

GCSE

Additional Science B

Gateway Science Suite

General Certificate of Secondary Education **J262**

OCR Report to Centres June 2016

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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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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 was some evidence to suggest that a few candidates had struggled to complete the paper as a minority of candidates seemed to not answer the final few questions. More concerning was the noticeable increase in the number of 'no response' answers scattered throughout the examination. This even included objective, multiple choice type questions where candidates just needed to select from a list or tick a box. Candidates must be encouraged to attempt all the questions.
- Answers were appropriate to the question and there was little evidence of guessing taking place. Questions which tested the quality of written communication were affected by a lack of literacy skills. Many were unable to express answers clearly and were unable to construct meaningful sentences. Candidates should be encouraged to break down the question into appropriate steps and respond accordingly. This may avoid the rather haphazard approach that some take, leading to either key features being missed through repetition or confusion of ideas. This often limited the access to the higher marks in this type of question. Some of these questions were no response answers but in the main candidates did have an attempt.
- Candidates were 'on task' throughout the session and there was some evidence that some struggled to complete in the time available due to the no responses towards the end of the paper.
- The rubric of most questions was interpreted correctly.
- Candidates continue to find difficulty in questions which test the candidates' ability to apply their knowledge and understanding. Marks ranged from single digits to mid-sixties and it is encouraging to see higher marks are now being obtained by the more able candidates.
- Many candidates were able to calculate percentage yield and interpret data on yield and atom economy to make an appropriate choice of manufacturing method. However, many candidates struggled to use data on a speed-time graph, often describing the horizontal line as a stationary phase rather than a constant speed.
- 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.

Comments on Individual Questions:

Question No 1.

Q 1(a). Candidates were generally within the correct age range but some gave the mass instead of the age.

Q 1(b). Many answers were vague, only referring to growth or not giving specific age ranges for changes. Perhaps some were confused by the mention of 'growth' in the question, and didn't reference height and mass from the graphs specifically.

Q 1(c). Some candidates did recognise 0-2 as the correct age range. Many, however, chose 16-18 or 12-14.

Question No 2.

Q 2(ai). Most scored both marks. Where they didn't, they often picked up one mark for 190.

Some candidates did 200-30 so got max heart rate of 170 and then failed to get the second part as well.

Q 2(aii). Many candidates referred to training more or working harder (generally) without specific reference to swimming as evident from the table. Some did not identify that the intensity of swimming needs to be increased.

Q 2(aiii). Often candidates did not specify a time to count beats. Some only scored 1 mark for bpm (no reference to heart/pulse).

Q 2(b). Very few marks were scored for this question, and 'muscles need more oxygen' was the most common creditworthy response. Most responses referred to the heart beating faster and more oxygen needed round the body/breathing more to get more air/oxygen into lungs, which did not address the question. Candidates were not able to link aerobic respiration to the need for more energy for muscles that were doing more work.

Question No 3.

Q 3(ai). There were few examples of level 3 responses as not many candidates commented on the breathing problem, or inbreeding. Quite a few identified 2 selective breeding points, although many thought that the wolf was bred with a different type of dog. Smaller dogs were sometimes chosen without specific features. Breathing problems were sometimes due to smaller bodies or differences in the habitats of wolves/dogs. Also many responses were about genetic engineering or artificial insemination.

Q 3(aii). Many scored well here. The most common incorrect answer was 'cell'.

Q 3(bi). This was reasonably well answered. However, incorrect answers varied considerably with no apparent reasoning for the choice of number.

Q 3(bii). Some candidates got this correct. All other responses were seen and gamete and acrosome were the most common incorrect answers. Rather concerning was the number of candidates who left this as a 'no response'. They must be encouraged to attempt objective questions where they just have to choose a correct response from a list.

Question No 4.

Q 4(ai). Most candidates grasped the reference to acidic conditions, but mentioning 'not boiled' was rare.

Q 4(aii). A diagram was often given with no labels or incorrect labels. A large number of responses confused the lock and key, stating pepsin was the key and protein the lock. Also, there was much repetition of the information in the stem of the question. This question also had a significant 'no response' rate compared to others indicating it was an unfamiliar area to candidates.

Q 4(b). The idea of a fair test was often given as a response. Rarely did candidates refer to optimum/best/body temperature as a correct response but some referred only to needing warmth.

Question No 5.

Q 5(a). Most candidates answered this well. Most put the arrow and plus signs in the correct place. However, a few missed off water at the end.

Q 5(bi). Although candidates did score here, many gave 0.5 as a response and were just outside the tolerance for this response.

Q 5(bii). This item was reasonably well answered. Ticks were mainly in the first three boxes.

Q 5(biii). In general this question was quite poorly answered. Many compared the warm and cold acid curves, or failed to express their ideas coherently.

