Course report 2024

National 5 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: 15,561

Number of resulted entries in 2024: 15,894

Statistical information: performance of candidates

Distribution of course awards including minimum mark to achieve each grade

A	Number of candidates	6,600	Percentage	41.5	Cumulative percentage	41.5	Minimum mark required	86
B	Number of candidates	2,983	Percentage	18.8	Cumulative percentage	60.3	Minimum mark required	73
C	Number of candidates	2,598	Percentage	16.3	Cumulative percentage	76.6	Minimum mark required	60
D	Number of candidates	2,055	Percentage	12.9	Cumulative percentage	89.6	Minimum mark required	47
No award	Number of candidates	1,658	Percentage	10.4	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

Marker and centre feedback suggested that the question paper was fair but challenging, and that the allocated time was appropriate, allowing candidates to answer all questions.

Candidates were able to access the full range of marks, and the question paper provided good differentiation and discrimination.

Candidates were well prepared for the different types of questions used in the question paper.

Section 1perfomed as expected.

Section 2 was more demanding than intended. This was considered when setting grade boundaries.

Assignment

The assignment performed as expected. Candidates were able to access the full range of marks, and the assignment provided good differentiation.

Assignments covered a range of topics, including rates of reaction, electrochemical cells, and, to a much lesser degree than in previous years, alcohols as fuels. This year, some new topics included conductivity, and polyprotic acids.

Teachers and/or lecturers must agree the choice of topic and ensure that it will allow candidates to carry out experiments that are appropriate to chemistry at National 5 level, and avoid biology- and physics-based topics — for example radioactivity, enzyme activity, glucose and Benedict's solution.

Many candidates that investigated alcohols as fuels, with the aim of relating the number of carbon atoms present in the alcohol to the quantity of energy produced, did not access the mark for sufficient raw data because they did not provide the actual measurements they took during their experiment (initial mass and final mass of alcohol, initial and final temperature). This was also an issue for candidates conducting titration experiments that did not include initial and final volumes.

Additionally, candidates that investigated alcohols as fuels had difficulty accessing the mark for mean and/or derived values.

Many candidates input mean and/or derived data into a pre-populated table. This is not permitted.

Some candidates inserted photocopies of the graph for their experimental data. The graph must be drawn during the write-up stage — photocopies are not permitted.

In the underlying chemistry section, it is acceptable for candidates to quote from their extracts, but it was noted that some candidates had inserted printed diagrams into their underlying chemistry. The underlying chemistry is an opportunity for candidates to demonstrate their understanding of the topic, and so printed inserts from their extracts are not acceptable.

In the evaluation section, many candidates failed to evaluate the experimental procedure. Instead, they simply referred to repeating their experiment.

Section 2: comments on candidate performance

Areas that candidates performed well in

Question paper

Section 1 (objective test)

Question 1	Many candidates identified the units for reaction rate, given a change in quantity and time.
Question 2	Most candidates identified isotopes of the same element when given the number of protons, neutrons and electrons.
Question 3	Many candidates calculated the mass number of an atom, given the element name and the number of neutrons in the atom.
Question 5	Most candidates identified a substance that will have hydrogen bonds between its molecules when given a description of how hydrogen bonds arise.
Question 6	Most candidates identified a compound that will change the pH of water.
Question 7	Many candidates identified the number of moles of a reactant required to react completely, given a balanced equation and the number of moles of the other reactant used.
Question 10	Many candidates identified the most likely use for an alkane.
Question 11	Most candidates identified the general formula for the cycloalkanes, given three molecular formulae.
Question 12	Many candidates identified the structure for an isomer of pent-2-ene.
Question 13	Most candidates identified a shortened structural formula for a branched carboxylic acid from a full structural formula.
Question 14	Many candidates identified the bond contained in ethane, ethene, ethanol and ethanoic acid.
Question 15	Many candidates identified a secondary amine, given information and examples of how amines are classified.
Question 16	Many candidates identified the combination of mass of water and temperature change that represents the most energy released.
Question 17	Most candidates identified changes to a combustion experiment that would not improve the experimental results.

