APPLIED GENERAL
APPLIED SCIENCE

1775/ ASCU

Report on the Examination

1775

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Overall comments

There were many examples of good quality work in the samples submitted for moderation in January 2023, and most centres had a clear understanding of the requirements of the specification and the performance outcomes. In most centres, it was also clearly understood that the approaches adopted by students should reflect fully the demands and expectations of a Level 3 qualification. However, a small number of centres had underestimated the depth and breadth of the portfolio evidence expected, and were too generous in their assessments. As a result, some fell out of tolerance and marks were regressed.

Some centres had clearly taken advantage of the Reports on the Examination published in the Summer 2022 series and, if necessary, had adjusted their approaches and marking to good effect. In addition, some centre assessors had taken advantage of the Teacher Online Standardisation Materials (TOLS) available online via eAQA (now Centre Services). All centres are required to complete internal standardisation (Specification p136) and use of TOLS materials would contribute to that.

Centres are reminded of the following when submitting student portfolios for moderation:

- The deadline for submitting marks to AQA is January 10th (January series) May 15th (summer series).
- The sample should be posted to the moderator promptly.
- Portfolios should be correctly sequenced, hole-punched and tagged (no plastic wallets, folders or staples) with a completed copy of the Unit Submission Form (USF) on the front.
- Marks and ticks recorded on the USF must be identical to the marks submitted to AQA by the centre.
- Signatures on the USF confirm that student work is their own.
- Only one copy of the Assessment Brief is needed per sample.
- For ASC2 portfolios, a completed Witness Confirmation must be enclosed for each student.
- For ASC5 and ASC6 portfolios, an observation record must be enclosed for each student.

ASC2

ASC2 provides opportunities for research; experimental work, risk assessment, analysis of results, drawing conclusions and evaluating outcomes, as well as exploring links to industry and commercial applications. It covers elements of biology, chemistry and physics and some centres deliver the course via three subject specialists. Others do not have this opportunity, and this is understood. Whichever delivery approach is adopted, effective internal standardisation and/or moderation processes, to ensure validity of assessments, must be in place.

Examples of good practice seen at moderation included the following:

- Researched content from the internet was reworded to demonstrate the student's own knowledge and understanding.
- Any direct cut and paste (prose) content was suitably annotated by the assessor and not given credit.
- All sources were referenced.
- Experimental work was carried out individually wherever possible (eg titrations, determination of resistivity).
- Where any pair or group work was necessary, it was confirmed that each individual had played a full part in all the experimental work and his/her own results were clearly identified.

This ensured that each individual had followed the standard procedures (SPs) and recorded their own results, providing clear evidence in all six relevant pass POs (Performance Outcomes).

- SPs had all been fully trialled by the centre so that students achieved data consistent with Level 3 expectations.
- No centre-issued templates or scaffolding were used in portfolios e.g. for recording results or carrying out calculations.
- Hand-drawn lines of best fit to support student understanding were evident (for instance in M2, P6, M9).

PO1: Demonstrate applied experimental techniques in biology
P1, M1, D1
The most common issue encountered is still that these three grading criteria all require both respiration and photosynthesis to be considered. It should also be remembered that M1 cannot be awarded if P1 is not met.

PO1a and PO1b
P2, **M2, D2**
Varying temperature was the most common approach seen and most centres have now adjusted their procedures to allow a suitable range of data to be recorded. D2 involves the evaluation of the results and the SP used.

P3, M3
M3 requires the same SP as used for P3 to be adapted for three different limiting factors (most commonly light intensity, wavelength of light, carbon dioxide, herbicides).

PO2: Demonstrate applied experimental techniques in chemistry
P4, M4
Volumetric analysis and colorimetry were outlined in terms of their basic principles and uses for P4. M4 then required explanations of the underlying science of the two techniques with specific reference to standard solutions, choice of indicators, and the Beer-Lambert Law.