Q 5(c). A reasonably well answered question. However, some just put 'there was nothing left to react with'. Common incorrect responses included - there's no more carbon dioxide / no more gas given off / its lost energy. Some candidates were focusing on the warm acid and suggesting that it had cooled down.

Q 5(d). Many candidates just referred to cooler temperatures slowing the reaction. Where candidates did reference particle theory they seemed to either reference particle energy/speed or collision frequency but not both.

Q 5(e). Catalyst was frequently seen but also increased concentration and larger surface area were responses correctly given. Many also incorrectly referred to temperature, despite it being in the stem of the question.

Question No 6.

Q 6(a). Most candidates did not score here. If they could identify a reactant they usually named it rather than giving the formula. Of those that got it correct, Mg was much a more common response than H_2O .

Q 6(b). Many candidates knew this, or if not, left it blank.

Q 6(c). Of the candidates that scored on this question many candidates got B but few gave the correct reason. Those that got the second mark normally got it for a correct column of numbers against the table, but most struggled to manipulate data to make a comparison.

Question No 7.

Q 7(a). Many candidates compared the 2 processes within the same marking point i.e. reverse arguments, rather than referred to another point. Most got the idea that when using the batch process only a limited amount is made/on demand. The point about the continuous process running 24/7 was also frequently made. Incorrect responses referred to cost, time, and labour. Also candidates sometimes said that continuous was continuous which was not credited as it repeated the stem of the question.

Q 7(b). Many scored well here, with references to research/testing, materials, labour, safety.

Q 7(c). Most candidates scored into level 2 and quite a lot got level 3. With some, the incorrect calculation prevented them from accessing L3, although many scored 4 marks for correctly calculating 60%. Most candidates suggested D, although some said B.

Question No 8.

Q 8. This question was not particularly well answered. Some common incorrect responses included strong, hard, sharp, found underground. Shiny was the most common scoring response.

Question No 9.

Q 9(a). A well answered question. Hertz and watt were also seen.

Q 9(bi). Some candidates scored 2 marks for 300. Some scored 1 for 75.

Q 9(bii). Most candidates put 'doubled' or 'twice' the amount. A few put 600, or got the e.c.f. of 150.

Q 9(c). A well answered question. Some candidates put Friday.

Question No 10.

Q 10. Candidates often referred to speed or acceleration but rarely both. Relatively few scored all 6 marks. Most got 3 or 4, with combinations of A-B accelerating / increasing speed, B-C constant / steady speed, C-D decelerating / slowing down. A common error was to say that it was stationary between B and C. Many candidates referred to the C-D as the return journey. A few wrote about the gradient of the line or descriptions of changes in the shape of the graph. Not all candidates interpreted the question correctly and realised at each part of the graph they were to comment every time on both of the variables speed and acceleration.

Question No 11.

Q 11(ai). Most candidates were able to describe using dummies and doing crash tests and some added that the injuries could be assessed. It was rare that any candidate mentioned anything about using the same conditions for the tests. Only a few got the idea that different seat belts could be used.

Q 11(aii). Most scored one mark by suggesting that the information should be shared or that the results needed to be checked. However, few candidates scored 2 marks.

Q 11(b). Many gained a mark here for the idea that the 3-point belt would hold you in better or would be stronger.

Q 11(c). Reliable was a common incorrect response, although many candidates scored with strong/elastic/stretchy. Many recognised that the belt may be damaged in some way after an accident, although a few said it would be just 'stretched' and not 'permanently/over stretched' and so were not credited.

Q 11(d). Many candidates scored here with an array of modern or traditional features. Incorrect responses mainly included reference to airbags and crumple zones. These were not credited as they protect during a crash but are not preventative.

Question No 12.

Q 12(ai). A well answered question with many candidates recognising the need to compare.

Q 12(aii). Many candidates scored 1, but few scored 2. Many compared the fuel consumption of the two cars, saying that it was less for Model R. Most then went on to compare emissions, and comparison between town and motorway fuel consumption was rare.

Q 12(b). Generally a well answered question, many scored both marks here. Some put **F** but did not give an acceptable figure, others got the correct figure but lost the 1st mark for putting 2 letters, e.g. **F** and **G**.

Q 12(c). Of candidates that attempted this, most referred to the idea of less speed in town / more on the motorway. Some linked kinetic energy to speed, but did not state where it was highest.

