

OCR Report to Centres

June 2013

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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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General Certificate of Secondary Education Biology A (Twenty First Century Science) (J243)

OCR REPORT TO CENTRES

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Overview

This is the first assessment session for the controlled assessment of the new work-related portfolio consisting of a total of 64 marks amounting to 25% of the total marks available for this specification. The tasks are now set by OCR and taken under controlled assessment conditions. Centres should note that the marking criteria have been amended.

Centres who have not yet sent staff to training events would be well advised to do so as there was evidence of generous marking from some Centres who were clearly still coming to terms with the new criteria. This resulted in significant scaling for some Centres. In general the work was of a high standard and Centres and candidates should be complemented for their efforts.

With respect to the three theory examination papers, Centres may need to be reminded that the content of B7, which is assessed in paper A163, is equivalent to the content of three other units and should be allocated the appropriate amount of teaching time.

It was pleasing to see that most candidates found the papers accessible and demonstrated sound knowledge and understanding of the course content. It was clear that candidates had been well prepared by their Centres. Questions towards the end of the papers were answered equally as well as questions at the beginning of the paper indicating that there was no evidence that candidates ran out of time, nor was there any evidence that any group had been disadvantaged by the language or by any cultural issues.

It was intended that candidates should feel that they had a positive experience in taking the examinations and it would seem that this proved to be the case. The papers were constructed to allow candidates to feel that they had every opportunity to demonstrate their knowledge and understanding while at the same time discriminating between candidates of differing abilities.

There has been a continued improvement in candidates answering the three, six-mark extended-writing questions. The majority of candidates performed well. Many wrote extensive answers and a considerable number scored Level 2 marks and above. However there is always room for improvement. The most common error was where candidates failed to spend sufficient time to understand the nature of the task and plan their response accordingly. It is vital that all aspects of the question are covered by the answer. Failure to do so will inevitably lose marks. Each year a number of candidates lose marks unnecessarily because of their haste to complete the paper. It cannot be stressed too strongly that reading and re-reading the question is time well spent, in order to ensure that they do indeed answer the question that is being asked on the examination paper.

A few candidates are still leaving some questions blank. This may be due to their intention to return to the question later and subsequently forget that they have not yet answered it, or just that they are unable to answer the question. Candidates should be reminded that they gain no credit for unanswered questions. At least attempting the questions opens up the opportunity of them scoring some of the available marks. Candidates should be encouraged to at least make an attempt with every question and re-read their completed paper to ensure that they have not left any questions unanswered.

When answering questions that include numerical calculations, candidates are always asked to show their working. It is vital that they do this. Candidates are very good at answering calculation questions intuitively or performing simple mental arithmetic and then writing down the answer. Providing the answer is correct, this is not a problem as they will gain full marks. However it is a very risky strategy. A simple mistake in their mental calculations will lose them all of the marks. If they had written down their working, they could have salvaged at least one of the marks available for the question.

Candidates should be encouraged to have access to a calculator. It was disappointing to observe scripts where candidates indicated that they did not have one available.

Candidates need to be aware that examination papers are scanned and marked online. Candidates who write outside of designated areas are at risk of their answers not being fully marked. Candidates would be well advised to ensure that they use the answer lines and spaces provided in which to write their answers. This problem is sometimes exacerbated by candidates crossing out their initial response and then cramming the answer into a much smaller space that may not be immediately visible to the examiner. The examination papers are designed such that an answer can gain full credit and still be written in the space provided.

The following reports provide more detail on how candidates performed on specific papers and in the controlled assessment, highlighting areas of concern and applauding good performance.

A161/01 Twenty First Century Science Biology A (B1, B2, B3) Foundation Tier

General Comments

This specification paper was accessible to most of the candidates sitting it. It was evident from the six-mark extended-writing questions that candidates were trying to address all sections of the question set, however Centres need to ensure that candidates know that unless they address all sections in detail they will not achieve a Level 3 mark on these questions.

It was good to see that on the whole candidates are limiting their responses to the available space and were therefore more precise in their answers. Candidates did not seem to run out of time on this paper as there were few nil responses.

In general, candidates showed a good understanding of genetic inheritance and interpretation of data relating to heart disease. Candidates showed some understanding of antibiotics and how pathogens cause disease. Candidates were not so confident answering questions on evolution.

Comments on Individual Questions

- 1 (a) In this question candidates were asked to complete the table by writing each characteristic in the correct column. Many candidates were able to assign 3 characteristics correctly and it was encouraging to see that over half could assign all 4 correctly.
- 1 (b) This question required candidates to comment on the conclusions having applied their knowledge of the inheritance of gender to the conclusions given. Most candidates who scored on this question knew that the statements were incorrect; however, few were able to explain why.
- 2 (a) This question tested candidates' ability to link up different results of tests with possible decisions. It was encouraging to see that candidates were able to link most of these correctly.
- 2 (b) In this question, candidates were asked to explain why parents may make different choices regarding the termination of a foetus. Few candidates were able to explain the general idea that polydactyly was not as serious as brain damage and to therefore explain which couple may terminate the pregnancy.
- 2 (c) (i) It was encouraging to see that more than half of the candidates were able to draw the second gene in the correct position.
- 2 (c) (ii) In this question candidates were asked to circle the maximum number of alleles. Candidates who failed to score here tended to circle 46 or 23 as the correct answer.
- 3 This was the first six-mark extended-writing question on the paper. Candidates were asked to explain how cystic fibrosis and Huntington's disease are inherited. The stem of the question asked candidates to explain this, using genetic diagrams. Many candidates knew that cystic fibrosis was recessive and that Huntington's was dominant. Few were able to use genetic diagrams effectively to explain the inheritance and many failed to use genetic diagrams in their answers, limiting the number of marks they could score.