PO2a
P5, M5, D3
P5 was generally completed well by students and M5 followed where students had correctly calculated the concentration of the standard solution prepared and the unknown concentration. For D3, students researched titrimetric methods used in industry with particular reference to use of auto-pipettes, auto-titrators, electronic end-point detection, accuracy, precision and the use of primary standards was explained.

PO2b
P6, M6, D4
It must be remembered that part of the P6 criteria here is the determination of the unknown concentration from the calibration curve produced. For M6, students must have explained the choice of filter or wavelength in relation to the colour of the unknown and the visible spectrum (and in the best portfolios, by referring to a graph of abs readings v filter colour and determining λmax). Students should also have described any anomalies in the data recorded, referred to the Beer-Lambert Law and compared the expected line (straight line through the origin) with that achieved.

There was some generosity of marking seen from centres in awarding D4. Students must have evaluated the outcome of the analysis of the data, considered errors or lack of precision that may have resulted, considered the data recorded and its reliability through repeats, and precision of recording.

PO3: Demonstrate applied experimental techniques in physics
P7, M7
Resistivity was still an issue in many students portfolios, often being misunderstood and defined as resistance. Specific Heat Capacity (SHC) was usually better described/defined. Both resistivity and SHC, however, were poorly explained "in relation to material properties". It is essential to get P7 correct as, if weak, it usually followed that M7 was not met. M7 needs to concentrate on (researched) values of resistivity and SHC, and how these determine uses of a range of materials in industry.

PO3a
P8, M8, D5
In P8, it is important that students had followed a SP to measure resistivity and not just resistance. Results were recorded (with at least three repeats), including the length and diameter of the wire. Students who achieved M8 had compared their calculated values of resistivity with (researched) industry standard values. This required accounting for any anomalous readings with reasons for differences, not just stating their own and industry values.
To achieve D5, students described industry standard methods of measuring resistivity, such as 4 point probes. Students considered the improved accuracy and precision that result from these methods.

PO3b
P9, M9, D6
P9 was generally well-completed by students. Issues arose with achievement of M9 where the graph should be temperature change v time and error bars should be plotted. Many students had calculated percentage errors but not plotted the error bars on the graph. In addition, the shape of the graph must be explained in terms of heat transfer (heat gain v heat loss and how this may vary as temperature increases; Newton's Law of cooling is relevant here).
D6 was often attempted by students who did not attempt other distinction criteria. However, it must be remembered that D6 is achieved for explaining how the standard procedure used in P9 is adapted to measure the SHC of a material in a different phase. Many students had simply given a procedure with no mention of adaptations to the original procedure.

PO4: Understand safety procedure and risk assessment when undertaking scientific practical work
P10
As in previous series, P10 tended to be either be well done or very poorly done in respect of the Risk Assessments (RA) seen. This remains an area that needs to be addressed by a number of centres.
Some centres need reminding that a student's portfolio must contain 6 RAs. One RA from each of PO1, PO2, PO3 should be prepared by the student themselves and should be identified as such. The remaining three RAs can be centre-issued. Centres should note that a missing student RA will lead to P10 not being given credit.
The approach to RAs needs to be coordinated across the three science areas.
RAs should be in a template which includes:

- Equipment / chemicals - including relevant states / concentrations.

- Hazard -the nature of the hazard should correctly reflect the state / concentration of the chemicals.
- Risk – specific to the experiment.
- Control measures – description of precaution measures taken to reduce risk, disposal if relevant, etc.
- Emergency measures – action on spillage and injury, etc.

Centres should note that a numerical approach to risk is not required and RAs written in prose are not suitable and will not gain credit.

ASC5

Students' portfolios seen during moderation in January 2023 demonstrated that some centres had clearly made good use of the Student Worksheets: "ASC5 Investigations Task Overviews" (available on the AQA website). Teachers can print off the double-sided card for each investigation to produce a useful teaching aid which can be issued to students to support them in the conduct of their investigation. There are ten different investigations represented and each provides advice and information on how to approach the various assessment criteria.