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

General Comments:

The majority of candidates were well prepared for this examination however a significant number of candidates would have performed better if entered for the foundation tier paper. Most candidates attempted all three of the 6 mark questions and usually scored some marks. These questions are marked using a level of response mark scheme which uses the concept of 'best fit'. The biology question concerned selective breeding and the specific problems arising from selective breeding pug dogs. It was targeted at all grades up to and including grade A. About a quarter of candidates gained level 3 (5 or 6 marks) and about half gained level 2 (3 or 4 marks). The chemistry question concerned the interpretation of data to calculate the percentage yield and to explain their choice of the best method to use to make a painkiller. It was targeted at all grades up to and including grade C. About a third of candidates scored level 3 (5 or 6 marks). The physics question asked candidates to describe the changes in acceleration during a journey and to explain how to calculate the distance from the graph. It was targeted at all grades up to and including grade A. Again about a quarter of candidates scored level 3 (5 or 6 marks) and about half gained level 2 (3 or 4 marks). Candidates need to ensure that they address all aspects of the question if they are to access level 3. Candidates should understand that, if they require more space to answer these questions, they should not write into the bar codes but may use the additional answer space at the end of the paper before asking for extra paper. Careful numbering of answers in this space is essential. Candidates generally performed well in straightforward calculations. Overall Examiners felt that the question paper, although challenging, was appropriate to the ability range of the candidates for whom it was intended.

Comments on Individual Questions:

Section A

Question 1

This question was about predicted maximum heart rates, respiration and haemoglobin.

(a) (i) Most candidates were able to partially calculate the percentage of max heart rate and almost half of them were able to give the correct answer of 86% or a correctly rounded percentage.

(a) (ii) Almost two thirds of candidates were able to use their answer to part (a) (i) to explain why Mike will not get maximum benefit from his training. A number of candidates did not use their answer from part (a) (i) and weaker candidates just repeated the information in the question.

(b) Just over a third of candidates were able to explain that haemoglobin combines with oxygen but fewer were able to link this to the importance of delivering more oxygen for aerobic respiration or that there is less fatigue.

Question 2

This question was about selective breeding and cell division.

(a) As stated previously, most candidates attempted this question with varying degrees of success. The best answers recognised that continued selective breeding leads to a reduced gene pool and that the flat nose causes the breathing problems. Many candidates chose to only write about the continued selective breeding or the breathing problems and so did not fully answer the question. Weaker candidates confused selective breeding with genetic engineering or thought that the grey wolf and the pug were being bred together or just wrote about mutations. Very few candidates expressed the concept of recessive characteristics or answered in terms of multiple generations.

- (b)(i) About half the candidates identified the cell division as meiosis.
- (b)(ii) Again, about half the candidates were able to identify diploid as the word to describe dog skin cells.

Question 3

This question was about enzymes and DNA base sequences.

- (a) (i) Three quarters of the candidates were able to identify that pepsin requires acidic conditions to work. Fewer candidates were able to explain that the pepsin must not be boiled in order to work.
- (a) (ii) About two thirds of candidates were able to describe that the enzyme is a 'lock' or were able to draw a diagram showing the substrate and enzyme. Fewer candidates were able to explain why starch does not fit the 'lock' shape. Weaker candidates confused the 'lock' and the 'key'.
- (b) Almost three quarters of candidates were able to pair A with T and G with C.
- (c) (i) About half the candidates gave the correct order of amino acids. Weaker candidates did not understand the table and just gave further base sequences.
- (c) (ii) Less than half the candidates explained why the order of amino acids is important and even fewer went on to explain that shape is important to the functioning of a protein or active site.
- (c) (iii) Less than a quarter of candidates realised that with the code TAT the same amino acid, isoleucine, is coded and so there will be no effect on the structure or function of pepsin. Many candidates assumed that a TAT coded for a different amino acid because they failed to use the information given in the table to answer the question. A few thought that a gene mutation was going to stop pepsin functioning.

Section B

Question 4

This question was about the reaction between sodium carbonate and ethanoic acid.

- (a) Three quarters of candidates were able to complete the symbol equation with half of these also being able to balance it correctly.
- (b) Almost all candidates were able to read the value of 3 minutes from the graph.
- (c) (i) Candidates found this question difficult, with the majority of candidates not gaining any marks. Better candidates clearly understood how to calculate the rate of reaction during the first 1.5 minutes for the cold acid, but weaker candidates calculated the rate of reaction for the first 5 minutes or for the whole time stated on the graph.
- (c) (ii) About half the candidates were able to interpret the gradient of the graph in terms of the rate of reaction. Better candidates compared the steeper gradient during the first 1.5 minutes with the rest of the graph. Weaker candidates tried to answer the question without using the graph.
- (d) This question discriminated well. Most candidates were able to explain that cold ethanoic acid particles have less energy. Many of these candidates then went on to explain that these particles have less frequent collisions. Fewer then wrote about less energetic or less effective collisions. Weaker candidates only described, in terms of the reacting particle model, the reaction with hot ethanoic acid and so could only gain a maximum of two marks as they had not answered the question. A significant minority answered in terms of 'vibrating more' or 'spreading out more'.
- (e) Just over a third of candidates completed the sentence with the word limiting.

Question 5

This question was about the reaction between magnesium and water.

