OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry A

Twenty First Century Science Suite

General Certificate of Secondary Education **J244**

OCR Report to Centres

January 2012

J244/R/12J

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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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Overview

Major changes to the design of the papers, seen for the first time in this session, gave candidates a different experience to previous years. More marks were available: 60 instead of 42. More able candidates scored more of these additional marks than weaker candidates, but not in proportion to the increase in marks available. The main reason for this was probably the introduction of three six-mark questions to the paper, marked by level of response. Almost all candidates made an attempt at these questions, often writing at length. Some very good answers were seen from more able candidates, but level 3 answers were in a minority. Many weaker candidates made only one point and often repeated this through the answer. At all levels of ability, only a few candidates fully explored in their answers the areas indicated in the questions.

The papers also contained more questions that required shorter prose style answers. Many candidates lost marks because they gave incomplete answers, again not fully exploring what the questions asked. Where two or three marks were available it was common for candidates to express only one idea, hence scoring only one mark. The papers contained a smaller number of objective style questions than those in previous sessions. Performance in these questions was broadly similar. Few candidates left questions unanswered and most followed the rubric

All papers discriminated across their target ability ranges, affording more able candidates the opportunity to score highly whilst allowing weaker candidates to score a reasonable number of marks. At foundation tier level candidates performed best on questions that asked for interpretation of simple graph or table of data. Questions which demanded recall of knowledge were less well answered. At higher tier level many candidates showed a sound knowledge of most areas of the specification and the ability to apply this knowledge, though others showed a patchy appreciation of specification content.

A171/01 Twenty First Century Science Chemistry A (C1, C2, C3) Foundation Tier

General Comments

Candidates were generally appropriately entered for the foundation tier, with most candidates attempting all questions. Very few blanks were left in the questions which involved recognition or choice. The longer answer questions were generally attempted and long answers were usually written for the six mark questions.

Candidates performed best on questions that asked for interpretation of a simple graph or table of data. Questions which demanded recall of knowledge, for example knowledge of how particular pollutants are formed in the car engine, were less well answered.

Most candidates made honest attempts at the six mark questions. Most gave answers that showed a level of communication sufficient to gain the Quality of Written Communication component of the mark, with only a few giving answers using language which impeded the communication of the science. Foundation tier candidates typically gave a single point in their longer answers and should be encouraged to make more points to fully answer the task. It is also important that candidates recheck the question for the longer answer questions because many of the candidates omitted part of the task when the task had more than one instruction to follow.

Comments on Individual Questions

1 **(a)** About half of the candidates gained both marks. The commonest error was to add up only the percentages of the main gases and omit the less common gases from the total.

    (b) Most candidates commented that there are more vehicles in towns, but fewer linked this to the idea of less fuel being burned. Most knew that photosynthesis removes carbon dioxide from the air, although some wrongly chose 'respiration'.

    (c) Candidates did not know how nitrogen oxides are made. Many commented that they came from burning fuel, or vaguely 'from the engine'. Some identified that the starting reactant was nitrogen, but thought that this was in the petrol rather than in the air. Few knew that the temperature of the engine was important for their formation.

2 **(a)** The graph proved straightforward for most candidates who correctly stated 'increases' as the correct answer.

    (b) This question was targeted at standard demand and was designed to differentiate between candidates working at C or D grades. This meant that it proved very difficult for most foundation tier candidates. Most candidates gave answers in level 1 of the three levels available, usually for making points about the correlation on the graph on the facing page. Fewer candidates made other points, but some did make links between the amount of confidence and other issues such as the amount of evidence available or that asthma has many causes, not just the concentration of particulates. Very few candidates gave the detail of response necessary to access marks in level 3. The quality of communication was generally good, however, and few gave answers where the communication of science was impeded by the level of their use of language.

(c) **(i)** Candidates did not know how sulfur dioxide was made. Some gained two marks for stating that it came from the fuel when the fuel was burned, but few stated clearly that sulfur or sulfur compounds are present in fuels.

(ii) Most knew at least one of the chemicals that react with sulfur dioxide to form acid rain, but few gave both correct answers. Carbon dioxide was a popular incorrect choice.

3 **(a)** Many correctly interpreted the diagram and recognised the purpose of the strip for measurement, but there were many incorrect answers, usually focusing on safety.

(b) **(i)** Most candidates talked vaguely about a fair test being accurate or important. The commonest correct answer was to recognise that different weights would give different bending measurements, and also many mentioned the importance of reliability.

