Course report 2022

Subject	Chemistry
Level	Higher

This report provides information on candidates' performance. Teachers, lecturers and assessors may find it useful when preparing candidates for future assessment. The report is intended to be constructive and informative and to promote better understanding. It would be helpful to read this report in conjunction with the published assessment documents and marking instructions.

The statistics used in this report have been compiled before the completion of any appeals.

Grade boundary and statistical information

Statistical information: update on courses

Number of resulted entries in 2022	9565

Statistical information: performance of candidates

Distribution of course awards including grade boundaries

A	Percentage	34.9	Cumulative percentage	34.9	Number of candidates	3340	Minimum mark required	84
B	Percentage	24.1	Cumulative percentage	59.0	Number of candidates	2305	Minimum mark required	68
C	Percentage	19.3	Cumulative percentage	78.3	Number of candidates	1840	Minimum mark required	53
D	Percentage	12.9	Cumulative percentage	91.2	Number of candidates	1240	Minimum mark required	37
No award	Percentage	8.8	Cumulative percentage	N/A	Number of candidates	840	Minimum mark required	N/A

You can read the general commentary on grade boundaries in appendix 1 of this report.

In this report:

- ‘most’ means greater than 70%
- ‘many’ means 50% to 69%
- ‘some’ means 25% to 49%
- ‘a few’ means less than 25%

You can find more statistical reports on the statistics page of SQA’s website.

Section 1: comments on the assessment

Question paper 1: multiple-choice

The multiple-choice paper performed as expected.

Question paper 2

The question paper proved to be less demanding than anticipated.

Statistical evidence for question paper 1 and question paper 2 showed that there was a range of questions in terms of difficulty, and that questions showed good discrimination.

Assignment

The requirement to complete the assignment was removed for session 2021–22.

Section 2: comments on candidate performance

Question paper 1: multiple-choice

Question 4 Many candidates could describe reducing agents.
Question 5 Some candidates could identify the correct redox equation.
Question 6 Many candidates could calculate moles of ions.
Question 7 Most candidates could name an ester.
Question 9 Most candidates could identify functional groups.
Question 12 Most candidates could identify a step in the cleansing action of a soapless detergent.
Question 13 Most candidates could identify a secondary alcohol.
Question 16 Many candidates could describe how to fill a burette.
Question 18 Most candidates could calculate a reaction time from the given graph.
Question 24 Many candidates could identify a precipitate.
Question 25 Some candidates could select appropriate apparatus.

Question paper 2

Candidate performance was generally good in questions that assessed calculations taught as part of the Higher Chemistry course. Candidates performed less well in questions that related to practical aspects of the course and in questions where they were required to state or explain terms given in the course specification.

Question 1(b)(i) Some candidates could state what is meant by the first ionisation energy.
Question 1(c)(i) Few candidates could explain how hydrogen bonding arises between molecules.
Question 1(c)(ii) Some candidates could explain the increase in boiling points of hydrogen halides.
Question 2(a) Most candidates could balance an equation.
Question 2(b)(i) Many candidates could calculate the volume of oxygen produced.
Question 4(a)(iii) Few candidates could suggest a correct name for a product (alcohol).
Question 4(c)(i) Few candidates could state how emulsifiers are made from edible oils.
Question 4(c)(ii) Few candidates could explain how emulsifiers prevent non-polar and polar liquids from separating.
Question 5(b)(ii) Few candidates could suggest why potassium dichromate must be acidified.
Question 6(a)(i) Most candidates could state what is meant by an enzyme.
Question 6(a)(ii)A Most candidates could circle a peptide link.
Question 6(a)(ii)C Most candidates could state what is meant by an essential amino acid.
Question 6(a)(iii) Some candidates could explain fully what happens to an enzyme structure.
Question 6(a)(iv) Some candidates could draw diagrams with correct labels.
Question 6(b)(i) Few candidates could explain why antioxidants are added to food.
Question 7(c) Most candidates could calculate an atom economy.
Question 7(e)(i) Few candidates could calculate the enthalpy change for the reaction.
Question 7(e)(ii) Most candidates could draw the full structural formula for methylhydrazine.

Question 8(c)	Few candidates could calculate the number of moles of ammonium ferric citrate.
Question 8(d)(i)B(I)	Most candidates could identify that isoprene units join to give terpenes.
Question 8(d)(i)B(III)	Most candidates could state the number of isoprene units.
Question 8(d)(ii)A	Most candidates could name water as a product in the given reaction.
Question 9	Some candidates mentioned experimental procedures.
Question 10(a)(iii)	Some candidates could suggest why compounds have an ODP of zero.
Question 10(b)(ii)A	Most candidates could state the name of a step in a free radical reaction.
Question 10(b)(ii)B	Few candidates could write an equation for a possible propagation step.
Question 10(c)	Some candidates could calculate the number of moles of pentafluoroethane.
Question 11(a)(i)	Some candidates could name the other products in a reaction.
Question 11(a)(ii)	Few candidates could write the ionic formula of copper(II) ethanoate.
Question 11(b)	Few candidates could describe how to prepare a standard solution of an accurately known concentration.
Question 11(c)(i)	Few candidates could draw a diagram of a pipette.

Section 3: preparing candidates for future assessment

Question paper 1: multiple-choice

Questions linked to statements in the course specification

Candidates need to be able to accurately recall and use statements from the course specification, for example question 4.

