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Report on the Examination in

SCIENCE: CHEMISTRY

Syllabus Code 1375

SUMMER 1994

SCIENCE: CHEMISTRY

(Syllabus Code: 1375)

GENERAL INTRODUCTION

The percentage of candidates awarded each grade was as follows:

	A*	A	B	C	D	E	F	G	U
Percentage in Grade	6.5	20.7	27.6	18.6	13.2	7.4	3.9	1.4	0.5
Cumulative Percentage in Grade	6.5	27.2	54.8	73.4	86.6	94.2	98.1	99.5	100

These statistics are correct at the time of publication.

The total entry for the examination was 11 275, a decrease of 2125 candidates from the entry last year.

The entry this year was of high quality with fewer poor performances recorded. Overall the standard was very good. This improvement in overall candidature is reflected by the quality of the grades awarded, with almost three-quarters of the entry obtaining Grade C or better.

For the first time the new grade A* has been awarded.

Once again, the degree of positive achievement by all candidates was high, there being very few questions unanswered.

Coursework standards now are unrecognisable when compared with those of the very early years of this syllabus. Next year sees the introduction of the new National Curriculum version of the Coursework and counting for 25% of the total marks.

Spelling, punctuation and grammar marks were awarded for components 2, 3 and 4 of the examination. It was pleasing to note the high standard of this aspect of the work.

With the introduction of a new syllabus and new examination format in 1995, it is most gratifying to see this syllabus go out on such a high standard of performance, quite easily the best encountered over the span of GCSE Chemistry 1375.

Next year questions requiring candidates to write word equations will have marks determined by outcome, with candidates merely being asked for an equation. More marks will be allocated if the response is a balanced symbol equation.

PAPER 1 – MULTIPLE CHOICE

Items in this paper had either been extensively pre-tested or had been used in previous operational papers; they had been selected to have facility values between 0.200 and 0.900. The higher the facility value an item achieves the more accessible it is to the candidates.

The mean mark was 34.8; 45 questions had a facility greater than 0.500.

The correct response to each item was as shown below.

Item	Correct Response	% Correct	Item	Correct Response	% Correct
1	B	62.1	26	D	60.2
2	C	91.9	27	D	76.9
3	D	92.6	28	E	92.7
4	D	65.8	29	B	64.8
5	E	69.3	30	C	79.7
6	A	80.9	31	E	54.1
7	D	94.0	32	B	71.5
8	C	76.2	33	B	66.3
9	D	89.3	34	C	29.6
10	C	63.6	35	D	52.5
11	B	41.2	36	C	72.0
12	A	58.2	37	D	43.9
13	C	56.0	38	C	67.3
14	C	82.2	39	C	90.6
15	C	75.7	40	B	86.9
16	E	59.9	41	C	58.6
17	C	88.7	42	E	77.7
18	B	63.9	43	D	84.5
19	D	68.6	44	C	75.9
20	E	87.6	45	E	95.7
21	C	67.6	46	A	38.5
22	E	64.5	47	C	55.3
23	D	52.5	48	D	53.2
24	C	59.0	49	E	49.8
25	B	77.1	50	D	55.4

PAPER 2

General Comments

The overall standard of achievement by the candidates this year was high.

The majority of the entry coped well and produced good quality work. There were fewer low scores than last year.

As on previous occasions, it was pleasing to see the majority of candidates attempting all the questions. Predictably, the question most often shunned was the calculation, Question 11.

As in the past two years, up to five marks were awarded for spelling, punctuation and grammar. On a paper such as this, with limited opportunities for writing extended prose, the spelling of the candidates tends to come to the fore as the major criterion for the award of marks.

Using subjective judgements, it certainly seems that the spelling of scientific terms has improved, with examiners awarding slightly higher marks for spelling, punctuation and grammar.

Alas, it was somewhat disappointing to see in a minority of cases, words used on the paper and Periodic Table wrongly spelled.

Most pleasing were the majority of scripts well written, particularly those using black or blue ink as compared with biro.