- (a) Less than a quarter of candidates were able to show that the mass is conserved. Many candidates attempted this question but were unable to add the correct relative atomic masses together.
- (b) This question discriminated well, with the stronger candidates giving a full answer in terms of bond breaking being endothermic, bond making being exothermic and the fact that more energy

is given out than taken in. Weaker candidates confused endothermic with exothermic and then thought it was all about a balance between how much each of these processes gave out in terms of energy. A common error was with the candidate's use of language, as many wrote about using energy without appreciating that this implies taking energy in (endothermic) and this often negated an otherwise good answer.

(c) Over a third of candidates were able to use the results to explain why heater D was able to heat 227 g of food to 56°C in less than 12 minutes. Good answers included the correct calculation of 9.3 minutes or the idea that D heats up by 60°C in 10 minutes.

Question 6

This question was about the different industrial methods used to make drugs.

(a) Almost half the candidates were able to describe why a batch process is used for making pharmaceutical drugs. Many candidates gave more than one description and clearly understood the meaning of a batch process.

(b) This 'How Science Works' question was well answered by the majority of candidates. Most gave answers about the need for research, raw materials, safety and labour.

(c) The majority of candidates were able to calculate the percentage yield for method C and explain their choice of method to make the painkiller. Good answers included a comparison between the four different methods. Weaker candidates only gave limited explanations and tended to state the information about each method rather than compare the information for each method e.g. percentage yield is 90%.

Section C

Question 7

This question was about work and power.

(a) (i) Almost a third of candidates were able to calculate the work done as 300J. Weaker candidates were able to calculate the weight but had difficulty calculating the height she had climbed.

(a) (ii) Less than a quarter of candidates realised that to do more work, the force or the distance needs to increase. Good answers included her underestimating her mass and not considering the fact that when walking up the stairs she was moving horizontally and vertically.

(b) Candidates found it difficult to link power, work done, and time together. Many identified that on Thursday the table showed that the power developed was the highest but they did not explain the reason why by using the power equation.

Question 8

This question was about a speed-time graph

This question discriminated well across the ability range. Better candidates wrote about changes in acceleration in terms of non-uniform acceleration or in terms of the changing gradients on the graph. The majority of candidates described how to calculate the distance and gave simple descriptions of acceleration. Weaker candidates only gave simple descriptions in terms of speed rather than acceleration.

Question 9

This question was about seat belts as a safety feature.

(a) (i) Most candidates wrote of the use of crash test dummies and the use of measurement and observations about these dummies during a crash. Weaker candidates only mentioned the use of the dummies and failed to explain how the dummies could be used to collect valid test data.

(a) (ii) This 'How Science Works' question was well answered by the majority of candidates. Most gave answers about the need to compare results and to use the results for further tests.

(b) Over three quarters of candidates were able to suggest why 3-point seat belts are better at reducing injuries. Good answers included that they are able to hold the lower half of the body in the seat and that they spread the force over a larger area.

(c) Less than a quarter of candidates were able to link the ability of the seatbelt to stretch with the reason why this is a property seat belts must have. Many candidates thought the seatbelt must be soft or strong or that it just protects the person in a crash.

(d) Many candidates were able to give a benefit of a pregnant woman wearing a seatbelt but were unable to describe a risk in terms of the position of the seatbelt or the possibility of the actual seatbelt causing an injury during a crash. Weaker candidates gave answers about the seatbelt being uncomfortable, which is the question, not reaching around the woman or that they are used to stop the woman's stomach touching the dashboard.

Question 10

This question was about fuel consumption and emissions in cars.

(a) Over a third of candidates wrote down another condition that needs to be kept constant. Weaker candidates did not read the question and just gave answers from the question such as speed or how the car is driven.

(b) (i) Almost three quarters of candidates used the data to explain that model S has a higher fuel consumption.

(b) (ii) Less than a quarter of candidates were able to suggest why the emissions quoted were average values. A common misunderstanding was that an average value is an estimate and that it is actually not possible to (accurately) measure emissions.

(c) Only the best candidates were able to use the kinetic energy equation to explain the relationship when speed and mass changed. Weaker candidates confused kinetic energy with velocity and thought that doubling speed and doubling mass only doubles kinetic energy.

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

General Comments:

The paper differentiated well and candidates were able to demonstrate their knowledge and understanding across Modules B4, C4 and P4. Candidates performed best on Section A (B4) and worst on Section C (P4). Candidates found Section D, the analysis of data section, more challenging.

The longer 6 mark questions, which were marked using a level of response approach, were generally slightly better answered than in 2015, with candidates generally scoring best on the physics 6 mark question.

Candidates demonstrated the ability to apply their knowledge and understanding of science to unfamiliar contexts and were able to analyse and evaluate evidence, make reasoned judgements and draw conclusions based on evidence.

