Course report 2024

Higher Chemistry

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. You should read the report with the published assessment documents and marking instructions.

We compiled the statistics in this report before we completed the 2024 appeals process.

Grade boundary and statistical information

Statistical information: update on courses

Number of resulted entries in 2023: 9,684

Number of resulted entries in 2024: 9,902

Statistical information: performance of candidates

Distribution of course awards including minimum mark to achieve each grade

A	Number of candidates	2,943	Percentage	29.7	Cumulative percentage	29.7	Minimum mark required	101
B	Number of candidates	2,277	Percentage	23.0	Cumulative percentage	52.7	Minimum mark required	83
C	Number of candidates	2,137	Percentage	21.6	Cumulative percentage	74.3	Minimum mark required	65
D	Number of candidates	1,636	Percentage	16.5	Cumulative percentage	90.8	Minimum mark required	47
No award	Number of candidates	909	Percentage	9.2	Cumulative percentage	100	Minimum mark required	N/A

We have not applied rounding to these statistics.

You can read the general commentary on grade boundaries in the appendix.

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 statistical reports on the statistics and information page of our website.

Section 1: comments on the assessment

Question paper 1: multiple choice

The multiple-choice paper performed as intended.

Statistical evidence shows that there was a range of questions in terms of difficulty, and that questions showed good discrimination.

Question paper 2

The question paper proved to be more demanding than intended. The grade boundaries were adjusted to take account of this.

Statistical evidence shows that there was a range of questions in terms of difficulty, and that questions showed good discrimination.

Assignment

The assignment returned this year and was supported by a range of Understanding Standards events and candidate examples on the Understanding Standards website. The assignment performed as intended.

Section 2: comments on candidate performance

Candidate performance was generally good in questions that examined 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 candidates were required to state or explain terms given in the course specification.

Areas that candidates performed well in

Question paper 1: multiple choice

Question 7	Most candidates identified an unsaturated secondary alcohol.
Question 8	Most candidates calculated relative rate of a reaction.
Question 9	Most candidates identified an α-amino acid.
Question 10	Most candidates identified an isoprene unit.
Question 14	Most candidates linked the boiling points of alkanes to strength of London dispersion forces.
Question 18	Most candidates applied Hess's law.
Question 20	Most candidates identified the rates of the forward and backward reactions at equilibrium.
Question 21	Most candidates established a relationship between four equations.
Question 24	Most candidates identified an action to help a student to accurately observe an end-point.

Question paper 2

Question 1(a)(ii)	Most candidates wrote the equation for the first ionisation energy of phosphorus.
Question 1(d)(iii)	Most candidates determined the molar volume of carbon monoxide.
Question 2(a)(i)	Most candidates stated the term used to describe the minimum kinetic energy required by reacting particles.
Question 4(a)(i)	Most candidates named water as the other product in the formation of proteins.
Question 4(a)(iii)	Most candidates stated what is meant by an essential amino acid.

Question 4(a)(iv)A	Most candidates named the process occurring when protein fibres change shape.
Question 5(b)(i)	Most candidates drew a structural formula for glycerol.
Question 5(d)(i)	Most candidates stated the term ‘rancid’.
Question 5(d)(iii)B	Most candidates named step 1 as initiation.
Question 5(e)(iii)B	Most candidates stated the number of isoprene units in farnesene.
Question 6(c)(ii)	Most candidates suggested an improvement to prevent heat loss.
Question 6(d)	Most candidates calculated the cost of biodiesel.
Question 9(b)(i)	Most candidates calculated atom economy.
Question 10(a)	Most candidates used the data booklet to find a range in chemical shift values.

Assignment

Section 1	Most candidates stated an aim, or aims, that could be investigated.
Section 3(b)	Most candidates supplied sufficient data from their own experiments.
Section 3(e)	Most candidates supplied information from an internet source.
Section 4(a)	Most candidates selected an appropriate graphical format.
Section 8	Most candidates gave a clear and concise report, with an informative title.

Areas that candidates found demanding

Question paper 1: multiple choice

Question 16	Some candidates calculated the number of moles of positive ions in 5 moles of ammonium phosphate.
Question 17	Some candidates determined the enthalpy change from a potential energy diagram.
Question 22	Some candidates identified the residue and filtrate.
Question 23	Some candidates identified a piece of apparatus to accurately measure 45 cm^3 of a solution.

