Principal Assessor Report 2004

Assessment Panel:	**Chemistry**
Qualification area	
Subject(s) and Level(s) included in this report	**Chemistry Higher**

Statistical information: update

Number of entries in 2003	9290 (Pre Appeal)

Number of entries in 2004	9269 (Pre Appeal)

General comments re entry numbers

The significant and worrying decline in the uptake of Higher in the latter part of the last decade (from 11,805 in 1997 to 9,730 in 2000) has been widely discussed.
Although the number of candidates studying at Higher level showed a decrease from 2000 to 2003, it would appear that many of these 'lost' candidates were from the bottom end of the ability range, some having gone to Intermediate 2 Chemistry, others to more appropriate courses.
It is now reassuring to note that there is a pretty steady candidature from 2003 to 2004.

Statistical Information: Performance of candidates

Distribution of awards

Distribution of awards	%	Cum %	Number of candidates	Lowest mark
A	23.1	23.1	2137	75
B	23.3	46.4	2160	60
C	26.3	72.7	2440	45
D	11.3	83.9	1043	37
No award	16.1	100.0	1489	0

Comments on any significant changes in percentages or distribution of awards

Performance in Section A multiple choice questions which are pre-tested and/or have been used in previous examinations suggested that the candidate population was very similar or even slightly more able than in the previous year.

It would appear that the small but continued improvements in the distribution of awards in percentage terms at both A Grade and the pass/fail interface can be attributed at least in part to sounder preparation of candidates for a steady examination. The slight increase in the percentage A-rate in Higher Chemistry from 21% in 2003 to 23% recognised improved levels of achievement in more discriminating questions.

Grade boundaries for each subject area included in the report

Grade Boundaries	Lowest mark	Percentage of maximum marks
A	75	75
B	60	60
C	45	45
D	37	37
No award	0	0

General commentary on passmarks and grade boundaries

- While SQA aims to set examinations and create mark schemes which will allow a competent candidate to score a minimum 50% of the available marks (notional passmark) and a very well-prepared, very competent candidate to score at least 70%, it is almost impossible to get the standard absolutely on target every year, in every subject and level
- Each year we therefore hold a passmark meeting for each subject at each level where we bring together all the information available (statistical and judgmental). 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 senior management team at SQA
- We adjust the passmark downwards if there is evidence that we have set a slightly more demanding exam than usual, allowing the pass rate to be unaffected by this circumstance
- We adjust the passmark upwards if there is evidence that we have set a slightly less demanding exam than usual, allowing the pass rate to be unaffected by this circumstance
- Where the standard appears to be very similar to previous years, we maintain similar grade boundaries
- 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 are different. This is also the case for exams set in centres. And just because SQA has altered a boundary in a particular year in say Higher Chemistry 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
- Our main aim is to be fair to candidates across all subjects and all levels and maintain standards across the years, even as arrangements evolve and change.

Comments on grade boundaries for each subject area

Once again the examination was relatively well-received by the chemistry community in presenting centres and the consistency of the information used to illuminate discussion offered very little room for manoeuvre regarding cut-off decisions.

A tightening up to make Section B more discriminating for the more able candidates had a significant impact on the performance of 'average' candidates. This factor, in addition to a number of questions that turned out to be more difficult than expected for 'C' candidates and some severe marking decisions, resulted in the pass mark being reduced from 49 to 45. The negative national rating for the subject also influenced the decision to go for a cut-off of 45 rather than 46.

With the comments on the increased difficulty of the examination at the top end, in line with a setting strategy to lower the cut-off without affecting standards, a decrease in the cut-off by 1 mark was judged to be appropriate at the A/B interface.

The cut-off for an upper A (84%) continues to be in line with previous years.

Comments on candidate performance

General comments

It is pleasing to report that although chemistry clearly continues to be a difficult subject, there was some evidence of improved preparation leading to sounder performances in familiar questions by 'average' candidates. Questions on organic chemistry were again particularly well done and the more encouraging performances in questions involving calculations were again maintained.
In contrast, the achievements of candidates in questions set in a Standard Grade/Intermediate 2 context (in both Sections A and B) and PPA questions tended to be overall disappointing.