Candidates used their knowledge and skills appropriately to respond to questions about decay, Group 1 elements, electrostatics and nuclear radiation.

Candidates did not seem to have the knowledge required to respond to questions about ecology in the local environment, molecules & compounds, electrical resistance and radioactive tracers.

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

Comments on Individual Questions:

Question 1

- (a) Many candidates correctly chose fertiliser.
- (b) Many candidates described preserving strawberries 'to stop them going mouldy', which was insufficient to gain the mark.
- (c) Most candidates gained full marks in this question.

Question 2

- (a) In part (i) most candidates correctly suggested ideas about loss of habitat and loss of food. The idea that decomposers feed on dead material was less well known in part (ii). The meanings of the terms 'population' and 'community' were not well understood in part (iii). 'Lake' was usually correct in part (iv).
- (b) Good responses described that blocking the xylem would result in leaves not getting any water and that, as a consequence, photosynthesis would stop. Many candidates referred to stopping transport of water but references to photosynthesis were less common.
- (c) Examiners saw a range of incorrect responses with many candidates not able to use the key correctly to identify the leaf.

Question 3

- (a) Most candidates successfully interpreted the information in the graph and described the patterns shown.
- (b) Examiners saw a range of incorrect responses outside the accepted range of 78 – 82.
- (c) Organic farming was a common misconception in this question.

Question 4

This 6 mark question was targeted up to grade C. Many candidates were able to how the oxygen levels changed in both bottles or explain that sunlight affects the amount of oxygen and gained credit at Level 1 (1 – 2 marks). To gain Level 2 candidates needed to appreciate that photosynthesis is happening in the clear bottle or explain that photosynthesis produces oxygen. Candidates needed to link photosynthesis in the clear bottle to oxygen production and respiration in the dark bottle to decreasing oxygen levels to gain credit at level 3 (5 - 6 marks). Very few candidates attained the higher levels on this question.

Question 5

- (a) The roles of the scientists involved in the development of the Periodic Table and the structure of the atom were not well known with examiners seeing a wide range of incorrect responses.
- (b) Good responses described the idea that more experiments have been carried and/or more evidence is now available.

Question 6

This 6 mark question was targeted up to grade C. To gain credit at level 3 (5 – 6 marks) candidates needed to write the balanced symbol equation for the reaction between calcium and oxygen and to explain why O_2 is a molecule and CaO is a compound. Most candidates were unable to explain ideas about molecules and compounds and only gained credit at Level 1 for an unbalanced symbol equation.

Question 7

- (a) Good responses correctly interpreted the data and appreciate that potassium gives a lilac flame in a flame test and iodide gives a pale yellow precipitate with silver nitrate. However, the results of tests for ions were generally not well known.
- (b) Practical details of how to carry out a flame test were not well known with many candidates describing heating a solution in a test tube.

Question 8

- (a) Zinc carbonate, despite being the reactant and not a product, was a common misconception.
- (b) Many candidates correctly calculated the decrease in mass as 0.88g. A far smaller proportion of candidates were able to explain that the mass decreases because a gas is given off.
- (c) Many candidates correctly identified that there are three different elements in the formula $ZnCO_3$. Five, being the number of atoms in the formula, was a common misconception. Examiners also frequently saw the answer two, presumably from candidates who thought the different elements were Zn and CO.

Question 9

- (a) Good responses explained that Group 1 elements react with water and with oxygen.
- (b) Most candidates correctly identified another Group 1 element.

Question 10

- (a) Many candidates correctly added up the electrons to obtain the answer of 20.
- (b) Many candidates realised that the atom had 4 occupied shells. A far smaller proportion of candidates were able to explain how they had deduced their answer.

Question 11

- (a) Most candidates correctly chose 'positive' and 'negative'.
- (b) Good responses described that aluminium is a conductor so the balloon does not become charged. When candidates did not gain credit it was usually because they gave explanations in terms of balancing out charges or friction between the foil and the balloon.
- (c) Many candidates were able to give a use of electrostatics.

Question 12

- (a) A common error was to divide the battery voltage by the ammeter reading to give an answer of 4.5 ohms.
- (d) A common error was to divide the length of the wire by its resistance to give an answer of 20cm.

Question 13

This 6 mark question was targeted up to grade E. At the simplest level, a candidate who correctly labelled one or two features on the longitudinal wave, or gave a similarity or a difference between the waves, gained Level 1 (1 – 2 marks). To gain Level 2 (3 – 4 marks) candidates needed to label one or two features and give a similarity or a difference between the waves. Many candidates did not gain credit at Level 3 as they did not label three features on the wave correctly and were unable to give a similarity between the waves.