Question 18	Many candidates identified the substance that has metallic bonding, given a diagram of the bonding and a table of data containing melting points, boiling points and electrical conductivity.
Question 19	Many candidates identified the substance formed in the reaction of a metal and an acid.
Question 20	Many candidates identified the redox equation, given ion electron equations for a reduction and an oxidation reaction.
Question 22	Most candidates identified a compound that provides two of the elements essential for healthy plant growth from chemical formulae.
Question 23	Most candidates identified the catalyst used in the industrial manufacture of ammonia.
Question 24	Many candidates identified the radioisotope formed following two beta emissions and an alpha emission from a radium-228.
Question 25	Most candidates identified the colour in solution and the flame colour for a compound, using their data booklet and a table containing the colour in solution of selected ions.

Section 2 (restricted-response and extended-response)

Question 1(a)(i)	Most candidates balanced an equation.
Question 1(a)(ii)	Most candidates stated the role of a chemical as a catalyst, given a description.
Question 1(a)(iii)(B)	Most candidates accessed two marks for calculating the volume of a gas collected, given the average rate of reaction over a given period of time.
Question 1(b)(i)	Many candidates described the change observed when carbon dioxide is bubbled through limewater.
Question 1(b)(ii)	Most candidates stated the term used to describe all chemical reactions that take in heat energy.
Question 2(a)(i)	Many candidates stated the term used to describe the shape of the ammonia molecule.
Question 2(a)(ii)	Many candidates drew a diagram showing all the outer electrons in a molecule of ammonia.
Question 2(b)	Many candidates named the product made by the Ostwald process.
Question 2(c)	Most candidates accessed all 4 marks for drawing a bar chart. Few candidates did not access the partial marks for this question.

Question 3(a)	Most candidates stated the term used to describe oils as given in the passage.
Question 3(b)	Most candidates accessed 2 marks for completing a table using information from the passage.
Question 3(c)	Many candidates stated the type of lavender oil that could be sold as an aqueous solution, given the information on solubility in the passage.
Question 3(d)	Many candidates described the chemical test, including the result, to show that molecules are unsaturated. In a number of candidate answers, it was not clear whether the molecule or the bromine was being decolourised.
Question 3(f)	Most candidates accessed 2 marks for calculating the mass of a sample of nerol, given the volume of the sample, the relationship of density multiplied by volume in the question, and the density of nerol in the passage.
Question 4(a)	Most candidates stated the term used to describe a family of compounds that share a general formula and have similar chemical properties.
Question 4(b)(i)	Many candidates predicted the boiling point of pentan-1-ol from information in a table.
Question 4(b)(ii)	Most candidates described a relationship shown by a table of data.
Question 4(c)(i)	Most candidates identified the change in functional groups in a chemical reaction, given the homologous series of the reactants and products.
Question 6(a)	Many candidates stated why the bonding in metal elements allows them to conduct electricity.
Question 6(d)(i)	Most candidates named the ion bridge from a diagram of a cell.
Question 6(d)(ii)	Many candidates suggested a possible compound that could be used as an electrolyte in the cell shown.
Question 7(a)	Most candidates stated why ozone is used to clean water, from information in the passage.
Question 7(d)	Many candidates drew the products of a reaction, given a worked example.
Question 8(a)(i)	Many candidates rewrote an equation with the spectator ions removed.
Question 8(b)(i)	Many candidates named the most appropriate piece of apparatus to measure 10 cm^3 of a solution.