Areas of external assessment in which candidates performed well

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

Q1	Bonding and structure
Q2(b)(ii)	Half-life calculation
Q3(d)	Faraday calculation
Q5	Equilibrium
Q7(c)	Denaturing of an enzyme
Q13(a)	Organic naming
Q13(b)	Organic structures
Q14(a)(i)	Organic structures
Q14(a)(iii)	Hydrogen bonding
Q15(a)	Hess's Law calculation
Q17(a)	Problem solving – selecting information

Areas of external assessment in which candidates had difficulty

The following questions in Section B proved to be difficult. However, it should be noted that questions marked with an asterisk * were included in the examination to provide discrimination at the top end of the cohort.

Q3(a)	Problem solving – analysing information
Q3(b)*	Standard Grade
Q6(b)(i)	Reaction time calculation
Q8(a)	Enthalpy of neutralisation calculation
Q8(b)*	Concentration of hydroxide ions calculation
Q11*	Problem solving – design and plan
Q12(b)*	Ion-electron equations
Q13(c)*	Organic reactions
Q17(b)(c)*	Problem solving – analysing information

See 3(b) below.

Areas of common misunderstanding

Q2(a) Nuclear chemistry
Many candidates seemed to have difficulty with the meaning of phosphorus-32 and used a mass number of 31 from the Data Booklet in the calculation.

Q3(a) Problem solving – analysing information
Many candidates appeared to focus on the production of sulphuric acid and answer 'hydrogen' without proper attention to other information.

Q3(b) Standard Grade
The wide variety of answers included reactions like cracking and precipitation as well as distillation, filtration, purification, fragmentation, etc.

Q3(d) Electrolysis calculation
Many candidates did not use two moles of electrons for one mole of zinc in the calculation.

Q4(a) Standard Grade
As well as other carbohydrate polymers like cellulose and glycogen, common answers included poly(glucose), protein and glycerol.

Q6(b)(i) Reaction time calculation
Very few candidates appreciated that rate is inversely proportional to time.

Q8(b) Concentration of hydroxide ions calculation
The most common answer involved using 10^{-1} as the concentration of $H^+(aq)$ ions in 1 mol l^{-1} hydrochloric acid.

Q10(a)(ii) Molecular formula for an aromatic compound
$C_6H_7Cl_3O$ and $C_6H_6Cl_3OH$ were frequent answers.

11(a) Problem solving – design and plan
Responses were extremely variable; while some answers were excellent, many candidates showed no real understanding of what would actually work. Also, the quality of the diagrams was generally extremely poor with few candidates using a ruler.

11(b) Problem solving – design and plan
Answers like 'time of reaction', 'pH of solution', and 'temperature', etc. indicated that many candidates were very poorly prepared for this type of question.

Q12(a) The idea of excess
Many candidates failed to appreciate the need to make the comparison based on the number of moles of reactants. In calculating the number of moles of iodine, it was common to use the gram atomic mass and not the gram molecular mass.

Q12(b) Ion-electron equations
As in previous years, this type of question was very poorly done.

Q15(b) Salts of a weak acid/strong base
Common misunderstandings included 'Sodium is a strong base.' and 'Sodium ethanoate is a weak acid.'.

Recommendations

Feedback to centres

In addition to the points covered in the 'Comments on candidate performance' section, the following should be considered.

As in previous years, many questions that require recall of basic facts were still relatively poorly done. The great majority of candidates, including able candidates, could continue to improve their grades through more attention to the rote-learning of the chemical knowledge in the course. Recall of Standard Grade/Intermediate 2 content is particularly poor.

Achievements in relatively straightforward PPA questions were often disappointing and centres may benefit from a review of the way that such practical work is approached and revised.

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.

Each year there is at least one problem-solving question that requires candidates to think about an unfamiliar experiment (for 2004, see Q11). It is clear that many candidates are 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 2004, see Q17). 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 involve more extended writing by candidates (for 2004, see Q15). It is clear that some candidates are better prepared than others for this type of question.