OCR
Oxford Cambridge and RSA

GCSE

Additional Science B

Gateway Science Suite

General Certificate of Secondary Education **J262**

OCR Report to Centres June 2014

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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.

OCR will not enter into any discussion or correspondence in connection with this report.

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B721/01 Additional Science B modules B3, C3, P3 (Foundation Tier)

General Comments:

- In general the paper was balanced and accessible to all candidates.
  There were, however, a significant number of candidates who had no responses even to multiple choice type questions and surprisingly in some cases even the first question was left unanswered.
- Answers were appropriate to the question and there was little evidence of guessing taking place. On the contrary it seemed that candidates were prepared to leave the question unanswered rather than guess. Questions which tested the quality of written communication were better developed by candidates, although there was a reluctance to consider the full extent of the question to their response, often only responding to certain parts of the question. This often limited the access to the higher marks in this type of question. Some of these questions were left blank but in the main candidates did have an attempt.
- No artistic embellishments were observed indicating that the candidates were 'on task' throughout the session.
- The rubric of most questions was interpreted correctly. Candidates continue to find difficulty in questions which test their ability to apply their knowledge and understanding. Marks ranged from single digits to low sixties and it is encouraging to see higher marks are now being obtained by the more able candidates.
- Most candidates were able to use data from a graph to work out difference in height between genders. Encouragingly, most candidates knew respiration is used to release energy in cells and could use data on (and, in many cases, also calculate) the changes in temperature when fuels are used to heat water and use this to explain which fuel transfers the most energy.
- Candidates, as in previous exam seasons need to be more aware of making comparisons to avoid losing marks. Candidates should also be more alert to applying their knowledge to given situations in questions.
- Some questions were very well answered but these tended to be the ones with a lower demand on literacy. Many candidates seemed to understand many science concepts but found it difficult to translate understanding into clear and concise meanings.

Comments on Individual Questions:

Question No.

Q1ai. The second marking point scored more often (red blood cells). White blood cells was often the most common error for the first marking point. It was surprising, however, the number of candidates failing to give any response to a straight forward starter question.

Q1aii. Very few candidates scored both marks. Many failed to be precise with regards to growth of cells etc. ‘forming a scab’ was quite a common response.

Q1bi. Disappointingly, on a straightforward recall question, not many scored here. Very few got the tricuspid valve. There was quite a lot of confusion as to which side was left and which right.

Q1bii. Similarly not many scored here. A common error was to refer to veins and arteries without mentioning where the blood was going. Again confusion over left and right seemed to cause issues.

Q2a. Very few scored both marks with many appearing to select well known substances such as glucose.

Q2b. In general this was well answered. However, there were lots alternative spellings for respiration. Very few gave aerobic or anaerobic respiration but scored for just respiration. Common errors included 'mitochondria' or 'mitosis'. Some candidates were looking for a more complex answer and occasionally some attempted an equation.

Q2c. A poorly answered question. Candidates tended to believe that pepsin & trypsin were acidic and alkaline respectively thus completely missing the point. Poor use of language meant that it was often difficult to decide if the candidate was referring to an organ or an enzyme. Many talked about rates of reaction.

Q3. Many candidates failed to demonstrate an understanding of genetic engineering. Poor language meant that it was often not clear if the candidate was describing an external chemical being sprayed onto crops or was trying to insert a chemical/gene that would cause the plant to produce a chemical. The advantage was the most likely to score but often the feature would run into the advantage and become indistinguishable. The risk was least likely to score and these were often poorly expressed.

Q4a. Many candidates failed to score marks due to the lack of precision in relation the age. Too many failed to read the question and produced a response relating to a comparison of males and females.

Q4b. Most candidates scored here if they looked at the data carefully.

Q4c. Lack of precision once again cost candidates marks as the growth spurt was missed.

Q5a. Many scored here. Common responses included shiny, hard and clear. The description of a use was often included, such as 'used in jewellery' and 'used in tools'.

Q5b. Again this was a reasonably well answered question.

Q5c. This was frequently left blank. However, some did score even with the correct spelling. Some candidates realised that it was an allotrope of carbon.

Q6a. Many scored at least one mark. A common error was 'same amount of fuel' without saying the same mass of fuel.

Q6b. This was another high scoring question, possibly as a result of exothermic being the most common type of reaction candidates meet. Surprisingly, catalysed was a common error, possibly due to familiarity with the word.

Q6ci. Many scored well here. Quite a few candidates actually calculated temp differences on the table even though this wasn't a requirement.

Q6cii. Most failed to score, with a common error being the failure to use the mass of water , 100g, they chose to use a mass of 1.0g (mass of fuel)instead. Having got their wrong answer some understood what 2 sig figs meant whilst others just dropped off the last 2 numbers.