(ii) Many were confused by the need to clamp the ruler or gave ideas about the wooden strip. The marks were for recognising the need to control the size of the sample, for example the width or length of the ruler.

(c) **(i)** Most gave the correct range to gain two marks.

(ii) The best estimate was usually correct, but some lost marks by clearly showing that they had used the mode or median, rather than the mean, to work out their value.

(iii) Very few candidates recognised that the narrow range of data was important, but the frequency of the value of 34 was often mentioned and was awarded a mark.

(d) This was the second of the six mark questions. Typically, candidates mentioned using plasticisers or shortening chain length to increase flexibility, and some gave good answers which discussed polymers in terms of long chain molecules. To reach level 3, answers needed to discuss the chains moving relative to each other. Few candidates gained level 3. There was some confusion shown in that some thought that longer chains increase flexibility. Others discussed adding cross links (rather than removing them). Some incorrectly discussed using nanoparticles, perhaps after looking at question 4. As before, the quality of written communication was usually appropriate to the level of the question..

4 **(a)** Candidates did not generally know the meaning of the term 'nanotechnology' but most gained at least one of the available marks, either for knowing that nanoparticles are 'very small' or 'tiny' or for discussing an improvement in properties. Answers that used the term 'microscopic' were not accepted.

(b) Almost all candidates correctly identified that the new tennis rackets are stronger.

(c) Most gained at least one of the available two marks for identifying concerns about nanoparticles.

5 **(a)** This question was the highest scoring of the six mark questions on the paper. The main difficulty that candidates had was that most answers did not address the question fully enough to access the highest level of response on the markscheme. The question had two parts. Candidates were asked to explain what the diagrams show about the rock and how it was made, but then there is another part of the question asking them to suggest what further evidence might be found in the rock.

Almost no candidates gave a response to the second part of the question, limiting their achievement to level 2.

Most candidates described features of the rocks, such as ripple marks or shell fossils and many correctly linked the features to the mechanism for its formation, for example that it formed under the sea, from a beach or under pressure. Some answers wrongly discussed igneous or metamorphic rock. Such answers were treated as impeding the communication of correct science and were awarded the lower mark in the mark range for the answer (typically earning 1 or 3 marks, depending on whether the answer was otherwise a level 1 or 2 response).

(b) Most candidates were able to identify at least one of the necessary resources.

(c) **(i)** About two thirds of candidates gained at least one of the available two marks, but many identified only one correct pollutant effect.

(ii) Less than 15% of candidates knew that hydrogen chloride is the waste product that is used to make chlorine.

5 **(d)** **(i)** About half of the candidates knew that chlorine is linked to the treatment of bacteria. A single mark was awarded for partially correct answers such as 'to get rid of' bacteria. Some gained two by stating that bacteria are *killed*, and some discussed how chlorination stops the spread of disease. Some thought that chlorine was added to improve the taste of tap water.

(ii) Less than half of the candidates knew why chlorine in water can be harmful to health.

6 **(a)** Almost every candidate stated either that salt is a flavouring or that it is a preservative in food.

(b) **(i)** Most worked out the correct value for the total salt. Some incorrectly added up the total mass of food eaten from the list of meals.

(ii) Almost all candidates realised that the amount of salt exceeds the maximum intake.

(iii) The question included the instruction to 'use the tables'. Some candidates did not process this instruction and gave vague answers such as 'eat less of the salty foods' or 'choose low salt options'. Better answers gave clear ideas about which foods should be avoided, such as hamburgers, and what Sam should replace them with, for example fish.

A171/02 Twenty First Century Science Chemistry A (C1, C2, C3) Higher Tier

General Comments

This paper had two major changes from previous years. There were 60 marks overall instead of 42, and three six-mark level of response questions were included. Only the more able seem to have been able to gain many of the 'extra' marks. Weaker candidates were able to score only marginally more marks than they did on the 42 mark paper. One reason for this was probably the inclusion of the three six-mark free response questions. Whilst these questions did give good discrimination, weaker candidates found the exercise particularly difficult.

As in previous sessions, more able candidates showed a broad knowledge and understanding of modules C1, C2 and C3. The most able could apply this knowledge and understanding successfully to the majority of questions on the paper, including the other (not six-mark) free response questions. Many weaker candidates, however, showed sound ability in some areas but weakness in others, whilst some showed a general weakness across all three modules.

