GCSE

Science B
Gateway Science Suite

General Certificate of Secondary Education **J261**

OCR Report to Centres June 2014

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General Certificate of Secondary Education

Gateway Science B (J261)

OCR REPORT TO CENTRES

B711/01 Foundation Tier

General Comments:

The paper differentiated well and performance across the three sections of the paper appeared to be fairly consistent, allowing candidates to demonstrate their knowledge and understanding across Modules B1, C1 and P1.

The longer 6 mark questions, which were marked using a level of response approach, were generally well answered, with the exception of question 9(b). A significant proportion of candidates did not have the knowledge and understanding of polymerisation to apply to this question about the polymerisation of propene.

Candidates demonstrated the ability to apply their knowledge and understanding of science to unfamiliar context 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 the human health and diet, designer polymers and data transmission.

Candidates did not seem to have the knowledge required to respond to questions about the hormone insulin, sun protection factors or some aspects of carbon compounds and combustion of fuels.

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
This question tested ideas about the structure and function of the eye.

(a) Cornea was a common misconception.
(b) Good responses described that light is refracted by the cornea or lens and then focused on the retina. When candidates failed to gain credit it was often because they thought the light was reflected inside the eye.
(c) Candidates who scored the mark here appreciated that binocular vision enables a tiger to judge how far away its prey is. Many candidates referred to distance, but it was in the context of seeing further rather than judging distance.

Question 2
This question was about controlling plant growth.

(a) Most candidates correctly described that the plant had grown towards the light in part (i). Hormones was a common misconception in part (ii).
(b) Geotropism was not well known. Candidates who failed to gain credit usually referred to gravitational pull.

Question 3
This question focused on the hormone insulin.

Good responses to this question interpreted the patterns in the graph and stated that there is an increase in insulin levels because there is glucose or carbohydrates in the meals. Candidates then described the idea that insulin is released (from the pancreas) to lower blood sugar. Candidates who failed to gain credit usually simply described the patterns in the graph.

Question 4
This question was about smoking.

(a)   Good responses to this question described that carbon monoxide reduces the 'oxygen-carrying' capacity of the blood so the heart rate increases. Answers such as smoking damaging arteries or tar blocking arteries did not get marks.

(b)   This 6 mark question was targeted up to grade E. Many candidates were able to suggest a reason why less people smoke and to describe one or more patterns from the graph and gained credit at Level 2 (3-4 marks). To gain credit at Level 3 (5-6 marks) candidates needed to suggest a more specific reason (e.g. a link to a specific cancer of health problem) why less people smoke.

Question 5
This question tested ideas about human health & diet and the effects & risks of drugs.

(a)   The percentage of carbohydrates in a balanced diet was usually correctly calculated.

(b)   Many candidates were able to explain that teenagers need more protein for growth. When candidates failed to gain credit it was usually because they gave answers in terms of the poor dietary habits of teenagers.

(c)   Most candidates were able to suggest at least one health consequence of a high fat diet.

(d)   This question assessed the 'How Science Works' aspect of the specification and required candidates to identify different views that people may have with regard to stimulants and to describe how stimulants could affect athletes, including the possible risks. Good responses showed an appreciation that taking stimulants is cheating and described a health issue for the athlete.

Question 6
This question was about paints.

(a)   Thermochromic was usually correct.

(b)   This question required candidates to apply their knowledge of the ingredients of paint to identify A as the paint that would spread most easily as it contained the highest percentage of solvent. Candidates who correctly chose paint A often failed to gain the second mark as their answer did not compare the percentage of solvent in A to that in B or C.

Question 7
This question was about fuels.

(a)   Many candidates were able to write a correct word equation for the combustion of ethanol. When candidates did not gain credit it was often because they used 'and' instead of '+'.

(b)   Common misconceptions in part (i) were ash, charcoal and coal. Good responses in part (ii) described that incomplete combustion produces less energy, soot and poisonous carbon monoxide. Candidates often simply described that the reaction would not finish.

(c)   Most candidates were able to analyse the experimental data in the question and suggest at least one reason why butanol is not a better fuel for heating water. When candidates failed to gain credit it was usually because they described ethanol as being the better fuel because the temperature of the water at the end of the experiment was higher.

Question 8
This question tested ideas about polymers and Gore-Tex®.

(a)   Most candidates correctly identified Gore-Tex® as the most suitable material because it is waterproof and breathable.

