

Science B

Gateway Science Suite

General Certificate of Secondary Education **J261**

OCR Report to Centres

January 2012

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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

B711/01 and B711/02 were the first examinations in this new specification. There were a number of new aspects to the examination when compared to the previous specification. These included 6 mark extended writing questions marked using a level of response mark scheme, an increased emphasis on 'How Science Works' and an increased emphasis on the assessment of candidates ability to apply their knowledge of science in new contexts and analyse evidence, make reasoned judgements and draw conclusions based on evidence.

The majority of candidates attempted to answer the 6 mark questions. As a consequence most gained some credit. Examiners were able to award marks at all levels in each of the 6 mark questions. Centres could usefully explain to candidates that there is often more than one aspect to these questions and that all the aspects have to be addressed to access the higher levels.

The questions requiring a knowledge of 'How Science Works' proved variable. Centres are reminded that there is a double page spread at the front of the specification, which details the knowledge and skills required to answer these questions and that the recommendation is that these aspects will be integrated into the teaching of the course. An example of lack of understanding was the question involving risk versus benefit on the higher tier paper.

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. These skills will be assessed on future papers and will be required to answer the questions on unit 2 papers in the new section D.

Candidates generally performed well on calculation questions. Where there was a 'developed quantitative' question, ie a calculation where the answer obtained was then used for further processing, any error in the initial calculation was carried forward to the subsequent question to avoid penalising candidates twice.

The writing of chemical formulae and equations was generally well done.

B711/01 Foundation Tier

General Comments

The level of difficulty of the paper appeared to be appropriate for the ability range of the candidates, producing a good distribution of marks, covering almost the whole mark range available. In a large number of cases candidates answering two mark questions only gained one mark. They often neglected to give more than one idea in their answer. All candidates appeared to have had sufficient time to complete the paper, with the majority attempting most of the questions.

The quality of candidates' spelling, punctuation and grammar was good however there were a few cases where deciphering a candidate's writing posed a serious difficulty.

The majority of candidates had attempted all three level of response questions. There was some evidence that candidates had been well prepared for the new style of questions. Responses at all three levels were seen.

Comments on Individual Questions

Question 1

- (a) The majority of candidates gained at least one mark, mostly with the answer of 'exercise'. A number of candidates missed the instruction about 'other than diet' and wrote about low fat diets or alcohol.
- (b) Again candidates tended to score one mark by mentioning the safety idea, few went on to discuss the idea of finding out if the drug worked or not.

Question 2

- (a) The majority of candidates were able to describe the barrier idea without using the term. Most candidates gained a mark for stopping infection but few gained the second mark stating that bacteria or pathogens caused the infection. In part (ii) about half the candidates identified proteins.
- (b) Most candidates knew that body temperature is 37°C and that sweating can increase heat loss. However some candidates missed the reference to the skin and incorrectly mentioned behavioural ideas such as having cold drinks.
- (c) Generally well answered with sensitivity to heat being the most common answer.

Question 3

- (a) Most candidates made a relatively good attempt at answering this question. The majority scored L2 (3-4 marks) as they were able to identify differences and explain they were due to the environment. The L3 answers were less frequent as explanations of how characteristics are carried by genes was often missing or confused. Many thought they had slightly different genes as they missed the fact that they were identical twins.
- (b) Few candidates were able to give a clear description of X and Y chromosomes. Many candidates went down the line of physical features.

Question 4

- (a) The majority of candidates simply quoted from the table and gave an incorrect answer of 440ml.
- (b) Many candidates were unable to take information from the several places needed to answer this question. Most of the answers seen looked like guesses. In part (i) some candidates were able to grasp the idea that Billy could be a child, but many just thought he had drunk more.
- (c) Again few candidates gained marks, most gave the incorrect answer A as it contained the highest number of units per can. They made no attempt to calculate units per 100ml.
- (d) Most candidates gained at least one mark. However they should be encouraged to be more specific in their answers. Vague comments such as 'he might not stop in time' are not enough to explain that he might cause a crash. Some candidates thought he should not drive in case the police stopped him.

Question 5

- (a) Most candidates correctly identified displayed formula B.
- (b) This was one two mark question where the majority of candidates scored both marks instead of one.
- (c) A number of candidates gave the answer as alkenes instead of identifying displayed formula A.
- (d) Few candidates got this correct, plastics being a common wrong answer.
- (e) Candidates still find this type of question difficult and there were few correct answers seen.

