**OCR**
Oxford Cambridge and RSA

# GCSE

# Science B
# Gateway Science Suite

General Certificate of Secondary Education **J261**

# OCR Report to Centres June 2016

Oxford Cambridge and RSA Examinations

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This report on the examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

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

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**Gateway Science B (J261)**

**OCR REPORT TO CENTRES**

# B711/01 Foundation Tier

**General Comments:**

The paper differentiated well and candidates were able to demonstrate their knowledge and understanding across Modules B1, C1 and P1. Candidates performed best on section B (C1) and worst on section C (P1).

The longer 6 mark questions, which were marked using a level of response approach, were generally well answered on sections A and B. Candidates did not seem to have the knowledge and understanding to respond to the physics 6 mark question about analogue and digital signals.

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 drugs, carbon compounds, crude oil and chemical changes.

Candidates did not seem to have the knowledge required to respond to questions about the nervous system, energy efficiency in the home and applications of total internal reflection.

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 was about drugs

(a)     Most candidates knew that hallucinogens distort what you see or hear. A common misconception was that stimulants slow down brain activity.
(b)     Many candidates performed the calculation correctly. A significant number of candidates correctly calculated the number of units of alcohol drunk as 21 but then incorrectly subtracted 14 from 21.
(c)     Examiners saw a wide range of incorrect responses. A significant number of candidates failed to follow the rubric and ticked more than two boxes.

Question 2
This question tested ideas about insulin.

(a)     The job of the pancreas was not well known.
(b)     The majority of candidates correctly stated that insulin travels around the body in the bloodstream. In blood cells was a common misconception.
(c)     The function of insulin in regulating blood sugar levels was not well understood. Candidates who scored the marks appreciated that carbohydrates are made of sugar (or glucose) molecules and understood that insulin lowers or controls blood sugar levels. When candidates failed to gain credit it was often because they wrote about carbohydrates providing energy or insulin providing sugar.
(d)     In part (i) chromosomes or DNA were answers that gained credit more often than nucleus. Sperm was a common incorrect response. Cystic fibrosis and colour blindness were incorrect responses frequently seen by examiners in part (ii). As in Q1, a significant number of candidates failed to follow the rubric and circled more than one response and failed to gain credit even if they had circled the correct response.

Question 3
This question focused on ideas about staying healthy and required candidates to analyse information.

(a)     This 6 mark question was targeted up to grade E. Many candidates were able to describe a pattern in the data and gained credit at Level 1 (1 – 2 marks). Some candidates were then able to suggest a simple reason for the pattern and reached Level 2 (3 – 4 marks). To gain credit at Level 3 candidates were required to describe and explain patterns using data. Centres are strongly advised to guide candidates towards supporting patterns they have identified with data from the question.
(b)     Good responses described that viruses are destroyed by white blood cells engulfing them and making antibodies. Candidates who failed to gain credit usually referred to antibodies eating, killing or covering the virus.

Question 4
This question tested ideas about the nervous system.

(a)     Good responses described that the response was not a reflex action because it was too slow and involved a thought process.
(b)     Many candidates failed to gain credit in this question, frequently writing simply about something sending a signal to the brain.
(c)     The structure of a motor neurone was not well known and examiners saw a wide range of incorrect responses.

Question 5
This question was about carbon compounds.

(a)     Most candidates correctly identified B as the displayed formula containing 11 atoms.
(b)     Most candidates indicated that C was not a hydrocarbon because it contains oxygen or because it does not contain carbon and hydrogen only. Where candidates failed to gain credit it was usually because they referred to oxygen, carbon or hydrogen *molecules* or indicated that a hydrocarbon is a *mixture* of carbon and hydrogen.
(c)     Few candidates were able to deduce the name of compound A as propene. Examiners saw a very wide range of incorrect responses.
(d)     Many candidates did not understand what is meant by a molecular formula.

Question 6
This question focused on crude oil.

