Course Report 2018

Subject	Chemistry
Level	National 5

This report provides information on the performance of candidates. 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 Post Results Services.

Section 1: comments on the assessment

Summary of the course assessment

Component 1: question paper

The revised National 5 Chemistry question paper places an emphasis on candidates gaining an understanding of chemistry and developing this through a variety of approaches, including practical activities, investigations and problem solving. The National 5 course places significant emphasis on the development of numeracy and literacy skills as well as developing skills of scientific inquiry and related chemistry knowledge and understanding.

The overall impression of the question paper from feedback received from markers and centres was it was fair but challenging. Feedback from markers and centres confirmed that the allocated time was appropriate allowing all candidates to answer all questions. The full range of marks was accessed by candidates and the question paper provided good differentiation.

Candidates were well prepared for many of the different types of questions used in the question paper. However, they did not appear to be as well prepared for the open questions and questions that require recall of chemical knowledge in the course specification (questions 1(a), 7(a), 7(b)(i), 9(a)(i), 9(a)(ii),10(d)) and simple calculations (questions 13(a)(ii) and 14(b)(iii)).

Component 2: assignment

The assignment requires candidates to apply skills, knowledge and understanding to investigate a relevant topic in chemistry and carry out a related practical activity. The topic should draw on one or more areas of the course.

The distribution of marks across the different sections and the skills, knowledge and understanding to be assessed is detailed in the coursework assessment task. This can be found on the National 5 Chemistry page of the SQA website. It is essential centres use the revised documentation and prepare their candidates using the most up-to-date information, as this will help them access all available marks.

The full range of marks was accessed by candidates, and the assignment provided good differentiation. A range of topics was submitted including hydrogels, rate of reaction, fuels and voltage. Due to the level of understanding of chemistry involved in hydrogels, this investigation proved difficult for candidates to achieve full marks in section two.

Within the investigation on fuels (alcohols) that relates the number of carbon atoms to quantity of energy produced, many candidates were not able to access the mark for sufficient raw data as they did not provide the actual measurements taken during their experiment, ie initial mass and final mass of alcohol, initial and final temperature.

Within the evaluation section many candidates evaluated their experiment by referring to repeating their experiment, rather than evaluating the experimental procedure itself.

It was evident an increased number of candidates had clearly followed the ‘Instructions for candidates’ section of the coursework assessment task.

Section 2: comments on candidate performance

Areas in which candidates performed well

Component 1: question paper

Section 1

Question 1	Most candidates could identify the factor that would not speed up a chemical reaction.
Question 2	Most candidates could identify the location of a proton and an electron in an atom.
Question 3	Most candidates could identify the element that does not exist as diatomic molecules.
Question 8	Most candidates could identify that an alkaline solution contains more hydroxide ions than hydrogen ions.
Question 10	Most candidates could identify another way of representing the shortened structural formula.
Question 11	Most candidates could identify the isomer.
Question 14	Most candidates could identify the alcohol that is the least soluble in water.
Question 17	Most candidates could identify the order of reactivity of metals.
Question 19	Most candidates could identify the metal, which when connected to lead in a cell, would produce the highest reading on the voltmeter.
Question 20	Most candidates could identify the salt that would not be used as a fertiliser.
Question 21	Most candidates could identify the metal used as the catalyst in the industrial manufacture of ammonia.

Section 2

Question 1(b)(i)	Most candidates could calculate the average rate of reaction and include the appropriate unit.
Question 1(b)(ii)	Most candidates could draw a graph with appropriate scales and units/labels.
Question 1(b)(iii)	Most candidates were able to estimate the volume of gas produced at 30 seconds using the graph they had drawn.
Question 2(a)(i)	Most candidates could name the type of polymerisation as addition.
Question 2(a)(ii)	Most candidates were able to draw a section of the polymer showing three monomer units joined together.
Question 3(a)	Most candidates could describe how the percentage of carbon in coal affects the heat content.

