RECOGNISING ACHIEVEMENT

GCSE

Chemistry B

Gateway Science Suite

General Certificate of Secondary Education **J264**

OCR Report to Centres

January 2012

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Oxford Cambridge and RSA Examinations

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This report on the examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

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Chemistry B (Gateway) (J264)

OCR REPORT TO CENTRES

Overview

The examination papers were the first for the new specification and there was evidence that a small but significant proportion of the candidates that took the Foundation Tier could have successfully taken the Higher Tier. As with the legacy specification the majority of the candidates took the Higher Tier paper. Both examination papers allowed candidates to demonstrate positive achievement in GCSE Chemistry. There was no evidence that candidates did not have sufficient time to finish the examination papers.

Many candidates did attempt the six mark extended answer questions although there was still a significant number of candidates that did not attempt at least one of these questions. These questions were marked using a level of response mark scheme that allowed candidates who attempted the question the opportunity to get some credit. In some questions candidates took the opportunity to support their written answers using diagrams or equations. Centres should encourage candidates, where appropriate, to use equations or labelled diagrams to enhance their written communication.

Candidates had particular difficulty with questions that addressed Assessment Objective 3 (Analysis and Evaluation) and often did not make reasoned judgements or could not explain how experimental results supported a conclusion. Some candidates had similar difficulties with questions that addressed Assessment Objective 2 (Application) because these questions involved using knowledge and understanding rather than just recalling knowledge.

Both examination papers demonstrated that candidates had not mastered some of the new topics included in this specification. In particular, questions that addressed the Fundamental Scientific Process item and atom economy, proved difficult for candidates.

These examination papers have an increased proportion of quantitative questions and although these were often well answered, candidates must be reminded of the need to be careful about the use of significant figures, decimal places and standard form.

B741/01 Modules C1, C2, C3 (Foundation Tier)

General Comments

It was clear that some candidates prepared well and were successful as a result. A significant number of candidates (about 10%) would have been better served by entry to the Higher Tier paper. These were candidates who scored over 50 marks. Some of the new aspects of the examination papers proved difficult for many candidates. The 6 mark questions were marked using a level of response approach. Candidates attempted to answer the questions and therefore almost always gained some credit. The exception to this was question 3 where just under a third of candidates omitted the question. Candidates need to address **all** aspects of the questions to gain access to the higher levels. Candidates also struggled with the new style questions assessing Assessment Objective 3 (Analyse and evaluate evidence, make reasoned judgements and draw conclusions based on evidence). Candidates need to quote specific examples of the data to support a conclusion, rather than make generalised statements. Question 14(b)(i) is a good example of this.

Candidates continue to perform well in calculations and more care was taken, in this session, with writing chemical formulae correctly (using the correct case and subscripts).

Overall, examiners felt the question paper was appropriate to the ability range of candidates intended. There was no evidence of lack of time.

The mean mark for the paper was 36.2 and the standard deviation was 12.6.
40 marks were required to gain grade C and 12 marks for grade F.

Comments on Individual Questions

Section A

Question 1

(a) Very few candidates scored both marks on this question, although many scored one mark, usually for ‘irreversible’. Common unacceptable answers included ‘changes colour’ or references to taste and texture.

(i) About a third of candidates scored this mark. A number of candidates named incorrect gases such as ‘hydrogen’, ‘oxygen’ or ‘air’ and failed to score.

(ii) Both marks were gained only by the better candidates. A number correctly positioned the formulae but did not then balance the equation scoring one mark.

Question 2

(a) This question was well answered with most candidates correctly identifying compound **C**.

(b) Again, this was well answered with the appropriate use of subscripts in the majority of cases. Weaker candidates often stated ‘butane’ or ‘propane’.

(c) A number of candidates scored both marks for ‘contains carbon and hydrogen’ (1) ‘only’ (1). Weaker candidates tended to score the first mark.

Question 3

As stated earlier, about a third of candidates omitted this question, which was targeted at all grades up to and including grade C. At level 1 (1 or 2 marks), candidates were required to name poly(propene) **or** give a condition **or** a simple description of polymerisation. Most answers seen were at level 1. At level 3 (5-6 marks), as well as naming poly(propene), candidates needed to give a condition and a complete description of polymerisation. Few managed this. A number of candidates confused polymerisation with cracking and failed to score.