- 4 (a) This question required candidates to use the graph about heart disease to draw conclusions. Over half of the candidates knew at least 2 of the correct conclusions and stronger candidates knew all 3.
- 4 (b) This question was testing candidate's knowledge that correlation does not always prove causation in relation to the data given. Most candidates scoring 1 mark usually scored this for the beginning of the sentence "C".
- 4 (c) On this section candidates were being tested on their knowledge of what factors need to be controlled in order to make the study /data collected more valid.
Most candidates knew at least 1 of the factors and over half knew at least 2 factors.
- 5 (a) This was a well answered question, many candidates knew both damage and toxins.
- 5 (b) This question asked the candidates to calculate the number of bacteria present in Jake's cut after 2 hours and required them to be able to show how they arrived at their answer. Very few of the candidates were awarded 1 mark for demonstrating that they knew that doubling had occurred and this mark was awarded for their working. Centres need to remind candidates that showing the working is important and may lead to marks being awarded even if the answer is incorrect.
- 5 (c) This question required candidates to use the information from parts (a) and (b) to explain why it was important to produce antibodies quickly. It was disappointing to see that many had not followed the guidance in the stem of the question.
- 6 This was the second of the six-mark extended-writing questions. As with Q3, candidates would be well advised to read the whole question and ensure that they answer all sections of the question in order to maximise their marks. Many candidates knew that antibiotics killed fungi and bacteria and many knew that they do not work on viruses. Some candidates knew that bacteria could become resistant to antibiotics but few were able to link this to the bacteria mutating. It was disappointing to see that many of the candidates who had addressed how streptomycin should be used by doctors had not considered the reasons as to why it is important to regularly discover new antibiotics.
- 7 (a) (i) This question required candidates to calculate the percentage of insects resistant to pesticides, using data in the table provided. There were very few candidates who were able to calculate this value and many candidates wrote down 2458 from the table.
- 7 (a) (ii) This question was much better answered and over half of the candidates were able to calculate this value as 100%.
- 7 (a) (iii) This question required candidates to suggest how the farmer should use the information when spraying his crops. Just over half of the answers scored at least 1 mark and most of these were for an understanding that the farmer needed to change to a different pesticide.
- 7 (a) (iv) This was a poorly answered question. Candidates were asked to look at the data provided and suggest why it was not sufficient to draw a valid conclusion. Very few had understood that 20 square meters was a small area or that the sample size was small.
- 7 (b) This question was testing the candidates' ability to apply their knowledge to a new situation. Many knew that adding a new predator into a food web would disrupt it, however, the majority of candidates who gained marks wrote about competition between the new predator and existing predators. Centres would be advised to remind candidates that in such questions where there are several marks available and where a number in emboldened, in this case 3, it is important for them to write a sufficient number of different points.

- 8 (a)** This was the third of the six-mark extended-writing questions. This question was common with the higher tier paper. Candidates were asked to explain how evolution produces new species. Many of the candidates who gained marks on this question did so for answers relating to natural selection.
- 8 (b)** This question asked the candidates to explain how they would prove that an unusual beetle was a new species. Very few candidates gained marks on this, only a few suggested checking the DNA.
- 8 (c) (i)** Just under half of the candidates understood which statement referred to a species.
- 8 (c) (ii)** This was slightly better answered than 8c)(i) , more candidates knew which statement referred to a kingdom.
- 8 (d)** In this question, candidates were asked to indicate the two best responses regarding classification. This was a well answered final question.

A161/02 Twenty First Century Science Biology A (B1, B2, B3) Higher Tier

General Comments

Candidates were clearly well prepared for the examination. There were few questions to which there was no response and answers to the six-mark extended-writing questions were particularly pleasing in this regard.

In the objective questions candidates made very few mistakes in following the instructions. However, understanding the exact requirements of other questions was more problematic and suggests further practice would pay dividends. In some cases, poor communication made it difficult to reward candidates efforts.

Comments on Individual Questions

- 1 (a) The majority of candidates scored well on this question, when marks were lost it was generally because of confusion between the definitions of dominant and recessive
- 1 (b) (i) This proved to be a difficult question, with only the strongest candidates gaining all three marks; as similar questions where punnet squares have to be completed generally score well perhaps candidates have less experience of unpicking family trees. A large number of candidates only wrote one allele in the spaces provided, others correctly identified the double recessive individuals but then lost marks for not realising all the individuals with Marfan syndrome were heterozygous.
- 1 (b) (ii) The majority of candidates wrote the parental genotypes as one allele/letter only so gained no marks. Even those candidates who correctly wrote genotypes often lost a mark for not realising that “gg and Gg” is the same as “Gg and gg”. Some wrote numbers from the genetic diagram suggesting they had misread the question.
- 1 (c) Many candidates were aware that the test carried a risk and the result would require a decision about termination, although answers here were often too vague to score e.g. “what will they do with the baby”. Fewer candidates recognised that the tests could produce false results. A significant number of candidates discussed ethics, job prospects, insurance premiums which were not appropriate answers to this specific question.
- 2 This was the first of the six-mark extended-writing questions. Candidates generally understood what a clone was and could give examples. Explanations of how identical twins are formed were often good and nuclear transfer answers showed a better understanding of the process than in the past, although some answers were very confused and referred to stem cells here. Plant clones were less well known with candidates often not being able to explain the processes involved. A number of candidates thought seeds were clones.
- 3 (a) All of this question (Question 3) was common with the foundation tier. This question was well answered candidates were clearly well trained in interpreting graphs.

- 3 (b) This part was well answered. Where only one mark was scored this was often because candidates thought the graph proved a causal link rather than just being a correlation.
- 3 (c) This part was also well answered with candidates showing a good understanding epidemiological study design.
- 4 (a) (i) Most candidates produced credit worthy axes and plotted correctly. There were however a surprising number who insisted on reversing the axes or plotted 1, 3, 8, 24 and 64 evenly spaced so giving a straight line graph; a few candidates even drew bar charts.
- 4 (a) (ii) Comparatively few candidates managed to draw a credit worthy line of best fit. There were many who drew either a straight line with a second line going through the plotted points or just a straight line suggesting they thought lines of best fit needed to be straight. Even when curves were plotted, presentation and lack of care in the exact placing of the line lost some candidates marks.
- 4 (a) (iii) Calculations based on the tabulated data or from a reading of the graph were credited but this still proved to be a difficult mark for candidates to gain.
- 4 (a) (iv) Few candidates recognised that the rate of growth was rapid and even fewer linked this to an increase in toxins or the need to seek treatment with antibiotics.
- 4 (b) Most candidates correctly identified A as the line showing the number of bacteria but some then failed to use the graph to explain their reasoning but simply stated a fact about bacteria and so failed to gain credit. The commonest explanation was that the number of bacteria went down as the number of antibodies increased.
- 4 (c) Most candidates scored at least one mark here knowing that white blood cells produce antibodies and engulf bacteria, fewer also knew that white blood cells digest the bacteria and managed to gain both marks.
- 4 (d) Most candidates understood that antibodies have to fit the antigen and a great variety of appropriate shapes were drawn. A significant number of candidates drew a white blood cell engulfing the bacteria. Some lost the second mark by not clearly indicating the need for a complementary shape for the antibody to attach to the antigen.
- 4 (e) (i) Common wrong answers here were 10 or 20 days referring to the first rather than the second infection, perhaps thinking that the graph showed three infections at day 0, then at day 10 and day 65.
- 4 (e) (ii) Only slightly more than half the candidates knew the role memory cells play in responding to second infections by the same microorganism. White blood cell was a common answer.
- 4 (e) (iii) Only the best candidates recognised that there were two distinct conclusions that they needed to comment on and so gave answers suggesting that the student was either correct or incorrect and so failed to gain credit. A significant number of candidates clearly thought that as Jake has a second infection he could not be immune and failed to realise the rapid large scale production of antibodies shown in the graph was evidence for immunity. Many attributed the fall in antibodies round day 83 to Jake taking antibiotics, or that antibiotics were making Jake immune suggesting a confusion between the roles of antibodies and antibiotics.