Question 6

- (a) Most candidates correctly answered this question.
- (b) Many candidates incorrectly identified polymer C thinking that the bin should be biodegradable.
- (c) Most candidates correctly answered this question.

Question 7

- (a) The majority of candidates provided answers at level 1. They were able to identify the shortfalls or the excess but were unable to describe the process of cracking or simply use the word cracking. Many simply thought that the manager should just buy more petrol or make less fuel oil. Very few gave a description of cracking in terms of converting large molecules into smaller molecules. Level 3 needed a very clear answer which included at least one of the conditions needed for cracking.
- (b) Most candidates gained one mark for harming wildlife in some way. Few could provide a second idea such as damage to beaches or economical consequences. There were lots of vague answers such as 'affects the environment' without saying what the affect was.

Question 8

- (a) The majority of candidates managed to identify at least one reason for using fuel A.
- (b) The majority of candidates gained all three marks, however some simply listed all the characteristic of fuel C without identifying advantages or disadvantages. Some candidates seemed to think being a solid was a disadvantage; this could be because of the fuel in part (a) being for a car.
- (c) Most of the candidates chose answers from the table such as availability or pollution; few were able to identify a different factor.
- (d) Very few candidates understood that sulfur dioxide forms when sulfur reacts with oxygen. Many thought it came from carbon dioxide.

Question 9

- (a) Few candidates were able to name features X and Y. Y was often called a trough; also frequency and wavelength appeared as common incorrect answers.
- (b) Many candidates divided instead of multiplied and gave the answer as 4cm/s instead of 16cm/s.
- (c) The majority of candidates answered this question correctly. Those who got it wrong thought the pond got higher instead of deeper.

Question 10

- (a) Few candidates understood that the hottest object cools at the fastest rate. Many failed to make a comparison and just said it was very hot.
- (b) The majority of candidates incorrectly calculated by dividing 320 000 by 80 000 or subtracting one from the other. Some candidates lost a mark because they put 25 instead of 0.25 or 25%. In part (ii) many thought you should just use a different kettle or a saucepan of water on the stove.

Question 11

The majority of candidates provided answers at either level 1 or level 2. They were able to identify other forms of insulation and make an attempt to explain how they worked. Very few could correctly describe how the forms of insulation reduced conduction or convection. Those that gained level 3 did so because they answered in terms of silver foil reflecting radiation. Less able candidates thought that energy loss had not halved because the double glazing did not work.

Question 12

- (a) Candidates should be encouraged to use a ruler to answer this type of question. Some candidates lost a mark because their line did not join or because arrows drawn on the lines made it difficult to see if the angles were correct.
- (b) The majority of candidates could name one use of a laser.

- (c) Some candidates missed the fact that the health risks came from using the phone and incorrectly answered in terms of keeping the phone in the pocket. Most candidates did however gain at least one mark but a large proportion only gave a risk and did not say how to reduce the risk.

Question 13

- (a) The majority of candidates correctly identified sun cream E those that got it wrong tended to choose C.
- (b) Candidates should be encouraged to refer to skin cancer from exposure to sunlight not just cancer.
- (c) A number of candidates lost this mark as they put UAV instead of UV. Infrared was also a common error.

Question 14

Few candidates correctly identified Olivia and of those that did a number referred to light or sun reflecting, not heat. Many incorrectly thought the answer was the white paper bag.

B711/02 Higher Tier

General Comments

It was clear that some candidates prepared well and were successful as a result. A significant number of candidates was entered for the incorrect tier, which was evident from many omissions to questions from some candidates and lack of ability in answering the 6 mark questions. The latter may be due to a lack of familiarity, as this was the first assessment opportunity on the new specification. The new aspects of the examination papers proved difficult for many candidates. The 6 mark questions were mentioned earlier. These questions were marked using a level of response approach. Candidates attempted to answer the questions and therefore almost always gained some credit. Candidates need to address **all** aspects of the questions to gain access to the higher levels. Those questions addressing aspects of 'How Science Works' proved to be challenging to candidates. The idea of balancing risk and benefit in question 3 (b) was poor. Candidates struggled to understand the political issues involved in the supply of crude oil in question 7(b). 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.

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

Overall, assistant examiners and team leaders 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 28.6. 19 marks were required to gain grade C and 36 marks for grade A.