Common errors remain and, for the benefit of teachers and candidates, attention is drawn to the following:

1 Multiple answers being given where only one is required, eg Question 9(d), where a few candidates gave multiple answers to parts (i) and (ii). Examiners are instructed to award zero marks in such cases.

2 Candidates in some instances ignore, or do not comprehend, the marks awarded for each part of a question. Far too often candidates gave one word answers when two or three marks were on offer, eg Question 4(a)(iii), and two lines or more given for the answers.

3 To help the candidates this year, as far as possible they were asked to give a name or formula, eg Question 1. However, examiners were instructed to be strict in other instances where a name **or** formula was required.

4 A few candidates gave vague, unqualified answers in some parts of the paper, eg Question 7(c)(ii), just the word "pollution" without reference to anything else.

As already indicated, writing and general presentation were good.

Specific Comments

Question 1

Designed as an easy starter, this opening question did provide the candidates with at least four or five marks, with part (f) providing slight differentiation.

(a) 'Nil" was not accepted.

(c) Allowed were silver, gold, platinum and copper but **not** aluminium or lead.

(e) Both calcium and argon were accepted.

(f) Here any named group 1 element **or** copper or silver was accepted. The charge was not required.

Question 2

Well answered in part (a) with (b) providing some differentiation. In (a)(i) and (ii) few candidates wrongly interpreted the information, particularly in (i) where 'three' was the most popular wrong answer.

In (a)(iii) candidates wrongly referred to using different liquids or using different solvents. Some wrote about "more experiments", which was not accepted unless qualified.

In (b)(i) most candidates scored the mark for reference to reaction rate or increased surface area. However, reference to breaking down the cells to release the colour was also accepted.

Part (ii) was the least well done with some candidates not realising that water does not dissolve colour. There were a number of vague answers, such as "it works" or "not enough dissolved".

Part (iii) was well answered with "sieving" being accepted in this particular case.

Question 3

Well answered by the majority of candidates. The most common error here was 'D' in part (b) and 'A' in part (d).

There were a few multiple answers.

Question 4

A question which, perhaps surprisingly, provided more differentiation than anticipated, in particular part (a).

The words "process" in (i) and "change of state" in (iii) created a few problems for some candidates.

In (i) 'evaporation' and 'vaporisation' were accepted but not 'transpiration'.

In (ii) 'cooling', 'condensation' and 'precipitation' were all accepted.

In (iii) 'cooling' had to be stated, implied or explained. Some candidates referred to clouds rising, without any other explanation.

Part (b) was well answered by the vast majority of candidates.

In (ii) 'chlorine', 'chlorination', 'ozone', 'boiling' and 'sterilising tablets' were all accepted.

Question 5

This differentiated well but still allowed most candidates to score reasonable marks.

(a) (i) "Clear" and "colour changes" were not accepted. The mark was awarded for the final colour.

(ii) Well answered and well-known but even here vague answers such as "to make plastics" were received but not accepted.

(b) (i) Reasonably well-known but a surprising number of candidates referred to the production of octane and ethene.

(ii) Well answered.

(iii) C_2H_6O was accepted in addition to C_2H_5OH. Many candidates tried to add various "bits and pieces" to the equation to give products of which they knew the formula!

(c) (i) Well answered and very few bar graphs were drawn.

(ii) The range of 210 °C to 225 °C was accepted, the marks being given consequentially to the graph.

(iii) Well answered. It was decided to make this part an "easy" mark; hence as long as candidates had the right general idea the mark was awarded.

(iv) This part was well answered and marked using the following guidelines:

Supply or more available.
Economic consideration, ie more affordable.
The need, ie climatic consideration.
Technology or industrial slant.

Answers referring to pollution or "Africa has none" were not accepted.

Question 6

A good differentiation, in particular part (a)(iv) and (b).

(a) Fairly well answered with the most common wrong answer being (ii) 5 neutrons (iii) Group 2/3. Part (iv) was answered badly with only the much better candidates scoring the mark.

(b) (i) The most common wrong answer here was X_2 instead of 2X. Some candidates had little idea how to balance the equation.

