



**General Certificate of Education (A-level) Applied  
June 2012**

**Applied Science**

**SC01**

**(Specification  
8771/8773/8776/8777/8779)**

**Unit 1: Investigating Science at Work**

***Report on the Examination***

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## General Comments

**(Centres are advised to read and act on their own personal feedback reports on the unit entries made this year).**

Centres are to be congratulated for preparing students well for the units in this award, and, as in previous years, some very high quality work was evident, resulting in good grades.

An increase in the use of Assessment Objective (AO) based mark grids by centres to support marking has been evident, and some centres (but by no means all) have also included good supporting annotation, including carefully checking calculations, identifying downloads and responding in detail to the requirements (marked #) for teacher evidence to support marks awarded. Conversely, some centres have no mark grids, no break-down of marks in AO3, little supporting annotation or any indication of having marked the scripts. Whilst many centres used mark grids appropriately and clearly cross referenced the descriptors with the portfolio evidence, some centres' use of mark grids indicated that marks had been applied very leniently and the significance of key words ('comprehensive', 'complete', etc) did not appear to be understood or were not applied appropriately.

A worrying trend is an apparent increase in the use of group work for the collection and recording of data which is subsequently used for calculations. Sometimes it seems that candidates have not carried out significant levels of practical work on an individual basis. In these cases, moderators have found some difficulty in determining candidates' levels of participation and the contribution of the individual to practical work. This made supporting centre assessments of candidates' abilities and skill levels more difficult in these centres. At its extreme, there was evidence that some practical work in some centres was little more than teacher demonstrations, making it almost impossible to award marks based on clear evidence for some assessment strands.

There is also clear evidence from some centres of increased levels of teacher guidance and direction. This is to be expected in a teaching context, but when producing portfolio evidence, over-guidance and over-direction of candidates' work detracts from opportunities for candidates to demonstrate their own skills. Over-guidance is often seen in the form of issued templates, or similar, for calculations. In such cases, candidates are unable to provide evidence of the application of their own knowledge and understanding and marks may be limited accordingly. Unfortunately, this style of centre approach can affect able students most. Candidates who find work challenging may be helped by 'scaffolding' sheets and work should be marked appropriately. However, able students may not actually require the help and may thus be marked down (by the centre) for help that was not required.

In most units there is a high demand for research, and material is often being cut and pasted and not reworked. SC01, SC04, SC06, SC07, SC12 and SC15 are particularly affected but so, on occasions, are others. Some candidates have openly acknowledged and referenced a large amount of downloaded material and their portfolios can have large sections which are little more than an accumulation of downloaded segments, referenced but not reworded by the candidate. Unfortunately, some centres have made no comment on this practice and awarded very high marks, giving the impression that they think it is acceptable. In a few cases, it has become apparent that centres are guiding candidates via the provision of extensive materials on a 'virtual learning environment' section of the centre website which is not accessible by moderators. Similarly, the availability of booklets, pamphlets and other written materials in centres which provide excessive levels of guidance needs to be questioned with regard to their effect on autonomy and research.

Centres can expect moderators' requests for clarification of the centre approach in this regard and for provision of details or examples of specific materials which students have used.

Risk Assessments (RAs) are an integral part of all units apart from SC01. The standard of RAs is widely variable, but few candidates actually manage to target all the materials used in terms of amounts and, crucially, state and concentration. As a result, the subsequent hazard identification can be wrong. Correct hazard identification, precautions for safe working, control measures and disposal are also appropriate to include. Some portfolios contained page after page (up to 16 pages for a single experiment have been seen) of simplistic considerations of the hazards associated with glassware and the like, often repeated several times where repeats or similar activities were carried out using the same or very similar materials. These are not necessary. However, for microbiology-based experiments, e.g. SC07, SC12, SC15, detailed risk assessments for investigations using bacteria of various types are very important, but these are often neglected or sparsely treated. Sometimes candidates mis-name bacteria and use the names for pathogenic forms when (it is hoped) non-pathogenic strains have been used. There seems to be the impression that school laboratory strains of bacteria are without risk. In fact a number of candidates actually stated this, when clearly it is not the case. All cultures should be treated as potentially pathogenic, since contamination could have occurred.

In most units, mathematical skill assessments are made. It is noted this year that there appear to be some weaker mathematical skills evident from some candidates and this goes across the mark ranges. It is really important that candidates are guided in the appropriate collection, presentation and processing of data. Where calculations are undertaken, the appropriate formulae should be displayed, the logic of calculations explained and the sources of numbers made clear. Appropriate precision should be used and values should be quoted to the appropriate number of significant figures. Candidates should be encouraged to consider the significance of any values calculated and where percentage error values are calculated, these should be used and related to the experimental values found. To simply calculate percentage errors and not use them in any way indicates a lack of appreciation of their significance. Candidates should consider the best way to display data using graphical techniques. They should show correct choice of scales, correct axis labels, correct units, correct plotting of points, correct lines of best fit, and anomalous points should be identified and ignored for line construction. Graph lines should not be double, 'jagged' or kinked if meant to be straight. A line of best fit/curve should be the line that best fits the pattern shown by points, ignoring clearly anomalous values. All these skills are expected and candidates should be guided in these conventional graphical techniques during the course.