Q7a. Most candidates scored here. Some, unusually, put commas in place of the plus sign. Those that tried a symbol equation were not successful.

Q7bi. Most candidates failed to score by just referring to 'the temp was the highest'. Some didn't gain credit by stating 'all the tablet had dissolved'.

Q7bii. Well answered. Most picked up the idea of reaction times were the same.

Q7biii. This question discriminated quite well. Some candidates tended to miss the idea of a faster reaction and just described the data in the table of results. Those with better understanding referred to the particle model to explain the results. Many identified that experiment 1 was significant but failed to link it to experiment 3. Particles moving more/vibrating and faster collisions were further examples of poor understanding or possibly poor use of language?

Q8a. Often both marks were scored for 9, but working out was surprisingly missing in many.

Q8b. This produced a wide range of responses indicating a wide lack of understanding of the concept.

Q8c. Candidates demonstrated that few understand 'atom economy'. Many scored one or even both marks without mentioning it and scored through their understanding of the lack/presence of waste products.

Q9a. This was a well answered question with 'braking distance' being the most common error.

Q9bi. Again a well answered question.

Q9bii. Not well answered. A common error was relating it to weather conditions.

Q10. A poorly understood concept. Often candidates showed little understanding of what was happening. Many included such terms as 'terminal velocity' or 'air resistance' or 'the pull of gravity' inappropriately.

Q11a. A reasonably well answered question but common errors were linking the lines to either 'speed' or 'whether the car was in the right lane'.

Q11bi. Most candidates did not understand the need to have accuracy and that the time was needed to calculate the speed.

Q11bii. Many understood that the second photo would be a problem and usually scored by referring to the car having gone past the area when the photo would be taken.

Q11ci. A well answered question. Many scored here with answers of 8.8. A common incorrect response was 4.4 x 0.5 = 2.2.

Q11cii. A well answered question by all.

Q12a. Many candidates scored here. However, there were a significant number that did not know 'petrol' and 'diesel' and also a common error was to put petrol and oil.

Q12bi. Far too many failed to score because they were not accurate enough and did not use the word 'light' in their response.

Q12bii. It was common for candidates to score one mark or even two. 'Low speed' or 'long distance' were marking points that were rarely picked up on.

Q12biii. It was rare for candidates to score both marks. Far too many wanted to 'put lights on the vehicle shining onto the solar cells' or 'add an engine' or 'more powerful motor'. Many talked about increased risk of crash without linking to possible cause or risk to driver.

Q13. Most candidates identified F but too few scored 3 by picking 750N, 1.8m and completing the calculation correctly. 750 was frequently identified correctly but 1.8 was less frequent often coming in as 1.75. The calculation was rarely performed although some did it for all 6 lifts.

B721/02 Additional Science B modules B3, C3, P3 (Higher Tier)

General Comments:

Most candidates have been entered for the correct higher tier but a minority would have been better suited to sitting the foundation tier.

Some candidates' handwriting was very poor and they might have benefitted from the use of a scribe.

A significant number of candidates struggled to rearrange equations correctly and to follow logical steps when expressing their answers mathematically.

Candidates' answers often did not fit in the designated area. A sensible approach used by many candidates was to indicate part of the answer is elsewhere on the page. An arrow was often used to highlight this. Other candidates chose to use additional sheets and these were usually clearly labelled with the question number.

The paper was of appropriate length and there were very few examples of candidates running out of time. Although a few candidates left some answers blank, these 'no responses' tended to be scattered throughout the paper rather than concentrated at the end.

Comments on Individual Questions:

Question No.

Q1ai Candidates were expected to label two parts of the heart. Many candidates confused the left side of the heart with the right side of the heart and bicuspid valve with tricuspid valve.

Q1aii The majority of candidates were awarded one mark for correctly identifying that the left ventricle has to pump blood to the body rather than just the lungs. Fewer candidates recognised that the left side of the heart needs to develop a higher pressure to do this. Many candidates incorrectly referred to withstanding high pressure rather than causing high pressure.

Q1bi The balanced symbol equation for aerobic respiration proved to be a challenge to candidates. Some gave the word equation and others gave the incorrect formula for glucose or one of the other reactants or products.

Q1bii This question about weightlifters being unable to hold the weights above their head for longer than three seconds required an answer that referred to the muscles in the arms. Most candidates were able to explain that lactic acid built up but failed to explain that this was due to the muscles having insufficient oxygen.

Q1c The majority of candidates were able to explain that ribosomes are involved in the synthesis of proteins. A few candidates thought that ribosomes are involved in energy production.

Q2a This question involved analysing information from a graph about pepsin and trypsin enzyme activity. Candidates who structured their response carefully in terms of the activity of pepsin in the stomach and the intestine followed by the activity of trypsin in the intestine and the stomach were awarded all marks for this question. Other candidates concentrated on just pepsin and trypsin or the pH in the stomach and intestine so failed to be awarded all the marks available. A few candidates repeated the information in the question rather than using the information from the graph. Other candidates confused the pH of the stomach and intestine with that of the enzymes rather than the optimum pH at which the enzymes worked.