- 5** This was the second of the six-mark extended-writing questions. Blood pressure was not on the previous specification and many candidates did not seem to have a good understanding of the topic. However, the majority of candidates knew factors that affected blood pressure, although many digressed into a discussion of heart disease. Stronger candidates could say whether the factors they listed increased or decreased blood pressure and in some cases, particularly for fatty foods, could explain the mechanism. A significant number of candidates were not aware that blood pressure is composed of two readings and those that did mention it commonly thought one of the readings was heart rate, possibly because many electric sphygmomanometers also read heart rate.
- 6 (a) (i)** Most candidates recognised Habitat D as having the greatest diversity but related this only to the number of species and not the size of the populations.
- 6 (a) (ii)** This was generally well answered.
- 6 (a) (iii)** That genetic variation plays a role in biodiversity was only known by a few of the best candidates.
- 6 (b)** The majority of candidates knew that “all living things are dependent on other organisms for their survival” and most also correctly identified that finding new antibiotics or new useful genes may depend on maintaining biodiversity and so scored two or three marks.
- 6 (c)** There were many good answers often describing deforestation or monoculture and how they destroy habitats and reduce biodiversity. Weaker candidates tended to give only an example of human activity without explaining its consequences.
- 7** This was the third of the six-mark extended-writing questions. There were some excellent answers but the process of speciation was not well known or well explained. Most candidates gained marks for an explanation of natural selection, at the lowest level showing knowledge of adaptation and mutation but few gave a coherent full description of natural selection and how it drives evolution.

A162/01 Twenty First Century Science Biology A (B4, B5, B6) Foundation Tier

General Comments

Candidates generally seemed well prepared for this paper, and gave some individual responses which were clear and perceptive. Where there was most general room for improvement was with giving enough detail where there was opportunity to go beyond a simplistic answer (as with the six-mark extended-writing questions), and in tackling questions which touched on the Ideas About Science which are highlighted in the specification. It may be worth stressing to candidates that this type of question will probably be asked in a different context to the one it was studied in, but within any given paper there will be a number of marks available through them.

Comments on Individual Questions

Q1(a) Nearly all candidates scored at least two marks, and many did even better than that. Where marks were lost it was most common to have the idea that photosynthesis builds up large food molecules wrong.

Q1(b) was one where the weaker candidates struggled to express their ideas clearly. While there was a good deal of mention of the lock and key model few seemed able to link this to other ideas on the markscheme for a second mark, and it was surprising to see so many responses which had a confused idea such as the enzyme has to fit into the active site.

Q1(c)(i) was generally very well answered, The great majority of candidates seemed well able to read data from the graph.

Q1(c)(ii) again was an area where candidates often struggled to express themselves clearly, their biggest difficulty being to link a comment about the rate of reaction to the temperature. It is true to say that the rate of reaction increases and then decreases across the whole temperature range, but the question is about the range from 30°C to 45°C, and so the correct response is that the rate decreases. More were able to score a mark on the explanation than on the description of the pattern of results.

Q1(c)(iii) tended to be very well answered, with most candidates able to correctly identify both outliers. Some candidates lost a mark here by being careless and drawing such a large ring around the point at 10°C that they included the point at 15°C as well and so could not be awarded the mark.

Q1(d)(i) was generally very well answered, with most candidates picking up on the idea that the highest rate of photosynthesis is best explained by the light intensity being highest, which should have been helpful to them in **Q1(d)(iii)**.

Q1(d)(ii) called for a calculation of the difference between 50 and 15, and it might have been expected from the high degree of skill in reading the graph demonstrated in **Q1(c)(i)** that even more candidates would have scored this mark than actually did.

Q1(d)(iii) Many scored one mark on **Q1(d)(iii)** for the idea that the difference would be less, or for the idea that the rate of photosynthesis would be lower on a cloudy day, but very few candidates seemed able to put the two ideas together and it may be that this was simply a failure to give enough detail for two marks here rather than to a problems with Biological knowledge.

Q1(d)(iv) was generally well answered, showing that many of the candidates were able to draw a conclusion based on the evidence in the graph.

Q2(a) Few candidates failed to score one mark, but many went for the options that glucose is taken up from the soil or that it is lost from the underside of leaves instead of giving both correct options.

Q2(b) showed that most candidates were unclear about which nitrogen containing chemicals plants make, with cellulose and starch being among the more popular choices.

Q2(c)(i) was very often answered with the responses in exactly the reverse order to the correct one, suggesting that candidates were unclear about the mechanism of osmosis.

Most candidates were able to draw a reasonable conclusion from their answer to the first part of the question in **Q2(c)(ii)**.

Q3 is a six-mark extended-writing question. From some of the responses it was clear that some candidates were unclear on what quadrats and identification keys are, or how to use them. Most candidates were able to construct some sort of response, but often there was a lack of detail which prevented many marks being awarded. Some candidates gave answers about the plants in the two areas rather than about how to investigate them.

Q4(a) revealed that a surprisingly large proportion of the candidates were unable to correctly recall the term “mitosis” for one mark

In **Q4(b)** the same apparent confusion was apparent as in **Q4(a)** as candidates were largely lacking in clear and confident descriptions of the phases of the cell cycle and the place of mitosis in it. This has been noted as a weak area in previous examination sessions.

Q4(c)(i) was an “Ideas about Science” question asking about ethical issues in the study, and it proved very difficult for candidates to link the key term ethical with ideas of right and wrong or fairness.

Q4(c)(ii) called for ways to improve the study, and again proved difficult for the great majority of candidates. The responses which were not creditworthy often seemed to be far less ethical than the scenario given in the question!

Q5(a) was another six-mark extended-writing question. Examiners were pleased to see the inventiveness and variety of uses candidates came up with for the given equipment, and some of the best answers were a real pleasure to read. On the other hand, as with **Q3**, there were too many candidates who gave only a bare response about the expected outcome, e.g. “The cress will grow towards the light” without giving any of the required detail of how the equipment might be used in a controlled experiment.

Q5(b) had one mark available for the idea that the plant gets more light, and a second mark for the idea that more light leads to more photosynthesis. Many candidates failed to score at all on this question, and for those who did it was unfortunate that they seemed unprepared to construct an argument based on the recall of a plain statement in the specification.

In **Q6(a)** the most common fault was to confuse the receptor with the effector. Many of the incorrect responses had chosen the correct terms, but had not placed them in the correct order – or more accurately, had not matched them to the correct process.

Q6(b)(i) showed that the great majority of candidates were able to correctly calculate the mean speed.