Some centres seem to be unaware of what constitutes MB4 work, and are awarding high marks for work attributed to different assessment objectives when there is little in-depth quality science evident. Centres are advised to compare their portfolios with exemplar and standardisation materials, and/or consult their portfolio adviser if they are uncertain, but, clearly, a correct sub-heading with just a few lines of basic content will not be worthy of marks in the higher mark bands. For consideration in MB3 and MB4, work has to demonstrate both depth and breadth and demonstrate understanding commensurate with high grades at GCE Advanced Level. This must be borne in mind at all times and for all strands in each assessment objective. Marks awarded consistently in MB4 are likely to be representative of a good 'A' grade candidate's work. Centres are advised to consider whether marks at this level are realistic when considering the overall picture of work seen and the likely performance of particular candidates.

Accredited centres can sometimes demonstrate a degree of 'drift' in marking standards, and there may have been changes in the assessor for individual units. This 'drift' is apparent for some centres which were part of the random sample of accredited centres, not all of which are found to be in tolerance. Accredited centres are advised to monitor the standards applied throughout the accreditation period and it would be worth considering obtaining and examining the most recent teacher standardising materials for the appropriate units prior to assessment of work and submission of centre marks.

### **Format of portfolios**

AQA does not specify how portfolios should be constructed. However, experience has shown the following points will be of use to candidates:

- Construction to match specification unit layout aids coverage of the required aspects of study by candidates, and can help avoid omissions of required aspects.
- Use of sub-headings to match specification requirements aids coverage and helps to produce a logical progression through the work.
- Over-large portfolios are problematic. A number of centres continue to produce very large portfolios despite being given advice that this is not good practice. These portfolios take students far too long to produce, make monitoring, review and draft marking very time consuming and make moderation overly lengthy. Production of large portfolios can demonstrate an inability of the candidate to decide what is and is not important to include and can be a measure of the candidates' Quality of Written Communication (QWC) skills. Centres are requested to discuss portfolio construction with candidates and determine what a reasonable size is; a portfolio should not simply grow as students find more and more potentially relevant information but should be well constructed, containing relevant and sufficient details to cover the unit well but not becoming unmanageable.
- It would aid candidates' QWC if they fully checked their portfolios before submission. Many have duplicated pages, pages out of sequence or inverted, pages not numbered, work not proof read or spell checked. Many also need to learn the correct use of superscript and suffix functions on their computers.
- Plastic A4 wallets (poly-pockets) are not acceptable. It is best to secure portfolio pages by treasury tags. The use of numbered pages should be seen as a routine matter.
- Word-processed portfolios are much easier to read than handwritten documents. Candidates should balance legibility against font size and line spacing, use of double sided printing, 'white-space' and resultant effect on portfolio size.

## **Comments on Individual Unit**

Centres should note that reports for previous years are still available on the AQA website and that their content is still valid, as the same concerns are evident every year in a small number of centres.

### **SC01**

Many surveys continue to be weakly completed. Organisations are still being included where little or no science is used by the organisation and where no qualified scientists work. Repeats of similar types of organisation also limit the wide range expected. Some summaries have very little detail on the science that is actually carried out in the organisations selected, and candidates do not demonstrate good use of a suitable variety of research techniques. Some candidates are still inappropriately following their summary with a study of 3, 4 or even 5 organisations in slightly more detail than the summary and then choose a further single organisation for the main study. There is only a need for a summary of organisations and then a main study on one good, science-based organisation. A key criterion for inclusion in the summary is, 'are there any qualified scientists who work in the organisation and who need their qualifications to do the job they hold?' If the answer is no, then leave this organisation out. To consider that an organisation is science-based because 'it uses cleaning fluids (or similar) and these are chemicals' is an inappropriate view of the use of science by an organisation in relation to this unit. The science-based aspect refers to the fundamental work of the organisation which means it is using scientific knowledge and skills to manufacture products or provide a service.

### **Main organisation**

Centres are choosing more appropriate examples where science is being carried out and where scientists work, e.g. power-stations, hospital departments, (some) zoos, dentists, (large) breweries. Even with a good choice of organisation, some candidates seem unaware of the extensive nature of the scientific activities carried out and tend to concentrate only on the core activity or the one that is most easily researched. In zoo studies for instance, the work of vets and veterinary nurses and animal nutritionists is often only weakly covered if at all, and in breweries the microbiological work, the chemical analysis, quality control and assurance, water quality, effluent analysis, etc. can all be absent, but would be very relevant if included. If the description of the science of the processes used by the organisation is weak or incomplete, there are then problems with linking the skills, qualifications, roles, ICT, etc.

### **Mark Ranges and Award of Grades**

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