(ii) This was fairly well answered with most scoring at least one mark. Here a mark was awarded for fact, the other for explanation.

(iii) Well-known by the majority.

Question 7

Generally well answered by the majority of candidates.

In part (a) correct formulae were accepted in addition to names. Part (b) was well-known.

(c) (i) It was decided to award the marks with the following provisos:

A reason regarding the soil for one mark, eg replenish nutrients in soil.

A reason regarding economics for one mark, eg to increase profits.

However, two marks could be awarded for two reasons involving crops, eg to improve crop quality, to increase crop yield.

References to adding minerals, crumb structure, make food look better, adding NPK, unless qualified, were not accepted.

(ii) Well answered but reference to pollution had to be qualified.

(iii) Well answered but reasons relating to cost, longer lasting or re-usable were not accepted.

(iv) Well answered.

Question 8

A good differentiator.

(a) (i) The name was often correct but less managed a correct formula with MgO_2 and Mg_2O being given.

(ii) Well answered with the majority of candidates having the right idea. A common wrong concept was that the magnesium powder could be blown around.

(iii) Well answered but some candidates referred to the uses of compounds, eg magnesium sulphate instead of magnesium metal.

(b) This differentiated well.

(i) Most candidates got the mark, the most common error being copper and iron the wrong way around.

(ii) Well answered but several candidates gave a glowing splint for the test, which was marked incorrect.

Each part was marked independently.

(iii) Only the better candidates scored both marks.

A common error was to give calcium oxide and/or water as a product. The symbol equation was marked consequentially to the word 'equation'.

(iv) Well answered.

Question 9

This also provided good differentiation.

(a) (i) Well answered.

(ii) Solids/insoluble materials/the metal were all accepted, but not impurities and residues.

(iii) Specific answers referring to steel or plastic were required. If 'it' was used the assumption was that 'it' referred to the plastic pot.

Cost was not accepted.

(b) (i) Here the marks were awarded as observation one mark, reason one mark. Most candidates scored a single mark on this part with the two rather harder to achieve.

(ii) Well answered. In this part the result of the test was not required.

(c) Once again the marks were awarded for the result and the reason.

(d) Well answered by the majority but in (iii) comparison and control, written or implied, were the key words.

Question 10

Another good differentiator.

(a) Not as well answered as expected with candidates not scoring the mark for substance Y as one would have expected.

(b) Parts (i) and (ii) were well answered but parts (iii) and (iv) differentiated well with some guesswork involved.

Here some candidates ignored the phrase "one code letter" writing in complete equations which, if in the right space, were accepted.

(c) (i) Badly answered to some extent because of vague and repetitious answers. In (ii) virtually any item made from steel was accepted. However, far too many candidates failed to read the question properly and included aluminium, paper and glass in their answers.

Question 11

Predictably, parts (b)(i) and (c) were the principal differentiators in a question which otherwise was well answered.

(a) (i) Well answered.

(ii) Well answered other than, in some instances, candidates went outside the information in the bar chart.

(iii) Less well answered than (i) and (ii) with too many candidates giving answers relating to pollution and water.

(b) (i) A good differentiator.

(ii) Here some candidates failed to mention that the sulphur dioxide reacted or combined with water. Many used the word "mixed", which was not accepted. "Dissolves" or "reacts" were the key words here.

(iii) Well answered.

(c) (i) The using of atomic numbers and not atomic masses caused problems for some.

(ii) An attempt was made in this part to encourage the candidates to give the thought process and working needed to obtain the answer. This worked for the more able candidates, although even some of these had little or no idea how to answer.

Conclusion

The target group performed well on this paper with very few candidates with low marks. This paper proved to be very accessible at grades E and F.

The paper seemed to suit the candidates better than that of last year and it was pleasing and gratifying to see such quality work.

At the time of writing no comments have been received from any Centre.

There was no evidence to suppose that the paper was too long.

PAPER 3

General Comments

The scripts were well presented and there was no evidence of any time problem. Almost all candidates attempted all questions, though with varying degrees of success. Common weaknesses were in the analytical and mathematical areas of the syllabus but comment on environmental issues was more detailed than has been the case on occasions in the past.