Q6(b)(ii) then asked the candidates to make a conclusion based on comparing the calculation with the other results in the table. Many who made the correct calculation went on to draw the wrong conclusion because they did not recall the key knowledge that the fatty sheath around neurons speeds up the conduction of the electrical impulses.

In **Q6(b)(iii)** it was interesting to note a number of responses along the lines of operator error with neuron A “because it is the first one he did, and so he might not be as good at doing the experiment” as this is an outstandingly good response. It was a little disappointing to see that most candidates did not offer a response worthy of credit.

Q6(c) was the final six-mark extended-writing question. It is interesting to note that the topic of reflex arcs has been a weak one in some previous examination sessions, and it was again here. It was possible to construct a very high scoring response by recalling the structures of the reflex arc in the correct order and by saying that the damage indicated in the question would prevent a normal response on the left side. Even with the prompt of the diagram this was another occasion where many candidates failed to give enough detail to score many of the marks.

A162/02 Twenty First Century Science Biology A (B4, B5, B6) Higher Tier

General Comments

Many candidates were able to access all aspects of the paper. The more open, six-mark extended-writing questions were challenging for many candidates although some candidates produced good answers to the fieldwork and operation of synapse questions. Some candidates did not present their responses in a logical order.

The majority of questions did not seem to generate errors due to the misinterpretation of instructions or rubric. Many candidates appear to have been well-prepared for this paper and completed all questions. A small number of candidates crossed out responses but they tended to replace them with an alternative response. Candidates appeared to have sufficient time to complete the paper and the number of 'nil responses' was relatively limited.

Comments on Individual Questions

- 1 (a) Many candidates obtained full marks for this question.
- 1 (b) Unfortunately, a number of candidates gave the response 'plants' without appreciating that these are not microorganisms. Some candidates incorrectly selected fungi and bacteria
- 1 (c) Most candidates appeared to have a good grasp of the topic, with references to active site and the substrate molecule. Some correctly referred to the lock and key hypothesis.
- 1 (d) (i) The majority of candidates were unable to calculate the correct value but obtained one mark for the working shown.
- 1 (d) (ii) Although many candidates realised that there is a clear link between increased light and photosynthesis some inappropriately referred to the power of the sun suggesting this was why. photosynthesis or the reaction rate increased.
- 1 (d) (iii) It was clear that many candidates could describe the features of carbon dioxide levels but the explanation was often missing or incorrect.
- 1 (e) (i) Many candidates correctly referred to a positive correlation, others described the features of the two factors involved.
- 1 (e) (ii) Most candidates appreciated that an increase in replication would be a useful change to the experiment and others appreciated the importance of comparison of data. Very few candidates considered the temperature range but some did realise the value of secondary data.
- 1 (e) (iii) It was interesting to see that many candidates considered that the collision rate was decreasing, rather than increasing. Although many candidates identified the active site and the denatured feature of the enzymes, few appreciated the permanent change.
- 1 (e) (iv) Many correctly noted the lock and key model.

- 2 (a) (i)(ii) Relatively few candidates used the images and scenario to identify the correct labelling of the potato chip. However, for those who did this correctly they were able to move on to part (ii) and note the correct value for the unknown potato chip.
- 2 (b) A surprisingly large number of candidates failed to recognise amino acids and enzymes as nitrogenous compounds. Many other options were unfortunately selected, with no particular pattern.
- 2 (c) Although some candidates completed this question correctly some struggled to identify the importance of the membrane and/or that energy was involved.
- 2 (d) Very few candidates applied their knowledge to the scenario of water-logged soils. Some completed the question well but most struggled, often referring back to the earlier question of active transport without substance.
- 3 This was the first of the six-mark extended-writing questions. This question was generally answered well with correct references to all three pieces of equipment. It was clear that some candidates had actively taken part in fieldwork and appreciated features such as the use of a transect for quadrat application.
- 4 (a) (i) Mixed responses were demonstrated for this question. Some candidates obtain the mark but many were challenged by the sequence of cell division. Others referred to fertilisation and other incorrect interpretations of the model. The terms meiosis and mitosis were often spelled incorrectly in answers to this question.
- 4 (a) (ii) It was encouraging to note the good understanding of combined genetic material at the stage of fertilisation, involving gametes from the two parents. Some responses referred to identical features without involving a reference to genetic material (either DNA, chromosomes, genes etc.).
- 4 (b) (i) Most candidates gave the correct response for this question.
- 4 (b) (ii) It was unfortunate that, although many realised that the cells were unspecialised, they did not link this to the potential to create any form of cell. A number of responses correctly described the importance of the 8 cell stage but very few candidates incorporated references to genes being switched on/off.
- 4 (b) (iii) The majority of candidates correctly noted that the cell, embryo, potential baby etc. was killed by this procedure.
- 5 This was the second of the six-mark extended-writing questions. It was encouraging to observe some effective descriptions of the appearance of the three shoots. It was unfortunate that a number of candidates ignored the scenario with reference to the dark conditions and continued to give a response based on the direction of light. Some excellent responses were given for this question – a third of candidates gained Level 3 marks.
- 6 (a) Many candidates struggled to complete the three features listed in this question. Some candidates correctly described the function of the receptor but many were challenged with the function of both the effector and processing centre.
- 6 (b) (i) Most candidates presented a good analysis of the data, with particular reference to the higher mean value for neuron B. It was encouraging to note the level of analysis by candidates with regards to outliers and the consistency of data values within each range.

- 6 (b) (ii)** This question was challenging for many candidates. Many candidates had difficulty in articulating the problem of impulses leaving and/or entering neurons without the myelination. Some candidates referred generally to the mixing of impulses without further description.
- 6 (c)** Some excellent responses were given for this question with good descriptions of neurotransmitter/chemical release, diffusion and recognition at the receptor sites. However, most candidates struggled to describe the basis of the one-way direction of the impulse at the synapse. Many candidates were unable to identify the basic feature of synaptic operation but did recognise that synapses represent a gap and that chemicals were involved in transmission at this site.

A163/01 Twenty First Century Science Biology A (B7) Foundation Tier

General Comments

This was the first time that candidates were able to access this new specification paper.

Many candidates appeared to have been well prepared for the examination, attempting the majority of questions. However several candidates did not attempt the six-mark extended-writing questions as well as some of the other questions that required the candidates to answer with a written response of several sentences. A number of these candidates did score well on the objective 'tick box' and quantitative skill questions however, which perhaps indicates a lack of application rather than lack of ability.

Most candidates used the spaces provided for their responses with very few extending their answers to other parts of the paper. Candidates should be reminded that additional examination sheets should be used if their responses are likely to extend beyond the available space.

There were a number of specification areas that appeared to be causing some problems for the candidates, for example 'Closed Loop Systems' (Specification point section B7.4), Nanotechnology (B7.5.7 & 8) and 'Genetic Modification' (B7.5.3 & 4).