Question paper 2

Question 1(d)(ii)	Some candidates named carbon as a reducing agent.
Question 2(a)(iii)	Some candidates stated the charge on an azide group ion.
Question 2(c)	Some candidates explained why silicon dioxide has a high melting point. However, some candidates only gained a partial mark due to the mention of molecules or an intermolecular force.
Question 4(a)(iv)C	Few candidates completed a diagram to show a hydrogen bond.
Question 4(b)(ii)	Few candidates suggested why only three spots appear on the chromatogram.
Question 5(a)	Few candidates stated a reason why fats and oils form part of a balanced diet.
Question 5(d)(iv)B	Few candidates explained the suitability of vitamin E as an antioxidant in oils and fatty foods.
Question 5(e)(i)	Few candidates wrote the formula for the sodium salt of myristic acid.
Question 5(e)(iii)(A)	Some candidates stated the systematic name for an isoprene unit.
Question 6(a)(ii)(A)	Few candidates drew a labelled diagram of apparatus suitable for preparing an ester. Some candidates did not add labels, and some drew closed systems which would not work.
Question 6(a)(ii)(B)	Few candidates added a line to the diagram to show the change in potential energy for a reaction without a catalyst.
Question 6(c)(i)	Few candidates suggested a variable to be kept constant in an experiment.
Question 7(b)(i)B	Few candidates described how a pipette should be prepared and used. Some candidates described rinsing with seawater or correctly filling the pipette for a partial mark.
Question 9(a)(ii)	Some candidates suggested the type of bonding and structure in titanium chloride.
Question 9(b)(iii)	Few candidates calculated the number of moles left unreacted. Some candidates achieved partial marks by calculating the number of moles of reactants and/or applying the mole ratio.
Question 9(c)	Some candidates suggested why one industrial method should be used in preference to another.

Question 10(b)	Few candidates suggested the name for a compound from a given NMR spectrum.
Question 10(c)	Some candidates drew an NMR spectrum for a given compound.

Assignment

Section 3(a)	Many candidates did not summarise their experimental method. Many candidates did not include a statement identifying additional safety measures or a statement indicating that additional safety measures were not required.
Section 5	Many candidates did not provide a valid comparison of their experimental data with data from their internet or literature source.
Section 7	Many candidates did not provide an appropriate justification for their evaluative statements, based on their own experimental results.

Section 3: preparing candidates for future assessment

Question paper 1: multiple choice

Calculations

The question paper contains calculations that are taught as part of the course. Calculations were mostly done well, but candidates would benefit from further practice of questions involving redox equations (question 4) and the use of chemical formulae (question 16).

Questions relating to practical work

As was the case in previous years, candidates tended to perform less well in some of the questions relating to practical work. This was true for techniques such as filtration (question 22) and accurate measurement of solution volume (question 23).

Candidates must be allowed time during the course to develop practical skills associated with Higher Chemistry. Teachers and lecturers must specifically teach candidates the proper use of equipment and the techniques listed in the course specification to ensure candidates gain a full understanding.

Question paper 2

Questions linked to statements in the course specification

Candidates must be able to accurately recall and use statements from the course specification — for example, question 5(a), 'why fats and oils form part of a balanced diet'. In addition, related compound names and structures in the course specification may be asked for as part of a question — for example, question 5(b), 'draw a structural formula of glycerol', and question 5(e)(iii)A, 'state the systematic name for isoprene'.

Calculations

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

Calculations that are taught as part of the course were generally well done, for example, question 1(d)(i), percentage yield and 9(b)(i), atom economy. Calculations linked to practical work, such as titration, were done as well as in previous years.

Candidates should be encouraged to set working out clearly, as candidates can still obtain partial credit, if not full credit, for the questions. In question 7(b)(iii)B, when assigning partial marks, candidates received credit for applying $n = c \times v$ correctly and for applying the stoichiometry of the equation correctly.

Generally, candidates did general numeracy calculations set in a chemical context well. However, teachers and lecturers need to give candidates practice in scaling up answers to give quantities per mole, or giving answers in other units such as grams per litre, kilojoules per gram, and milligrams.

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 need to be made aware that, to gain full marks for the question, they must give a detailed explanation.

When the weighting of the question is 3 marks, candidates are expected to make at least three correct points within their answer. For example, in question 1(b), candidates needed to mention that intermolecular forces are higher for P_4 than N_2. The second mark was awarded for a correct identification of London dispersion forces, and the third mark for an explanation linking the strength of London dispersion forces to a number of electrons.

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 be made aware that, while there are no definitive answers to open-ended questions, their answer should make statements which are relevant to the situation or problem given. For example, answers to question 3 would be expected to include mention of chemical tests and observed results.

Candidates can give broad answers covering a number of aspects of a question, or focus on one particular aspect and give a detailed explanation.

Candidates are not expected to give a perfect answer to gain the full mark allocation for the question. Open-ended 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).

Questions relating to practical work

Approximately 10 marks are allocated to the assessment of knowledge and skills relating to practical work. Apparatus and techniques that candidates should be familiar with are listed in the Higher Chemistry Course Specification.

As was the case in previous years, candidates tended to perform less well in questions relating to practical work. This was particularly true when suggesting a variable to keep the same to allow for a fair test, and the correct use of a pipette. The drawing of a diagram showing an assembled apparatus with labels still poses a challenge for some candidates.

Teachers and lecturers must allow candidates time during the course to develop practical skills associated with Higher-level Chemistry so that they can understand the proper use of the equipment and techniques listed in the course specification.