Q2bi The calculation of Q_{10} was performed correctly by the majority of candidates.

Q2bii The majority of candidates were unable to explain the significance of a Q_{10} of 2.1. Many thought that it increased the reaction by 2.1 rather than just over doubling the rate of the reaction.

Q2biii Candidates found this question about bacteria living in hot springs challenging. They tended to write general answers about enzymes working or surviving in hot temperatures. The answers required more details in terms of the enzyme A not being denatured at high temperatures or that the optimum temperature of the enzyme being higher.

Q3a This question was the first level of response question on the paper. Candidates were asked to explain the different ways the corn could be improved and the steps involved in genetic engineering. The majority of candidates were able to select at least one suitable feature to improve but fewer candidates were able to describe the steps involved in genetic engineering. Many candidates failed to explain that a gene was involved and wrote about features being inserted instead.

Q3b Candidates found it difficult to explain how a double strand of DNA forms from a single strand of DNA. They performed slightly better in describing complimentary base pairing and the A-T and G-C base pairing rule.

Q4a Candidates were able to explain why diamond is used for jewellery with lustrous and shiny being the most popular properties.

Q4b Candidates were usually awarded one mark for describing that graphite exists in layers and that these layers can slide over each other and onto the paper. Fewer candidates were able to describe the weak intermolecular forces between these layers. Many thought that the bonds were covalent or that the weak bonds were between atoms in the same layer.

Q4c This answer required candidates to write about strong covalent bonds and lots of energy needed to break these strong covalent bonds. Many candidates wrote about bonds but were not specific about them being strong covalent bonds. They also wrote about needing more energy to break them but not about the need for lots of energy.

Q5a Candidates were either awarded two marks for correctly working out the final temperature or were unable to use or manipulate the equation provided in the question. A few candidates calculated the temperature change but failed to add this to the start temperature or specifically state their answer was the temperature change which would have gained them a mark.

Q5bi Few candidates correctly completed the sentence ‘When bonds are broken, energy is absorbed’.

Q5bii The majority of candidates correctly completed the sentence 'Making new bonds is exothermic'.

Q6a Most candidates were able to write the symbol equation for the reaction described. Fewer candidates were able to balance the equation. A few candidates were careless when writing the formulae and balancing numbers with incorrect capital and lower case letters and the subscript numbers or balancing numbers being too large or too small.

Q6b Candidates found it difficult to describe the meaning of 'limiting reactant'. Many wrote about the product that was stopping the reaction occurring.

Q6c This question was the second level of response question on the paper. The majority of candidates were able to apply a basic understanding of the reacting particle model to the information in the table about relative rates of reaction for four experiments. They tended to quote the data in the table about the relative rates of reaction. They did not analyse the data to explain that when the concentration doubles the rate or reaction doubles or when the temperature doubles the rate of reaction quadruples.

Q7a Candidates had difficulty calculating the atom economy for the manufacture of aspirin.

Q7b Candidates were able to describe why it is 'greener' to have a high atom economy.

Q7c Candidates were able to use the information about the melting points of different substances to determine that batch C contains the purest sample of aspirin. They also gave the reason for selecting batch C as the melting point is not a range and that it is just below the real melting point of aspirin.

Q7di Candidates that set out the calculations carefully were able to show that the relative formula mass of aluminium sulphate is 342.

Q7dii Candidates were able to use the information in the table and the balanced equation to show that mass is conserved. Candidate's answers were well structured and clearly showed the steps involved in the calculation.

Q8ai Candidates were usually awarded a mark for this question. They usually gave the answer that the road may have been wet or slippery or that the brakes were faulty. Answers that described a general factor such as poor road condition or poor weather were not awarded a mark. A few candidates gave factors that increase thinking distance rather than braking distance.

Q8aii Candidates were able to give a factor that increased the thinking distance. The most common factor was drinking alcohol.

Q8b Many candidates correctly identified that as speed doubles the thinking and braking distance increases. Only a few recognised that when the speed is doubled the thinking distance doubles and the braking distance quadruples.

Q8c Candidates found it difficult to suggest why drivers should reduce speed when travelling down steep hills. Many gave incomplete answers about being more likely to have an accident or that you will travel faster.

Q9 This question was the third level of response question on the paper. The question involved using the equations for GPE and KE to explain the information given in the diagram and to explain what happens when the mass of the ball is doubled. Candidates answered this question well in terms of the changing GPE and KE as the

ball falls. Candidates who then went on to explain that doubling the mass doubles the GPE and KE were able to achieve level 3 and 5 or 6 marks.