(b)   Most candidates correctly explained what is meant by non-biodegradable in part (i). In part (ii), methods of disposing of non-biodegradable polymers, e.g. landfill, burning or recycling, were well known.

Question 9
This question was about carbon compounds.

(a)   (i)   Most candidates correctly identified C as a hydrocarbon.
       (ii)   Most candidates were successful in deducing the number of each type of atom in compound B. Candidates who failed to gain credit usually gave the names of the elements.
       (iii) A was a common misconception, presumably because it contained the element bromine.
       (iv)   Most candidates selected C_2H_6 rather than either of the reactants.
(b)   This 6 mark question was targeted up to grade C. Good responses described that many propene monomer molecules join together in a polymerisation reaction to form the long chain polymer molecule poly(propene), and included the conditions needed for the reaction. When candidates did not gain credit beyond Level 1 it was usually because their answer simply named the polymer or gave only one of the conditions needed for the reaction. Many candidates incorrectly named the polymer as poly(ethene).

Question 10.
This question was about transverse waves.

(a)   Many candidates correctly identified the length of two wavelengths on the diagram.
(b)   Good responses to part (i) appreciated that to calculate the speed of the water wave it was necessary to half the length of two complete waves given in the question. One mark was awarded for candidates who demonstrated that they knew that $v = f\lambda$ and multiplied 1.5Hz by 4.0cm. Most candidates realised that the speed of the wave would increase in part (ii).
(c)   This question required candidates to know that all electromagnetic waves travel at the same speed in a vacuum. A common misconception was that radio waves are sound waves and the idea that radio waves also travel at the speed of light was not well known.

Question 11
This question focused on interpreting data about sun protection factors and drawing conclusions based on evidence.

This 6 mark question was targeted up to grade C. At the simplest level, a candidate who suggested that Ben and Anton must use different sunscreens because dark skin does not burn as much as fair skin scored Level 1 (1-2 marks). To gain Level 2 (3-4 marks) candidates needed to explain why dark skin allows a longer safe time in the sun (in terms of more pigment or more melanin) or to carry out a correct calculation of safe time using the data given. As in other 6 mark questions on the paper, candidates had to address all aspects of the question to gain credit at Level 3 (5-6 marks). Many candidates did not use the information in the question about the sunscreens **and** the skin types to explain why dark skin allows a longer safe time, supporting their answer with appropriate calculations so did not gain credit beyond Level 2.

Question 12
This question tested ideas about heat & temperature and insulation.

(a)   80°C was usually correct, although a wide range of incorrect responses were seen.
(b)   Many candidates scored one mark for a steeper gradient from 100°C. To gain both marks candidates also needed to appreciate that the line would level out at 80°C.

(c)   Good responses showed an understanding that bubble wrap contains trapped air and that air is a good insulator. When candidates did not gain credit it was often because they described that bubble wrap was trapping moving hot air or heat. Some candidates thought that bubble wrap is a good conductor of heat.

Question 13
This question was about passive infrared (PIR) sensors.

(a)   Good responses to part (i) described that a PIR sensor detects or senses body heat. One mark was awarded for responses that described the PIR sensor detecting the person, but the idea of detecting movement did not gain credit. In part (ii) few candidates appreciated that if the sensor is not set at the correct angle then the doors will not open in time before the person reaches them.

(b)   In part (i) good responses described that the pulses of microwaves take a shorter time to reach the sensor or are reflected from the person. Candidates often described that the pulses of microwaves got quicker, but these responses did not gain credit. Part (ii) assessed the 'How Science Works' aspect of the specification and required candidates to recognise the importance of the peer review process in which scientists check each other's work.

Question 14
This question tested ideas about optical fibres.

(a)   Most candidates gave a correct value in the range 57 to 63%.

(b)   Most candidates correctly stated that 1700nm would be the best wavelength to use because it loses the least signal strength. Error carried forward was allowed from an incorrect value of less than 51% in part (a).

B711/02 Higher Tier

General Comments:

The level of difficulty of the paper appeared to be appropriate for the ability range of the candidates. Most candidates appeared to have had sufficient time to complete the paper, with the majority attempting most of the questions. There were a few candidates however that had not attempted the last few questions suggesting they ran out of time. There were also a number of candidates whose scientific knowledge suggested they would have been better entered for the foundation tier.