(a)     In part (i) cracking was often confused with fractional distillation. Many candidates were able to correctly name two fractions that are separated from crude oil in part (ii). Diesel was a common response that did not gain credit, as it was given in the stem of the question. Oil and gas were other common responses that failed to gain credit.
(b)     In part (i) good responses described that carbon monoxide is poisonous/toxic. Vague statements that carbon monoxide is harmful or causes pollution were often seen and did not gain credit. A common misconception was that carbon monoxide causes global warming. Antioxidant and engine were common misconceptions in part (ii).
(c)     Most candidates were able to describe at least one environmental problem resulting from oil spills.

Question 7
This question was about fuels.

(a)     Most candidates were able to write a correct word equation for the combustion of butane. When candidates did not gain credit, it was often because they used 'and' or an → instead of '+'. Writing 'fuel' instead of 'butane' as a reactant was also a common error.

(b)     Chemical or kinetic energy were frequent misconceptions.

(c)     This 6 mark question was targeted up to grade C. At the simplest level, a candidate who analysed information from the table, to describe an advantage or a disadvantage of methane, scored Level 1 (1 – 2 marks). Marks at Level 1 could also be awarded for stating two other factors that need to be considered when choosing a fuel, although this was more rarely seen. To gain Level 2 (3 – 4 marks), candidates needed to describe an advantage or a disadvantage of methane and state two other factors that need to be considered when choosing a fuel. 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) and were required to describe more than one advantage and disadvantage. Candidates were usually successful in describing the advantages and disadvantages of methane but often omitted to write about other factors that need to be considered when choosing a fuel. Centres are advised to stress to candidates that all aspects of a 6 mark question need to be addressed to gain full credit.

Question 8
This question was about chemical changes.

(a)     Most candidates correctly identified B and C, but a significant proportion failed to gain full marks for this question because their explanation lacked clarity.
(b)     Nitrogen, cobalt and carbon dioxide were common incorrect answers.

Question 9
This question was about waves.

(a)(i)   Radio was a common misconception.
(ii)   Infrared was well known but examiners also saw a wide range of incorrect responses.
(iii)  Ultraviolet was well known, but radio was a common misconception.

(b)     Examiners saw all possible incorrect responses, with only a small proportion of candidates gaining the mark.

Question 10
This question was about data transmission.

This 6 mark question was targeted up to grade C. Good responses identified signal A as analogue and signal B as digital and gained credit at Level 2. Many candidates, however, referred to the waves by names such as microwave and ultraviolet or sound. Very few candidates were able to describe how the signals change when noise is added, or to explain why it is easier to remove noise from a digital signal.

Question 11
This question focused on the stable earth section of the specification.

(a)     Good responses in part (i) stated that the prediction was correct because the reading in 1997 is the lowest. Credit was also given for candidates that stated that the prediction was incorrect because the general trend of the graph is downwards. Most candidates understood the concepts of repeat readings or comparing results with other scientists in part (ii).
(b)     In part (i) most candidates correctly gave the answer 1972. Most candidates gained at least 1 mark in part (ii), usually for stating that skin cancer is caused by too much exposure to UV. As on previous examination papers, cancer was insufficient to gain credit. Heat stroke / sun stroke were responses that were frequently seen and failed to gain credit.

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Question 12
This question tested ideas about energy efficiency in the home.

(a)     Good responses appreciated the idea of fair testing. Many candidates however focused their response on why a time period of 9 hours during the day is used for house efficiency measurements.
(b)     Many candidates correctly gave the energy efficiency equation.
(c)     In part (i) responses in terms of payback time were rarely seen. Candidates more often gained credit for calculating the saving over 5 years as £600. Good responses in part (ii) correctly identified that cavity wall insulation saves £1450 more than low energy light bulbs and a thermostat.

Question 13
This question was about applications of total internal reflection.

Good responses gave descriptions for shapes B and C that followed the 'style' of the description given for shape A. Candidates often failed to gain credit as it was not clear from their answers which shape they were referring to. Few candidates were able to explain that shape B sparkles the most because all the light is reflected and enters the eye.