Q10a Many candidates explained that the distance between the two cameras would need to be measured but failed to describe that this distance measured needs to be divided by the time recorded to calculate the speed.

Q10bi Candidates found this question about the calculation of speed at camera B very difficult. Few were able to identify or rearrange the equation required. Other candidates failed to convert the time of 2 minutes into a time of 120 seconds.

Q10bii Many candidates correctly explained that when the average speed is doubled, the time recorded will decrease. To be awarded the two marks candidates needed to explain that the time would be half as much.

Q11a The majority of candidates explained that there was no carbon dioxide produced at point of use or that there are no fossil fuels being used in the car and were awarded the first mark for this question. Candidates had more difficulty in explaining that pollution or carbon dioxide is produced when the car is manufactured.

Q11b Candidates recognised that making the car travel at a higher speed will increase the risk of the driver suffering a greater injury. Fewer candidates were able to link the change made to the car with the reason why this is an improvement to the design, e.g. the car can be made more streamlined is correct but to be awarded the mark the candidate also needed to link this to the fact that this would reduce the air resistance acting on the car.

Q12 Candidates usually selected letter F and were able to give a reason for this selection as being that the lift was completed in the shortest time. Few candidates were able to link the distance, force and time together to explain that the most powerful lift is when the rate of doing work is the highest.

B722/01 Additional Science B modules B4, C4, P4 (Foundation Tier)

General Comments:

This 85 mark foundation paper gave a good range of marks (0 to 67) but a lower mean (30) than June 2013. The answers showed that candidates generally were well prepared and appropriately entered for this tier.

The paper was of appropriate length and there were very few examples of candidates running out of time. Although a few candidates left some answers blank, these ‘no responses’ tended to be scattered throughout the paper rather than concentrated at the end.

It was evident that there was largely a full participation in the paper this time with most candidates tackling the 6 mark questions. However the majority of candidates failed to read the question properly and because of this gave a partial answer which only scored part of the marks.

There also appeared to be an abundance of candidates continuing answers on extra booklets. Much of this appeared unnecessary, with candidates repeating the question in their answers, writing at great length on ideas that were not asked for in the question and generally failing to answer in a succinct manner.

The How Science Works questions were nearly always attempted but some candidates were often unsure how to tackle the questions. Generally though, these questions were done better this year.

Comments on Individual Questions:

Section A

Question No. 1

1(a) Candidates were asked about carbon dioxide entering plants. This was a two mark question and most candidates gave the correct answer ‘through the leaves’ however few went on to say either ‘by diffusion’ or ‘through the stomata’.

1(b) Most candidates correctly identified herbicide as the chemical used to get rid of weeds.

1(c) This question proved very straight forward and most candidates correctly gave crop rotation as the answer.

1(d) Candidates were asked to draw conclusions from data provided. Most candidates were able to identify the two correct conclusions. Very few candidates failed to score on this question.

1(e) This question relates to how science works . Whilst the majority of candidates gave good reasons as to why work should be published a significant number of candidates failed to score.

Question 2

This question was about the decay of plant material and uptake of minerals

2(a) Candidates were asked why a gardener let air into his compost heap. The majority of candidates gave a vague answer such as 'to help it decay' which did not receive credit. Examiners were looking for the idea that air contains oxygen or that oxygen was needed for bacteria or fungi to respire.

2(b) Candidates were asked how minerals get into plants. Most candidates gave the answer 'through the roots' and while this was given credit the answer 'root hairs' was rarely seen. The other most common scoring answer was 'from the soil' but few realised that they were dissolved in water. A common misunderstanding was that they were made during photosynthesis.

2 (c)(i) The question asked candidates to compare the decay however the majority of candidates described the graph in terms of temperature and did not score. Only the most able were able to translate a high temperature into a rapid rate of decay.

2(c)(ii) About half the candidates were able to put the materials in the correct order (A,C,B) for the graphs.

Question 3

3(a) The question showed a kite diagram and asked how the data was collected and what conclusions could be drawn from it. This was a six mark question. Most candidates were able to provide some kind of conclusion usually involving the species found at different places on the shore, which was fine. Less satisfactory was the description of how the data was collected. Some candidates had used a quadrat and described eloquently how it should be used but a significant number of others had little idea of its use and often did not mention it. To score full marks on this question candidates needed to describe the use of a transect. This was rarely seen.

Question 4

4(a) Only about a quarter of candidates correctly identified the part of a plant cell as a chloroplast.

4(b) Candidates were asked why bacteria were attracted to this part and a clue was given by providing the photosynthesis equation. The best answer was that it produces oxygen and bacteria need oxygen to respire. A logical wrong answer was that bacteria were attracted to the glucose for food. Many of the candidates, however, ignored the question and explained photosynthesis.