Candidates often found it difficult to communicate their answers clearly. There were a few cases where deciphering a candidate's writing posed a serious difficulty.

The majority of candidates had attempted all three levels of response questions. There was some evidence that candidates had been well prepared for this style of question. Responses at all three levels were seen, however candidates tended to score better in section C Q12. This was mainly due to the fact that this question also appeared on the foundation paper.

Comments on individual questions:

Question No. 1
Candidates find the structure of the eye a difficult concept. Few could describe the function of the iris correctly in terms of controlling the amount of light entering the eye. In part (b) very few used the term refraction. Only the most able candidates demonstrated a clear understanding of how two images are used to judge distance in part (c).

Question No. 2
Most candidates could recall the term auxin in part (a).However in part (b) few were able to apply their knowledge to explain the results. Many candidates incorrectly answered part (i) in terms of the shady side growing more and in part (ii) few stated that auxin was made in the tip even though they realised removing the tip would result in less growth.

Question No. 3
The majority of the candidates just attempted to interpret the graph. Very few actually explained how insulin regulates the blood. Common errors when interpreting the graph included assuming the insulin injections caused an increase in blood sugar levels.

Question No. 4
In part (a) the majority of candidates were able to interpret the graph. The majority of candidates explained that animal had resulted in more knowledge about the effects of smoking. However a few just referred to humans not being harmed by the testing. In part (c) only the more able candidates gave a detailed explanation. A common misconception is that tar from cigarettes blocks the arteries.

Question No. 5
Many candidates failed to give a specific answer to part (a). The use of the word 'it' or 'they' made it unclear as to the subject being the blood cells or the individual. This made a difference to whether or not the mark was awarded. In part (b) some candidates failed to draw a diagram and simply guessed an answer for the probability. This could not be awarded marks as the question specifically asked them to use a genetic diagram to work out the probability.

Question No.6
Very few candidates could recall the term colloid in part (a). Many candidates in part (b) assumed the presence of binding medium would help the paint dry faster. Few answered in terms of just the solvent content.

Question No. 7
Most candidates could plot the points on the graph. But in part (aii) very few could use the graph to estimate the boiling point of pentane. Those that answered correctly tended to be the only ones that drew a line of best fit onto the graph. In part (aiii) most candidates gained one mark but few gave a complete explanation that linked size to intermolecular forces and boiling points. Most candidates could recall the symbols for carbon dioxide and water to start the equation in part (b) but very few were able to balance the equation. Some candidates are still losing marks for not making the size of letters and numbers clear. In part (c) many candidates incorrectly referred to the size of naphtha as a reason for cracking and not comparing its availability to its use. Few candidates gained the second mark for suggesting that petrol or LPG could be made by cracking naphtha.

Question No.8
The majority of candidates identified the relationship seen in the graph. A few lost the mark for referring to nitrogen rather than nitrogen dioxide or they talked in terms of the numbers of asthma attacks rather than the severity. In part (b) most candidates identified the need to collect data from women, other regions or age ranges.

Question No. 9
Very few candidates were able to explain that the change in texture was due to proteins denaturing. Many incorrectly answered in terms of cell walls. In part (b) less than half the candidates gave a complete explanation of how emulsifiers work.

Question No. 10
The majority of candidates could explain that hydrocarbons contained only hydrogen and carbon atoms. Some candidates incorrectly answered in terms of double bond. About half the candidates identified the alkene as the chemical that can decolourise bromine water. In part (b) many candidates confused polymerisation with cracking. Only the most able candidates were able to give the correct equation. A number of candidates part matched level 2 answers but failed to mention the conditions needed or left the 'n' out of the formula and or the equation.

Question No. 11
Candidates were able to identify increasing wavelength in part (ai) but many thought arrow B showed increasing speed rather than energy. In part (b) candidates found it difficult to explain the term frequency; they often neglected to mention time and just referred to the number of waves. In part (ci) most candidates successfully calculated wave speed. A few tried to divide the numbers instead of multiply or they lost a mark for the incorrect number of zeros. In part (c) candidates found it difficult to express their answer clearly. Many made reference to the powers adding up to the same but failed to mention the idea of multiplying the numbers to gain the same answer. Some mentioned frequency increasing as wavelength decreased but not by the same amount.

Question No. 12
Few candidates gave a complete answer to this question. Most gained low marks for simply identifying different skin colour. Very few completed a calculation and answered in terms of melanin. The question asked the candidates to use the information; many thought this meant they simply needed to quote the numbers given. Only the more able actually calculated safe time or SPF.