# B711/02 Higher Tier

**General Comments:**

The level of difficulty of the paper appeared to be appropriate for the ability range of the candidates. Candidates appeared to have had sufficient time to complete the paper, with the majority attempting most of the questions. There was evidence that some candidates had been entered for the wrong tier. Their scientific knowledge suggesting they would have been better entered for the foundation tier.

The majority of candidates had attempted all three levels of response questions. All three questions showed clear discrimination with only the high level candidates producing level three answers.

This was the first year candidates had been provided with additional pages on the paper to use instead of adding extra answer booklets. Many candidates made good use of these pages, especially when answering the level of response questions. However in some cases these pages were ignored and answer booklets used instead.

**Comments on Individual Questions:**

Question No.1
Q1(a) Most candidates answered this question correctly. A few candidates lost the mark by assuming that insulin was carried in the blood cells.
Q1(b) The majority of candidates gained at least one mark, usually by identifying the fact that insulin controls blood sugar levels. Some candidates failed to identify that eating carbohydrates results in increased blood sugar levels, the common error was to think that it contained fat.
Q1(c) Although candidates gained marks in this question, not all of them grasped the concept of converting sugars into glycogen for storage in the liver. Many referred to fat storage around the organs or under the skin.
Q1(d) Most candidates failed to understand the term phenotype and instead answered in terms of dominant and recessive or homozygous and heterozygous.

Question No.2
Q2(a) Most candidates gained at least one mark, usually for identifying that alcohol is a depressant, very few gave a complete answer.
Q2(b) The majority of candidates gained both marks, those that did not tended to just calculate the total and not subtract the advised amount from this to gain the second mark.
Q2(c) Candidates were mostly successful at interpreting the data.

Question No.3
This question discriminated well, most candidates gained some marks, with only the more able candidates giving a complete explanation of how a vaccine works. Although, many candidates failed to realise that the data in graph started four years before the campaign, so answered in terms of changes from 1984 instead of 1988.

Question No.4
Q4(a) Very few candidates could identify the correct pathway taken by a reflex action. Many incorrectly used the term reflex for the relay neurone and brain for the effector.
Q4(b) Only the minority of candidates identified the cell body of the neurone, more used the term dendrite which was given credit.
Q4(c) This question discriminated well with less able candidates gaining one mark, while higher ability candidates gained both marks. Candidates should be encouraged to use the term impulses when explaining about nerve transmission slowing down rather than messages, information or reflexes.

Question No.5
Q5(a) The majority of candidates understand what makes a hydrocarbon, although some still refer incorrectly to molecules rather than atoms of hydrogen and carbon.
Q5(b) Most candidates were able to write the molecular formula correctly, although some common errors included not making the numbers smaller than the letters.
Q5(c) Most candidates understood that unsaturated compounds contain a double bond, the most common answer not to gain a mark was to state it is an alkene.
Q5(d) Few candidates were able to draw a display formula for a polymer. Some came close, but left the double bond in the molecule.

Question No.6
Q6(a) Most candidates understood that finite fuels will run out, yet many still incorrectly believe that non-renewable fuels cannot be reused, rather than the correct idea of them being used up faster than they are formed .
Q6(b) Few candidates could explain two environmental problems, most simply described two, which is low demand and did not answer the question.
Q6(ci) The few candidates that failed to answer this question correctly tended to choose petrol rather than diesel.
Q6(cii) Many candidates gained at least one mark, usually for mentioning cracking. The most common error was to assume that fractional distillation could be used to obtain more petrol rather than cracking.

Question No.7
Q7(a) Most candidates could write out the correct symbol equation but very few could balance the equation. Again marks were lost by not taking care to use small numbers and capital letters.
Q7(b) Most of the candidates knew that carbon monoxide was converted to carbon dioxide.
Q7(c) The answering of level of response questions has improved and this one was answered very well by most candidates. Those that failed to provide a level 3 answer did so because, although they identified the advantages and disadvantages of each fuel, they did not make a justified choice as to which fuel to use.