Comments on Individual Questions

- 1 (a) Candidates answered this part well, with the majority gaining all three marks.
- 1 (b) This was very poorly answered by candidates with over half failing to score any marks. Many candidates failed to draw anything on the diagram and many candidates were confused as to the function of ligaments and tendons
- 1 (c) (i) Over half the candidates gained full marks on this question, however a significant number of candidates multiplied the numbers instead of dividing them.
- 1 (c) (ii) Candidates did well at extracting the necessary information from the table.
- 1 (c) (iii) There were many vague answers with most candidates failing to suggest a suitable second answer.
- 1 (c) (iv) Many candidates did not read the question correctly, which referred to ceramic type replacements, and referred to other types of hip replacement in their responses. This limited the number of marks that Examiners could award.
- 2 (a) It was pleasing to see that many candidates knew how to expand the brackets in this question and gain all three marks.
- 2 (b) Most candidates gained this mark; their skill of making a conclusion from interpreting the table was generally good.
- 2 (c) Candidates rarely considered the idea that measuring pulse rates could cause problems or the idea that fitness was measured in ranges. Many candidates managed to suggest another suitable factor.

- 3** This six-mark extended-writing question differentiated well with many candidates showing that they had learned the basic structures associated with blood. However a number of candidates were confused with the functions of the red and white blood cells.
- 4 (a)** Many candidates struggled with the correct names for the blood vessels and the chambers.
- 4 (b)** Disappointingly only half the candidates were aware of the direction of blood flow around the body.
Candidates were instructed to place two arrows on the diagram, many also placed other contradictory ones at various points.
- 4 (c)** Candidates responses here showed a clear attempt to engage with the question. Many knew that the structure was a valve and what its function was; many other candidates gained one mark either for the name or its function.
- 5** In this six-mark extended-writing question most candidates managed to relate some ideas about temperature control in humans. However many misconceptions were apparent, such as blood vessels moving up and down in the skin. Very few candidates were able to make comparisons with aquatic mammals and again a number of candidates thought that these were cold blooded and that fish were mammals.
- 6 (a) (i)** This question indicated that many candidates were unsure about what a 'factor' and an 'outcome' were. Many candidates confused the two or failed to say that photosynthesis rate increased.
- 6 (a) (ii)** This area of the specification caused a number of problems. Many candidates appeared to be unaware of 'closed loop systems' or failed to explain why carbon dioxide levels were rising.
- 6 (a) (iii)** Most candidates scored at least one of the two marks available here. However it was disappointing to see candidates fail to follow the instructions to place two ticks in the boxes.
- 6 (b) (i)** There were a large number of candidates who managed to interpret which of the three diagrams represented the closed loop system.
- 6 (b) (ii)** Those candidates scoring in question (b)(i) went on to score well here.
- 6 (c)** Few candidates were aware of the cloud formation point (specification point B7.4.10) and hence very few candidates scored both marks (three correct responses were required for the two marks).
- 7** This six-mark extended-writing question produced a very disappointing response from the majority of the candidates. The key indicative science points about how the gene is obtained, transferred or expressed were either missing totally or explained in a very confused way.
- 8 (a)** most candidates were aware of most of the differential sizes of the structures listed. However too many candidates thought that DNA was bigger than a cell.
- 8 (b)** This answers to this question showed that approximately half the candidates were able to apply the mathematical idea to size.
- 8 (c)** Surprisingly many candidates were not aware of the fact that viruses can only be observed using an electron microscope. Additionally a significant number of candidates appeared not to have read the first three lines of the question and gave made up names for instruments.

- 8 (d) (i)** Candidates had difficulty in this question and failed to link the points from the article to their answers.
- 8 (d) (ii)** Candidates struggled again to suggest a suitable reason.
- 8 (e)** Again very few responses gaining a mark. Weaker candidates found this question very difficult to access.

A163/02 Twenty First Century Science Biology A (B7) Higher Tier

General Comments

Most candidates were well prepared for this paper and made a very good attempt at answering all of the questions.

The paper included three; six-marks extended writing questions. Centres that scrutinise the mark scheme for this paper will notice that the marking of these questions is more structured and the mark scheme allows credit for what the candidates know and can do.

The trend for candidates to write outside the allocated area continues. All too often candidates write in any white space that they can find. This is nearly always caused as a result of the candidate failing to think the answer through before commencing to write. It is common to see most of the lines allocated filled with a repeat of the question, before the candidate even begins to answer it. This is a very dangerous practice. Due to the fact that these scripts are marked electronically, examiners do not see the whole page by default and unless there is some indication that the candidate has written outside the allocated window, it is possible that the examiner will fail to spot additional text and the candidate could lose marks. It cannot be stressed too strongly that candidates should attempt to contain their answer in the space provided.

Some Centres have not yet come to terms with the fact that Appendix C deals with the mathematical skills required by candidates.

The paper was suitably challenging and discriminated well between candidates. Very few sections were unanswered suggesting that the paper was accessible to most candidates. There was no evidence that any of the candidates ran out of time.

Comments on Individual Questions

Question 1

- 1 (a) This question proved to be a straightforward start to the examination with most candidates scoring both marks. For candidates who did not write down the correct answer, credit was available for one mark for correct substitution of the numbers into the formula.
- 1 (b) The vast majority of candidates correctly realised that the category for BMI had changed to overweight and thus scored the mark. Examiners were instructed to use an error carried forward from part (a) to ensure that candidates were not penalised for the same mistake twice.
- 1 (c) This question discriminated well. Just over one third of candidates failed to score. However those who had learnt the definition knew that accuracy was how close to the true value the measurement was and that repeatability meant getting the same results when the experiment was repeated. Weaker candidates simply thought that the experiment had to be repeated.
- 1 (d) (i) This proved to be a difficult question with over a third of candidates failing to score. Most scored one of the two marks available. Good answers included

reference to the fact that the BMI change was very small so the change in risk would be small, or that the risk was averaged from the group and not everyone within the group would have the same risk. Weaker candidates wrote about BMI and the different factors that affected the risk of having heart disease.

- 1 (d) (ii) This question proved to be more difficult than expected. Although most candidates scored the first mark for stating that the risk was low, very few went on to state that the consequence was very high e.g. “they could die”. This was often due to the fact that most candidates did not understand the meaning of the word “consequence which is a specification word.

Question 2

- 2 (a) This question discriminated well and stronger candidates scored all three marks on this question. Regarding A, credit was not given for reference to illness and to score candidates had to refer to disease, infection, or the immune system. In C credit was not given for reference to scabs or wounds not healing.
- 2 (b) This question was answered well with most candidates scoring all three marks.