Examples of good practice seen at moderation included the following:
• All aspects of the investigation reflected the Level 3 nature of the Applied Science qualification.
• It was clear that the recommended number of guided learning hours (60GLH) had been spent on the investigation.
• The suggested titles represented in the "ASC5 Task Overviews" on the AQA Website were followed as written or other approaches agreed by an NEA Adviser.
• A minimum of three factors, all at Level 3, had been investigated by students which allowed access to the higher level criteria if completed fully and to an appropriate standard.

Investigations seen during January moderation included the following:
• "Electrochemical Cells" has proved to be successful in the past and provided opportunities for good Level 3 approaches and theory, eg application of the Nernst equation and redox potentials
• "Output of a wind turbine" lists three factors and all needed to be investigated to reach the required standard. Approached seen used appropriate apparatus, avoiding the simplistic approach with cut out pieces of card and blue-tack
• "Factors that affect reaction time" is another popular investigation, and was seen here with weaker students able to achieve a pass overall. There are four factors listed in the Specification, and there are various real and virtual timers to trial. There are good links to background science in ASC4, although other sources and other relevant aspects of science should also be researched. Obtaining sufficient data in order to make valid conclusions is always a problem, and this has to be recognised and explained.

ASC6a

Some excellent portfolios were seen in January 2023, with suitable high-level practical work which was not only complete but also logically ordered and presented. This followed through to the inclusion of good supporting evidence, data, images, etc for all experiments. High scores also reflected a consistent approach across all four POs and good levels of knowledge of the required content and approaches.
ASC6a contains more practical work than the optional units. PO1 (P3), PO2, and most of PO3 are all based on practical activities, and clarity and full supporting evidence, descriptions, results/data, photographs, images, etc are all very important.
An issue noticed by moderators was that PO4, as in previous years, was often a weaker section than any other. In some cases, this appeared to be a time issue, and in others it was seemingly due to the independent nature of the expected approach, based almost solely on individual research. Overall, PO4 can generate 6 marks - or almost 25% of the overall marks available - and this is potentially a very significant contribution to overall scores.

Examples of good practice seen at moderation included the following:

- For all practical work, an Observation Statement or Witness Confirmation was included which provided the evidence that the student had followed the SP, applied the risk assessment, used aseptic technique and recorded results correctly.
- Students provided a coherent set of results for all practical work.
- USF signatures of both the student and the teacher confirmed that the work submitted is the student's own independent work. If there was a degree of pair or group work, this was made clear.

ASC6b

Some excellent portfolios were seen for ASC6b during January 2023 moderation. ASC6b remains a popular choice of optional unit. It should be noted, however, that centres should not choose this optional unit unless they are able to meet the practical requirements relating to radioactivity.

Examples of good practice seen at moderation included the following:

- Practical work requirements relating to radioactivity were interpreted correctly.
- An Observation Statement or Witness Confirmation was included which provided the evidence that the student had followed the SP, applied the risk assessment, and recorded results correctly.
- Higher scoring portfolios seen were based on extensive research. Research included medical applications of imaging, radiotherapy, tracers, optical fibres and lasers, coupled with a sound understanding of the underlying physics.
- The best work was supported by an appropriate range of images, graphs, data, decay equations, and mathematical relationships.
- The ability to provide, explain, use equations, and apply quantitative support for the background theory also typified high scoring portfolios.

ASC6c

ASC6c is introduces students to preparative organic chemistry and its importance in a range of applied contexts. The importance of yield, rates and purity of compounds resulting from organic synthesis is expected to be understood, and this is alongside their characterisation using spectroscopic techniques. The key roles played by structure and isomerism in the uses and applications of organic compounds are also considered.

Examples of good practice seen at moderation included the following:

- The PO1 reports fully represented the unit content, but contained primarily just factual content and suitable examples: ie a source of reference or “aide memoir”.
- Students’ sourced and used relevant images, structures, formulae and data.
- The two practical preparations (mostly Aspirin and ethyl ethanoate) were completed well and enabled melting point and boiling point to be carried out.
- Observation Statements or Witness Confirmations were included which provided the evidence that the student had followed the SPs, applied the risk assessments, and recorded their own results.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.