Question No.8
Q8(a) The most common error was to assume that Helen should not be poisoned by the perfume as it was a non-irritant. However, most candidates answered this correctly.
Q8(b) Only the most able students could explain evaporation in terms of intermolecular forces, many simply described diffusion.

Question No.9
Q9(ai) Most candidates correctly identified infrared.
Q9(aii) Fewer candidates identified radio waves.
Q9(b) The most common incorrect answer was either 0.5 or 1, very few correctly calculated the answer of 2cm.
Q9(c) Many candidates failed to gain marks because they did answer in terms of transmitters. Many simply wanted to increase the number of signals or place the signals up higher, rather than the structures that send out the signals.

Question No.10
Candidates found it very difficult to explain why it is easier to remove noise from a digital signal. The most common answer to gain marks was the understanding that digital is an 'on and off' signal, few could then go on to explain that analogue has a range of values rather than just 1 and 0. Although the word multiplexing was seen, many candidates did not explain why it was important in the switch to digital TV broadcasts.

Question No.11

Q11(a) Most candidates identified that 1997 was the year for the lowest reading.

Q11(bi) The majority of the candidates identified that as ozone increases, UV decreases.

Q11(bii) About half the candidates understood that ozone protects us from UV radiation, those that did not tended to talk about harmful rays from the Sun rather than UV.

Q11(c) Candidates found it hard to express their answers when it comes to how science works, most of the candidates simply described what an international agreement was, rather than explaining why it was needed.

Question No.12

Q12(a) Candidates were able to identify double glazing and loft insulation as being energy saving measures, but few linked these correctly to the processes of conduction, convection and radiation.

Q12(bi) Candidates that used the figures in the table to calculate the payback time as being 3.5 years, or calculated total saved in 5 years, scored well on this question. A few candidates just quoted the numbers in the table or made a general statement about getting money back sooner or saving more money.

Q12(bii) Most candidates correctly identified cavity wall insulation and backed this up with calculations. Candidates however, should be encouraged to use the answer lines when completing their calculations.

Question No.13

Candidates were more likely to describe the two differences rather than the similarities between the two wave patterns. This resulted in only a few gaining all three marks.

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# B712/01 Foundation Tier

**General Comments:**

The level of difficulty of the paper appeared to be appropriate for the ability range of the candidates. Candidates appeared to have had sufficient time to complete the paper, with the majority attempting most of the questions. There was evidence that candidates had not read the whole question, as examples in some questions had been given as answers where another idea was required to gain the marks. See question 1(a) as an example.
Candidates had attempted all three levels of response questions, although the section B question proved to be more difficult than the other two.

**Comments on Individual Questions:**

Question No.1
Q1(a) Most candidates gained at least one mark for this question. The most common error was to provide the answer of hunting, which had already been given in the stem of the question and therefore gained no marks. Many candidates have the misconception that natural predators can also cause a species to become endangered, under normal circumstances this would not be the case.
Q1(b) Very few candidates were able to define the term 'sustainable resource' as a resource that can be removed from the environment without it running out.
Q1(c) Most candidates could identify the opinion amongst the facts.
Q1(d) Candidates tended to gain one mark for identifying that the winter months were when higher numbers of dolphins were seen, however, few realised that there was no data to support the theory of fewer fishing boats.

Question No.2
Q2(a) There were a number of candidates unable to interpret a simple food chain, many thought the reasons were to do with the plants rather than the lack of frogs. There were also some candidates that thought the herons ate the grasshoppers.
Q2(b) Most candidates gained at least one mark, there was no clear pattern to their answers except a large number thought nitrogen was reactive rather than unreactive.
Q2(c) Candidates find the concept of mineral transfer form dead plant difficult, few answered in terms of decay with most candidates simply referring to uptake by the roots.

Question No.3
Most candidates gave a level two answer, as they were able to identify that increased populations lead to more rubbish and therefore food for the eagles. Fewer candidates gave a detailed explanation in terms of exponential growth or increased use of packaging.