Question 8(b)(ii)	Many candidates explained why only the results of the second and third titre are used to calculate the average volume.
Question 9(a)(i)	Many candidates suggested how the student would know when an acid was completely neutralised by an insoluble metal carbonate.
Question 9(a)(iii)	Many candidates stated the term used to describe substances that neutralise acids.
Question 9(a)(iv)	Many candidates calculated the concentration of a solution from a number of moles and a volume given in cubic centimetres.
Question 9(b)	Many candidates named the experimental technique used to remove excess nickel(II) carbonate from a solution.
Question 9(c)	Many candidates suggested how the evaporation of a solution could be carried out in a much shorter time.
Question 9(d)	Many candidates accessed 3 marks for calculating the percentage by mass of nickel in nickel(II) sulfate.
Question 10(a)	Many candidates stated what is meant by the term ‘hydrocarbon’.
Question 10(b)(i)	Many candidates accessed 2 marks for completing a table for a bond enthalpy calculation, given a worked example. Some candidates accessed the partial marks for either identifying the correct number of bonds or correctly calculating the energy from an incorrect number of bonds.
Question 10(b)(ii)	Many candidates calculated the energy change using a given a relationship and a calculated value.
Question 10(c)(ii)	Most candidates drew the structure for a cycloalkane formed by the reforming of hexane, given an example showing the reforming of octane.
Question 10(d)(i)(B)	Many candidates named the type of addition reaction taking place between ethene and water.

Assignment

Section 1	Most candidates wrote an aim for their investigation.
Section 3(b)	Most candidates provided sufficient raw data from their experimental procedure.
Section 3(e)	Most candidates provided an internet or literature source relevant to their experiment.
Section 3(f)	Most candidates provided an appropriate reference for their internet or literature source.

Section 4(a)	Most candidates selected an appropriate graph type by plotting either points or bars.
Section 4(b)	Most candidates selected suitable scales on their axis or axes.
Section 4(c)	Most candidates added suitable labels and units to their axes.
Section 8 (a) and (b)	Most candidates provided an appropriate title and a clear and concise report.

Areas that candidates found demanding

Question paper

Candidates were well prepared for the different types of questions used in the question paper. However, they did not appear to be as well prepared for the following questions:

- identifying reaction type (question 8(a)(ii))
- writing formula (questions 4(c)(iii), 10(d)(i)(A))
- writing a chemical equation (question 7(c))
- drawing structures (questions 4(c)(ii), 10(d)(ii)(B))
- titration calculation (question 8(b)(iii))
- practical chemistry techniques (questions 1(a)(iii)(A), 8(a)(ii))
- identifying how a process can be made more economical (question 2(d))

Section 1 (multiple choice)

Question 4	Some candidates identified the structure and bonding of a compound, given information on its state of matter, electrical conductivity and solubility in water.
Question 8	Some candidates identified the element with the lowest gram formula mass.
Question 9	Some candidates identified the effect of dilution on the number of moles and the pH of a sodium hydroxide solution. The answer with the correct effect on number of moles but the incorrect effect on pH was identified as a notable distractor, meaning that many candidates chose this.
Question 21	Some candidates identified that ammonia will react with acids.

Section 2 (restricted-response and extended-response)

Question 1(a)(iii)(A)	Some candidates identified that oxygen could be collected over water because it is insoluble. A number of candidates incorrectly gave answers related to density.