Question 3

- 3 This was the first of the six-mark extended-writing questions. It was targeted at strongest candidates which explains why a quarter to a third of candidates failed to score any marks. Examiners were looking for answers that correctly referred to diffusion, tissue fluid and changes in concentration. Good answers included reference to the fact that the blood pressure on the diagram was the wrong way round and went on to explain how the pressure was responsible for the formation of tissue fluid. The answer then continued to describe how diffusion takes place to provide the cells with nutrients and take away waste products. Weaker answers were often the result of not reading the question carefully enough and included reference to carbon dioxide and other waste products. Another common failure seen by Examiners was that many candidates gave a lengthy explanation of what was wrong with the diagram but failed to give a single example of how it could be improved.

Question 4

- 4 As credit was not given for yes or no answers, approximately one third of candidates failed to score on this question. Irrespective of whether candidates thought that Sir Charles Blagden would die, credit was given for how his body would respond. Good answers included reference to sweating, loss of heat by evaporation (references to cooling down were not credited), vasodilation and denaturing of enzymes.

Question 5

- 5 (a) Approximately half of the candidates scored both marks for this question. Correct answers referred to a high fibre diet and eating more complex carbohydrates.
- 5 (b) This question was well answered with the majority of candidates correctly identifying all three points to score the single mark available. Candidates who gave additional incorrect responses were not awarded the mark.
- 5 (c) This question was answered very well by the majority of candidates. Errors were few but when they did occur it was nearly always to transpose fibre with carbohydrate. This scored candidates one of the two marks available.

- 5 (d) This question was answered well with almost all candidates scoring at least one of the two marks available. When errors did occur they were randomly spread across the other distractors.

Question 6

- 6 This was the second of the six-mark extended-writing questions. It was anticipated that the vast majority of candidates would score at least two or three marks on this question and this did indeed prove to be the case. The stronger candidates went on to score the full six marks. Examiners were looking for a good explanation of what a closed loop system is; an example of how human activity can make this system go open loop; and finally an explanation of the consequences of going open loop. Good answers stated that a closed loop had no waste and that the output from one organism became the input for another organism; that deforestation or fertiliser run-off, were examples of humans affecting the environment; and finally the consequence was that land became desertified or fish died because of lack of oxygen. Examiners were pleased to see some full and very good answers to this question.

Question 7

- 7 (a) This question was extremely well answered with almost all candidates being awarded the single mark.
- 7 (b) Most candidates scored at least one mark on this question. Credit was given for the idea of restrictions on the number of fish taken, the size, age or species of fish taken, or restricting fishing at certain times or places. References to fish breeding were not credited.
- 7 (c) Most candidates were awarded this mark for the idea that local people needed certain resources from the environment to survive.

Question 8

- 8 (a) Most candidates scored at least one of the two marks available for this question. Incorrect answers were randomly distributed across the remaining distractors. Candidates who gave an additional incorrect response were restricted to one mark.
- 8 (b) Candidates needed to give both points of view to gain the two marks for this question. Good answers referred to countries with high levels of blindness being more inclined to accept the genetically engineered rice, whereas, in the UK we had alternative sources of vitamin A and would be more likely to be concerned with the ethics and dangers of genetically modified food.
- 8 (c) This six-mark extended-writing question was common with the Foundation Tier.. Examiners were looking for how the gene was obtained, how the gene was transferred and how the gene was expressed. Some candidates went down the route of transferring the gene to a viral vector that could administer the gene to a human being, others went down the route of transferring the gene to a bacterium that could copy and express the gene such that factor 8 could be isolated and injected into a human being. Both types of answers were credit worthy. However those candidates that confused and mixed up both routes were restricted to Level 2 marks by the Examiners.

Question 9 – This question was common with the Foundation Tier.

- 9 (a) This question was answered well with the majority of candidates being awarded both marks.
- 9 (b) Approximately two thirds of candidates correctly worked out the conversion.
- 9 (c) Most candidates answered this well and scored both of the marks. Good answers calculated the size of the virus or stated that it was smaller than 2000nm and then went on to say that an electron microscope would be needed to see it.
- 9 (d) (i) Most candidates gave a single mark answer to this question even though they could clearly see that it was worth two marks. Good answers stated that not enough was known about nanoparticles and that they would be released into the washing water when the socks were washed.
- 9 (d) (ii) This question was not well answered and two thirds of candidates failed to score. Good answers referred to making sure that the nanoparticles were more firmly fixed to the socks or that less were released. Candidates who stated that fewer nanoparticles should be used, failed to score.
- 9 (e) This proved to be a difficult question with most of candidates failing to be awarded the mark. Good answers stated that particles just slightly larger than 100nm could still have similar properties to nanoparticles even though the products would not be labelled.

A164/01/02 Twenty First Century Science Biology A

Overview

This was the first session for the assessment of the Twenty First Century Science suites Investigation controlled assessment. There were significant changes to the structure and assessment criteria for the investigation from the previous specification. Many centres managed the transition from the old specification very successfully, demonstrated a good grasp of these changes and criteria. However a disappointingly large proportion of centres had their marks altered this session, many with large scalings. The most common cause of significant changes to centres marks related to the hierarchical nature of the marking criteria, details of which are addressed below.

Administration

Documentary evidence of internal standardisation was also supplied in a large number of instances, but for many Centres, this was not provided. Much inconsistent marking seen suggested that internal standardisation procedures had not been applied by some Centres, and Centres are reminded of their obligations:

'It is important that all internal assessors of this Controlled Assessment work to common standards. Centres must ensure that the internal standardisation of marks across assessors and teaching groups takes place using an appropriate procedure.' Section 5 of the specifications suggests some ways in which this can be carried out.

In general the provision of samples was very good, with work sent promptly with all the correct administrative documents. When not correct the most common omission was the CCS160 Centre Declaration although a number of centres failed to attach the controlled assessment cover sheet to the front of each candidate's work, which always causes problems to the Moderator. When submitting samples please do not use plastic wallets, the preferred method for holding a candidates work together is treasury tags. There were few clerical errors this session, but where they did occur they were nearly always the result of careless addition or transcription of marks.

Few Centres provided their Moderator with detailed accounts of how the tasks and levels of control were administered; where present, these aided the moderation process. Candidates' scripts from a small number of Centres were overly long, although timings indicated in the specification are for guidance only; it was clear that in some instances these had been exceeded markedly. Candidates should not be allowed unreasonable amounts of time and it should be impressed upon candidates that producing reports is an exercise in conciseness.

Annotation

Annotation of candidates' work was excellent in many instances, but variable from Centre to Centre, and sometimes within a Centre. The annotation ranged from *just a series of ticks here and there to the relevant skill area code written adjacent to where the point had been made, backed up by a supporting comment.* We would always encourage centres to adopt the latter of the two approaches. Please note that it is a requirement that 'each piece of internally assessed work should show how the marks have been awarded in relation to the marking criteria'.

Hierarchy

A significant number of centres did not treat the criteria as hierarchical. Where this was the case centres were often significantly out of tolerance. Each statement at a lower must be met before marks can be awarded at a higher level. So for example all the criteria at level 1–2 marks need to be met before 3–4 marks can be awarded.

