SCOTTISH QUALIFICATIONS AUTHORITY

Principal Assessor Report 2003

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

Statistical information: update

Number of entries in 2002	
Pre appeal	9,551
Post appeal	9,560

Number of entries in 2003	
Pre appeal	9,290

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 at Higher shows a decrease of 440 from 2000, this year’s distribution of attainment suggests that many of the ‘lost’ candidates have been from the bottom end of the ability range, some having gone to Intermediate 2 Chemistry, others to more appropriate courses.

Grade Boundaries at C, B and A for each subject area included in the report.

Maximum Mark for Higher Level = 100

Grade Boundaries expressed as a percentage mark in brackets

Year	Upper A	A	B	C
2002	86 (86%)	77 (77%)	62 (62%)	47 (47%)
2003	84 (84%)	76 (76%)	62 (62%)	49 (49%)

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 syllabuses evolve and change

Comments on grade boundaries for each subject area

Given a very consistent examination, there is very little room for manoeuvre regarding cut off decisions.

Taking account of the change in structure of the examination (no grid items), setting and marking strategies to address the relatively low cut-off at the pass/fail interface as well as comments on the examination, a rise in the pass mark by 2 or even 3 marks was anticipated if standards and quality of achievement were to be maintained. The rise by 2 marks in line with expectations actually increased the percentage pass rate. The statistics for Section A, distribution of performance and the very negative national rating for the subject influenced the decision for a cut-off 49 rather than 50. With comments on the increased difficulty of the examination at the top end and in line with a setting strategy to lower the cut-off, a decrease by 1 mark was judged to be appropriate at the A/B interface. The resulting increased A rate recognised improved levels of achievement in more discriminating questions.

The cut-off scores applied were close to teachers' estimates for both grade A and grade C.

The cut-off for an upper A (84%) continues to be in line with the other science subjects.

Comments on candidate performance

General comments

It is pleasing to report that although chemistry clearly continues to be perceived as a ‘difficult’ subject, there is a significant decrease in the number of candidates who make little of the examination. This would appear to be linked to improved levels of achievement at the bottom end of the ability range as well as to the decrease in the number of entries. In addition, the performances of the candidates at the top end continue to be very satisfactory.

Areas of external assessment in which candidates performed well

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

Q1(a)	Organic naming
Q2(a)	Kevlar property
Q3(a)	Half-life
Q4(b)	Hess’s Law calculations
Q5(a)	Synthesis gas
(b)	Organic reactions
(c)(i)	Organic structural formulae
(ii)	Themosetting plastics
Q6(b)	Ester structure
Q7(c)	Strong/weak acids
Q8(a)(i)	Organic structures
(b)(i)	Organic reactions
Q11(a)	Potential energy diagrams
(b)(i)	Catalysts
(b)(ii)	Catalyst/potential energy diagram

Questions on organic chemistry were generally particularly well done. Also, there was some improvement in answers to PPA questions and the more encouraging performance in questions involving calculations was again maintained.

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.

Q4(a)	Problem solving
Q6(c)	Percentage yield calculations
Q8(a)(iii)*	Ion-electron equations
Q10(b)*	Equilibrium
(c)*	Problem solving calculation
Q14(c)	Balanced equations
(d)*	Precipitation reactions
Q15(b)(i)*	Organic structures
Q16(b)	PPA

Areas of common misunderstanding

Note that types of questions marked * were also mentioned in 2002

Q6(c)*	Percentage yield calculations This proved to be a relatively difficult calculation.
Q7(a)	The idea of excess Many candidates failed to take account of the one mole magnesium: two mole of acid relationship.
Q7(b)	Experimental procedures The quality of answers were extremely variable; while some answers were excellent, with the additional piece of apparatus drawn with a ruler, many candidates showed no real understanding of what would actually work.
Q8(a)(iii)*	Ion-electron equations Many candidates tried to write a redox equation involving silver ions.
Q10(b)	Equilibrium Answers involving movement of solvents were common.
Q11(b)(i)*	Catalysts A small number of candidates confused heterozygous, a genetic term, with heterogeneous.
Q11(c)(i)	Calculation The units given often included the (g) for gas.
Q12	Intermolecular forces While candidates tended to be aware of the names of the intermolecular forces involved and their relative strengths, few were able to explain how the intermolecular forces arise; covalent bonds were often classified as intermolecular forces and hydrogen bonding was often described in terms of the –OH bond within a molecule rather than a bond between different molecules.
Q14(c)*	Balanced equations Writing formulae is still a great difficulty with a significant number of candidates; calcium hydroxide was often written as CaOH.
Q14(d)*	Precipitation reactions Very few candidates recognised that magnesium carbonate is insoluble in water.
Q15(b)	Carboxylic acids The reaction of the carboxyl group with alkali is very poorly understood.
Q16(a)	Electrolysis calculation Many candidates did not use two moles of electrons for one mole of hydrogen gas in the calculation.

Recommendations

Feedback to centres

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

Although 2003 saw a significant improvement, many questions that require recall of basic facts are 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.

Candidates should 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.

Further practice in writing formulae and balancing equations would prove helpful to many candidates.