Question 1(a)(iii)(C)	Some candidates predicted the average rate of reaction for a period of time later in the reaction. A number of candidates incorrectly tried to calculate a value, rather than predict.
Question 2(d)	Some candidates drew an arrow on the flow diagram to show how the process could be made more economical.
Question 3(e)	Some candidates accessed 2 marks for explaining why geraniol has a higher boiling point than linalool and nerol. A few candidates were able to access 1 mark. However, a number of candidates tried to explain this in terms of molecular size, which was not appropriate, as the three structures are isomers.
Question 4(c)(ii)	Some candidates drew a structure for butanoic acid as the product of the reaction of butan-1-ol with acidified potassium dichromate, given the example of propan-1-ol forming propanoic acid. A number of candidates did not correctly draw the functional group, or incorrectly drew a four carbon chain connected to the carboxyl group.
Question 4(c)(iii)	Few candidates wrote the formula, showing the charges on both ions, for potassium dichromate.
Question 5	Some candidates accessed 2 marks for commenting on the chemistry of the periodic table. Most candidates accessed 1 mark, and few candidates accessed all 3 marks.
Question 6(b)	Some candidates suggested a correct method to extract copper from its ore.
Question 6(c)(i)	Some candidates accessed 2 marks for arranging copper and the four metals A–D into an electrochemical series. Some candidates accessed 1 mark for either correctly placing copper or correctly ordering the other four metals.
Question 6(c)(ii)	Some candidates explained why a glucose solution cannot be used in a cell, given its formula. A number of candidates tried to explain this in terms of solubility.
Question 7(b)	Some candidates named all the elements present in sodium hydrogensulfite.
Question 7(c)	Some candidates wrote an equation, using symbols and formulae, for a described reaction. A number of candidates did not give the formula for chlorine as a diatomic element.
Question 8(a)(ii)	Some candidates stated that a reaction is precipitation from an ionic equation, with state symbols.
Question 8(b)(iii)	Some candidates correctly calculated the concentration of sodium hydroxide used in a titration reaction. Few candidates accessed the

	partial marks for this calculation due to the use of formula masses, which is the wrong concept for this question.
Question 8(b)(iv)	Some candidates stated the colour change at the end point of a titration, given the colour of the indicator in different conditions.
Question 9(a)(ii)	Some candidates named water as the compound produced in all neutralisation reactions.
Question 10(c)(i)	Some candidates gave the systematic name for a branched alkane from a structural formula.
Question 10(d)(i)(A)	Some candidates wrote the molecular formula for an alkane formed during cracking.
Question 10(d)(ii)(A)	Some candidates named the polymer made from a named monomer.
Question 10(d)(ii)(B)	Some candidates drew the repeating unit for a polymer from a monomer structure.
Question 11	Some candidates accessed 2 marks for commenting on the chemistry of radioactive decay. Few candidates accessed all 3 marks.

Assignment

Section 2	Some candidates had difficulty explaining the underlying chemistry related to their chosen topic. Some candidates' reports contained underlying chemistry, but it was not clear that they understood the chemistry involved.
Section 3(a)	Some candidates had difficulty summarising their experimental method, with many candidates giving a detailed description of each step taken through the procedure.
Section 4(d)	Some candidates had difficulty accurately plotting their data points and, where appropriate, drawing a line of best fit.
Section 5	Some candidates had difficulty analysing their data and/or information. Many candidates provided a conclusion related to each source, rather than comparing the information provided by their experimental data with their internet or literature source.
Section 6	Some candidates had difficulty stating a valid conclusion that related to their aim. Many candidates stated a conclusion that was not supported by information in their experimental data and/or their internet or literature source.
Section 7	Many candidates had difficulty describing a factor that could or did have an impact on their experimental results.

Section 3: preparing candidates for future assessment

Teachers and lecturers should refer to the National 5 Chemistry Course Specification, available on SQA's website.

Question paper

Centres are encouraged to familiarise candidates with the command words used throughout the question paper and ensure that they understand the response expected. Candidates should know that when a question asks them to 'predict' a value, that there is no need for a chemical calculation, and that when a 2-mark question asks for an explanation, they must demonstrate a deeper understanding of the concept to achieve full marks.

Although candidate performance in calculations and numeracy questions has again improved in the 2024 question paper, candidates should continue to learn basic 'routines' for the different types of calculation, in particular titration calculations.

In all calculations worth more than 1 mark, candidates should be aware that credit is given for the correct demonstration of chemical concepts or for intermediate results in a multi-step calculation. Teachers and lecturers should encourage candidates to show their working clearly to maximise their chances of obtaining marks.

Candidates should be prepared to meet calculations with a mole ratio other than 1:1, 1:2 or 2:1.