Question 4

(a) This question was well answered with most candidates correctly naming petrol.

(b) Again this question was well answered. Most candidates talked about oil spillages and better candidates gave a problem associated with spillages eg damage to wildlife or beaches.

(i) This question was answered correctly by the majority of candidates.

(ii) Most candidates scored one mark for a simple description of cracking. Better candidates correctly gave a condition and gained the second mark.

Question 5

(a) This question was well answered with a number of candidates scoring all three marks. Most candidates correctly identified perfume **C** (with perfume **B** being the most popular incorrect choice). They usually identified a suitable property (often more than one). The best candidates then linked the property to why it was important and scored the third mark. When perfume **B** was selected, candidates could score the mark for identifying a property but rarely scored the third mark, as the links were often incorrect.

(b) This question was well answered.

Section B

Question 6

(a) This question was correctly answered by about two thirds of candidates. ‘Steel’ and ‘limestone’ were common incorrect answers.

(b) Only one fifth of candidates correctly identified lead. The most common incorrect answer was ‘brick’.

(c) Just under half of candidates chose granite and could justify it as being the **hardest.** Steel was commonly incorrectly quoted, with a number of candidates confusing strength with hardness.

(d) This question was well answered with most selecting steel for its strength.

In general terms, candidates have not yet developed the skills of analysis required for this type of question.

Question 7

(a) About half of all candidates could extract the information from the flowchart to write the word equation correctly. Frequently the conditions were included in the body of the equation which failed to score. It was acceptable (but not necessary) for the conditions to be included either above or below the arrow.

(b) This question was well answered.

(c) Over two thirds of candidates correctly answered this question.

(d) **(i)** Again most candidates could select the appropriate line and read the values correctly.

(ii) Many candidates scored one mark for realising that it was expensive to generate either high pressures or temperatures, but only a few linked this to energy costs or equipment costs for the second mark.

(e) About a third of candidates scored this mark. Predictably '4' was the most frequent incorrect answer followed by '9'.

Question 8

(a) This question was very poorly answered. Oxygen was frequently incorrectly included in the answer. A number of candidates wrote down all four elements, clearly not understanding the term 'essential elements' even though it was emboldened in the question.

(b) **(i)** This was well answered by most candidates. A small number thought that fertilisers were absorbed through the leaves or the stem.

(ii) Most candidates scored at least one mark on this question. Vague references such as 'helps plants grow' or 'plants grow better' did not score. Pleasingly a number of candidates referred to eutrophication.

Question 9

(a) This question was aimed at grades E, F and G and scored well. Significant numbers of candidates were able to reach level 3 (5-6 marks). The mark scheme required the naming of the core, mantle and crust but, pleasingly, many candidates included the inner and outer core and the lithosphere. The results of the meeting of tectonic plates were well known.

(b) This question proved more challenging. The mark scheme required the idea that the crust is too thick to drill through and that seismic waves need to be used. Commonly answers were vague or referred to the use of satellites.

Section C

Question 10

(a) About half of candidates understood the difference between a batch and a continuous process.

(b) Most candidates scored at least one mark on this question. 'Wages', 'energy', 'legal costs' and 'raw materials' being the most common correct answers. A number of candidates included 'packaging' or 'transportation' which were not acceptable.

(c) Again most candidates gained at least one mark and many scored both. The favoured answers were that tests on animals could give different results than with humans or the idea of cruelty to animals. The mark scheme gave credit to a wide variety of answers.

Question 11

(a) This question was well answered by over four-fifths of candidates. Nonane was almost always identified correctly and most scored the second mark for recognising that nonane has the largest temperature rise (often calculated alongside the table). A number of candidates stated that nonane had the highest finishing temperature and lost the second mark.

(b) Again, this question was well answered. Common incorrect answers were '2' or '3'.

Question 12

(a) Just over half of candidates could calculate the relative formula mass of sulfuric acid correctly. A number either could not perform the addition accurately or tried to multiply the relative atomic masses and failed to score.

(b) Less than 10% of candidates scored this mark. Atom economy is new to the specification and was not well understood. The question was omitted by more than half of candidates.