When marking the work each criterion should be annotated where it is met. Beginning with the lowest level and working up to the level where a criterion is not met. This will determine the level of marks awarded. If the candidate meets all the criteria at a given level then the higher of the two marks is awarded. Where the candidate meets some of the criteria at a level the lower of the two marks must be awarded.

For example, in strand **Eb** a candidate who fails to make any comments about outliers is limited to a maximum of 3 marks no matter how well they consider the degree of scatter and general pattern of results. A consequence of this is that it is important that:

- candidates are taught to address lower level criteria as well as higher level criteria.
- teachers take care in identifying where the criteria are met otherwise quite large alterations in marks may result during moderation.

Particular criteria that have not been addressed by candidates are identified below

Interpretation of assessment criteria

Sa – formulating a hypothesis or prediction

For Twenty First Century Sciences a scientific hypothesis is a tentative explanation of science related observations or some phenomenon or event. The key point here is the idea of the explanation. A useful hypothesis allows a prediction to be made from it that can be tested experimentally.

The most common difficulties here were insufficient science used to develop the hypothesis. A common mistake was to provide 'a large chunk' of scientific knowledge but not relating this clearly to the development of the hypothesis.

Secondly, major factors were not considered before selecting a factor for the development of the hypothesis. It is not sufficient to state a factor, give a hypothesis and then list other factors as control variables.

At the highest levels (7–8 marks) it is important that candidates consider all relevant factors. A quantitative predication must be derived or related to the hypothesis not simply an unjustified guess.

It is worth mentioning that work in this strand may not be credited for work in strands **Ra** or **Rb** which are carried out under conditions of high control.

Sb – Design of techniques and choice of equipment

In this session, this strand was often generously marked. It was often not possible to justify the centre marks because candidates limited themselves to a maximum of 5 marks by failing to explain their chosen range of data. It was disappointing to find that the range (of the independent variable) was rarely explained. Centres seemed to believe that just 'stating' the range was sufficient. This explanation can be pragmatic, 'there were only 5 different strength lens available', based on safety issues, 'the upper end of the range was limited to 2M as any more concentrated would be too corrosive' or based on prior knowledge/preliminary work 'from PE I know candidates cannot do step ups steadily for more than 3 minutes' or 'my preliminary work showed a reasonable change in the dependent variable of this range'. Note both ends of the range should be mentioned.

Good scientific justifications of the method, equipment and techniques selected must be provided for candidates to be awarded marks in the 7–8 mark level. Some candidates carried out preliminary work prior to the experiment proper. Although not a requirement, if it is practicable to do so in the allotted time, this can help candidates to justify the method, equipment or range used. Justifications, however, were often weak, and the reasons for the use of a particular method, in particular, were often not provided. Many candidates produced tables, ostensibly to justify the equipment used, but these often listed every piece and simply described how they were used rather than justifying the choice, some very mundane statements were seen. At this mark level, candidates should be using terminology such as ‘resolution’, ‘accuracy’ and ‘precision’ in their justifications.

In this strand, candidates are also required to review aspects of Health and Safety, ranging from comments, through to producing full and appropriate Risk Assessments. These were sometimes absent, and where a high mark had been awarded, centre marks had to be lowered significantly. It is suggested that there is no excuse for omitting Risk Assessments; this phase of the task is under limited control, and more importantly, a Risk Assessment is a prerequisite to any practical work being carried out. Risk Assessment proformas can be used, and these should include the chemical, organism, piece of equipment or activity that is likely to constitute a hazard, the hazard defined (using the appropriate terminology), the associated risk(s), and measures intended to reduce risk. Risk Assessments should pertain to the experiment in question and not to generic hazards and risks (though clearly, candidates are not penalised for the inclusion of these).

Please also note the hierarchy of awarding marks here; hazards must be identified for 3–4 marks, with ‘some precautions’ to minimise risk for 5–6 marks. While the word ‘some’ is used, it was not possible to support Centre marks where arguably the most important safety precautions are omitted e.g. the use of low voltage power supplies in electrical experiments. For 7–8 marks, for a Risk Assessment to be ‘full’, it must refer to *all* potential hazards and risks. This includes such things as using low voltage power supplies, limiting concentrations of solutions and the source of biological materials. Here, candidates should be encouraged to use statements such as ‘low hazard’ and ‘limited risk’. Candidates should also consider hazards and risks of a final product of the experiment, e.g. the products of a chemical reaction or incubated agar plate. For a Risk Assessment to be ‘appropriate’, the hazard/risk must be appropriate to that for the chemical/equipment/activity used or undertaken. At this level they should ideally refer to PAT testing of electrical equipment, COSSH, Cleapps Hazard cards or other similar documents and show an awareness of who/where the first aider is in case of injury.

C – Range and quality of primary data

Errors in marking in this strand tended to be at the higher end. The ‘*correctly recording of data*’ at the 5–6 mark level requires meaningful column headings, correct units and consistency in the number of significant figures/decimal places used. To match 6 marks, candidates need to show consistency both with the number of decimal places reported for their raw data and the actual measuring instrument as well as including all quantities and units in table headings.

In strand **C** there is no need to do more than 2 sets of results if there is close agreement between the two sets obtained. If they are not close, however, then there is a need to do a further repeat for this value – an intelligent repeat. The *regular repeats or checks for repeatability* criterion would then be matched and a possible outlier could be identified. In the new (2011/2012) specifications for Twenty First Century Science, statement 1.6 in the ‘Ideas about Science’ has clarified the definition and treatment of outliers (compared with the version in the legacy (2006) specifications) to state, “*If a measurement lies well outside the range within which the others in a set of repeats lie, or is off a graph line on which the others lie, this is a sign that it may be incorrect. If possible, it should be checked. If not, it should be used unless there is a specific reason to doubt its accuracy.*” Potential outliers in data collected during a Controlled Assessment should be handled in accordance with this statement.

Please note that experiments that 'pool' data from a class are not suitable for this controlled assessment. Strand **C** is based on the primary data collected by the candidate. Data collected by other candidates is secondary data. It is very likely that a candidate pooling data with other candidates in a class will be limited to the 1-2 mark level.

A – Revealing patterns in data

Overall, the quality of work in this strand was disappointing. Arguably, this should have been the strand of the Practical Data Analysis where candidates scored the highest marks, but it was here where often the largest discrepancies between Centre and Moderator marks occurred.