Question No. 13
Very few candidates calculated the temperature rise. Many used the initial temperature in their calculation instead of the mass of water. A few candidates successfully calculated the rise but then subtracted the initial temperature so that their final answer was incorrect. In part (b) few candidates answered in terms of heat loss to the metal or the surroundings. Many thought it was a safety issue stopping the temperature getting too high. In part (ci) very few candidates explained in terms of specific heat capacity. In part (cii) candidates failed to link the answer to heating the room. Many simply repeated the stem of the question or answered in terms of energy cost.

Question No. 14
Few candidates identified the signal as being digital. Many incorrectly thought the signal would only go to the TV. They had not grasped the concept of different signals or codes for each device. In part (b) most candidates gained at least one mark.

Question No. 15
Many candidates failed to give a comparison. They stated the signal was fast but not faster.

B712/01 Foundation Tier

General Comments:

The level of difficulty of the paper appeared to be appropriate for the ability range of the candidates. Most candidates appeared to have had sufficient time to complete the paper, with the majority attempting most of the questions.

Candidates often found it difficult to communicate their answers clearly. There were a few cases where deciphering a candidate's writing posed a serious difficulty.

The majority of candidates had attempted all three levels of response questions. There was some evidence that candidates had not read the complete question as they only gave part of the answer. Most candidates found the mathematical questions difficult. Many were unable to convert answers from Watts to Kilowatts.

Comments on individual questions:

Question No. 1
Many candidates failed to calculate the input energy. A common error was to add the amounts for respiration and growth but miss off the energy in the waste. In part (b) most candidates seemed to just guess at an answer. Very few candidates correctly identified the arthropod in part (b) as an insect.

Question No. 2
Most candidates identified the correct pattern in part (a). In part (b) those that lost a mark tended to give food or minerals as an answer. This showed they had not read the entire stem of the question. Although most candidates gave the correct answer on 'no' in part (c) many were unable to explain their answer. A number of candidates simply said the pattern would be different without saying how and why it would be different. In part (d) the concept of the nitrogen cycle proved difficult. The most common mark was awarded for the idea of decomposition. Very few candidates went onto explain that nitrates were needed for proteins in order for the trees to grow.

Question No. 3
In part (a) candidates failed to give a full explanation that linked all round vision to protection from predators. Many simply described monocular vision making no attempt to explain how it helps with survival. This highlights the need for candidates to understand the command words used especially the difference between describe and explain. In part (b) the majority of candidates gained a mark for 'fur' but could not explain how the fur reduced heat loss in terms of trapping air or acting as an insulator. Part (c) provided an opportunity for candidates to demonstrate their understanding of animal behaviour. The majority of candidates were able to interpret the information and provide at least a level 2 answer.

Question No. 4
In part (a) the majority of candidates were unable to apply the process of natural selection. In part (bi) about half the candidates correctly suggested an observation that could be made. Most candidates showed an understanding of how science works to suggest that more people accept theories if they are repeated by other scientists.

Question No. 5
Very few candidates realised the reaction was oxidation because there was a reaction with oxygen. Many answered in terms of rusting and stated that it involved water. Some candidates referred to the oxide in that it was in the reaction but did not say it was formed. In part (b) many candidates answered by referring to the use of iron and aluminium in cars. Very few gave general properties that they both have. Instead they concentrated on the differences. Part (c) was answered correctly by most candidates.

Question No. 6
Very few candidates understood how to count the number of elements and atoms in the compounds. Many thought NO was one element and so gave the answer for atoms in $C_3H_8NO_5P$ as 4 or they calculated the actual number of atoms. For $NaNO_3$ they neglected to include three oxygen or they multiplied everything by 3. In part (c) the majority of candidates identified calcium hydroxide but failed to give the correct reason. Most thought it was because calcium hydroxide was a soil conditioner not because it was an alkali. Few candidates identified calcium hydroxide as not containing any essential elements most candidates thought it was glycophosphate. Even less candidates understood that ammonium phosphate had more essential elements. Instead they thought it was due to there being more atoms or elements.

Question No. 7
Only a very small minority of candidates knew air was the raw material for the Harber process. A large proportion identified a fossil fuel. In part (b) candidates were able to write the symbol equation but not balance it. A few changed the formula of ammonia to NH_4 in an attempt to solve the problem. Most candidates could recall at least one use of ammonia.