Question 14

- (a) This question required candidates to identify the isotope with the shortest half-life and to explain how they had made their choice. Most candidates correctly chose isotope A but then were not able to clearly articulate ideas about half-life.
- (b) Examiners saw a wide range of incorrect responses.
- (c) Candidates gained two marks for correct ticks in all five rows of the table. One mark was awarded for four or three rows correct.

Question 15

- (a) Good responses identified that statements 1 and 2 were correct whereas statement 3 was incorrect. Whilst many candidates gained this mark, fewer candidates were able to explain why the statements were correct/incorrect.
- (b) Similarities between x-rays and gamma rays were not well known.

Question 14

- (a) Good responses in part (i) appreciated that the deciduous tree lost most of its leaves in October because the graph drops most in that month. In part (ii) most candidates correctly interpreted the graph to give the answer of 1000 kJ.
- (b) In part (i) very few candidates appreciated that the data related to the same month / area of forest / area of tree. Good responses in part (ii) calculated the total energy trapped by the evergreen tree and then appreciated that this was the same as the total energy trapped by the deciduous tree.
- (c) Many candidates correctly calculated the efficiency as 5%.
- (d) Examiners saw a wide range of incorrect responses.

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

General Comments:

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

Numeracy skills appear to be continuing to improve, although examiners did seem to witness the increased inappropriate use of reoccurring dots in answers.

The main areas of weakness on the paper included the interplay between photosynthesis and respiration, as witnessed in the answers to Qu3. Also, very few candidates seem to have a working knowledge of the principles of radiocarbon dating, as shown by question 14.

Comments on Individual Questions:

Question No

Q.1 This was well answered by many candidates.

Q.2(a)i The main issue here for some candidates is that they simply stated that the detritivores were feeding off the fungus. This would have been acceptable if there was reference to the fungus being dead. Better answers referred to the dead trees as a food source.

ii There was considerable confusion here between the terms population and community.

iii There were good references to loss of habitat for animals and disruption to food chains along with reduction in the variety of plant species present. A number of answers simply defined the term biodiversity and then said that it will be reduced.

(b) As has been the case on some previous papers, the mechanism for stomatal closure is not well understood and answers to the reasons for death often confused photosynthesis with respiration and oxygen with carbon dioxide.

Q.3(a) The majority of candidates failed to make any mention to photosynthesis in their answers and so limited themselves to level 1. Very few candidates appreciated that respiration occurs in plants all the time despite a clear statement in the specification. This all resulted in a poorly answered question.

(b) Although this question has been well answered on previous papers there were still vague references to nutrients and the colour of the leaves.

Q.4(a) Most candidates could **describe** the difference between the results for the two groups but far fewer could explain the difference as asked in the question.

(b) This question proved to be a good discriminator with some candidates calculating the profit using the graph but then failing to take off the cost of the food in the barn or taking this figure off from both groups.

(c) Most candidates scored marks here but there were some vague answers that simply referred to animal rights or ethics.

Q. 5(a) Electron shells was by far the most common incorrect answer here.

(b) Many answers did refer to the splitting of the atom or the presence of a nucleus but many candidates became preoccupied with the nature of the subatomic particles.

Q6 Candidates construction of 'dot and cross' diagrams is certainly improving. However, there were still answers that showed the same electron in two places at the same time. There were also many answers that failed to focus on all three aspects of the question.

Q7(a) The link between the lilac colour and potassium was made by most candidates. The link between iodide and the yellow precipitate was less secure and a small number of candidates incorrectly referred to iodine.

(b) Most candidates answered well here, although there were cases of the liquid being heated in a test tube or beaker.

Qu8(a) Well answered.

(b) Most candidates could calculate the mass of carbon dioxide and explain how you could tell which carbonate produced the most but explaining the concept of percentage change was very challenging.

(c) There were a significant minority of candidates that confused manganese with magnesium.

Qu9(a) There was some confusion between conduction of heat and electricity in the weaker answers here.

(b) Many candidates simply referred to the high cost in their answers without referring to the need to maintain a very low temperature.

Qu.10 This question produced a good spread of marks with no real discernable pattern.

Qu11(a) Weaker answers here are still referring to the movement of 'positive electrons' in the wrong direction and so failed to score.

(b) Well answered by most.

(c) The idea of pooling knowledge or ideas was picked up by many candidates as was the idea of checking results. However, just obtaining more results was not credited.

(d) Most correctly outlined the idea of an even spread of paint.

Qu12(a) There were a number of various answers given usually involving some calculation using the figures provided but the majority could use Ohm's law correctly using the figure from the voltmeter.

(b) This was answered correctly in the majority of cases.

(c)i & ii The calculation was well carried out by most but a number of reoccurring dots are incorrectly appearing in some answers. Once the current was calculated as 3A, some candidates incorrectly chose 3A as the fuse.