Specific Comments

Section A

Question 1

This question proved to be difficult for many candidates who were unable to identify carbonate ions in salt X or ammonium ions in salt Y. Some consequential marking was available for those who failed to identify the compounds fully, but not to the extent of allowing candidates to write their own question. Despite the clear insolubility of X, it was often given as sodium carbonate, whilst salt Y was rarely a sulphate. Salt Z was regularly appreciated as a copper salt but the correct formula was rare and the ionic equation almost never seen.

Question 2

This relatively straightforward question proved a rich source of marks for many candidates. Common errors were to include iron in (b), calcium carbonate in (c) and lead metal in (e).

Question 3

Almost all candidates calculated the relative molecular mass of methanoic acid and many correctly calculated the mass in 250 ml of solution. However, only the stronger candidates were able to convert to moles and to dm^3. While the chemical name for kettle scale was widely known, very few candidates appreciated that carbon dioxide and water were amongst the products and only a handful gave a correct equation. In the final part the mark was awarded for relating washing to the **hazards** of the descaler.

Question 4

In the first three sections, most candidates were able to interpret satisfactorily the information in the table but in the last part many candidates focussed on the density differences rather than abundances and reactivities.

Question 5

In (a) and (b), candidates who appreciated that the conditions in the furnace were designed to separate the lead and the zinc scored well. Others gained some credit from identifying the physical states at the specified temperatures. Most made sensible comments about energy conservation. In (c), the relative positions of zinc and chromium were well understood and explained but only a minority were able to interpret the statements relating to strontium and rhodium correctly.

Section B

Question 1

Stronger candidates were able both to identify problems and suggest a pleasing range of possible solutions, whereas the weaker ones could only offer a passionate plea for action.

Question 2

In (a), at all levels, there was considerable confusion as to the nature of ionic and covalent bonding and of the typical properties of such compounds. Even candidates who understood the principles of the bonding often erred in describing and accounting for the physical properties. Part (b) discriminated between candidates in the extent to which **detailed** differences were recalled. For example, "They are different colours" and "They have the same number of electrons in the outer shell" did not score. By contrast in (c) there were many detailed accounts of the benefits and disadvantages of chlorine and its compounds, most commonly the use of the element for water treatment.

COURSEWORK

Once again, the moderation of GCSE Coursework has been carried out effectively. This is due to the expertise developed within the team of moderators and the awareness of the teachers in the Centres to the requirements of moderation.

There were few new ideas for assessment tasks seen by the moderators. This is to be expected as this is the last year of the present system. Many Centres are still using suggestions provided in training in 1988. Where new ideas were seen they had obviously been developed with Sc1 in mind and showed the benefits of Sc1 training. It is important to remember that no Skill A, B or C task currently used or previously supplied by MEG in training is at all suitable for the new Coursework arrangements based on Sc1 of the National Curriculum. A few Skill D tasks might be suitable, **with modification**, for the new Coursework system.

Two changes this year which need to be commented on are annotation of samples and the application of spelling, punctuation and grammar. Both of these are as a result of the imposition of the Mandatory code by SCAA.

Paragraph 79 of the Code requires teachers to annotate each piece of Coursework to show how marks were awarded in relation to the marking criteria defined in the syllabus. Some Centres did not do this and, although their candidates were not penalised in any way, they were reminded individually in the Report to Centres of this requirement. Some Centres annotated the work by stapling an additional sheet while others wrote clearly in red on the first or last page. Either method is acceptable, although the second is probably less work for teachers and avoids the chance of the piece of paper becoming detached.

Most Centres applied the additional marks for spelling, punctuation and grammar adequately according to the rules applied in Section 125 of the Mandatory Code. No Centre had marks reduced just because of a generous interpretation of the criteria for SPG. However, in any Centre where a reduction was justified this reduction may have been increased or decreased according to the application of SPG.

