation, the various practical methods and standard procedures which might be applied.
- Little understanding of the need for the extensive use of secondary sources of information and their validation.
- Little evidence of realistic and useful trialling of experimental procedures.
- Candidates failing to produce a presentation for the client, outlining findings and providing an “answer” to the initial query or problem based on scientific evidence.
- Candidates making little reference to how the investigatory topic can be related to an area of study in the specification. This should not be seen as a barrier to work with an investigatory topic, more an opportunity for candidates to seek matches in an investigatory activity to some aspect of the GCE Applied Science specification.
- Little evidence of an appreciation for precision, accuracy, reliability or for the need to evaluate fully both the methodology and the data obtained.

The key points to consider in completing this unit are:

- A client should be identified who has made a *realistic* request for information about a topic. (These could come from a local science based company or could be sourced through the local authority Education Business Partnership links).
- A plan of approach to the activity should be set out, outlining research opportunities, possible routes of investigation to follow, places to visit, items to obtain, investigatory activities, conclusions and preparation of the client report. Some ideas of target times should be included.
- Trials or “dummy-runs” should be evidenced, even if they fail to work, that could be what the trial is about. These trials should be based on an initial standard procedure, itself based on research of the topic under investigation.
- Methods chosen and associated risk assessments should be included.

- The level of autonomy demonstrated by candidates is important. This should not be seen as a barrier to helping candidates or a way of restricting marks. Assessors should be aware that to lead candidates through activities (this could be the school teacher acting as the “lead”, a university demonstrator or post graduate candidate) constrains their opportunities to show individuality and flair and limits marks. However to abandon the candidate and not help them when they need help – because they, “have to work autonomously” is also unfair. Better to give help and guidance where needed and allow candidates to progress on appropriate lines and gain appropriate marks rather than leave them alone to get it wrong and gain very few marks.
- When the investigatory work is completed, data should be analysed and appropriate conclusions should be drawn, related to the initial problem set. Findings should be displayed in the most appropriate way to allow conclusions to be drawn.
- A clear, concise presentation should be prepared for the client; this can be in any form the candidate and client judge to be the most appropriate. The most common methods are a PowerPoint presentation or a leaflet containing both text and images.

With some investigations, it may be that some criteria in the assessment grids are not met at a high level due to the nature of the approach, calculations, for instance may not be more than simplistic or straightforward. In such cases, if all other strands are met at a high level, the “best fit” approach may lead to marks in a high mark band. However, if the nature of the investigation, leads to a number of the required criteria being met at only a low level, then high marks may not be appropriate.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results statistics](#) page of the AQA Website.