Course Report 2018

Subject	Chemistry
Level	Higher

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 question paper is worth 100 marks and consists of two sections: section 1 (objective test) has 20 fixed-response, multiple-choice questions worth 1 mark each, and section 2 contains restricted and extended-response questions worth 80 marks. Calculations in section 2 cover general numeracy calculations in a chemistry context, as well as specific chemistry calculations that are taught as part of the Higher Chemistry course.

In view of the grade boundaries set for the 2017 Higher Chemistry question paper, the proposed 2018 paper was reviewed to ensure a higher level of difficulty in both section 1 and section 2. The 2018 paper proved to be more demanding in both sections than intended, and adjustments were made to the grade boundaries as a result.

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

Component 2: assignment

The assignment is worth 20 marks, and the table below shows how marks are allocated to each section of the report.

Criteria	Mark allocation
Aim(s)	1
Applying knowledge and understanding of chemistry	4
Risk assessment	1
Selecting information	2
Processing and presenting data/information	4
Analysing data/information	2
Conclusion(s)	1
Evaluation	3
Presentation	2

This component performed as anticipated. The average mark for this component fell slightly. A number of candidates managed to achieve full marks, with few candidates scoring very low marks.

Section 2: comments on candidate performance

Component 1: question paper

Some candidates achieved 20 marks for section 1. No candidate achieved all 80 marks in section 2 of the paper, but a number of candidates achieved 78.

Candidates' performance in questions that examined calculations taught as part of the Higher Chemistry course was generally good.

Candidates performed less well in questions that related to practical aspects taught as part of the Researching Chemistry unit of the course, and in questions where candidates were required to state or explain terms given in the course specification.

Component 2: assignment

Candidates' performance was generally good overall, although the average mark was down compared to last year.

Comment on candidates' overall performance in the assignment is made under each assignment criterion detailed in the sections below.

Areas in which candidates performed well

Component 1: question paper

Candidates performed well in the following questions:

Section 1

Question 1	Calculating an enthalpy change from an energy profile diagram.
Question 2	Calculating the relative rate of a reaction.
Question 3	Interpreting an energy distribution diagram.
Question 6	Identifying functional groups.
Question 10	Defining essential amino acids.
Question 17	Enthalpy change calculation using Hess's Law.

Section 2

Question 3(a)	Describing a safe method of heating.
Question 3(b)	Identifying the use of a condenser.
Question 3(c)(i)	Naming water as a product in the given reaction.
Question 4(b)	Naming a reagent to distinguish between an aldehyde and a ketone.
Question 6(b)(ii)	Naming the propagation step in a free radical reaction.
Question 6(c)(i)	Circling a peptide link.
Question 7(a)(ii)	Naming the class of terpene for humulene.
Question 8(b)	Calculating the enthalpy change of a reaction.
Question 9(c)	Drawing a structural formula of a diol that contained three carbon atoms.
Question 11(c)(i)	Calculating the average volume of sodium thiosulfate solution used in a titration experiment.

Component 2: assignment

Aim(s): 1 mark

Nearly all candidates stated an aim or aims that could be investigated. There was evidence that teachers and lecturers had taken the advice given in previous Course Reports and the General Assessment Information, to ensure the aims were clear, and all aspects of candidates' aims could be investigated.

Applying knowledge and understanding of chemistry: 4 marks

Most candidates provided chemistry that was relevant to the topic.

Selecting information: 2 marks

Candidates are required to select at least two data sources relevant to the aim that, when analysed, should allow the candidate to draw a conclusion related to the aim. One of these sources must be the candidate's own experimental data.

Many candidates were able to provide relevant information that would be sufficient to allow a conclusion relating to the aim to be drawn.

Processing and presenting data/information: 4 marks

Only one set of data needs to be processed and presented. This data must come from an experiment carried out by the candidate. Most candidates processed and presented their own experimental data.