Question No.4
Q4(a) Very few candidates could identify the two arthropod classes correctly. Many thought that myriapods had two body parts and ten legs instead of crustacean, however more were able to identify the arachnids.
Q4(b) Few candidates explained correctly why A and B were not more closely related. The common error was to state that their binomial name was completely different, rather than the idea of their genus not being the same.
Q4(ci) Few candidates were able to draw the pyramid of biomass to scale, although some gained one mark for the correct labels. Candidates should be encouraged to draw the pyramids with the producers at the base.
Q4(cii) Although most candidates could describe the difference between the pyramids, few explained this in terms of light availability and photosynthesis or growth.

Question No.5
Q5(a) Most candidates understand that there were three different elements in the compound.
Q5(b) Candidates found it harder to calculate the number of atoms in the compound, three was a common incorrect answer.
Q5(c) Most candidates correctly identified ammonium nitrate.

Question No.6
Q6(a) Candidates were mostly successful in gaining all three marks, very few gained no marks at all. The core seemed to be the answer that most knew.
Q6(b) Few candidates could explain two reasons why theories take time to become widely accepted. Some candidates incorrectly went down the religious path, instead of the scientific one of lack of original evidence and testing by other scientists.

Question No.7
Q7(ai) Although most candidates could identify the correct metal, not all of them could link this to the temperature being higher than 2000°C. A common mistake was to simply say it was the highest melting point or they made random comments about strength or density.
Q7(aii) Very few candidates actually identified metal C, most went for metal A which allowed them to gain two marks by saying A had a relatively high electrical conductivity, but did not allow them to gain marks for understanding that C had a lower density.
Q7(b) Candidates find the idea of properties a difficult one, some candidates mentioned the properties to consider, but failed to say enough about them to gain the mark. For example, they said strength or density, rather than saying it needs to be strong or have a low density.

Question No.8
Only a very small minority of candidates produced a level three response to this question. Candidates did not seem to know how salt was obtained from solution mining or the products of the electrolysis of sodium chloride solution. Many attempted to describe the electrolysis of copper, confusing this with a question that had appeared on a previous paper.

Question No.9
Q9(a) Most candidates identified the correct percentage yield.
Q9(b) The majority of candidates identified that the yield would decrease.
Q9(c) Very few candidates could suggest why the conditions were chosen, they tended to answer in general terms, such as increases yield, rather than linking each condition to why it is used. The most common correct answer was identifying that a catalyst would speed up the reaction.

Question No.10
Q10(ai) Most candidates identified the appliance with the highest power rating.
Q10(aii) Most candidates identified the appliance which cost the least to run.
Q10(b) Very few candidates could correctly calculate the cost of heating the water. Some candidates incorrectly converted kW to W before they started the calculation.

Question No.11
Q11(a) Most candidates gained one mark for providing a reason against the use of wind farms, which in many cases was the idea of spoiling the view or the noise. The most common error, when giving an advantage, was to provide a reason for the use of wind farms in terms of less pollution, rather than being more specific about carbon dioxide emissions. Candidates should be encouraged not to answer such questions in terms of cost.
Q11(b) Most candidates identified D, but failed to explain why in terms of current.
Q11(c) Many candidates failed to realise that a larger surface area would be required.

Question No.12
Many candidates were able to correctly calculate efficiency, however, a common error was to add the units kJ to their answer. Candidates found it difficult to describe the different stages, they tended to just describe the pathway through the diagram without adding any science. For example, they described the coal going in the furnace and the steam going in the turbine but did not say the coal was burnt to heat water to produce steam which turns the turbine.

Question No.13
Q13(ai) Many candidates failed to read the whole question and provided medical uses instead of industrial uses of nuclear radiation.
Q13(aii) Few candidates provided a correct harmful effect, many gave vague answers, such as, it can kill you or harm the body.
Q13(aiii) Candidates tended to answer in terms of general lab safety, rather than the handling of radioactive material. Very few suggested the idea of limiting exposure time or remote handling. Some incorrectly talked about ways to store the radioactive material.
Q13(b) Few candidates answered in terms of the different types of radiation. Many incorrectly thought the liquid waste leaking out would be a problem, rather than the radiation being emitted from the waste.