4(c) Provided a list of leaf cells, candidates were asked to identify the type of leaf cell used. About 20% correctly identified the cell as palisade mesophyll.

Section B

Question 5

This question was about group 3 elements.

5(a) Candidates were asked to name a group 3 element. This proved straight forward and the majority of candidates gave the answer aluminium with the usual variety of spellings. The more adventurous chose indium or gallium.

5(b)(i) Candidates were given a partially labelled diagram of a boron atom and asked to name one of the particles in the nucleus. The majority correctly identified it as a neutron, Examiners were lenient in the spellings accepted but newton and neuron were not accepted as they were incorrect words correctly spelt.

5(b)(ii) Candidates were asked for the relative charge on a boron nucleus. This question proved extremely challenging for the majority of candidates and few correct answers of +5 were seen.

5(b)(iii) Candidates were asked for the charge on the boron atom being given three alternatives. The correct answer, neutral, was the least popular response.

Question 6

This six mark question was, in general, very well answered. However there was evidence that candidates had not read the question carefully. The question was in two parts, firstly to identify the properties necessary for the metal to make 'The Orbit' and secondly to identify with reasons which metal was most suitable from the list provided. Most candidates ignored the first part and went on to answer the second part correctly. Several candidates included all the properties rather than being selective and omitting melting point and electrical conductivity which have little relevance to the structure. Only those candidates who answered both parts were able to score full marks.

Question 7

7(a) Candidates were asked how they knew that O_2 was a molecule and O^{-2} was an ion. Few candidates stated that the molecule had two oxygen atoms but the majority of candidates were able to say the ion could be identified because it was charged.

7(b) Candidates were asked why sodium atoms formed positive sodium ions. The reasons were not well understood by candidates. Examiners were looking for the ideas of stability for example they lose an electron ' to get a full outer shell', ' to get a noble gas structure' etc.

7(c) In this question candidates were asked to work out the formula of sodium oxide. Correct answers were rare and candidates did not realise they needed to balance the charges.

Question 8

This question was about water.

8(a) Most candidates were able to name a water resource correctly.

8(b) Candidates mostly read the graph correctly and gave the leakage as 1500 cubic metres and then went on to calculate the percentage as 16.7%.

9(c) Candidates were required to name a water pollutant and explain how it got into the water. By far the most common response was pesticides and fertilizer caused by run off from farmers' fields. Some candidates mistakenly interpreted pollutants as chemicals added to water on purpose such as chlorine for purification or fluoride for teeth.

Question 9

This question was about elements in group 7.

9(a) The question asked for uses of chlorine and iodine. Candidates gave many correct answers but sometimes omitted to say which element they were describing. A common answer that failed to score was to clean swimming pools. Examiners were looking for the use as killing bacteria or microbes in swimming pools. For iodine vague answers such as medical use were not accepted and specific examples such as to sterilize wounds or to kill bacteria on skin before operations was needed.

9(b) This question required a word equation. In most cases this was correctly answered however a common mistake was to use the wrong ending on the salt by writing 'Chlorine + Calcium *iodine* → iodine + calcium *chlorine*.' Occasionally the + and → were missing and so failed to score.

9(c) The majority of candidates identified fluorine as the most reactive element in group 7, the remainder chose astatine as they realised it must be at one end of the group.

Section C

Question 10

10(a)(i) The question required candidates to relate resistance to length and thickness of a wire and then apply it to current in a circuit. This proved challenging for the majority of candidates and few gave the correct answer B.

10(a) (ii) The majority of candidates correctly calculated the resistance as 4 although only about 10% gave the correct unit.

10(b) There were some excellent answers to this question but usually only from the most able who had a sound knowledge of electricity. The most common misunderstanding was that the current or power was being shared between the two bulbs in circuit F. Examiners were looking for basic statements at this level such as the current in E is bigger than the current in F, both bulbs in F have the same current, the circuits have different resistance.

10(c)(i) It is becoming clear that as most appliances are supplied with a moulded plug the ability to wire a plug is becoming a forgotten skill with less than half the candidates choosing C as the correct answer.

10(c)(ii) Examiners were looking for some indication of safety. Common misunderstandings were that the fuse provides power for the circuit or that it controls the current in the circuit.

Question 11

This question was about electrostatics

11(a) Candidates seemed to make this question more complicated than expected. Examiners were looking for the idea that artificial turf is an insulator; Sophie became charged and got a shock when earthed through the post.

11(b) In this question most of the candidates described the information in the table. The question had asked that they explain the results in the table. Credit was given for statements such as the charged rods were insulators, metal rods cannot be charged etc.

11(c) The uses of electrostatics was not as good as in previous papers with only about half the candidates giving a correct use such as paint or crop spraying, defibrillators, photocopiers, printers etc.