Question No. 8
Many candidates struggled to express their answer to part (a). They chose properties and materials without linking them to use. In many cases they simply listed the values from the table without applying them to the situation. For example quoting that material B has a relative strength of 400 without actually saying it is very strong. In part (b) most candidates gained at least one mark.

Question No. 9
The majority of candidates gained one mark in part (a). In part (b) many failed to attach both ends of the wire to the ammeter. Instead they completed a circuit to include the magnet. Few mentioned the need to move the magnet relative to the coil.

Question No. 10
The majority of candidates could name a greenhouse gas. However they were unable to explain what it was. Incorrect references to ozone were seen along with comments about being a man made gas that caused pollution. In part (b) candidates were able to calculate power in W but not in kW. They then tended to multiply this value by either the time used in one year or the cost of electricity per kWh but not both. Or they multiplied time by cost and did not include the power.

Question No. 11
Very few candidates could apply their knowledge of radioactive sources to answer the question. Many simply stated facts about beta being able to go through paper but alpha being stopped. Some thought gamma could not be used as it would be too harmful. Very few understood that the count rate would decrease as the plastic got thicker. Many thought it was the other way round.

Question No. 12
Most candidates could calculate the waste energy but very few could calculate the efficiency. Of those that calculated a value of 20 many neglected to give the % sign and some even gave the units of joules to their answer. In part (b) many candidates gave an answer of solar panels or photocells as they had not read the start of the question. Heating water was a common answer but as they made no reference to passive solar heating marks could not be awarded.

Question No. 13
The majority of candidates knew that asteroids collided with the Earth, although some thought they were comets. Fewer candidates realised the Moon came from a collision with a planet. In part (c) only the most able candidates answered in terms of gravity. In part (d) most candidates gained at least one mark. However some lost marks because they just quoted data from the table and did not apply it to the situation. For example quoting the temperature of the surface bit not saying it was too cold to survive.

Question No. 14
Very few candidates were able to interpret the scale on the graph to give the correct answer for part (ai). In part (aii) about half the candidates described the general trend. Some incorrectly picked out Asia as having the most instead of looking at the total use. Over half the candidates were able to describe the change for part (aiii). However some incorrectly compared the use in the two countries or they did not make it clear which country was increasing and which was decreasing their use. The rest of the World was the most common wrong answer in (bi). Most candidates however gained at least one mark. Those that lost the mark for suggesting why there was an increase did so because they neglected to make a comparison; they said copper was needed to make good but not more goods. Very few candidates were able to calculate the percentage in part (bii). Those that did tended to also get the mark in part (biii).

B712/02 Higher Tier

General Comments:

Many candidates had been well prepared for this new style paper, having learned from the experiences of B712/02 in previous years. About 3000 candidates would have been better served by entry to the foundation tier having scored less than 20 marks. Most candidates attempted all the 6 mark questions with varying degrees of success. These questions are marked using a level of response mark scheme using the concept of 'best fit'. The biology question on a conservation project to protect Bali Myna birds was targeted at grades up to A/A*. Only a small number of candidates scored level 3 (5-6 marks) on this question. The chemistry question on the choice of materials for a girder and a kitchen worktop was targeted at all the grades covered by the paper. Just under half of candidates scored level 3. The physics question on how the current from a solar panel varies with the distance from the light source was targeted at all grades up to and including A*. Less than 10% of candidates scored level 3 with almost half of candidates gaining level 1 (1 or 2 marks). Responses to the 6 mark questions continue to indicate that candidates need to address **all** aspects of the question in their answer in order to access level 3. Candidates should understand that if they require more space to answer these questions, they may use any blank space left on that page before asking for extra paper.

Candidates attempted the data response questions in section D well. Very few omissions were seen. In answering questions of this type, candidates need to quote specific examples of the data to support a conclusion, rather than make generalised statements.

Candidates continue to perform well in straightforward calculations. Calculations involving more than one step were less well answered. The writing of the chemical equation in question 7(a) was well answered.

Overall, the question paper was appropriate to the ability range of candidates intended.

Comments on individual questions:

Question 1

1(a) Approximately a quarter of candidates performed this calculation correctly. A number divided 150 by 4 and arrived at 37.5. Others multiplied 150 by 4 and gave 600. Neither of these answers gained credit.
1(b) This question was not well answered. Candidates were required either to state which organism eats dung or that it is decomposed by bacteria. Most answers did not identify an organism and so failed to score.