Processing and presenting experimental data was generally done well, with most candidates scoring highly. Candidates chose appropriate formats (table, chart or graph) to present data.

Processing of experimental data should involve calculating or skills such as plotting on a graph.

Conclusion(s): 1 mark

Most candidates gave conclusions that related to their aim.

Presentation: 2 marks

Most candidates structured their report appropriately with a title, then the body of the report, finishing with a reference section, containing only references. The only information that is allowed to follow the reference section is any clearly labelled appendices that the candidate wishes to include with their report.

Areas which candidates found demanding

Component 1: question paper

Candidates found the following questions demanding:

Section 1

Question 7	Naming a branched chain carboxylic acid.
Question 11	Giving a general formula.
Question 12	Calculating the number of moles of sodium ions in a mixture.
Question 15	Shifting equilibrium to the right by addition of sodium hydroxide.
Question 18	Identifying an ion able to oxidise sulphite ions to sulfate ions.

Section 2

Question 1(a)(i)	Stating what is meant by electronegativity.
Question 2(c)(i)	Explaining why silicon nitride has a high melting point.
Question 2(d)(ii)	Explaining why aluminium foil needs to be heated at the start of this reaction.
Question 4(e)(i)	Correctly describing a condensation reaction.
Question 6(b)(i)	Describing how free radicals are formed.
Question 6(c)(ii)	Drawing a structural formula for the amino acid serine.
Question 7(c)(i)	Naming a reaction as an addition reaction.
Question 8(c)(iii)	Suggesting why methanol and ethanol require less oxygen to burn.
Question 9(d)(i)	Describing a procedure to prepare 100cm^3 of the 20% ethanol solution.
Question 9(d)(iii)B	Giving a formula for sodium glycolate.
Question 10	Open question on measuring and comparing molar volumes.
Question 11(a)	Describing a procedure to weigh accurately 50.0g of table salt.
Question 11(c)(ii)	Calculating the number of moles of iodine.
Question 12(a)(ii)	Naming a phenol compound.
Question 12(b)(ii)	Naming compound X formed in the Cumene Process.

Component 2: assignment

Aim(s): 1 mark

There were a few candidates who had no aim at all.

Applying knowledge and understanding of chemistry: 4 marks

Although many candidates provided chemistry that was relevant to the topic, certain topics give more opportunities to allow candidates to describe underlying chemistry at a depth appropriate to Higher Chemistry.

Select Information: 2 marks

Although many candidates were able to provide relevant information that would be sufficient to allow a conclusion relating to the aim to be drawn, in some cases, the information provided by the candidate was not sufficient to cover all aspects of the stated aim.

Risk assessment: 1 mark

For the risk assessment mark, candidates need to clearly link precautions taken to the nature of the hazard and the associated risk. In the assignment assessment task; *Appendix 1: Instructions for candidates* section — *Guidance on producing your report;* sub-section — *'Experimental procedure*, it states,

> *Here you must include a description of your experimental procedure. Safety measures should be included. This may include clearly labelled diagrams.*
> *It is acceptable to provide the experimental procedure as an appendix to the report*.

Processing and presenting data/information: 4 marks

Some candidates failed to gain the mark for cross-referencing information. When experimental results were given as raw data, either the title and aim of the experiment need to be given with the results data within the body of the report, or the title and aim need to be given in the reference section of the report. A full reference for the second data source needs to be given with the data, or the data clearly linked to a reference in the reference section of the report.

Analysing data/information: 2 marks

Many candidates did not achieve both marks for this section due to the limited nature of their data analysis. Most candidates only made simple comparisons of data sources or described data trends. Some candidates did extra calculations as part of their analysis but then failed to discuss the results of these calculations.

Conclusion(s): 1 mark

Although most candidates gave conclusions that related to their aim, many candidates with multiple aspects to their aims failed to gain the conclusion mark, either due to the conclusion not addressing all aspects of the aim, or failing to be supported by relevant information in the report.

