



General Certificate of Education

Applied Science

8771/8773/8776/8779

**SC12 The Actions and Development of
Medicines**

Report on the Examination

2009 examination - June series

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Set and published by the Assessment and Qualifications Alliance.

General Comments

The number of candidates entered for the portfolio units has again increased this year and many centres have continued to guide their candidates to achieve well. These units have generated much high quality work from centres. Credit should be given to both teachers and candidates in making considerable effort to meet the expected standards.

The random sampling of accredited centres confirmed the value of the accreditation process - with centre marking being confirmed as being in line with AQA standards in most cases, but with a small number showing some "slippage" leading to loss of accreditation.

(The accreditation scheme is used where centres have demonstrated that they are able to mark to the required AQA standards. Under the scheme AQA will accept centre marks without the need to complete the moderation process.)

Portfolio issues

Portfolio construction remains a concern with some candidates, and it is evident that further centre guidance is needed. However, it is very important that centres continue to provide the opportunity for candidates to demonstrate flair and individuality. It is easier for moderation if portfolio structure matches the structure of the unit. Centres are also advised to monitor portfolios during their production as some candidates continue to produce unreasonably large portfolios.

For some units, it appears that the level of expectation of the quality of portfolio content and/or the outcomes that candidates are able to produce are set too low. A number of centres are still judged to have marked candidates work too generously and where this was the case, centres marks were deemed out of tolerance by the moderator and had to be reduced.

Some of the causes of overgenerous marking included:

- 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", in such cases work should be assessed in line with the guidance given in section 9.2 of the teachers' guide
- Over-lenient interpretation of the assessment grids
- 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, marks allocated for work for which there is no evidence – or no supporting teacher comment (# in the assessment grids)
- Poor candidate skills in practical activities leading to a lack of precision and unreliability in results
- A lack of description by the centre assessor of candidate's level of practical skills, their awareness of safety procedures and degree of autonomy (marked # in the assessment grids) and resulting inconsistencies between the marks awarded by the assessor and the portfolio evidence
- The inclusion of materials downloaded from the internet either passed as the candidates own work or not referenced in the portfolio

As stressed at AQA standardising meetings held in autumn 2008, in communications sent to centres and in last year's Principal Moderators 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.

Centres are reminded that many issues and points of guidance made in the 2008 Principal Moderators exam report are still valid and this remains a valuable source of information for centres seeking to improve their portfolios.

Unit 12 – The Actions and Development of Medicines

Many centres are now aware of the relaxation of specification requirements and know it is possible to use different two medicines in each of sections A, B and C of the banner requirements (six medicines in total) and not restrict candidates to the use of two only in total.

Most candidates provided portfolios including appropriate medicines for the development and application report, the two chemical assays and the two bioassays.

Whilst Aspirin and Penicillin remain popular choices, it is encouraging to see other medicines selected for the report on development and application. Newer medicines which have gone through recent research and development, are perhaps more directly relevant than the historical perspectives that are needed for Aspirin and Penicillin.

In the report on the development and application of two medicines, good portfolios included the following:

- Demonstration of clear scientific understanding of the nature of each medicine, its category, its structure, functional groups, method of elimination and mode of action in the body - including site and principles of its action
- A clear scientific understanding of the factors that affect each medicine
- Clear information, with a scientific basis, of formulations of medicines. This is often a weaker area where candidates struggle to appreciate exactly what they have to research, and centre guidance may be necessary. There appears to be confusion between the term *Formulation* – the composition of the mixture (tablets, solution or suspension) that is used in order to administer the dose of active ingredient – and the *chemical formula* of the active ingredient itself. The two are quite different
- Clear information, with a scientific basis, of methods or routes of administration – it also seems that some candidates confuse this with formulation
- Clear evidence of research and subsequent description of the development of each of two medicines within the pharmaceutical industry, including pre-clinical testing, in-vitro, in-vivo testing, clinical trials, blinding, placebos, possible side effects, etc
- Thoughtful coverage of ethical issues relating to trials and testing
- A description of the roles and responsibilities of the manufacturers, the obtaining of licences through the UK (*not USA*) Regulatory Authorities

There is a tendency in this section for some candidates to rely heavily on the incorrect use of Internet sources. Even if referenced and acknowledged, direct downloads or text where modifications from the original are minimal must not be given credit when marking.

To score well in this section and access Mark Band 4 in AO1 and AO2, the candidates must demonstrate clear knowledge and understanding of the scientific principles that form the basis of all the various elements of the development and application of the two chosen medicines. Where there are inaccuracies in supporting scientific arguments or these are not well developed, then marks in the lower mark bands should be considered.

Common choices of medicines for the two chemical assays include Aspirin, Paracetamol and iron tablets. Candidates should research reliable techniques and adopt a particular method for use, fully justifying their chosen method using sound scientific and practical reasoning and an understanding that some assays are less appropriate and less reliable than others.

For the bioassays, most centres concentrate on careful application of microbiological techniques and study two appropriate, but different, types of medicine. In a few cases, the two medicines chosen were very similar types and this does not fit the requirements of the banner and the assessment grids. Whilst anti-bacterials of different types – an antiseptic and an antibiotic – are appropriate, centres could consider using anti-fungals as an alternative to widen the candidates' experience. Two clearly distinct types of medicine also allow less able candidates to differentiate between the two experiments more easily. A few centres persevere with assays based on daphnia, although these continue to present problems with reliability of results and links to human biology.

With four distinct assays required, it is important that candidates realise there are no short cuts and that they should carry out all four to the same depth and report on all four in the same detail. Where candidates merge the two bioassays into one and report and evaluate them together this made matters difficult for some candidates.

With each of the assays, it is important that precision in recording and reliability of results are evident in candidates' reports. A significant number of centres still need to guide candidates carefully in this respect and need to reinforce the idea that all raw data should be clearly recorded, not just the final processed data. All burette readings should be tabulated; all to ± 0.05 , concordant titres identified and means calculated from these concordant titres only, are all cases in point. Particular care should also be taken in ensuring that solutions used in the chemical assays are standardised and that the accurate molarities, quoted to appropriate levels of precision, are used in calculations. This applies to all the chemical assays and should enable candidates to achieve more accurate results than were sometimes apparent. Where candidates report percentages of active ingredients well in excess of 100%, there is clearly an error in either the method or the concentrations used and, if left uncorrected, will limit marks available in some areas.

In the bioassays, candidates should realise that the measurements for zones of inhibition present problems of precision and reliability and the procedure used should consider this. In this instance candidates should consider measuring more than one diameter of the zone to allow for variations. In some centres, candidates did not realise the need for repeat readings, nor did they appreciate that small zones of just a few millimetres have very large associated percentage errors and are thus unreliable.

It should also be remembered that methods for the analyses should be researched from a variety of sources and the method used should be evaluated and justified and the background scientific principles included. This can be an inconsistent area, with little explicit reference to research or sources. It does not help in judging candidate autonomy when it is apparent that there has been significant centre guidance of the research, including which "chosen" methods to adopt.

Mark Ranges and Award of Grades

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