Question No.14
Q14(a) Many candidates failed to answer in terms of objects within a solar system, many thought of alien life forms or black holes.
Q14(b) Few candidates grasped the concept of light years and did not realise that the solar system was too far away for a manned spacecraft. Those that did say it might be dangerous did not say why.

Question No.15
Q15(ai) Most candidates managed to correctly calculate the percentage, some thought the calculation was far more complicated than a simple addition followed by a subtraction.
Q15(aii) Most candidates gained one mark, usually for identifying the idea that fossil fuels would run out. Some mentioned pollution but not the idea of greenhouse gases.
Q15(bi) Most candidates identified Canada and gave a reason for their answer. Those that lost the second mark tended to state that they used less fossil fuels, rather than that they used more of the alternatives. Using less fossil fuels was in the stem of the question, so could not be credited.
Q15(bii) Most candidates were able to use the width of the bars to identify the USA.
Q15(c) Few candidates could identify that total world electricity was increasing, while the percentage had at first increased but had then started to decrease.

# B712/02 Higher Tier

**General Comments:**

The paper produced a mean mark of 32.5, with a standard deviation of 13.0. Many candidates had been well prepared for this paper, having learned from the experiences of B712/02 in previous years. About 5000 candidates would have been better served by entry to the foundation tier, having scored less than 20 marks. The six mark questions are marked using a level of response mark scheme using the concept of 'best fit'. The biology question on limestone formation and the effects of weathering 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, concerned with the electrolysis of sodium chloride solution was targeted at all the grades covered by the paper. This question was poorly answered and electrolysis continues to be a part of the specification that candidates find challenging. Only the best candidates scored level 3 and many weaker candidates omitted the question altogether. The physics question was concerned with the processes in a coal fired power station and its efficiency. It was targeted at all grades up to and including grade A. About 10% of candidates scored level 3 with almost a third of candidates gaining level 2 (3 or 4 marks). General messages from the 6 mark questions continue to include candidates needing 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 and then the additional answer sheet at the back of the booklet 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.

The calculations in the physics section (section **C**) were poorly answered. The writing of the chemical equation in question 9(c) was correctly answered by about half of candidates.

Overall, assistant examiners and team leaders felt that the question paper was appropriate to the ability range of candidates intended.

49 marks were required to gain grade A and 28 for grade C.


**Comments on Individual Questions:**

**Section A**

Question 1
1(a)   Most candidates understood the likelihood of extinction or the idea of disruption of the food chain in part (i). A few mentioned that the whales would become endangered which was insufficient to score. In part (ii), most candidates scored at least one mark, usually for the idea that it is difficult to police large areas of ocean. A number of candidates correctly mentioned the idea that whales are a source of resources or income in many communities.
1(b)   The most common idea mentioned was the idea of having a quota of whales caught. Some candidates went on to mention that this would leave enough to breed and maintain the population  scoring a second mark. The most common incorrect response was the idea of captive breeding, which showed a lack of understanding of the size of whales and the impossibility of such a strategy. Many just mentioned blanket bans which was insufficient to score.

Question 2

2(a)   This question was well answered by only the best candidates. Many candidates were confused by the ant activity on neighbouring acacia trees and overlooked mistletoe and birch trees. One mark was often gained for a definition of mutualism. Frequently more than one relationship was identified as not being mutualism with a number not realising the benefit to flowers from bees. A number of candidates answered 'yes' and failed to score.

2(b)   This question was targeted at the higher grades and was poorly answered. Few candidates understood the relationship between nitrogen-fixing bacteria in nodules and their host plants. Ideas of protection or the bacteria having somewhere to live featured prominently. Many candidates merely stated that they both benefited and failed to score.