Calculations

Question paper 1 contains calculations that are taught as part of the course and general numeracy calculations set in a chemical context. Most candidates handled calculations well, however they would benefit from practising questions where the number of moles links to formulae (question 24) and writing chemical formulae (question 6).

Questions relating to practical work

As was the case in previous years, candidates performed less well in some of these questions, particularly the questions about selecting apparatus (question 25) and describing a procedure to fill a burette (question 16).

Question paper 2

Questions linked to statements in the course specification

Candidates need to be able to accurately recall and use statements from the course specification, for example question 1(b)(i) on first ionisation energy.

Calculations

Question paper 2 contains calculations that are taught as part of the course and general numeracy calculations set in a chemical context.

Generally, candidates coped well with calculations that are taught as part of the course, for example question 2(b)(i) on molar volume and question 7(c) on atom economy.

Teachers and lecturers should encourage candidates to set out their working clearly, as they can gain partial credit. In question 11(d), markers gave partial credit if candidates applied $n = c \times v$ and/or the stoichiometry of the equation correctly.

Candidates performed general numeracy calculations set in a chemical context well, although questions 8(c) and 10(c) proved challenging.

Questions requiring more detailed answers

Questions that require more detailed answers are signalled by the words ‘explain fully’ or ‘explain clearly’ and are worth a minimum of 2 marks. Candidates should understand that, to gain full marks for the question, they need to give a detailed explanation.

For questions worth 2 marks, candidates should make at least two correct points in their answer. For example, in question 6(a)(iii) candidates needed to mention that enzymes

change shape or become denatured and give a correct explanation related to intermolecular or hydrogen bonds being broken.

Open-ended questions

As in previous years, a proportion of candidates did not attempt the open-ended questions. Candidates would benefit from more opportunities to answer this type of question.

Candidates need to understand that, although there are no definitive answers to open-ended questions, their answer should make statements relevant to the situation or problem given. For example, answers to question 9 should mention actual experimental procedures.

Candidates can give broad answers covering several aspects of a question or focus on one particular aspect and give a detailed explanation. These questions are marked holistically rather than on a number-of-points basis, (for example 1 point, 1 mark; 2 points, 2 marks). Marks are assigned according to whether the candidate's answer displays no understanding (0 marks); limited understanding (1 mark); reasonable understanding (2 marks); or good understanding (3 marks). Candidates do not need to give a perfect answer to gain full marks for the question.

Questions relating to practical work

Approximately 10 marks are allocated to assessing knowledge and skills relating to practical work. Apparatus and techniques that candidates should be familiar with are listed in the course specification.

As in previous years, candidates performed less well in some of these questions, particularly the questions about describing a procedure to make a solution of accurately known concentration (question 11(b)) and drawing a pipette (question 11(c)(i)). However, candidates this year did better with the diagram showing assembled apparatus with labels (question 6(a)(iv)) than candidates in previous years.

Candidates must be allowed time during the course to develop the practical skills associated with Higher Chemistry so that they can understand the proper use of the equipment and techniques listed in the course specification.

Appendix 1: general commentary on grade boundaries

SQA's main aim when setting grade boundaries is to be fair to candidates across all subjects and levels and maintain comparable standards across the years, even as arrangements evolve and change.

For most National Courses, SQA aims to set examinations and other external assessments and create marking instructions that allow:

- a competent candidate to score a minimum of 50% of the available marks (the notional grade C boundary)
- a well-prepared, very competent candidate to score at least 70% of the available marks (the notional grade A boundary)

It is very challenging to get the standard on target every year, in every subject at every level. Therefore, SQA holds a grade boundary meeting for each course to bring together all the information available (statistical and qualitative) and to make final decisions on grade boundaries based on this information. Members of SQA's Executive Management Team normally chair these meetings.

Principal assessors utilise their subject expertise to evaluate the performance of the assessment and propose suitable grade boundaries based on the full range of evidence. SQA can adjust the grade boundaries as a result of the discussion at these meetings. This allows the pass rate to be unaffected in circumstances where there is evidence that the question paper or other assessment has been more, or less, difficult than usual.

- The grade boundaries can be adjusted downwards if there is evidence that the question paper or other assessment has been more difficult than usual.
- The grade boundaries can be adjusted upwards if there is evidence that the question paper or other assessment has been less difficult than usual.
- Where levels of difficulty are comparable to previous years, similar grade boundaries are maintained.

Grade boundaries from question papers in the same subject at the same level tend to be marginally different year on year. This is because the specific questions, and the mix of questions, are different and this has an impact on candidate performance.

This year, a package of support measures including assessment modifications and revision support, was introduced to support candidates as they returned to formal national exams and other forms of external assessment. This was designed to address the ongoing disruption to learning and teaching that young people have experienced as a result of the COVID-19 pandemic. In addition, SQA adopted a more generous approach to grading for National 5, Higher and Advanced Higher courses than it would do in a normal exam year, to help ensure fairness for candidates while maintaining standards. This is in recognition of the fact that those preparing for and sitting exams have done so in very different circumstances from those who sat exams in 2019.

The key difference this year is that decisions about where the grade boundaries have been set have also been influenced, where necessary and where appropriate, by the unique circumstances in 2022. On a course-by-course basis, SQA has determined grade boundaries in a way that is fair to candidates, taking into account how the assessment (exams and coursework) has functioned and the impact of assessment modifications and revision support.

The grade boundaries used in 2022 relate to the specific experience of this year's cohort and should not be used by centres if these assessments are used in the future for exam preparation.

For full details of the approach please refer to the National Qualifications 2022 Awarding — Methodology Report.