Assignment

Centres should refer to the most up-to-date coursework assessment task on SQA's website.

The Higher Coursework Assessment Task document has been updated for the 2024–25 session. Centres must ensure that they are adhering to the conditions of assessment in the coursework assessment task and are applying them fully.

The Higher Chemistry Coursework Assessment Task contains information about how to conduct the research and report stages of the assignment. Particular attention should be paid to the 'Conditions of assessment' and 'Level of supervision and control' sections. The 'Instructions for candidates' section lists the permitted resources for the report stage.

Centres must provide candidates with the 'Instructions for candidates' section, in the current version of the coursework assessment task, during the write-up phase. This must not be altered in any way.

Teachers and/or lecturers must ensure that a range of topics is available for candidates to choose from. A range of topics means that it is acceptable for the same general topic to be investigated in a class and across classes, provided that a variety of independent variables are being investigated, or a variety of experiments are being carried out, or both. This is to ensure that centres do not use a whole-class experiment.

Centres must choose experiments that allow candidates to access all 20 marks for the assignment. An experiment should provide for the completion of appropriate chemical calculations. For a viscosity experiment, a calculation using the formula 1/t is **not** an appropriate calculation, as relative rate is not a measure of viscosity. Experiments must have measurable outcomes appropriate for a centre laboratory and the equipment available in each centre, which will provide candidates with a range of values for both the independent and dependent variables. For example, choosing to measure enthalpy of combustion of different brands of the same alcoholic drink would not yield data which the candidate could easily process.

Candidate aims must be specific to the experiment conducted by the candidate, and may not be written down and taken into the write-up stage.

Underlying chemistry must be relevant to the experiment the candidate conducts. For example, an experiment investigating the effect of temperature on rate of reaction would not link to other factors affecting rate, such as concentration and particle size. Candidates must collect their own data for underlying chemistry and for a comparative source. Centres may not provide packs of possible sources or allow candidates to photocopy each other's sources. Extracts from internet sources should be unedited. Candidates are not allowed to take a pre-prepared set of notes into the write-up stage.

Centres are reminded that candidates must not be given full experimental instructions, for example, previous versions of the Higher Chemistry prescribed practical activity or instruction sheets. Experimental instructions must not contain information on the number of repeats and sample calculations.

Candidates must be advised to graph calculated experimental data to allow for comprehensive analysis and evaluation. Best fit straight lines and smooth curves must fit the data collected and avoid including points not collected — for example, the origin. Correct

graphing allows candidates to make better-informed comparisons between experimental and internet data and provides evidence for evaluative comments.

Candidates should take their raw experimental data into the report writing stage. This may be tabulated, however, must not include additional blank or pre-populated columns for mean or derived values. Many candidates chose to input mean and/or derived data into a pre-populated table; this is not permitted. If candidates choose to bring in a pre-populated table, then they should either extend their table of raw data or produce a new table during the write-up stage. Candidates must ensure that they are completing labels and units for both raw and mean and/or derived data in the report writing stage.

Candidate analysis needs to involve both experimental and internet data, allowing for comments on relationships between the two sets of data. Candidates are also expected to discuss data values for their experiment in comparison with each other.

The conclusion must be applicable to all data in the report. If there is no agreement between the internet and experimental data, then the candidate must state that there is no agreement and that a conclusion cannot be drawn.

For the report stage, candidates must write their report under a high degree of supervision and control, in a maximum of 2 hours. If centres allow candidates to complete the reports over a number of periods, then teachers or lecturers must retain the reports between periods, as candidates must not work on their reports outwith these controlled conditions.

Teachers and lecturers must not scrutinise candidate reports, and no feedback or redrafting is permitted. The assignments must be kept securely until they are submitted to SQA.

Centres and candidates are encouraged to look at the available materials on SQA's Understanding Standards website.

Appendix: 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.

Every year, we evaluate the performance of our assessments in a fair way, while ensuring standards are maintained so that our qualifications remain credible. To do this, we measure evidence of candidates' knowledge and skills against the national standard.

During the pandemic, we modified National Qualifications course assessments, for example we removed elements of coursework. We kept these modifications in place until the 2022–23 session. The education community agreed that retaining the modifications for longer than this could have a detrimental impact on learning and progression to the next stage of education, employment or training. After discussions with candidates, teachers, lecturers, parents, carers and others, we returned to full course assessment for the 2023–24 session.

SQA's approach to awarding was announced in March 2024 and explained that any impact on candidates completing coursework for the first time, as part of their SQA assessments, would be considered in our grading decisions and incorporated into our well-established

grading processes. This provides fairness and safeguards for candidates and helps to provide assurances across the wider education community as we return to established awarding.

Our approach to awarding is broadly aligned to other nations of the UK that have returned to normal grading arrangements.

For full details of the approach, please refer to the National Qualifications 2024 Awarding — Methodology Report.