



External Assessment Report 2010

Subject	Chemistry
Level	Higher

The statistics used in this report are pre-appeal.

This report provides information on the performance of candidates which it is hoped will be useful to teachers/lecturers in their preparation of candidates for future examinations. It 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 question papers and marking instructions for the Examination.

Comments on candidate performance

General comments

Feedback points to a testing but fair paper and this is reflected in the cut-offs for the examination.

It is again pleasing to report that a generally sound performance was demonstrated by candidates across nearly all types of questions, eg relatively few non-attempts, good evidence of rote learning by many students, well-structured answers to calculations, etc. It is clear that many centres unpack the structure of the paper and successfully prepare candidates for the different types of questions that arise. There were the usual two exceptions. Firstly, in questions that required candidates to do some extended writing, many of the explanations tended to be lacking both in clarity and depth. Secondly, in some centres the PPA questions were very poorly done — responses suggest that some of the candidates have no experience of some of these experiments. This is disappointing for PPA marks tend to be relatively 'easy' to pick up.

Areas in which candidates performed well

The following questions in Section A produced high facility values.

- Q1 Standard Grade/Intermediate 2 — acids and bases
- Q2 Standard Grade and Intermediate 2 — precipitation
- Q9 Trends in the Periodic Table
- Q11 Covalent bonding
- Q12 Hydrogen bonding
- Q18 Fuels
- Q19 Structure of esters
- Q20 Primary, secondary and tertiary alcohols
- Q21 Addition reactions
- Q24 Synthesis gas
- Q26 Polyesters
- Q28 Fats and oils
- Q29 Fats and oils
- Q32 Hess's Law
- Q35 Strong and weak acids
- Q40 Radioactive decay

There were high levels of performance in the following questions in Section B.

(It should be noted that questions marked with a * were judged to be A-type questions and the selections are in relation to the more discriminating nature of the questions.)

- Q1 Bonding and structure
- Q2 (a) (i) Structure of aromatic compounds
- Q3 (a) (i) Equilibrium
- Q3 (a) (ii) Equilibrium

- Q3 (b) Standard Grade/Intermediate 2 calculations — mass to moles
- Q5 (a) (i) PPA — Effect of temperature on reaction rate
- Q6 (b) Half-life
- Q6 (c) Intensity of radiation
- Q8 (a) (ii) Organic reactions
- Q8 (b) Standard Grade/Intermediate 2 — balancing equations
- Q9 (a) Enzymes
- Q9 (b) PPA — effect of pH on enzyme activity
- Q9 (c) Enzymes
- Q11 (a) (i) Ionisation energy
- *Q12 (a) Calculations — excess
- Q13 (a) (i) Structure of hydrocarbons
- Q13 (a) (ii) Fuels
- Q14 (a) (ii) PPA — enthalpy of combustion
- *Q15 (a) Problem solving — selecting information
- *Q15 (b) (ii) Problem solving — selecting information
- *Q16 (b) (ii) Calculations — redox reactions

Areas which candidates found demanding

The following questions in Section A produced very low facility values.

- Q3 Standard Grade/Intermediate 2 — calculations
- Q6 Reaction rates
- Q10 Ionisation energy
- Q16 Standard Grade/Intermediate 2 — calculations
- Q39 Oxidation and reduction

The following questions in Section B proved to be difficult.

(It should be noted that questions marked with a * were judged to be A-type questions and the selections are in relation to the more discriminating nature of the questions.)

- Q2 (a) (ii) Condensation polymerisation
- Q4 (a) Standard Grade/Intermediate 2 — electrolysis
- Q5 (a) (ii) PPA — Effect of temperature on reaction rate
- Q5 (b) Effect of temperature on reaction rate
- Q6 (a) Nuclear equations
- Q7 (a) Explanation — intermolecular bonding (for full marks)
- *Q7 (b) Problem solving — organic reactions
- Q8 (a) (iv) Renewable sources of energy
- *Q11 (a) (ii) Calculation — use of the Avogadro Constant
- *Q11 (b) Problem solving — selecting information
- *Q12 (c) Explanation — salts (for full marks)
- Q14 (b) Enthalpy of neutralisation
- Q16 (b) (ii) Ion-electron equations

Advice to centres for preparation of future candidates

General information

Much of the following advice, based on the responses to the questions in Section B of the paper, has been given for a number of years. However, some centres, particularly those in which the number of awards at the different grades is less than the number that is estimated, may still benefit from a consideration of this information.

Centres should continue to help candidates with exam technique; some candidates do not read the information in the question carefully, eg in Q11 (b) no attempt is made to include state symbols. At other times, this leads to answers that go beyond the question that is asked, eg in Q2 (b), a significant number of answers also gave a use for poly(ethenol) and in Q3 (a) (ii) some candidates gave a detailed explanation to fit in with the answer.

Information on specific types of questions

Grades for some candidates could be improved through more attention to the rote-learning of the chemical knowledge in the course. Recall of some parts of the Standard Grade/Intermediate 2 content can be particularly poor.