Question 3

3(a)   Almost half of candidates either failed to score or omitted this question. Just over a third of candidates gained level 1 scoring 1 or 2 marks. Candidates needed to either identify how carbon from shells or dead organisms were trapped during limestone formation or how weathering produced carbon dioxide. At level 2 (3 or 4 marks) both ideas were required. At level 3 (5 or 6 marks), the ideas that shells were made from carbonates and **increased** levels of carbon dioxide were required but rarely seen. There were a lot of incorrect or irrelevant answers seen e.g. 'acid rain puts carbon into rocks', mention of the thermal decomposition of calcium carbonate or carbon 'getting into the pores in the rock forming layers of carbon'.

3(b)   About a quarter of candidates scored the mark for 'lichen' with a multitude of spellings seen. 'Moss', 'fungi' 'insects' and 'birds' were common incorrect answers.

Question 4

4(a)   Just under half of candidates scored this mark. Many simply referred to not having the same binomial name, without distinguishing genus from species and failed to score. Those that did score usually referred to **A** and **B** having different genera or **C** and **D** had the same genus.

4(b)   In part (i) about two thirds of candidates scored 1 or both marks. Most correctly labelled the pyramid of biomass. The most common error was failing to draw the pyramid to the correct scale. In part (ii) most candidates were able to describe a difference between the two pyramids of biomass and gain 1 mark, usually that winter biomass was less than the spring or that some organisms hibernate in the winter. Very few scored the second mark for relating the difference to levels of light and photosynthesis.

Question 5

5(a)   About a third of candidates gained this mark, understanding that artificial classification was based on where the birds live. Many candidates misunderstood the question. They interpreted 'artificial' as 'fake' or 'wrong' and often commented that many seabirds did NOT live by the sea. Many referred to physical features or characteristics and failed to score.

5(b)   Many candidates scored 1 or 2 marks on this question, with only the best candidates scoring all 3 marks. 2 marks were often gained for the idea of both birds adapting to cold climates often with an example. Weaker candidates described simple differences between the birds, such as whether they could fly or not, without any attempt at an explanation. Very few candidates scored a mark for the differences with the idea of geographical isolation seen only rarely.

**Section B**

Question 6

6(a)   Most candidates gained 1 or both marks on this question. Most candidates could explain that Wegener had little or no evidence to go on. Many went on to explain that subsequent evidence confirmed the theory. Many referred to religious reasons why the theory was not accepted. This was not worthy of credit.

6(b)   About half of candidates scored on this question. The most commonly awarded marks were for oceanic plate being more dense than continental plate and oceanic plate goes underneath the continental plate. Some candidates got both of these points the wrong way around and failed to score. Few candidates mentioned the convection currents in the mantle.

Question 7

7       Most candidates scored at least 1 mark on this question with many scoring 2 marks. Common errors which lost marks were 'nitrate acid', 'ammonia sulfate' and 'potassium acid'.

Question 8

8a      This question was well answered. Candidates could evaluate the two metals focusing on electrical conductivity, density and cost. The best answers seen approached the question in a comparative way, comparing the three important properties for metals **A** and **C**.

8(b)   Many candidates did not identify the important properties for making the body of a bus, but instead commented on all the properties. Candidates were required to identify two relevant properties for each metal to score the marks. Frequently only one correct property was given. A number just listed data from the table without commenting on it. This failed to score.

Question 9

9(a)   The majority of candidates identified that as the temperature increases, the yield of sulfur trioxide decreases.

9(b)   In part (i) about two thirds of candidates understood that a catalyst is used to speed up the reaction. Answers that were not worthy of credit included 'to help the reaction', to 'increase the yield', 'controls the heat' and references to pressure. In part (ii) better candidates scored 2 marks and understood the compromise between rate of reaction and percentage yield. Weaker candidates usually gained 1 mark for recognising that the reaction would be faster at $450^{\circ}$C.

9(c)   Most candidates scored at least 1 mark for correctly inserting the formulae into an equation. About half of candidates scored 2 marks, writing a correctly balanced equation.