Qu13 This question produced a good spread of marks. Some candidates could correctly construct the full nuclear equation and so achieved level 2. The full description of a beta particle as a high energy / high speed electron from the nucleus was less often seen.

Qu14(a) Isotope A was identified by most but the explanation of half-life was not always well explained.

(b) This was probably the poorest answered question on the paper with very few candidates being able to describe in any coherent way how radiocarbon dating works and why it cannot be used on recently grown material.

Qu15(a) The main difficulty candidates faced here was the use of loose terminology. References to energy being made or produced were not credited.

(b)i&ii Although the word **hitting** was emboldened in the question many candidates missed this and answered part i of the question in terms of energy **trapped**. Clearly there were then reluctant to give the same answer again in part ii.

(c)i & ii The calculation was well answered in part i and many candidates could correctly use the efficiency figures in their answer to part ii.

B723 Additional Science B Controlled Assessment

General Comments:

Overall centres have shown a good understanding of the requirements of the controlled assessments in the science subjects. The marking criteria have been mostly applied appropriately and it is good to see a large number of centres putting annotations on the scripts in the appropriate places to show how and why they have awarded the marks. Work submitted for moderation was generally well organised with all of the required paperwork submitted by the centres for the moderators' consideration.

However, a minority of centres are still submitting work that does not meet the full requirements of the courses. In particular;

- It is very important that marks are carefully checked before they are submitted. Moderators have noted a number of clerical errors this year where the marks submitted are not the same as those on the scripts sent to the moderator. This not only causes delays in the process but, if not corrected can result in incorrect marks being awarded to candidates.
- It is important that centres send the marks to OCR and the work to the moderators within the time frame set by the board. Unfortunately some centres are failing to meet these deadlines.
- It is important that the cover sheet for the work is completed correctly and, in particular, that correct candidate numbers are shown on scripts.
- All controlled assessments are valid for one year only. This is clearly indicated on the tasks that can be downloaded from the OCR web site. Some centres have submitted tasks for the wrong year. Some have submitted work from a previous year and others from next year's tasks. It is important that all centres make sure that the tasks they are undertaking are for the current year. The only tasks that are valid for 2017 are available on the website and clearly marked.
- All centres need to provide a copy of the CCS 160 Centre Authentication form with the candidates' work. On this staff are declaring that they have conducted the tasks under the required conditions as laid down by the specification. Controlled assessments require candidates to research, plan, carry out and review the tasks set and, other than for the practical work itself, this needs to be done independently. Even if candidates work in groups for the practical task they must complete their written work on their own and not work collaboratively.
- The amount of support that can be offered to candidates by the centre is the same regardless of the specification, the type of centre or the ability level of the candidates. Writing frames of any kind are not permitted and there should be no opportunity for candidates to produce a draft for review followed by a final piece of work for submission.

Previous reports have given considerable guidance on the application of the marking criteria, how to avoid common errors and the requirements for the award of high marks. Centres are advised to consult previous reports in addition to the notes given below as many of the comments below repeat advice that has been given previously and which is still being overlooked by a few centres.

Comments on specific Skill qualities:

Researching: Candidates generally scored well on this Skill quality and the marking criteria were usually well applied. In the main candidates have used a wide range of sources in their research although, not surprisingly, the majority of these are from internet sources and few references are given from books. If web sources are used then full URLs need to be provided so that these sources can be checked. If books are used then page numbers should be given as well as title and author.

In previous coursework, before controlled assessments were introduced, there was a requirement for candidates to consider the validity of sources. This **is not** part of the current marking criteria. Candidates are required to select information from their sources that is correct and relevant to the specific bullet points in task one that they are addressing and do not need to spend time considering where the information has come from. They should not use wholesale cut and paste from the sites although they may quote specific points, if referenced appropriately in the text. The inclusion of irrelevant material will reduce the mark available. For high marks candidates are also required to show which sources are relevant to the different parts of their notes. The easiest way to show this is by numbering the sources and putting numbers in the appropriate places within the text.

Planning: This Skill quality often begins with a hypothesis, except in the science specification, together with supporting science to explain and justify the hypothesis. This is only one part of the marking criteria and centres need to bear in mind that the marking is best fit not hierarchical. However, for high marks it is expected that candidates will demonstrate a suitably high level of understanding of the underlying science behind the task. This year there was a significant amount of misunderstanding of the science associated with the cold packs task for additional science, further additional science and chemistry.

Candidates sometimes find it difficult to obtain high marks when they do not address the task set. For example in the aerobic exercise task candidates will clearly obtain lower marks if they plan a task involving anaerobic exercise.

The methods written by candidates are now often of a high quality and frequently contain diagrams to support them. However, an appreciation of possible sources of error and how to control variables is still a weak area for many candidates. This is particularly true in biology tasks where there are many variables to control, for example how to maintain a constant pace in an exercise task.