(c) Again this was very poorly answered. Few candidates referred to a low atom economy or a lot of waste products. A lot of vague references to pollution were seen. One-fifth of candidates omitted the question.

Question 13

(a) Most candidates scored one mark on this question and a number scored both. 'Graphite has a low melting point' and 'graphite is extremely hard' were common incorrect answers.

(b) Less than half of candidates could correctly identify diamond. Common incorrect answers included 'graphene', 'Buckminsterfullerene, 'limestone' or named alkanes or alkenes.

Question 14

(a) This question was well answered by most candidates. A few tried to write a symbol equation and, because the formulae were incorrect, lost the mark.

(b) **(i)** This question was not well answered. Candidates, by and large, did not refer to specific experiments when writing their answers. Rather they wrote in general terms. The mark scheme required candidates to name and compare experiments **A** and **B** for the effect of temperature and **A** and **C** for the effect of concentration. Answering questions of this type is likely to be an area of focus for centres as they prepare candidates for future examinations.

(ii) This question was targeted at all grades up to and including grade C and was common with the Higher Tier paper. About two-fifths of candidates either omitted the question or failed to score, usually because they did not use collision theory. About 10% of candidates achieved level 1 (1-2 marks), about 20% achieved level 2 (3-4 marks) and a similar number achieved level 3 (5-6 marks). At level 1, a reference to the number of collisions was required. At level 2, either a full explanation of one factor or a partial explanation of both factors was required and for level 3 a full explanation of both factors was required. A number of candidates referred to concentration which was not worthy of credit.

B741/02 Modules C1, C2, C3 (Higher Tier)

General Comments

In contrast to some initial concerns expressed by centres, the three long questions were well answered by the majority of candidates according to their ability. The common question on collision theory was particularly well answered, with many candidates giving answers better than in previous years. Marks of 4, 5 and 6 were not uncommon. In a second long question, candidates answers displayed a good understanding of subduction.

Questions relating to the new topic 'atom economy' were not well answered and centres should ensure that candidates are better prepared in the future. Similarly, the mathematical demands of the paper have changed slightly, so candidates in the future must be expected to give answers to the specified number of significant figures if so requested.

Data interpretation questions are usually well answered. If however, candidates are asked to explain their choice, eg if granite was chosen, the explanation for the choice was often not explicit. Candidates' knowledge of properties was once again wanting. Many candidates confused hardness and strength.

Comments on Individual Questions

Section A

1 **(a)** Most candidates named the correct gas 'carbon dioxide'– the most common incorrect answers seen were 'hydrogen' and 'sodium hydroxide'.

(b) Most candidates correctly referred to the protein molecule denaturing or changing shape. Some candidates described macro changes – such as reference to a change in the texture of the meat.

2 **(a)** This was well answered with the vast majority of candidates giving an answer in the acceptable range.

(b) Most candidates managed one mark, often on the 'yes' side. Several candidates gave vague non-scoring answers such as 'the population increases and so does the level of CO_2'. Also several non-scoring answers referred to respiration.

3 **(a)** Candidates seem well prepared for this question with most now including the word 'only'. Some still lost marks by referring to 'molecules' of hydrogen and carbon.

(b) Overwhelmingly correctly answered; candidates are confidently writing molecular formulae correctly.

(c) Another well answered question. Most candidates described the presence of the double bond as indicating unsaturated compounds. Some candidates gave answers referring to 'availability of bonds/spaces to add further atoms on'; this was not given credit.

(d) This question discriminated very well with the full range of marks being used. It was targeted at grades B and above. Many candidates were quoted heavily from the stem of the question. However, the level awarded was largely dependent on the quality of the displayed formula shown – those that did not attempt a formula often

gave low quality written responses with very few candidates quoting the conditions needed. Many displayed formulae contained a double bond or omitted the 'n' after the brackets. There were however many excellent answers.

4 **(a)** Not a high scoring question with few 2 mark answers being seen. The 'for' responses often referred to price ie 'oil from these countries being cheaper' and hence did not score this mark. The 'against' reason was often based around the view that this was an exploitation of the people of these countries.