Comments on Individual Questions

Section A

Question 1

- 1 (a) Just over half of candidates correctly answered this question. Common errors were to write 180 ml or 440 ml rather than 18ml.
- (b) (i) The majority of candidates got this question correct with 90 minutes but a few 1 hours 30 minutes were also seen.
- (ii) Just under half of candidates got this question correct. However a common error was to focus on tolerance to alcohol rather than the condition of Billy. The idea that Billy had a different mass, weight or size than the average adult was required, although references to Billy being younger also scored.
- (c) Over 80% of candidates got this question wrong by choosing answer **A**, getting no marks. Most of the candidates that selected **E** showed the correct working to get 2 marks or chose to show no working at all and scored one mark.
- (d) About half of the candidates gained some credit in this question for mentioning the synapse. However, many candidates missed the second marking point by failing to state that the **release** of transmitters was slowed down or that the neurotransmitter was binding with receptor molecules. There were many vague answers about impulses travelling more slowly.

Question 2

- 2 (a) (i) Many candidates answered this question correctly, normally referring to not smoking, reducing stress or avoiding alcohol. Some candidates made the error of simply stating 'sleeping' or 'exercise' which were insufficient for the mark.
- (ii) Many candidates got at least one mark for this question, normally referring to allergies or diabetes. A number just listed the medical conditions but failed to link these with a reason eg diabetes, allergies, and gender gained one mark. Some candidates wrote very vague responses about how some people need different diets but were not specific enough to get any marks here.
- (b) Most candidates gained one mark for stating that sweating 'cools the body.' Fewer also stated that the sweat evaporated to get the second marking point. Some candidates missed the point of the question and wrote about how sweating gets rid of bacteria, enables weight loss or loss of excess water.
- (c) (i) This question was correctly answered by about half of all candidates. Most candidates who got this question correct wrote 'foot' rather than 'skin'. However many candidates wrote 'sensory neurone' and failed to score.
- (ii) This question was poorly answered. Many confused effector with response or simply stated that it was the 'hot water.'

Question 3

- 3 (a) Most candidates achieved one mark for mentioning antibodies; however only the best candidates were able to also write about antigens and memory cells to achieve all 3 marks. Some candidates wrote detailed answers but had not included the key terms in bold in the mark scheme to get the marks.
- (b) As stated in the General Comments, this was a very poorly answered question. Most candidates wrote about the advantages of vaccination but failed to compare it to the risks of the side effects of having the vaccine. Most candidates who got the mark stated the idea that 'benefits outweigh the risks'.
- (c) About 40% of candidates gained the mark here for recognising that antibiotics only kill bacteria not viruses. However quite a few candidates thought that viruses were immune to antibiotics or even confused the fact with statements such as 'antibiotics only kill viruses' or 'antibiotics are pain killers' or antibiotics are not 'strong enough'.

Question 4

- 4 This, on the whole, was quite a well answered question. It was very clear from the outset which candidates knew about the role of auxin and which didn't. Many candidates were able to recognise that auxin was made in the shoot tip and that the untreated seedlings showed phototropism for level 2. About a quarter of candidates were able to give detailed descriptions about auxin accumulating on the shaded side of the shoot causing elongation to get within the level 3 marking criteria. Candidates who did not know about the role of auxin were still able to achieve level 1 by stating what happened to the shoots.

Section B

Question 5

- 5 (a) Just over half of all candidates scored the mark for correctly identifying compound **A**. A number chose **D** and got the answer wrong.
- (b) About two thirds of candidates got the correct answer. Those that didn't often wrote a name, such as propane or put the numbers as superscript.
- (c) Candidates often missed out the 'n' but this was still sufficient to gain the mark. Only about a third of candidates answered this question correctly. Many just drew ethane or wrote something irrelevant to the question.
- (d) Only about a quarter of all candidates correctly stated that compound **C** contained only single bonds or did not contain any double bonds. The common error was for candidates to merely state it had single bonds or is an alkane.

Question 6

- 6 (a) (i) As mentioned in the General Comments, many candidates clearly knew the science here but were only able to get one mark for implying that plastics must not dissolve in petrol/water **and** must not biodegrade. A select few candidates successfully achieved two marks for comparing the individual polymers with each other. There will be questions on future papers which require the skill of supporting a conclusion with evidence. Candidates will need to refer to specific aspects of the data to gain full marks. This skill is also likely to be assessed in Unit 2 papers as part of the new, content free section D questions.
- (ii) Surprisingly few candidates could correctly link use to properties. Many candidates wrote answers such as, rubber, strong, waterproof, and durable and did not get the mark.
- (b) Candidates often successfully achieved one mark for recognising that the holes were too small for water to pass through. However, many referred to sweat without evaporation and could not gain the second mark. About a quarter of candidates referred to water particles and water molecules and could not get the mark there either. Some candidates just repeated the information in the stem of the question and achieved no marks.