All of the comments made in previous reports could still be made. These include:

1 Lack of suitable challenge in Skill A assessments to justify high levels.

2 Over-emphasis on the use of tick lists specially for Skill A.

3 Confusion over the use of formats for Skills B and C.

4 Not distinguishing Skills B and C.

5 Lack of true planning in Skill D.

Of these, the lack of true planning of Skill D is most important as a Centre falling into the trap now will have even more problems with Sc1 in the future. A true investigation needs some true planning. It cannot be a repeat of an exercise of the previous week or month. Having carried out experiments with sodium thiosulphate and acid for rate of reaction, it is unwise to use it again for an investigation. There must be some degree of freedom for the candidates. There must also be opportunities for the candidates to do some true evaluation.

Some Centres still have problems in internal standardisation (Paragraph 81 of the Mandatory Code) and it is not always the very large Centres who perhaps could claim to have the most problems in this respect. It is very useful for the moderator to know the steps that were taken to ensure internal moderation.

Another problem is marking the samples of work according to criteria. The syllabus gives some general criteria to describe levels 2, 4 and 6 for each of the four skills. It is essential then for the teacher to write specific criteria for the assessment that fit the syllabus criteria but are specific to the task. These should be sent to the Moderator who can check

1 that the specific criteria match the criteria in the syllabus;

2 that the teacher or teachers have marked strictly according to these criteria.

Adjustments of marks could be made if either or both of these were found not to be the case, although not for one or two slight differences. This procedure is in accordance with that laid down in the Mandatory Code (Paragraph 81).

In conclusion, in the seven years since the introduction of GCSE, there has been a steady improvement in the quality of work submitted for moderation and in the teacher's understanding of Coursework. Next year there is a big change in the Coursework requirement and teachers should plan for this by

1 finding out about the Sc1 situation in Science from colleagues in local Centres or local meetings of teachers;

2 looking critically at assessments used and devising true investigations;

3 starting the assessments early so that the bulk of the Coursework is not left until the end of the spring term or beginning of the summer term in year 11 when the emphasis should be on revision for the theory papers which account for 75% of the marks.

Grade Threshold Marks

Credit of up to 5% of the unscaled marks was available for spelling, punctuation and grammar in components 2, 3 and 4. In the Component Threshold Mark Table which follows, the respective component maximum mark totals include marks for spelling, punctuation and grammar.

Candidates' performances were assessed on each component. The minimum level of performance (the threshold mark) was determined for each grade. These thresholds are given below as unscaled marks (ie, the scale of marks used by the Examiners).

The relevant component thresholds were then related to each other in accordance with the component weightings to fix the overall threshold marks for each option. Each overall mark is shown below as a percentage.

Component Threshold Marks

Component	Max. Mark	A	B	C	D	E	F	G
1 Objective Test 1	50	–	–	35	30	25	20	15
2 Paper 2	99	–	–	70	62	54	46	38
3 Paper 3	76	52	42	–	–	–	–	–
4 Coursework	101	88	77	66	56	46	37	28

Overall Threshold Marks: Option A

	Max. Mark	A*	A	B	C	D	E	F	G
Components 1, 2, 4	100	–	–	–	70	61	52	43	34

Percentage of Candidates awarded each grade

Total Candidature: 918

	A*	A	B	C	D	E	F	G	U
Percentage in Grade	0	0	0	10.5	19.3	29.8	24.6	11.8	4.0
Cumulative Percentage in Grade	0	0	0	10.5	29.7	59.6	84.2	96.0	100

Overall Threshold Marks: Option B

	Max. Mark	A*	A	B	C	D	E	F	G
Components 1, 2 4	100	–	–	–	70	61	52	43	34
Components 3, 4	100	83	71	59	–	–	–	–	–

Note: All candidates were required to obtain a qualifying performance in Components 1, 2 and 4 in order to be considered for the award of a Grade A or B on their performance in Components 3 and 4.

Percentage of Candidates awarded each grade Total Candidature: 10 195

	A*	A	B	C	D	E	F	G	U
Percentage in Grade	7.1	22.5	30.1	19.3	12.7	5.6	2.1	0.5	0.2
Cumulative Percentage in Grade	7.1	29.6	59.8	79.0	91.7	97.3	99.4	99.8	100