Question 3(b)	Most candidates could calculate the percentage of iron in iron pyrite, FeS_2.
Question 4(a)	Most candidates could name the elements present in a hydrocarbon.
Question 5(a)	Most candidates could name the three chemicals found inside the generator.
Question 5(d)	Most candidates could use the graph provided to state the total volume of nitrogen gas produced was 44 litres.
Question 6(a)(i)	Most candidates could state the number of isotopes in the sample of boron.
Question 6(a)(ii)	Most candidates could use the formula given to calculate the relative atomic mass of boron.
Question 6(b)	Most candidates could write the nuclide notation for the isotope of carbon with 8 neutrons.
Question 10(a)(i)	Most candidates could correctly balance the equation.
Question 10(a)(ii)	Most candidates could state that the symbol indicates a reaction is reversible.
Question 11(a)	Most candidates could draw an arrow to show the direction and path of electron flow.
Question 11(c)	Most candidates could write the ion-electron equation for the reduction of copper(II) ions.
Question 12(a)	Most candidates could explain an alpha emitter would not be suitable as alpha particles would be stopped by paper.
Question 14(a)	Most candidates could identify source C as the source providing drinking water that does not have a noticeable taste.
Question 15(a)	Most candidates could name the piece of apparatus used by researchers as a diamond anvil cell.
Question 16(a)(i)	Most candidates could state the term used to describe a family of compounds such as the thiols as a homologous series.

Component 2: assignment

Section 1	Most candidates could write an aim for their investigation.
Section 3(b)	Many candidates provided sufficient raw data from their experimental procedure.
Section 3(e)	Most candidates were able to provide an internet or literature source relevant to their experiment.

Section 3(f)	Most candidates provided an appropriate reference for their internet/literature source.
Section 4	Most candidates were able to draw a graph with appropriate scales and units/labels.
Section 8	Most candidates could provide an appropriate title, and a clear and concise report.

Areas which candidates found demanding

Component 1: question paper

Section 1

Question 4	Some candidates had difficulty identifying the shape of a molecule of hydrogen bromide as linear.
Question 5	Some candidates had difficulty identifying sodium as the element with a single positive charge and an electron arrangement of 2, 8.
Question 7	Some candidates had difficulty calculating the concentration of the sodium hydroxide solution.
Question 12	Many candidates had difficulty identifying the reaction that takes place when an alcohol is formed from an alkene.
Question 13	Many candidates had difficulty identifying the systematic name for the alcohol.
Question 15	Some candidates had difficulty identifying the diagram showing the apparatus that would produce the most accurate result.
Question 18	Some candidates had difficulty identifying the redox equation for the overall reaction.
Question 24	Some candidates had difficulty identifying precipitation as the type of chemical reaction.

Section 2

Question 1(a)	Many candidates had difficulty naming the gas produced when a carbonate reacts with a dilute acid. A common incorrect answer was calcium chloride or hydrogen.
Question 1(c)	Many candidates had difficulty explaining the reason a greater volume of gas was produced when sulfuric acid was used in place of hydrochloric acid, was due to a greater concentration/number of hydrogen ions.

Question 4(b)	Some candidates had difficulty writing the systematic name for isobutane. The most common incorrect answer was 2-methylbutane.
Question 4(c)	Many candidates were not able to indicate the reason butane had a higher boiling point than isobutane was the stronger intermolecular bonds in butane. A common incorrect answer was this was due to stronger covalent bonds.
Question 5(b)	Some candidates could not name the compound that would give a lilac flame colour. Common incorrect answers were potassium and potassium nitrate.
Question 5(c)	Some candidates could not write the formula for the compound silicon dioxide.
Question 7(a)	Many candidates could not state the term used to describe the structure of solid strontium chloride as lattice.
Question 7(b)(i)	Some candidates could not state why ionic compounds conduct electricity when molten. A common incorrect answer was they contained free moving electrons.
Question 7(b)(iii)	Most candidates had difficulty explaining why a DC supply must be used when electrolysing a molten ionic compound. Common incorrect answers included the electrons flowed in one direction only or each electrode must have only one charge.
Question 8	Very few candidates were able to give a good understanding of the chemistry of water. The majority of candidates answered in terms of its formula and that it contained both hydrogen and oxygen. A few candidates went beyond this to say it changed the pH of water but incorrectly stated it neutralised an acid/alkali.
Question 9(a)(i)	Most candidates had difficulty defining the term unsaturated as a molecule containing a carbon to carbon double bond. A common incorrect answer was the term meant it can still form bonds.
Question 9(a)(ii)	Many candidates were not able to describe the chemical test for unsaturation. Although many candidates described the use of bromine solution, they indicated it was the olive oil and not the bromine solution that was decolourised and/or it was the bromine that was unsaturated and not the olive oil.
Question 10(d)	Many candidates had difficulty naming the salt produced as ammonium nitrate. Many candidates named the salt as ammonia nitrate.