Question 2

2(a) Most candidates could identify the relationship between amount of lichen and the distance from the factory for 1 mark. Fewer could link this pattern to sulfur dioxide levels for the second mark. Candidates could usefully note that the question asks them to describe **and** explain the pattern.
2(b) A majority of candidates could make a correct suggestion about how far the tree was from the factory. Fewer could explain it in terms of the percentage of squares covered.
2(c) About a third of candidates correctly answered this question. There was a variety of acceptable answers including the idea that actual levels of sulfur dioxide were not measured and that there were no results for 100m.

2(d) This question was poorly answered. Few candidates mentioned the decomposition of leaves by bacteria. Better candidates mentioned that nitrifying bacteria convert ammonia to nitrates.

Question 3

3(a) Most candidates scored at least 1 mark on this overlap question. The majority of answers identified thick fur as an adaptation. Fewer candidates mentioned that the fur is an insulator. Many thought that the fur traps heat rather than air. A minority of candidates identified small ears or a small surface area to volume ratio and scored the mark.

3(b) Biochemical adaptations were not well understood by the majority of candidates. Better candidates mentioned the idea of antifreeze and that this prevents the cells from freezing. Few candidates mentioned enzymes with lower optimum temperatures. Weaker candidates mentioned adaptations of the caribou rather than the lichen.

Question 4

4 The vast majority of candidates gained either level 1 or level 2 on this question. Most commonly answers referred to disruption of the food chain, the benefits of tourism or the benefits to local people. Significant numbers of candidates merely repeated points given in the question without elaborating on them. There were very few answers referring to a lack of genetic variation or other higher level answers which was required for level 3.

Question 5

5(a) Many candidates scored 1 mark on this question usually for the idea that striped zebra were bitten less. Fewer could express the idea that the striped adaptation was passed on to future generations.

5(b) Just over half of candidates correctly answered part (i). Many failed to realise that these were model zebra and answered as if they were real zebra. Answers suggesting the type of observations to be made and also answers referring to the likely outcomes were both acceptable. Part (ii) was well answered. Candidates understand the concept of peer review.

Question 6

6(a) Better candidates generally scored both marks on this question. Where one mark was gained, it was usually for identifying the number of atoms of phosphorus and oxygen in the formula.

6(b) Few candidates scored both marks on this question. Ammonia was the most common correct answer. Weaker candidates confused this with the Haber process for ammonia production and gave nitrogen and hydrogen. Phosphorus was a common incorrect answer.

6(c) The mechanism of how fertilisers increase crop yield was not well understood. A number of candidates stated that fertilisers provide nutrients or minerals. Essential elements or named essential elements were required. Few candidates mentioned that nitrogen is required to build plant protein.

Question 7

7(a) The equation for the production of ammonia from nitrogen and hydrogen was well answered. Better candidates scored both marks and weaker candidates scored 1 mark for the correct formulae with incorrect balancing.

7(b) This question discriminated well across the ability range. Better candidates showed an excellent understanding of the reasons for the conditions used in the Haber process scoring 3 or 4 marks. Weaker candidates usually recognised that the iron catalyst will increase the rate of reaction scoring 1 mark.

Question 8

8(a)   This question discriminated well across the ability range. Better candidates generally scored level 3 (5 or 6 marks). They made correct choices for both the girder and the worktop with good reasons and provided reasons why the other materials were unsuitable. Middle ability candidates usually scored level 2 (3 or 4 marks). They made a correct choice for one of the jobs giving correct reasons. Weaker candidates often did not make a choice, tried to make a choice of the same material for both jobs or did not make it clear which job the choice was for and gained level 1 (1 or 2 marks).

8(b)   Most candidates scored one or both marks on this question. The most commonly awarded mark was for the idea of destruction of the landscape.

Question 9

9(a)   Most candidates scored at least one mark on this question with many scoring both. The fact that aluminium does not corrode was a common answer with a number relating that to the fact that the car body will last longer. The low density of aluminium was commonly recognised, although weaker candidates referred to aluminium being light which was insufficient to score. Answers involving cost, strength or flexibility were seen but did not gain credit.