Teachers and lecturers should remind candidates that page three of the data booklet contains relationships that can be used for National 5 calculations.

Candidates should understand that they must correctly round their answers in all calculations.

Candidates should understand that if a unit is provided in the stem of a question, it is not necessary to state the unit with their answer. However, if a candidate does provide a unit, it must be correct, otherwise they will only have access to some of the marks. The use of incorrect units is only penalised once across the question paper.

Teachers and lecturers should encourage candidates to learn chemistry definitions, as provided in the National 5 Chemistry Course Specification.

Teachers and lecturers should encourage candidates to learn chemical tests, processes, and chemical reactions, such as the tests for common gases and the test for unsaturation. They should also be familiar with the concept of making a process more economical by recycling chemicals.

Candidates should know how to write molecular formulae, and practise writing these. Candidates should also practise writing chemical equations. When writing formulae, charges must be superscript, and numbers of atoms and ions must be subscript. Many candidates did not access marks due to errors in writing chemical symbols, particularly due to the

incorrect use of uppercase or lowercase letters, and in the position and size of numbers and charges in a formula.

Candidates should know that when drawing organic structures, they must draw the bond connections to familiar functional groups correctly. Many candidates did not access marks due to errors in the bond connections within organic structures.

Teachers and lecturers should consider the variety of practical work that candidates undertake. This will deepen their knowledge and understanding and develop practical laboratory skills. The National 5 Chemistry Course Specification details the common chemical apparatus, general practical techniques, analytical methods and reporting of experimental work that candidates must be familiar with.

Although candidates' performance in the open-ended questions improved in the 2024 question paper, candidates would benefit from more opportunities to practise answering open-ended questions. Candidates should be aware that, while there are no definitive answers to open-ended questions, their answer should make statements that are relevant to the situation or problem given. Where a candidate is asked to describe how a student could investigate a chemical reaction, there is an expectation that there will be a degree of planning or designing an experimental procedure.

Assignment

Centres should refer to the most up-to-date coursework assessment task on SQA's website. The National 5 Coursework Assessment Task document has been updated for session 2024–25. Centres must ensure that they are adhering to the conditions of assessment in the coursework assessment task and are applying them fully.

Centres must provide candidates with the 'Instructions for candidates' section in the current version of the coursework assessment task, and encourage candidates to follow the outline structure. The 'Instructions for candidates' section must not be altered in any way and templates are not permitted in the report writing stage. The marking instructions should be shared with candidates before and during the research stage. However, the marking instructions must not be available to candidates during the report writing stage.

Centres should carefully consider the choice of topic for the assignment to ensure candidates can access all marks. Centres should consider a variety of topics that lend themselves to carrying out experimental work relevant to National 5 Chemistry content. The teacher and/or lecturer 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.

Teachers and/or lecturers must minimise the number of candidates within a class:

- investigating the same topic
- investigating the same independent variable
- carrying out the same experiment

Candidates must carry out an experiment that allows them to make measurements, and these measurements must be included in their report. This includes initial mass and final mass. Change in mass and change in temperature on their own is not raw data, and would not be sufficient to be awarded marks in section 3(b). In addition, candidates must understand that their choice of internet or literature source must allow them to make a comparison with their experimental results. The reference for the internet/literature source must be given immediately before, after, or alongside the internet/literature source.

Candidates must not have access to lists of potential sources of comparative data or lists of sources to support their description of the underlying chemistry. Candidates must not be directed to specific websites, journals or textbooks. Candidates must not be provided with whole articles or extracts from websites, journals or textbooks, selected by a third party.

Candidates should take their raw experimental data into the report writing stage. This may be tabulated, but it must not include additional blank or pre-populated columns for mean or derived values. If candidates 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.

For the report stage, candidates must write their report under a high degree of supervision and control, in a maximum of 1 hour and 30 minutes. 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 or 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 all 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.