Many candidates also do not consider the resolution of the equipment they choose to use, as is required in the marking criteria for 5-6 marks.

Collecting Data:

This is often a high scoring Skill quality but some centres are still awarding high marks when there are errors in headings and units. In particular, for full marks, candidates should not put units next to each data point in the table but should include these in the headings. For the purpose of this Skill quality, the level of precision is taken to be an appropriate and consistent number of decimal places for the recorded data.

Occasionally there has still been evidence of centres penalising candidates for failing to present processed data correctly, for example, averages being shown to a varying number of decimal places. Also some centres have awarded high marks when not all raw data has been included, for example, failure to record initial and final temperatures and only recording temperature change.

As mentioned above, writing frames must not be provided and, if provide, can result in only very low marks being available to candidates as they have not constructed their own data table.

Managing Risk:

Most candidates now appreciate what is involved in carrying out and recording a risk assessment for an experiment. The weakest aspect remains their ability to evaluate the risk associated with a task, as required in the 5-6 marking criteria. This is particularly the case when a task is very low risk. Candidates vary from writing virtually nothing to coming up with a range of highly unlikely risk scenarios. It was surprising to see a number of candidates referring to the risk of mercury from the use of a thermometer when most modern thermometers do not contain mercury.

In order to score highly need to identify some hazards that are specific to the task and not just generic, they then need to identify the risk associated with these hazards and suggest way to both avoid and deal with these if they occur. These suggestions need to be specific and appropriate for high marks and not just comments such as “tell the teacher”. The likelihood and severity of these risks should also be identified and. If a numbering system is given to the risks, then some key to explain what the numbers mean should be given. An overall comment about the level of risk for the whole task is important particularly for a very low risk experiment.

The level of risk should be realistic for example, not all risks should be graded as high otherwise the experiment would be too dangerous to do in a school context.

Processing data

Most candidates obtain averages for their data and produce graphs of varying quality. For high marks candidates need to produce a line of best fit and show a quantitative consideration of uncertainty. Although not penalised by the marking criteria, centres are encouraged to talk about range bars rather than error bars as error bars require a much higher level of processing than simply looking at the range of repeat values.

As mentioned in previous reports the marking criteria relating to scale in the graphs includes choosing a scale that maximises the size of the graph paper. Plotted points should occupy at least 50% of the graph paper. Candidates should be taught that graphs do not have to go through (0, 0) if is not appropriate.

With regard to the use of complex mathematical techniques these are only part of the marking criteria “where appropriate”. For example, calculation of an energy change is an appropriate complex mathematical technique in cold packs but calculating a gradient in the cheese making task is not.

Analysing and interpreting

Most candidates were able to identify trends effectively and to link these both to their own data and data from a secondary source. Anomalous points were usually identified if present although few candidates used levels of uncertainty to explain why they classified points as anomalous. For high marks candidates analyse the level of uncertainty and this should be linked to the trend, for example discussing whether the line of best fit (trend) goes through all range bars.

In some tasks the trend was not well linked to relevant scientific understanding, particularly in the cold packs task where there was often confusion between the temperature change and the energy change. The science needed to explain the trends must be of a high level to support the award of high marks.

Evaluation

Again this was well marked by most centres but overall tends to be a lower scoring Skill quality.

Candidates often need more space to answer question 4 of part 3 than is available on the standard part 3. Centres may provide candidates with a reworked version of part 3 with more space available for answers if they choose to, as long as the wording is identical to that provided in part 3. This can be easier for candidates than using additional paper.

The marking criteria require candidates to consider both the data and the method and for high marks these ideas should be linked. Suggested improvements to the method should be explained in terms of how they would provide better quality data.

Question 4 of the task requires candidates to evaluate their method, their data and to make comments about risk. Many candidates fill the space available but focus primarily on just one of these issues and consequently can only score low marks.

Although most candidates have learnt how to produce range bars from their data few understand what these range bars represent and how they relate to an evaluation of the data.

The marking criteria require candidates to consider both the data and the method and for high marks these ideas should be linked. Suggested improvements to the method should be explained in terms of how they would provide better quality data.

Comments about risk do not contribute significantly to the mark for evaluation but can be used to further support the mark awarded in the risk Skill quality but as a general rule it would be unlikely for a candidate to obtain more than two marks for the risk Skill quality if their only consideration of risk was in part 3.

Conclusion

Question five of part 3 requires candidates to link their data to their hypothesis, or the hypothesis given in a science task. Few candidates complete the question by explaining their answer. For high marks this should also show appropriate scientific knowledge and understanding.

Question 6 provides the opportunity for candidates to link their experiment to their research and a demonstration of this is required for high marks in this Skill quality.

Evidence for this Skill quality can be obtained from any part of the task. Centres are encouraged to clearly annotate the text to show where evidence is used from other sections.

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