The majority of candidates followed instructions carefully. Most candidates could interpret simple data well, but many were confused by the more complex aspects eg axis labels and units. Other areas of the specification which many candidates found particularly challenging included polymer chemistry, formation of salt deposits and incomplete combustion. It was pleasing to see that many candidates had a good working knowledge of nanotechnology, a new area in the specification.

The overall spread of questions gave all candidates of appropriate ability for this paper the opportunity to demonstrate their expertise. Most questions discriminated well, giving a good spread of marks across the ability range. It was clear, however, that a small number of candidates would have gained a more fruitful experience from sitting the Foundation tier paper.

Comments on Individual Questions:

1 The six-mark level of response question contributed well to the overall good discrimination achieved by this question.

(a) Almost all of the candidates could correctly describe the correlation. Only the weakest found difficulty in putting together the correct words.

(b) The majority of candidates stated whether they had low or high confidence and presented ideas to support this opinion. Only the more able considered the support for and against high confidence and ventured an opinion based on the opposing evidence. Weaker candidates simply stated their choice of high or low confidence or presented some ideas that would affect confidence, but did not give both or gave no link between the two.

(c) Many candidates failed to score marks on this question. More able candidates realised that incomplete combustion takes place. Only the most able related this to carbon not having enough oxygen to form carbon dioxide and so forming carbon instead. Many weaker candidates simply said that carbon was released from the cars.

(d) The majority of candidates knew that carbon particulates settle onto and stick to surfaces such as buildings to gain the mark in (i). Common incorrect answers were that they were breathed in or used by plants in photosynthesis. Most of those who gained the mark in (i) also scored in (ii) for the idea that buildings etc became dirty.

2 Again the six-mark question was an excellent discriminator.

(a) Most candidates successfully calculated the mean as a best estimate of the nitrogen dioxide concentration and realised it was above the UK limit. More able candidates went on to give reasons why this conclusion did or did not have a high level of confidence. The most able presented support for both high and low confidence and made a choice based on this. Many weaker candidates did not calculate a best estimate. Some simply said that some of the values were above the limit or some below the limit and based their confidence choice on this.

(b) Most candidates knew that to form acid rain nitrogen dioxide reacts with water, but only the most able knew that it also reacts with oxygen. Common incorrect answers included sulfur dioxide, carbon monoxide and nitrogen.

(c) Very few candidates gave a completely correct answer BFE. A common error was to begin with A rather than B to gain two of the marks.

3 The six-mark level of response question proved to be challenging to even the more able candidates, reducing the overall score in this question

(a) The majority of candidates realised that stiffness was being measured. The most common incorrect answer was strength.

(b) Whilst most candidates realised that the value for sample 4 is higher than the other values and therefore might be considered to be an outlier, very few could explain why it should be omitted. There is a change in this area in the new specification. Candidates were expected to frame an answer to why a value much higher than the other is unusual eg the polymer would be expected to have properties within close limits.

(c) In part (i) most candidates could identify B as the more crystalline and less flexible polymer. Only the more able could go further to give some explanation for the difference in properties of the polymers. A small number of candidates gave excellent answers based on knowledge of polymers at the molecular level, citing ideas about chain proximity and inter-molecular bond strengths. Many weaker candidates became confused and could not relate crystallinity to flexibility, often choosing the wrong polymer as most crystalline and/or most flexible. In (ii) only a minority of candidates ticked boxes 1 and 3 to gain the mark. A common response was to tick only one box.

(d) Only the more able candidates related a property of their chosen polymer to use as a ruler to gain this mark. Many simply chose a polymer and said it was more/medium/less flexible with no further qualification.

(e) Only the most able gave answers based on chain length, cross linking or plasticisers that explained the results.

(f) All but the weakest candidates could give one advantage of using plastic. Many of the more able gave two.

4   Many candidates showed a good knowledge of this new part of the specification.

(a)   Most candidates wrote about the use of nanoparticles or their size, but only the more able gave both to gain the two marks. Many candidates gave an incorrect size for nanoparticles.

(b)   The majority of candidates knew a product that has been improved by the use of nanoparticles to gain the mark in (i). A number gave a property of nanoparticles rather than a product. Most of those who gained a mark in (i) could also explain how nanoparticles improved the product to gain a mark in (ii).

(c)   Most candidates chose boxes 3 and 5 to gain both marks for this question. There was no pattern to the incorrect responses.

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