Question 12

The majority of candidates scored 2 in this 6 mark question by choosing either isotope D or E and giving a reason – usually about enough time to find the blockage or penetrating power. The question had a second part asking how the position of the blockage was found. This part was ignored by the majority of candidates. Examiners were looking for ideas that it was detected on the surface, that there would be a lower count rate after the blockage and that the course of the pipe could be followed by tracking the radioactivity, but these comments were missing.

Question 13

13(a) Fission and fusion were not understood by candidates, with few scoring any marks.

13(b) Candidates did not know that no one has been able to repeat this work successfully.

13(c)(i) This question was a new way of asking what happened to the activity of a radioactive source over time. Whilst several candidates realised that the activity if the source decreased few went on to say that longer exposure was needed to get the same amount of radiation given out. A common error was that the patient was becoming immune to the radiation and so needed a larger dose.

13(c)(ii) The majority of candidates correctly said gamma.

Section D

Question 14

This question is the data handling question

14(a) The question was answered well with candidates naming the other three sources of radiation and calculating the percentage as 85.5.

14(b)(i) The majority of candidates correctly calculated Jackson's radiation as 4120.

14(b)(ii) The result was correctly interpreted by the majority of candidates. The two statements which scored most often were 'only just above average dose' and 'much lower than that needed to cause cancer'.

14(c)(i) Candidates realised that background radiation was included in the result.

14(c)(ii) The majority of candidates were able to complete the table correctly.

14(c)(iii) The majority of candidates correctly ticked the first two boxes.

B722/02 Additional Science B modules B4, C4, P4 (Higher Tier)

General Comments:

Candidates on the whole attempted all questions and there was no evidence that they had insufficient time. There were a very small number of candidates who were clearly entered for the wrong tier and would have been more suited to a foundation tier entry.

Analysing data and using the information to explain scientific concepts remains challenging for many candidates. One of the main issues involved candidates simply quoting data in questions that require comparisons. The words larger / smaller / greater etc were often missing.

Numeracy skills appear to be improving, with the exception of understanding the difference between 2 significant figures and 2 decimal places.

Candidates followed the rubric in nearly every case where they had to select a box or select from a list. However, when asked to do so, they did not always use calculations to explain their answers.

Comments on Individual Questions:

Question No.

Q1(a) Most candidates appreciated the importance of oxygen in decay although this was not always linked to respiration.

Q1(b) This question proved to be quite a good differentiator. Better answers included linking amino acids to proteins. Other answers often stated that nitrogen contained amino acids/proteins.

Q1(c) In part (i) many candidates simply compared the differences in temperature without linking this to decay. The identification of the compost heaps in (ii) was more successful.

Q2 This question certainly differentiated at the A*/A/B level. Many candidates interpreted the kite diagrams and gave a simple explanation. Only the better answers commented on two conclusions such as biodiversity, abundance or distribution. This was the difference between level 3 and level 2 answers.

Q3(a) Most candidates found it quite difficult to identify a palisade mesophyll cell from the diagram. Guard cell was a common wrong answer.

Q3(b) Very few candidates could go much beyond restating the stem of the question and writing that the bacteria moved to where the most oxygen is. Better answers appreciated that bacteria moved to the light and a few commented on the ability of chlorophyll to trap blue and red light but not green.

Q4(a) Many candidates were let down by the failure to use scientific terms in their answers. Better answers correctly referred to the diffusion of carbon dioxide with reference to air spaces or the thin nature of leaves.

Q4(b) This question was quite well answered with references to competition and availability of water and minerals.

Q4(c) Most candidates answered correctly.

Q4(d) Many candidates lost marks by simply quoting figures rather than making any comparisons.

Q5(a) Identification of the mass number was the most frequently correct answer.

Q5(b) In part (i) many candidates gave a melting point that was too low (some below absolute zero) and a boiling point that was too high. Even after getting part (i) correct, some candidates went on in part (ii) to give the state as solid. Answers in part (iii) were often correct with the most common incorrect answer being fluorine.

Q5(c) Many attempts at this equation were very poor, with the most common mistake writing the reactant as 2Cl rather than Cl_2.

Q6(a) The majority of candidates gave metal C and then listed all the properties.

Q6(b) Many candidates did not include a diagram, but those that did tended to score more marks. The most common error was to state that there are strong intermolecular bonds.

Q7(a) Very few candidates correctly gave the formula of sodium oxide. A significant number of answers gave the electron configuration.

Q7(b) In many answers ideas about covalent and ionic bonding were mixed up. Some candidates did not realise that two models were required, and instead attempted to integrate the two. The few candidates that attempted the structure of O_2 scored well.

Q8(a) Answers to this question were very confused. Many candidates knew the correct names of the processes but were unable to describe them correctly.

Q8(b) Many candidates thought that as nitrates had such small particles, they could not be removed. The better answers showed a realisation that nitrates were difficult to remove because they were soluble.