Question 10

10      About half of candidates either failed to score or omitted this question. Electrolysis continues to be a part of the specification that candidates find difficult. Good candidates gave some excellent answers, correctly identifying the products and the electrodes at which they are formed and writing correct half equations. There was considerable confusion with last year's question on the purification of silver and/or copper. Many candidates gave irrelevant answers referring to copper purification. A number of candidates thought that there were both positive and negative electrons moving in the solution. Some candidates gained level 1 (1 or 2 marks) by correctly identifying the electrodes that the ions were attracted to.

**Section C**

Question 11

11(a) Most candidates scored at least one mark with many scoring 2 marks.

11(b) About half of candidates scored on this question. Better candidates quoted the types of radiation and knew that alpha and beta are stopped by aluminium and that gamma penetrates aluminium. Weaker candidates did not mention any of the three types of radiation and sometimes gained the catch mark for radiation can penetrate aluminium or the need to use lead rather than aluminium. Many candidates talked about sealing the waste in glass and burying underground.

Question 12

12(a) This question was well attempted by most candidates. 'Renewable' was a common correct advantage of wind turbines and the idea of visual pollution or noisy were the most common disadvantages. Some candidates made reference to less pollution as an advantage. This was too vague to score. The mark scheme required the idea that less carbon dioxide or less greenhouse gases were produced.

12(b) About half of candidates scored marks on this question usually for correctly explaining the position of the windows. Passive solar heating was confused with solar panels for a significant number of candidates. Answers referring to IR radiation passing through glass, being absorbed by surfaces and being re-emitted at a longer wavelength were rare.

Question 13
13(a) About a quarter of candidates failed to score or omitted the question. Over half of candidates scored marks at level 1 or level 2 usually for correctly describing the stages in the process of electricity production. Candidates often stated that coal was 'heated' or 'boiled' rather than burned or that coal was burned to make steam. Very few candidates were able to perform the calculation of the mass of coal burned per second (250kg). A larger number did the calculation without considering the efficiency of the process (75kg) and scored at least level 2.
13(b) Most candidates that scored on this question gained 1 mark. This was either for increased frequency or increased amplitude. Very few candidates realised that both these changes occurred.

Question 14
14(a) About a fifth of candidates scored marks on this question. Most candidates multiplied 1.8 by 24 rather than dividing 1.8 by 24 and scored 0.
14(b) Again this was poorly answered. The most common error was to take the incorrect 43.2 worked out in (a) and multiplying by 16 to get 691.2p.
14(c) Only better candidates correctly explained why electricity is transmitted at high voltages in terms of reduced current leading to less heat loss. Most merely stated that less energy was wasted when using 10 000 volts and failed to score.

Question 15
15(a) About a third of candidates scored on this question. Those that correctly chose **B** usually went on to explain it in terms of greater gravitational force or faster movement. **A** and **C** were popular incorrect choices.
15(b) Few candidates understood that Jupiter's gravitational field prevented planets forming. Common errors included 'there is no gravity', 'the asteroids are not big enough' or 'they are all going in the same direction'.

**Section D**

Question 16
16(a) Almost all candidates scored 1 mark in part (i) with many scoring 2 marks. They had correctly interpreted the bar graph with regard to coal usage. Part (ii) was also well answered, with most candidates suggesting large populations or (less frequently) large industries. In part (iii) a majority of candidates scored at least 1 mark with many making three correct interpretations and scoring all 3 marks. Weaker candidates often combined countries together and made comments that were too general to score. Common correct answers referred to Canada using most hydro-electric power and UK using the most gas. Others correctly ranked the countries in terms of total amount of electricity produced.
16(b) A majority of candidates scored marks on this question usually for noting that total world electricity produced from nuclear fuels was increasing between 1971 and 2010. Candidates did not always make it clear whether they were referring to total world electricity production or percentage produced from nuclear fuels and lost marks as a result.
16(c) Many candidates correctly identified that some fossil fuels were likely to run out during the next 30 years. Most did not go on to predict that the use of either nuclear power or renewable energy sources were likely to increase.

# B713 – B763 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 p-laces. 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.

**19**

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 they 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.

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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