Evaluation: 3 marks

A number of candidates evaluated their experimental procedure but failed to provide details of the experimental procedure. Marks can only be awarded for evaluating the experimental procedure if the candidate includes the experimental method in their report, so that markers are able to judge whether an evaluative comment is valid.

When commenting on the validity/reliability/robustness of sources, candidates need to justify their comment. For example, if commenting on the robustness of data from a website, stating that the same information is given on other websites, and stating these websites.

Presentation: 2 marks

The most frequent mistakes made in terms of the presentation of the report were:

- Attaching processed charts and graphs to the report after the reference section.
- Including material, other than references, in the reference section, for example evaluative comments, which should have been stated separately.

Section 3: advice for the preparation of future candidates

Component 1: question paper

Questions linked to statements in the course specification

Candidates need to be able to accurately describe and explain terminology from the course specification, for example, question 1(a)(i), stating what is meant by electronegativity.

Open questions

A substantial proportion of candidates did not attempt the open questions; in particular question 10. Candidates would benefit from more opportunities to answer this type of question. Candidates also need to be made aware that there are no definitive answers to open questions. Candidates can give broad answers covering a number of 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 are not required to give a perfect answer to gain the full mark allocation for the question.

Researching chemistry questions

Approximately 10 marks are allocated to the assessment of knowledge and skills relating to the Researching Chemistry unit. Apparatus and techniques that candidates should be familiar with are listed in the *Higher Chemistry Course and Unit Support Notes*.

Candidates tended to perform less well in these questions. This was particularly true when describing a procedure to accurately weigh out a 50.0g sample, describing a procedure to accurately measure 20cm^3 and then make up to exactly 100cm^3, and the passing of chlorine gas over heated aluminium, and the passing of a gas mixture into a flask allowing the escape of unreacted chlorine.

The Researching Chemistry unit has a half-unit weighting in the course. This is to allow time to develop practical skills associated with the unit. It cannot be assumed that candidates will gain understanding of the proper use of equipment and the techniques listed without these being specifically taught.

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 two marks.

Candidates need to be aware that, to gain full marks for the question, a detailed explanation needs to be given.

When the weighting of the question is three marks, candidates are expected to make at least three correct points within their answer. For example, in question 1(b) candidates needed to mention type of intermolecular force, and that these increase down a group to be awarded two marks. The third mark was awarded for a correct explanation linking the relative strength of London Dispersion forces to the number of electrons in a molecule.

Calculations

The 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 well done for example, question 8(a), bond enthalpy and question 8(b), Hess’s Law.

General numeracy calculations set in a chemical context were also done well with the exception of question 8(c)(ii).

Candidates should be encouraged to set working out clearly, as partial credit can often be given to those who do not gain full credit for the questions. In question 11(c)(ii) when looking to assign partial marks, credit was given for $n = c \times v$ being applied correctly, and for the stoichiometry of the equation being applied correctly.

Manipulation/conversion of units was done well in question 7(b)(i).

Component 2: assignment.

From session 2018-19 onwards, the assignment criteria are changing. The revised assignment structure and mark allocation are included in the Coursework assessment task available on the Higher Chemistry page of the SQA website.

Teachers and lecturers can also access the *Webinar: Video overview of course assessment from session 2018-19* available on the Higher Chemistry page of the SQA website.

Teachers and lecturers can also refer to the example candidate evidence, and accompanying commentaries, that will be made available on the Understanding Standards website, and are encouraged to attend one of the Understanding Standards course events taking place in November 2018.

Grade boundary and statistical information:

(Completed by SQA)

Statistical information: update on courses

Number of resulted entries in 2017	10134

Number of resulted entries in 2018	9990

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	28.3%	28.3%	2830	81
B	25.3%	53.6%	2525	67
C	23.0%	76.6%	2300	54
D	9.5%	86.1%	945	47
No award	13.9%	-	1390	-

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.