Q8(c) There were many references to cost here but only the better answers explained why it was so costly.

Q9(a) Most candidates could perform the calculation but many do not understand what 2 significant figures means. Part (ii) was answered well.

Q9(b) Again, the calculation was well answered but very few candidates could follow this up with a quantitative explanation in part (ii) as to why the fuse will blow.

Q9(c) Good answers here separated the reasons for both the earthing and the insulating mat. Weaker answers amalgamated the two and were confusing. Also marks were lost through imprecise wording such as the flow of volts or shock.

Q10(a) Many candidates knew the frequency of ultrasound but some candidates answered part (b) here and some thought ultrasound was made up of electromagnetic radiation.

Q10(b) Previous reports and mark schemes have emphasised the need for answers to refer to reflection rather than ‘bouncing off’ but this still remained a source of lost marks.

Q10(c) Generally well answered although a small number of candidates believe that the foetus is housed in the stomach.

Q10(d) Very few candidates referred to A and B being adjacent rare fractions.

Q11 Many candidates identified D or E as being the best choice of tracer due to the penetrating power but better answers chose E due to the half-life. Some descriptions of the method were poor.

Q12(a) Calculations of the half- life were often correct.

Q12(b) This question proved more difficult than part (a). A number of candidates appreciated that they needed repeated halving and scored one mark.

Q13(a) Many candidates identified the correct numbers.

Q13(b) This was well answered although a number of candidates concentrated on the peer review idea rather than the advantages of working together.

Q14(a) Generally well answered.

Q14(b) The most common error in part (i) was to add 10 for the air travel rather than 100.Again in part (ii), some candidates lost marks for simply stating numbers and not making comparisons.

Q14(c) In part (i) a number of candidates could calculate the correct risk of smoking and buying work tops. Weaker answers simply stated that the first two statements were correct and repeated the data. Part (ii) was well answered.

B723 Additional Science B Controlled Assessment

General Comments:

Controlled assessment in its present form has now reached the half way point. This is the third year of its life and there are three more to go.

The addition of 'Extended Science' to the range of options available proved popular with some centres.

Centres are, in general, coping more efficiently with the system and some excellent work accurately marked was seen particularly in the separate sciences.

There were, of course, some exceptions and a number of centres used tasks from last year or from next year in error. This mistake will not disadvantage candidates but the centres concerned will be forbidden to use the same tasks for next year's assessment.

There seemed to be fewer large adjustments to the marks given by Centres as a result of moderation though, of course, there were still some which marked over-generously.

Most centres annotated candidates' work to show/explain where marks had been awarded. This aided the process of moderation and Centres are thanked for the efforts involved in this annotation.

Most centres also submitted samples of work which were well organised and securely fastened together. Moderators are grateful for this as, again, it makes the process of moderation more straightforward.

Centres are reminded that in signing the CCS160 (Centre Authentication) form they are guaranteeing that the work submitted is the candidate's own unaided work.

There were a small but significant number of centres where too much assistance had clearly been given to candidates. In a few cases two or more candidates were found to have completely identical work.

In previous years, comments on individual Skill Qualities have concentrated on how centres could avoid common errors in the interpretation of the criteria. Centres which feel the need for such guidance should consult the reports written in 2012 and 2013.

This year the report will deal with strategies to ensure that candidates score well in each Skill Quality. Some of the points made will, of course, be the same.

Research

Candidates should focus on the bullet points from Stimulus Sheet 1. They should deal with each of these points separately and ensure that each question posed is answered fully. It should be clear from references within the text where the information was sourced from.

It is not necessary to produce extensive research notes. The inclusion of material which is not relevant to the Bullet Points reduces the mark available as the candidate has not demonstrated their ability to 'select' the information which is relevant. Quality is much more important that Quantity.

Planning

A hypothesis, where appropriate, should start with the prediction and follow it with a scientific explanation of the reasons for making it. It need not be unnecessarily long.

Whilst not being essential, it is helpful if the variables which are part of the task are listed and an explanation of each including control where possible is given.

It is also helpful if apparatus to be used is listed and the reasons for choosing are given. This allows candidates to fulfil the criteria of 'ensuring accuracy' and 'avoiding errors'.

A plan should be detailed and step by step. Details of how to set up apparatus should be given where appropriate (a diagram can be helpful here).

The plan should give details of the range of values to be investigated and of the number of replicates to be attempted.

It is not necessary to introduce a moderation, though if the planned method is changed the reason for this should be given.

The plan should always be designed to produce numerical data which can be displayed as a graph (see Processing).

Collecting Data

Structure is more important than neatness. A very neat table which is confusing or incomplete is not worth the highest marks. A table laid out logically with appropriate headings and units where it is easy to understand how the data relates to the task and where all the raw data is included is worth high marks even if it is not very neat.