9(b)   This was a high demand question and was only well answered by the best candidates. They could correctly identify the materials used for the anode and the cathode, the electrolyte and some offered ionic half equations as well as clearly stating what happens at each electrode. Weaker candidates frequently failed to score with confusion over anode and cathode, no mention of electrolyte and even mentioning 'positive electrons'.

Question 10

10(a) This question was well answered. Most candidates scored at least 1 mark with many scoring both. Most candidates could identify the first two statements as facts. The statement about all the ice caps melting was frequently regarded as fact losing a mark.

10(b) Most candidates scored 2 marks usually for identifying that the low energy bulb lasts longer and uses fewer units of electricity. Fewer candidates provided calculations or a consideration of the relationship between cost to buy and lifetime for the third mark.

Question 11

11(a) This question proved challenging for candidates. In part (i) the most commonly awarded mark was for identifying that gamma radiation is used for NDT. Fewer candidates could explain why in terms of penetrating power. Candidates needed to state that **only** gamma can penetrate iron or that gamma has the greatest penetrating power. Many candidates merely stated that alpha is stopped by paper, beta by a few mm of aluminium etc. without relating their choice to NDT. Part (ii) was poorly answered.. Many candidates thought that a count rate would only be noted if there was an air gap, which was insufficient to score.

11(b) Only the best candidates understood ionisation in terms of loss and/or gain of electrons to make a charged particle in part (i). Part (ii) was better answered with many candidates recognising cell mutation or cancer. A number of candidates repeated the question and stated that radiation damages cells or stated that radiation 'kills cells', and failed to score.

Question 12

12   Just under half of candidates scored level 1 (1 or 2 marks) on this question. This was usually because they stated that the current decreased with increasing distance of the solar panel from the lamp or understood that light intensity was related to current. To access level 2 for 3 marks both of these relationships were required. Recognition that the relationship between current and distance from the lamp is not linear and the effect of light

intensity scored 4 marks. To access level 3 (5 or 6 marks), candidates needed to recognise the inverse square relationship between current and distance from the lamp and/or understand the mechanism of current production in terms of electrons being knocked loose from the silicon. Very few candidates mentioned either of the level 3 ideas.

Question 13

13(a) The vast majority of candidates correctly answered this question. Occasionally answers of 10 or 12 were seen which did not score.

13(b) Just over a third of candidates correctly answered this question. Some candidates did the calculation but then either did a further division by 100 or misplaced the decimal point and lost a mark. Weaker candidates divided 0.34 by 9×10^8 rather than multiplying them and lost both marks.

Question 14

14(a) Approximately half of candidates scored 1 mark on this question usually for correctly identifying the position and type of one star. Better candidates also scored the second mark for correctly identifying and placing all three.

14(b) The nature of black holes was not well understood by all except better candidates. A strong gravitational field was the most common scoring point. Common misconceptions were that there was a vacuum or that light was 'sucked in'. Few mentioned high density or very large mass.

14(c) Although many candidates recognised that distant galaxies are moving away, few realised that they were moving away **faster** and failed to score.

Question 15 (Data interpretation)

15(a) This question proved to be accessible to candidates of all abilities. Weaker candidates usually scored 1 or 2 marks usually for identifying the total consumption of copper is increasing and a correct statement about consumption in one of the continents. Better candidates usually scored 3 or 4 marks. They could give detailed conclusions about both total consumption and consumption on individual continents.

15(b) Part (i) was well answered. Most candidates scored 2 marks for identifying China and correctly performing the calculation that the change was 1650 thousand tonnes. Many also suggested a reason why the consumption of copper was growing often in terms of a growing population. Part (ii) was also well answered with candidates drawing the correct conclusion from the data and often offering a problem e.g. the need to import copper. Part (iii) proved more challenging. Most candidates scored 1 mark usually for a correct statement about copper supply and use in either 2008 or 2012. Fewer could recognise the issues in terms of the price of copper or the need to find more reserves or alternatives to copper.

B713

General Comments:

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 were still some centres 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 each candidate's own unaided work.

There was 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.

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 data).

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 clearly showing how the data relates to the task and including all the raw data 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 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 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. This should be the trend shown by the data not the one predicted by the hypothesis (though they should be the same). This description 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 difference 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. That is not the case 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 of 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 such as '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 another 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.

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 candidates' work on the OCR website**

- **Candidate guidelines for controlled assessment** (section H of the guide to controlled assessment) which is 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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