(b) Again, not high scoring. The most common non-scoring answers were based on where in the fractionating column these fractions come off, ie 'LPG comes off at the top of the tower so it has a lower boiling point'. Also many candidates seemed to have the idea that intramolecular bonds are broken in a change of state.

(c) Lots of good descriptions of cracking were seen – but they often scored only one mark due to a lack of reference to a named fraction to be cracked.

(d) Most candidates managed one mark, with many getting both marks. Failing to compare energy output with petrol caused many candidates top lose a mark or, in the case of hydrogen, that it produced most energy.

(e) Most scored one mark for correct formulae but only a minority got the balancing mark. It was very common to see 2 as the coefficient prefixing O_2

Section B

5 **(a)** A majority chose steel as their most scratch resistant material – presumably linking this to strength rather than hardness.

(b) Most candidates scored 2 marks here – although a few candidates chose copper.

(c) Few candidates scored more than 1 or 2 marks. Majority of candidates made no attempt to link use to property. Many candidates gave a list of properties classing each one as good or poor. Very often 'properties outside of the table were given eg cost, looks.

6 parts **(a) (b)** and **(c) (i)** were all well answered.

(c) **(ii)** This was poorly answered – many got the catalyst mark – a few also scored a mark for high pressure being expensive – but not many picked up both the required points, comparison of yield with rate of reaction for why a temperature of $450^{o}C$ is chosen.

7 **(a)** About half of the candidates completed the word equation for neutralisation with the word 'salt'.

(b) Fewer candidates than in (a), named nitric acid as the acid and potassium hydroxide as the base for one mark. Nitrogen and potassium were often given as answers.

(c) Large numbers of candidates were able to total the number of atoms in the formula of ammonium phosphate as 20. A number of candidates chose to add up the atomic masses of the elements.

8 **(a)** Subduction was often well described, with much essential detail of relative density, movement and consequences included in the candidates answers. Description of the theory of plate tectonics was often less well done – with many vague descriptions of what the plates are and where they are positioned. In general there were many excellent answers and showed the good attention given by centres to the specimen assessment questions.

(b) One mark was the common score here – often gained for a correct comment about the increase in temperature as you go deeper. Lots of vague answers seen about the difficulty of digging into the crust – ie without suggesting that it was the distance that was the difficulty.

Section C

9 **(a)** Where candidates scored a mark it was usually because they had the idea that in a batch process you can make to demand or in small amounts.

(b) This was a poorly answered question. The majority of candidates gave answers about the cost of testing which was explicitly excluded.

(c) Some very good answers about animal cruelty and animal rights but lack of further development in order to achieve a second mark.

10 **(a)** The question was slightly more difficult than in previous year but the majority of candidates should have been able to work out the energy change, 8400J for 1 mark. 42 and 4200 were common incorrect answers.

(b) More candidates spotted the anomaly than gave the general trend and just scored one mark Many non-scoring answers arose from simply quoting the stem of the question – ie 'the larger the hydrocarbon molecule the larger the amount of energy released'.

11 **(a)** This question tested a new concept 'atom economy'. It was well answered by candidates targeting A-grades. Other candidates found it very difficult.

(b) The ability of candidates to perform percentage yield calculations has improved over the years. This year was no exception. Most candidates were able to calculate the percentage yield of hydrogen peroxide correctly.

(c) Not particularly well done – again it exposed a lack of familiarity with atom economy (very few answers were seen that referred directly to a low atom economy). The idea of waste was used by most candidates who scored the mark.

12 **(a)** Too many candidates referred to the difficulty in breaking intermolecular bonds and scored no marks. Other candidates failed to appreciate that there are many strong covalent bonds, often just talking about one isolated carbon atom.

(b) Why diamond does not conduct electricity is generally well known.

13 **(a)** Candidates must learn the formulae shown in the fundamental chemical concept items. Few candidates knew the formula of magnesium chloride, substituting MgCl into their equation and scoring 0 marks.

(i) Very few correct answers seen – this proved to be a difficult calculation – and many candidates misunderstood or ignored the request for 3 significant figures. There was a significant omit rate for this question.

(ii) This was a common question with the Foundation Tier. It was very well answered with many high level responses about collision theory. There was an improvement in the quality of answers compared to previous examination sessions. Candidates must remember to write about the correct particles in their answers.

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