If all the data is there, well organised, easy to understand and with correct headings and units, centres should not be afraid to give full marks.

Managing Risk

The criteria for 5/6 marks state 'All **significant** risks in the plan **evaluated**'. The risk of having a heart attack whilst squeezing a clothes peg is not significant. Too many times candidates invent spurious risks. Evaluated means that the candidate needs to appreciate and state whether it is a low risk or a serious risk.

The criteria also state '**Reasoned** judgements are made to reduce risks by **appropriate specific** responses'. The highlighted words speak for themselves.

Processing data

To gain the higher marks a graph is essential and all tasks are designed so that they produce data suitable for graphing. Key words in the 5/6 criteria are 'scales and axes selected' These should be selected so that the correct data is accurately plotted to produce a graph which fills at least half of an A4 sheet of graph paper (this is the graph not the grid which it is plotted on). A line of 'best fit' is usually a straight line or a smooth curve. Neither should be artificially forced to go through the origin, which is not usually a point.

A treatment of uncertainty such as range bars is essential for 6 marks.

If a plan does not aim to collect a sufficient range of data then a suitable graph cannot be drawn and the higher marks are not accessible.

Analysing and Interpreting data

A correct description of the trend is required; the one shown by the data, not the one predicted by the hypothesis (though they should be the same). This should be linked to data (or the graph). Some scientific explanation for the trend is required though this could be credited if it present in the Conclusion.

Secondary data should not merely be mentioned but' links between primary and secondary data evaluated' Reasons for any differences should be explored. There should also be an analysis of 'the treatment of uncertainty'. Scoring 6 marks here is not straightforward and additional space may be required (see comments below).

Evaluating

A relevant comment about the data is essential. No data is perfect, candidates should refer to their range bars if present. They should comment on differences between replicates and how the points drawn relate to their best fit lines. Too many candidates seem to think that they gain marks from having accurate data, not in this skill quality.

Once weaknesses in the data have been identified remedies need to be suggested. It is not sufficient to say what went wrong. How to do it better next time is what is needed.

A simple statement such as use a video camera or use a data logger is not sufficient. Why would this be better?

Consider the words 'detailed and critical consideration' and 'suggestions for improvements justified'.

Justifying a Conclusion

Here the words 'critical analysis of the data' make it clear that a simple statement of “my results support the hypothesis” is not sufficient. Is there any doubt? Could they be interpreted differently? Please note also the words 'from research and investigation' this is where the answer to Q6 comes in.

However the most important words are 'clearly linked to relevant scientific knowledge and understanding'. The science used in the explanations in questions 5 and 6 must be known and understood not just half remembered from an earlier lesson. Good focussed research notes help here.

Comments

Candidates should not feel constrained by the space allocated in the Part 3 answer booklet. They can, of course continue on additional sheets which they should label unambiguously.

However, candidates are pre-programmed to write sufficient to fill the space provided and so a better solution is to create a Centre version of the booklet.

As long as the front page is retained and the wording of the questions are identical, the space allowed for answers can be as large or as small as you wish.

Such an answer booklet does not count as a writing frame as no guidance as to what to write is given.

Problems with Individual Candidates

If a candidate is absent for the research section of the task and there is no time for the task to be completed before part 3 is undertaken then the candidate will have to work without research notes and will be disadvantaged particularly in answering question 6.

If the candidate is absent for the planning stage then they may be given the plan of another candidate (but not a teacher plan). They will score zero for planning but can access all other marks.

If a candidate's plan is so poor that it will not work or is dangerous, they can again be given the plan of another candidate. Their own plan should be marked and they keep that mark for planning but, thereafter, marks may be based on the alternative plan.

Much the same applies to a candidate whose results are very poor. They should be given a mark for their own results under collecting data but can then be given the results of another candidate to use for processing etc. It is recommended that such candidates use their own results for the Evaluation section.

If a candidate is absent for the session where the investigation is carried out then they can be given the results of another candidate (but not teacher results). They will score zero for collecting data but can still access all other marks.

Candidates requiring the assistance of a scribe or amanuensis or with other access problems can receive help. For further details contact OCR.

There are a number of documents available to assist centre with the application and administration of these tasks.

- **The specification for Gateway Science**
- **Gateway Science Suite Guide to Controlled Assessment**
- **Exemplar tasks with marked candidate's work on the OCR website**
- **Candidate guidelines for controlled assessment** (section H of the guide to controlled assessment) also available separately from the website. These guidelines may be used by candidates in all parts of the controlled assessment.
- **The assessment criteria**. These may be given to candidates but the wording may **not** be simplified or changed in any way. Issuing the additional guidance to candidates is strictly forbidden.

Centres are thanked for the many hours of work put into running the assessments, marking the assessments and preparing the sample for submission. In the majority of Centres this work resulted in a moderation process which was accomplished without too much trouble.

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