Some graphs seen were of poor quality. There was clear evidence that some Centres had not checked the plotting of points carefully before awarding marks. Graphs drawn without appropriate scales, e.g. where these were non-linear, or without one or more labelled axes, and poorly-drawn lines of best fit, were often, incorrectly, awarded high marks. If the scale is inappropriate, or points are plotted incorrectly, the candidate mark cannot exceed four marks. Likewise, if an inappropriate line of best fit has been applied, a mark above five cannot be awarded, irrespective of whether the candidate has drawn range bars. For marks to be awarded in the highest mark levels, range bars must be drawn accurately (in addition to there being minimal errors in the plotting of data). The scales chosen by candidates often made difficult accurate plotting of data, as did crosses drawn with unsharpened pencils, particularly where millimetre graph paper was used. Although it is not essential that graph scales should start at (0,0), where axes begin with a 'zig-zag' section it is important that candidates do not extend their line of best fit into this 'undefined' area. This bad practice was seen on a number of occasions

In some instances, however, candidates that were awarded very low marks having drawn very poor graphs could be awarded three or four marks owing to their calculations of means, a point sometimes overlooked by Centres.

Centres are reminded that for candidates to be awarded marks at the 5-6 mark level and higher, graphs having gridlines should be produced. They should not be drawn on lined paper. Where computer software is used to generate graphs, these should have appropriate scales, appropriate labelling, and gridlines. For candidates to score high marks, lines of best fit and range bars should be drawn manually.

Ea – Evaluation of apparatus and procedures

This was generally well assessed by centres however the common errors consisted of over marking candidates who suggested improvements but did not consider the limitations, hence not meeting the criteria at 3–4 marks.

Some improvements mentioned were trivial or lacked the detail required for higher marks. In general doing more repeats is unlikely to be a significant improvement.

There was some confusion over improvements to the experimental procedure and apparatus which is addressed here in strand **Ea** and the additional data or methods which can be used to increase confidence in the hypothesis which falls in stand **Rb**

Eb – Evaluation of primary data

A major stumbling point here was the requirement for outliers to be considered at level 3-4 marks. A significant number of centres ignored this requirement. In addition there appeared to be some confusion over what an outlier is, both amongst candidates and teachers. The criteria state *'individual results which are beyond the range of experimental error (are outliers)'*. Not all anomalous results are outliers, in particular averages are not outliers and a set of data points for a single value cannot all be outliers. In the new (2011/2012) specifications for Twenty First Century Science, statement 1.6 in the 'Ideas about Science' has clarified the definition and treatment of outliers (compared with the version in the legacy (2006) specifications) to state, *"If a measurement lies well outside the range within which the others in a set of repeats lie, or is off a graph line on which the others lie, this is a sign that it may be incorrect. If possible, it should be checked. If not, it should be used unless there is a specific reason to doubt its accuracy."* Potential outliers in data collected during a Controlled Assessment should be handled in accordance with this statement. Candidates are permitted to draw a graph of their results during the (limited control) data collection stage of the Controlled Assessment task. This may help them to identify potential outliers. Ideally, any data points that look to be potential outliers should be re-measured, and this is easiest to achieve if they are identified during the data collection session i.e. strand **C**.

For 5–6 marks, although there were some often good discussions of spread of data, 'repeatability' was not always discussed. Candidates should discuss the spread of data qualitatively at this level, and quantitatively to obtain the highest marks at the top mark level at 7-8 marks. Candidates' evaluations were often very long, but many covered the pertinent points in the first few sentences.

Ra – Collection and use of secondary data

This strand was poorly addressed by many candidates.

The intention in strand **Ra** is that candidates should do some research and find their own examples of secondary data. The OCR data in the 'Information for candidates (2)' document is only provided as a back up for those who fail to find any relevant secondary data from their own research.

Generally candidates are limited to 5 marks in strand **Ra** if all they use is the OCR data and/or results from another candidate or group. In order to access 6 or more marks in strand **Ra** candidates must present a 'range of relevant secondary data', which means that some data from the candidate's own research must be included and the source(s) of the data must be fully referenced. Guidance on referencing can be found in the 'Guide to Controlled Assessment' handbook for Unit A154 / A164 / A174 / A184 (Practical Investigation). The direct download link is <http://www.ocr.org.uk/Images/77479-guide-to-controlled-assessment.pdf>

Secondary data can be of different types:

- the data provided by OCR in the 'Information for candidates (2)' document;
- data collected by other candidates doing the same (or a similar) investigation;
- data from other sources (e.g. textbooks or the internet).

Data do not necessarily have to be quantitative; they can be qualitative. Candidates do not necessarily have to find a table of numbers that looks exactly like the one they have generated from their own experiment; graphs, descriptions of trends, conclusions, mathematical relationships, relevant constants, models and simulations can all be presented as secondary data.

It is helpful to the Moderator if candidates included copies of the secondary data that they discuss in their report. This could be cut and pasted into the report (so long as it is clearly identified as third-party material), or may be attached to the end of the report. The material included should be carefully selected and cropped to show only the relevant parts, rather than comprising swathes of irrelevant material indiscriminately printed out.

Rb – Reviewing confidence in the hypothesis

This strand was also over-generously marked by some Centres. Candidates should be encouraged to re-state their hypothesis at the beginning of the review section to provide focus for this strand. Candidates often discussed findings but did not refer the hypothesis at all, or say if their data supported it. All candidates should make at least a statement referring to whether the hypothesis has been supported (or not), and the extent to which the data support the hypothesis.

At the 3–4 mark level upwards, candidates should make reference to some science when explaining their results. This was rarely done. It is not sufficient to merely refer to science used in strand **Sa**, as strand **Sa** is carried out under conditions of low control whereas strand **Rb** is done under high control conditions. At level 5–6 the science must be used to support the conclusion about the hypothesis.

When giving an account of extra data to be collected this must go beyond simply suggesting improvements to the procedure used, which is assessed in strand **Ea**. Different techniques or experiments that will provide additional data to assess the hypothesis are required for this strand.

Sources of Support

In addition to this Principal Moderator's Report, OCR also offers several avenues of **free** support, including:

- A 'Guide to Controlled Assessment' handbook for Unit A154 / A164 / A174 / A184 (Practical Investigation). The direct download link is <http://www.ocr.org.uk/Images/77479-guide-to-controlled-assessment.pdf>
- INSET training events for 2013-14 are available details may be found on the OCR website.
- OCR also offers a Controlled Assessment Consultancy service, in which candidate work that you have marked will be reviewed by a senior moderator prior to moderation.
 - To make use of this service, post photocopies of three marked pieces of work to the following address: *Carolyn Brawn, Science Team, OCR, 1 Hills Road, Cambridge, CB1 2EU.*
 - Typically, Centres are we encouraged to send work which covers a range of attainment or which illustrates particular points of concern. The Controlled Assessment scripts should be marked and annotated before being photocopied. Please include a covering note on Centre-headed paper, and give a contact email address. A senior Moderator will look at the work and will write a report on the Centre marking, which we will email or post back to you within 6 weeks. You can then make adjustments to your marking, if you wish, before submitting marks for moderation in May.

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