



General Certificate of Education

Applied Science

8771/8773/8776/8777/8779

SC06 Synthesising Organic Compounds

Report on the Examination

2010 examination - June series

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General Comments

The number of candidates entered has again increased this year *for many units* and many centres have continued to guide candidates to achieve well. The award has generated much high quality work from centres. Credit should be given to both teachers and candidates in making every effort to meet the requirements of the award, producing portfolios, many of which demonstrated a commendable standard of content, approach and presentation. The centre accreditation scheme currently numbers 94 centres at AS and 26 centres at A2 level and random sampling of these centres has again confirmed the value of the process – with centre marking being confirmed as in line with AQA standards in the vast majority of cases, but with a small number showing some “slippage” with marks going out of tolerance leading to loss of accreditation.

Portfolio issues

Portfolio construction remains a concern for some candidates, and it is evident that better centre guidance is required in some cases. However, it is very important that centres 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 production to identify “cut and paste” styles of working early and to ensure approaches are appropriate. Some centres correctly down-marked candidates’ final portfolio marks due to inappropriately including cut and paste or copied work – but early identification and correction of such work could have avoided these final mark reductions. Other centres missed the inclusion of un-reworded downloads and these were dealt with appropriately by moderators, with most instances resulting in portfolio marks falling out of tolerance, a situation which unfortunately affects the entire entry for that unit. It is essential that these situations are dealt with at centre level before submission of marks in order that all candidates are treated fairly.

Some candidates continue to produce unreasonably large portfolios and it is rare for such portfolios not to include irrelevant material or be repetitive or, indeed, to have omitted some areas that would benefit from additional time and consideration.

For some units, it appears that the levels of expectation of the quality of portfolio content and/or the outcomes that candidates are allowed 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, marks were reduced and fell out of tolerance.

Some of the causes of over-generous 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 fundamental 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 – marks allocated to students should be matched to the track record and overall ability of students to ensure they are justified. Weak students gaining uncharacteristically high grades could indicate lenient marking.
- 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).

- The inclusion of materials directly down-loaded from the internet – such work should be awarded NO MARKS as original student work.
- Weak candidate skills in practical activities leading to a lack of precision and unreliability as evidenced in results, but high marks awarded.
- A lack of description by the centre assessor of each 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 and the portfolio evidence.
- Many units require the use of risk assessments, and whilst many candidates include these, centre assessors are frequently over-generous in their allocation of marks in this area. The following are examples of where candidates are insufficiently accurate or specific and where marking is lenient.
 - Where solutions are used, the concentration is important and this can significantly affect the hazard and subsequent risk factors.
 - Where compounds or solutions are used, it is inappropriate simply to refer to and use the elemental form of the cation component of a compound – sodium has quite a different hazard rating to sodium chloride!
 - Common sense and an understanding of science should be applied when judging risk. Candidates should consider what are the real and sensible hazards and risks and then relate these to the actual compounds used at the concentrations involved as appropriate.

2010 was the first year for Quality of Written Communication (QWC) to feature in all portfolio units. The criteria appear in AO1 of Sc01 and AO3(ii) for all other units. Whilst appearing in particular assessment objectives, the intention is for the QWC statements to be applied across the entire portfolio. As explained at teacher standardising meetings, the intention was that QWC would consist of a cluster of criteria within each mark band and would generally be in line with other criteria at the level in question. As such there would be little change to existing standards. This has proved to be the case and only in a minority of instances did marks move up or down due to QWC alone. It was generally clear that centres had taken into consideration the QWC elements in their assessments. Unfortunately a minority of centres have continued to use the older criteria where QWC statements are not included and all centres are advised that they should be using the correct assessment grids.

Centres are reminded that many issues and points of guidance made in the 2008 and 2009 examination reports are still valid and these remain valuable sources of information.

SC06

Some excellent portfolios were seen where candidates clearly demonstrated good levels of practical skills in synthetic organic chemistry. The key areas of this unit are the preparation and purification of two organic compounds, one liquid and one solid, allowing a melting point and a boiling point determination of the purified compounds to be undertaken. These measurements are used as criteria for purity and should be specific, fully described experimental determinations with data recorded to appropriate precision.