Question 7

- 7 (a) Answers to this question varied. Very few candidates achieved level 3, although many achieved levels 1 and 2. Some candidates missed the point of the question and wrote about fractional distillation. Some candidates only wrote very basically about cracking (ie large molecules broken down into smaller or more useful molecules) and/or only stated that too much/little of some fractions were made and only achieved level 1. Those that achieved level 2 were able to outline the process of cracking in more detail (ie large alkane molecules broken down into smaller alkane and alkene molecules) and state the individual fractions that exceeded/insufficient to meet demand. A correct equation was required for level 3 and was rarely seen.

- (b) This was not a well answered question. Candidates often wrote about war and terrorism but did not link to how future supply of oil would not be secure because of it. Those that got one mark often wrote about environmental problems but very rarely linked this to how it could be politically damaging or costly for governments.

Question 8

- 8 (a) This was a very well answered question with most candidates achieving three marks. Candidates did however often write about how it was a solid as either an advantage or a disadvantage which was ignored.
- (b) Many candidates achieved two marks here for a properly balanced equation with correct chemical formulae. Common errors however were to have incorrect use of upper and lower case formulae and to forget the + sign in the second half of the equation.

Question 9

- 9 (a) About a third of candidates stated denaturing and scored the mark. However, many wrote 'cooking' for this question and got the answer wrong as a result.
- (b) This was a poorly answered question with candidates writing merely about the taste and texture of the potato. Cell wall breaking down was more commonly seen than starch grains swell or spread out or expand.

Section C

Question 10

- 10 (a) About half of all candidates correctly stated ultra-violet. The most common error was IR.
- (b) About a third of candidates got this question correct, although some named another pollutant and negated the mark for CFCs. Those that got this wrong often wrote about global warming, carbon dioxide, humans, fossil fuels and general references to pollution that were not relevant to CFCs.
- (c) This was a very well answered question with the majority of candidates recognising that rickets disease could be caused by using SPF sunscreen.

Question 11

- 11 (a) This was a question where most candidates gave vague answers, such as 'intense means strong' which was insufficient. Some candidates recognised that intense was a lot of energy in a small area/more concentrated and that coherent was in phase or monochromatic. However there were few candidates that gained even one mark here.
- (b) This was a very well answered question. A common error was to have more than 5 reflections at the upper surface as candidates drew angles far too small for total internal reflection. Another error was to have gaps so the ray was not continuous.

- (c) This was also a very well answered question, with most candidates getting 2 marks. Some candidates however only mentioned a health risk and not a solution and some only suggested holding the phone further away from the ear which was not sufficient for the second mark.

Question 12

Answers to this question varied with very few candidates achieving level 3. Some candidates merely repeated the stem of the question and some could only give the basic idea that increasing the air gap size decreases energy transfer, so the majority of candidates achieved level 1 for this question. Quite a few candidates were able to achieve level 2 by being able to state the latter relationship clearly and by writing about the reduction of conduction and/or convection. A large number of candidates thought that the air gap either traps warm air trying to leaving the house or traps cold air trying to enter the house. There were many incorrect concepts in candidates' answers including the idea that a vacuum or air gap contains no heat particles. For level 3 the idea that increasing the gap to more than 16mm makes little difference was required but rarely seen. This is another example of candidates failing to quote data to support their answer.

Question 13

- 13 (a) Less than a fifth of all candidates got this question correct and the majority merely stated that the ice cube was changing state which was not sufficient for the mark.
- (b) (i) Candidates achieved two marks here for the correct answer, but many only achieved one mark for writing 32800 (J). This answer was obtained by using an incorrect temperature change of 20°C. Some candidates completely missed the point of the question though and did a division calculation getting no marks.
- (ii) This question was very poorly answered, with very few candidates achieving even one mark. This question was often left blank or a guess answer was written.

Question 14

- 14 (a) Many candidates achieved both marks here, although some got UV and IR confused or did not fill in all the boxes. The majority of candidates gained at least 1 mark for getting two types of radiation in the correct boxes which were usually 'X-ray' and 'radio wave'.
- (b) (i) This was not a well answered question. Many candidates wrote about reflection from ionosphere or about reflection or refraction. Few candidates wrote about diffraction and those that did often gained just one mark. Very few achieved two marks.
- (ii) This was well answered by about a third of candidates with a number of candidates gaining 1 mark for an effect and a solution. A common error was to only write about an effect or to write about interference.

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