Although the recent improvement in calculations has been maintained, candidates should continue to make every effort to learn basic 'routines' for the different types of calculations in the Course. Due to partial marking, a significant number of part-marks can be picked up. There is also the opportunity for 'follow through' without further loss of marks once a mistake has been made.

In some centres, the benefits of effective teaching and learning with respect to PPAs were clearly evident with large numbers of candidates producing very sharply focused answers; in other centres however, many answers still suggest that the candidates have absolutely no experience of the PPA.

Each year there is at least one problem-solving question that requires candidates to think about an unfamiliar experiment (for 2010, see Q 10 (a)). It is clear that many candidates are relatively poorly prepared for such questions and centres may wish to reconsider how the assessed skills are developed over the Course. In particular, it should be noted that the quality of the diagrams produced in the examination remains very disappointing.

Each year there is at least one problem-solving question that requires candidates to decode unfamiliar information (for 2010, see Q7 (b), Q11 (b) and Q15 (a) and (b) (ii)). Here again, centres may wish to review how the skills assessed in this type of question are developed over the Course.

Each year there is at least one question that requires more detailed explanations from candidates (for 2009, see Q7 (a) and Q12 (c)). Centres should reconsider the extent to which candidates are given opportunities to practice answering such questions.

Areas of common misunderstanding: Section A

Q6 It was common to think that the same volume of gas is produced when excess zinc is added to the same volume of acid with different concentrations.

Q7 A large number of candidates failed to appreciate that a catalyst forms bonds with reacting molecules.

Q14 Many candidates thought that silicon forms a gaseous oxide.

Q15 Many candidates thought that the Avogadro Constant is the same as the number of molecules in 16 g of oxygen.

Q17 It was common to fail to recognise that water is a gas at 200 °C.

Q23 Twenty-three percent of candidates thought that ozone reflects ultraviolet radiation.

Q31 It was common to think that ammonia is a raw material.

Q39 Many candidates thought that hydrogen is an oxidising agent in the reaction with CuO.

Areas of common misunderstanding: Section B

Q1 Many candidates thought that the bonding in metals is ionic. Others seemed to be unaware of what is meant by structure, giving 'gaseous' as the answer.

Q2 (a) (ii) Many candidates lost a ½ mark by failing to leave the ends open.

Q3 (b) Many responses failed to appreciate the diatomic nature of oxygen.

Q4 (a) Few candidates seemed to notice the bubbles of gas in the diagram.

Q5 (a) (ii) Answers like 'room temperature varies' were common.

Q5 (b) Many candidates drew curves to show how rate varies with time at different temperatures.

Q6 (a) It was not uncommon to have the right atomic number but wrong symbol, eg C or N, for the product.

Q7 (a) (also Q12 (c)) Some candidates are clearly unaware of the kind of answer required for a question (worth 2 marks) that asks for an explanation.

Q7 (b) Some centres clearly prepare students to 'spot the pattern'; in other centres, the students appear to be unaware of how to tackle this kind of question.

Q10 (a) Once again, responses to this type of question were extremely variable. Also, when diagrams were drawn, the quality of some was extremely poor with tubes passing through the sides of beakers, test-tubes, etc.

Q11(b) There seems to be confusion between what is meant by atoms compared with molecules.

Q13(c) Hexene was a popular answer.

Q14 (a) (iii) Many candidates lost a $\frac{1}{2}$ mark by failing to include the negative sign in the answer.

Q15 (a) and (b) (ii) Some centres clearly have a very sound approach to the teaching and learning associated with this type of question. Candidates seem to have been given the confidence to attempt to decode the information given.

Q16 (a) Many candidates failed to appreciate what is meant by 'an accurate end-point' and answered in terms of 'take an average of the readings'.

Q16 (b) (ii) Writing a balanced ion-electron reaction continues to prove to be very difficult.

Statistical information: update on Courses

Number of resulted entries in 2009	9578
Number of resulted entries in 2010	10177

Statistical information: performance of candidates

Distribution of Course awards including grade boundaries

Distribution of Course awards	%	Cum. %	Number of candidates	Lowest mark
Maximum Mark —100				
A	28.2%	28.2%	2873	70
B	24.3%	52.5%	2473	57
C	23.6%	76.1%	2400	44
D	10.6%	86.7%	1074	37
No award	13.3%	100.0%	1357	—

General commentary on grade boundaries

While SQA aims to set examinations and create marking instructions which will 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.

Each year, therefore, SQA holds a grade boundary meeting for each subject at each level where it brings together all the information available (statistical and judgemental). The Principal Assessor and SQA Qualifications Manager meet with the relevant SQA Head of Service 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.

An exam paper at a particular level in a subject in one year tends to have a marginally different set of grade boundaries from exam papers in that subject at that level in other years. This is because the particular questions, and the mix of questions are different. This is also the case for exams set in centres. If SQA has already altered a boundary in a particular year in say Higher Chemistry this does not mean that centres should necessarily alter boundaries in their prelim exam in Higher Chemistry. The two are not that closely related as they do not contain identical questions.

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.