Good portfolios demonstrated a full account of organic compounds covering the functional groups, shapes of organic molecules, isomerism, and types of organic reactions as indicated in the Specification (page 77) with no omissions. Structures, formulae and nomenclature were correct, and suitable examples were used to demonstrate the points made and aspects of study being discussed. This carried through to the discussions of the uses of the required spectroscopic techniques.

Explicit research for synthetic methods, including the purification techniques, for the two chosen compounds was evident and supported by fully referenced sources. [Careful selection of the two compounds to make is a key decision. One solid and one liquid are required, each capable of being prepared with reasonable yields and of being successfully purified using school based apparatus.

For the liquid, a simple ester such as ethyl ethanoate or a liquid alkene such as cyclohexene, are popular choices. Ethanal, ethanol, ethanoic acid, however, present candidates with problems for a variety of reasons.

For solids, Aspirin and benzoic acid remain popular choices, although others which provide opportunities for candidates to access all the assessment criteria are also appropriate.]

Extensive data and observations for both preparations and the subsequent determination of melting point and boiling point of the purified products are clearly tabulated. Calculations of percentage yields were well laid out and stages explained clearly, with clear indications present of the significance of those calculated yields and having been taken to suitable levels of precision with appropriate use of significant figures and units. Balanced equations for both preparations, structures of reactants and products and thorough explanations of the types of reactions involved for both products are included. There is an evaluation of the yields obtained and of the purity of the compounds prepared, leading to a discussion of possible modifications to the methods used. [Modifications should be aimed at improving the purity and/or yield of the products. This is a difficult area for candidates and a degree of guidance by centres concerning the types of ideas that need to be discussed and applied would pay dividends. Candidates could consider – for example - alternative or modified methods of preparation, changes to the reaction conditions and alternative or modified methods of purification] Thorough research into the principles behind one spectroscopic technique and the benefits of its use linked **specifically** to one of the products made by the candidate making use of exemplar spectra and peak assignment.

Where portfolios had omissions or weaker areas, they most often appeared in the following areas and with the effects noted:

- Weak accounts of organic compounds with obvious errors in, say, structures, nomenclature, and formulae: limits marks available in AO1 and AO3(ii)/QWC
- Omissions in areas listed in the Specification such as types of reactions, functional groups, shapes of organic molecules, spectroscopy, limiting marks to MB1 or MB2 in AO1.
- The account of organic compounds generally lacking in detail and relevant examples, again limiting marks to the lower mark bands in AO1.
- Little or no evidence of research for the synthetic methods [Limits marks in AO1 to zero for this strand]
- Poor choice or guidance in the selection of compounds to be synthesised [does not allow access to all the required assessment criteria: e.g. carrying out a melting point and a boiling point]
- Standard procedures lacking in detail will affect marks in both AO1 and AO3(i)
- Standard procedures do not include methods of purification: this is likely to have a significant effect on AO3(i)
- Risk assessments have omissions and/or are superficial - limits marks in AO3(i)
- Observations and data from the preparations are incomplete and/or poorly documented or tabulated – limits marks in AO3(ii) to MB1 or MB2
- Balanced equations and structures for the reactants and products have errors or are incomplete limits marks in AO2, again to the lower mark bands.
- Types of reactions are omitted and/or lack detailed consideration and explanation similarly restricts marks in AO2.
- Calculations have errors and/or are poorly explained and/or lack precision, units – all limit AO2 marks
- Evaluations do not consider the yield and/or purity of the products in any detail, or do not have a scientific basis – this limits marks in AO3(ii)
- Modifications are absent or only weakly address the ideas of increased yield or purity, again affecting AO3(ii)
- The chosen spectroscopic technique and its scientific principles, benefits and uses are not considered in detail; spectra are not considered: all these omissions restrict marks in AO3(ii).

Mark Ranges and Award of Grades

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