Question 12(c)	Most candidates could not describe the effect on an atom when a beta particle was emitted. A common incorrect answer was the atomic number decreased.
Question 13(a)(ii)	Many candidates had difficulty calculating the mass of one mole of malic acid using the full structural formula provided in the question.
Question 13(b)	Very few candidates were able to describe how the acidity of the molecule was related to the position of the halogen in group 7 of the periodic table. Most candidates answered this question in terms of pH and not acidity.
Question 13(c)	Some candidates could not draw the structural formula for the carboxylic acid. Many candidates had joined the carbon bond to the hydrogen of the OH group.
Question 14(b)(i)	Most candidates had difficulty naming the most appropriate piece of apparatus used as a pipette. The most common incorrect answer was measuring cylinder.
Question 14(b)(ii)	Most candidates had difficultly explaining the two results used to calculate the average volume were concordant. Many candidates described them as being near each other or not rough values.
Question 14(b)(iii)	Most candidates were unable to calculate the number of moles of silver nitrate in 8·05 cm^3 given the concentration and volume of the solution. Many candidates did not divide the volume by 1000 and/or used an incorrect relationship.
Question 15(b)(ii)	Many candidates had difficulty using the information from the passage that pressurised sodium was an insulator, to say the bulb would not light. Many candidates stated the bulb would light.
Question 15(c)	Most candidates had difficulty writing an equation, using symbols and formulae, for the decomposition of iron(III) oxide. Common incorrect answers included an incorrect formula for iron(III) oxide and/or the formula for oxygen on the left side of the arrow.
Question 16(a)(ii)	Many candidates could not write the general formula for the thiols in an appropriate format.
Question 16(b)	Most candidates had difficulty relating their knowledge of a reaction of a hydrocarbon with oxygen to an unfamiliar compound containing hydrogen, carbon and sulfur. Common incorrect answers included ethanol, ethane or sulfur.
Question 16(c)	Some candidates were unable to calculate the mass of methanethiol produced from 640 grams of methanol. Many candidates either

calculated the mass of hydrogen sulfide or used hydrogen sulfide to calculate the mass of methanethiol produced.

Question 17

Many candidates had difficulty describing a good knowledge of the chemistry of methacrylic acid using the full structural formula given in the question.

Many candidates described the molecule in terms of the number of each type of atom present demonstrating a limited understanding of the chemistry involved. Very few candidates were able to describe reactions that could involve this molecule.

Component 2: 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 the candidate 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 3(c)

Some candidates had difficulty providing appropriate units and headings for all their tabulated data.

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/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/literature source.

Section 7

Some candidates had difficulty describing a factor that could or did have an impact on their experimental results.

Section 3: advice to centres for preparation of future candidates

Component 1: question paper

Candidates should continue to make every effort to learn basic 'routines' for the different types of calculation.

In all calculations worth more than one mark, candidates should be aware credit will be given for the correct demonstration of chemical concepts or for intermediate results in a multiple-step calculation.

Candidates should be encouraged to show their working clearly to maximise their chances of obtaining some marks. Candidates should be given practice at rounding values, as many were not able to access all marks in question 3(b) due to inaccurate rounding.

Candidates should be reminded that page three of the data booklet contains relationships that can be used for National 5 calculations.

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

Centres should advise candidates to consider calculations that involve the specific heat capacity for substances other than water, as well as being able to calculate any value from within this relationship.

Centres should stress to candidates that when writing the symbol for an element the first letter must be a capital letter and the second letter (if appropriate) must be lower case, eg Cu is acceptable, CU is unacceptable. Many candidates did not access marks due to errors in writing symbols and in the position and size of a number within a formula. In questions 5(c), 11(c), 15(c) and 16(a)(ii) many candidates did not access marks due to writing symbols and formulae incorrectly.

Centres are advised that candidates are still confusing electrons and ions when referring to the movement of charged particles in a solution.

Candidates should be encouraged to learn basic chemistry definitions such as the definition for unsaturation as well as learning chemical tests, processes and chemical reactions. Centres should advise candidates that they should use appropriate terminology when answering questions. For example, in question 1(c) many candidates were aware that a greater volume of gas was produced due to there being more hydrogen but were not specific in referring to hydrogen ions.

Candidates should be advised to learn the name of functional groups in organic compounds as well as being able to identify them from structural formulae. They should be advised that if the question asks for the name of the functional group, the formula will not be accepted if this is shown in the question. In question 13(a)(i), COOH in place of the name carboxyl is awarded zero marks as this structure is shown within the question.

When showing the path and direction of electron flow in a cell, candidates should be advised that an arrow going into the solutions or through the ion bridge negates an arrow drawn correctly on the wire.

Centres should stress to candidates that additional information given with a correct answer may negate the correct answer. For example, in question 13(a)(i) hydroxyl would negate the correct answer carboxyl and would be awarded zero marks.

Centres should consider the variety of practical work that candidates undertake. This may deepen their knowledge and understanding as well as developing practical lab skills. In the question paper it was evident that a significant number of candidates did not have an adequate awareness of experimental work and the use of appropriate apparatus in measuring volume (questions 9(a)(ii), 14(b)(i), 14(b)(ii)).

Centres should note that in the revised National 5 course from session 2017-18, a greater emphasis is placed on practical techniques and use of apparatus. Within the revised National 5 course, there are several mandatory items of lab apparatus with which candidates must be familiar. This also applies to the mandatory practical techniques and analytical methods contained in the document. Centres are advised to refer to the *Chemistry Course Specification* that can be accessed via the SQA's website.

Component 2: assignment

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

Centres must provide candidates with the 'Instructions for candidates' section from the coursework assessment task, and to encourage candidates to follow the structure outlined in this guide. Centres must not alter the 'Instructions for candidates' section in any way, and are reminded that templates are not permitted into the report stage. Centres should also share the marking instructions with candidates, before and during the research stage**.** However, the marking instructions must not be given to candidates during the report stage of the assignment.

Candidates must carry out an experiment that allows measurements to be made and these must be included in their report. This includes initial mass and final mass etc. Change in mass and change in temperature on their own is not raw data and would not be sufficient for the marks in section 3(b).

In addition, candidates must choose an internet or literature source that allows them to make a comparison with their experimental results.

The report stage of the assignment must be written by the candidates under a high degree of supervision and control in a maximum of 1 hour 30 minutes. If centres allow candidates to complete the reports over a number of periods, then the teacher or lecturer must retain the reports between periods as candidates must not work on their reports out with the controlled conditions. Candidates' reports must not be scrutinised by teachers or lecturers and no feedback or redrafting is permitted. The assignments must be kept securely until submitted to SQA.

Grade boundary and statistical information:

Statistical information: update on courses

Number of resulted entries in 2017	16399

Number of resulted entries in 2018	15930

Statistical information: performance of candidates

Distribution of course awards including grade boundaries

Distribution of course awards	Percentage	Cumulative %	Number of candidates	Lowest mark
Maximum mark				
A	36.3%	36.3%	5787	92
B	21.8%	58.1%	3468	78
C	19.1%	77.2%	3041	64
D	14.0%	91.2%	2233	50
No award	8.8%	-	1401	-

General commentary on grade boundaries

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

SQA aims to set examinations and create marking instructions which allow a competent candidate to score a minimum of 50% of the available marks (the notional C boundary) and a well prepared, very competent candidate to score at least 70% of the available marks (the notional 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 every year for each subject at each level to bring together all the information available (statistical and judgemental). The Principal Assessor and SQA Qualifications Manager meet with the relevant SQA Business Manager and Statistician to discuss the evidence and make decisions. The meetings are chaired by members of the management team at SQA.

- The grade boundaries can be adjusted downwards if there is evidence that the exam is more challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- The grade boundaries can be adjusted upwards if there is evidence that the exam is less challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- Where standards are comparable to previous years, similar grade boundaries are maintained.

Grade boundaries from exam papers in the same subject at the same level tend to be marginally different year to year. This is because the particular questions, and the mix of questions, are different. This is also the case for exams set by centres. If SQA alters a boundary, this does not mean that centres should necessarily alter their boundary in the corresponding practise exam paper.