**OCR**
RECOGNISING ACHIEVEMENT

GCSE

**Biology A**

Twenty First Century Science Suite

General Certificate of Secondary Education **J633**

# OCR Report to Centres

# June 2012

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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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**OCR REPORT TO CENTRES**

# Overview

Although legacy papers will be available for candidates in January 2013, this was the final session for these papers which will now be superseded by papers written for the new specifications.

Most Centres entered their candidates for the correct tier of examination. Weaker candidates that are entered for higher tier papers do not have a pleasant experience and find many of the questions too difficult to attempt.

The majority of candidates taking the Biology papers in this session performed extremely well with free response questions proving to be the most challenging. 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.

Most Centres had used the pre-release material to their advantage and prepared the candidates well. Candidates seemed to find 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 papers indicating that there was no evidence that candidates ran out of time, nor was there any evidence that candidates had been disadvantaged by language or cultural issues.

As always, there are lessons to be learned and specific points relating to each paper are picked up in the individual reports from each Principle Examiner and Course Work Moderator. Some issues however occurred across the suite of papers and these are detailed below.

Candidates are well advised to read questions carefully. 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. Candidates would also be advised to pay similar attention to their answers. Answers should always be re-read to ensure that they do indeed answer the question on the examination paper. It was noted by some Principal Examiners that failure to re-read their answers had resulted in contradictions in some candidate's responses. This is a simple error that can be avoided.

The use of questions that required extended answers proved to be challenging for many candidates. This challenge is going to increase in the new papers with three longer, six mark questions. All too often candidates answered the question by re-writing the question before starting their answer. This resulted in two problems for the candidates; running out of space in which to answer the question; then thinking that by writing out the question they had in fact answered it. This meant that many candidates either failed to score or performed badly on extended answer questions. It was clear however that most Centres are encouraging candidates to write more than in previous years. It is important to continue this trend as the papers for the new specifications contain three, six mark questions.

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 candidates 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 write down their working, the chances are that they could gain at least one of the marks available for the question.

Candidates, particularly at foundation level, had a tendency to leave some questions blank where they had difficulty answering. This was particularly noticeable in questions that required longer answers. Leaving questions blank will guarantee that they get no marks for the question. 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.

Centres and candidates should be aware that examination papers are scanned so that they can be 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 appropriate answer lines and spaces in which to write their responses. This is often exacerbated by candidates crossing out initial incorrect responses, and then cramming the answer into a much smaller space. This is another good reason why candidates should think carefully before beginning to answer the question.

Centres will be well aware that many of the questions in these papers consist of "Put ticks (✓) in the boxes next to the correct answers." In order to increase the degree of difficulty of higher tier questions, candidates are not always told how many correct responses are required. The more astute candidates may well look to see how many marks the question is worth and then assume that the number of marks available for the question must match the number of correct responses required. This is not necessarily the case. Some questions will award one mark for two correct responses. Some may award two marks for three correct responses. Candidates must be advised to answer each of these questions on their merit and place ticks next to those answers that they think are correct.

Candidates need to be aware that imprecise answers will not score. The use of the words "they" and "it" often do not clearly identify what the candidates are writing about.

With regard to Skills Assessment, there has been a continued improvement in a number of areas in the interpretation and application of the assessment criteria. This is pleasing to see as it fundamentally underpins Twenty First Century Science. However, certain aspects continue to be demanding and challenging for candidates and the spread of marks over the cohort was sufficient to allow secure differentiation between grades. **For next summer, tasks will be set by OCR under the new Controlled Assessment procedures and Centres must check the new unit entry codes and other requirements.**

Although most Centres had excellent administrative procedures in place, there are still a significant number of Centres who are not following the correct protocols. Centres need to include details of how the tasks were presented to candidates and work needs to be annotated. Help sheets should not be used and plagiarism from websites could constitute malpractice and penalties applied.

Too many Centres are still making unnecessary errors in calculating the Strands and correct procedures need to be followed more carefully.

The following reports provide more detail on how candidates performed on specific papers and skills assessment, highlighting areas of concern and applauding improvements from previous years. It is hoped that this trend will continue into the new specifications.

Please encourage your staff to read these reports and use the advice given in their teaching..

The reports are available on line at  www.ocr.org.uk

# A221/01 – Twenty First Century Science Biology A (B1, B2, B3) Foundation Tier

**General Comments**

It was encouraging to see that many of the candidates who had been entered for this tier of A221/01 demonstrated a good understanding of the concepts covered in this section of the syllabus. It is important that all candidates try to match the number of responses with the number required in the stem of the question to maximise their marks. There were several opportunities on the paper for candidates to demonstrate application of their knowledge in the free response questions. In order to gain credit on these sections it is important that candidates address the question in more depth and they would be well advised to practice writing such responses.

**Comments on Individual Questions**

1a) This question asked candidates to identify the nucleus as the site where instructions are found. Most candidates were able to identify "nucleus" as the correct site.

1b) This question wanted candidates to identify the correct name for the sets of instructions. This was well answered by the majority of candidates.

1c) This required two boxes to be ticked, one for "making proteins" and one for "storing information". Most candidates scored at least one of these marks with the majority of candidates ticking the "making proteins" correctly.

1d) Like 1b, this required one tick in the first box "1" however, most candidates ticked the box linked to "23" as the number of copies of EACH chromosome found in a human sperm.

2) This required four correct ticks for three marks. The majority of candidates knew that clones are genetically identical and many knew at least one other correct response.

3a) In order to credit on this question, candidates needed two correct responses. Many candidates hadn't appreciated this, writing down only one correct response and therefore failing to score.

3b) (i) This required candidates to identify an issue from a list of statements numbered 1-6. The majority of candidates found this difficult and there were a range of responses.

3b)(ii)  This was well answered with many candidates knowing which statement summarised the different views that might be held.

3b)(iii) This question asked candidates to choose two statements which Sunita needed to consider when she decides to have the test. Most candidates were able to identify at least one of the statements correctly. However, only half of the candidates were able to identify both statements and gain credit for their answer.

3c) This question was looking for a response which had identified both the decision and the impact of that decision. Candidates who scored one mark on this question were divided between the two aspects.

4a) Most candidates knew that bacterial infections can be treated with antibiotics.

4b) This question was very well answered with many candidates scoring at least one of the two marks. It was encouraging to see that most candidates had placed a tick in one box on each row.

4c) Many candidates knew that different people experience different side effects from vaccines.

4d) This was a free response question on which many candidates failed to score. Many repeated sections of the stem of the question without developing their ideas. Candidates who did gain credit tended to understand, and could justify, why a person may not want to be vaccinated.

5a) In this question candidates were asked to tick two boxes relating to why heart muscle needs its own blood supply. Most candidates knew that the heart muscle "needs to receive oxygen" and many knew that the heart muscle needed to receive glucose too.

5b)(i) Very few candidates were able to write down the feature of an artery and relate it to its function. Many candidates' answers were limited to statements such as "the artery carries blood to the heart."

5b)(ii) As with b(i) this was poorly answered and only a few candidates knew that veins have valves to prevent backflow of blood.

5c) There were only a few candidates that were able to link a health example to a correctly linked correlation and in most cases candidates scored one mark for a simple statement linking smoking to cancer or heart disease.

6 Most candidates found both sections of this question difficult.

7 In this question candidates had to choose phrases from the list to complete sentences. This was a well answered question. Most candidates knew that Evolution happens due to Natural Selection. It was encouraging to see that many candidates scored at least two marks.

8a) This question was well answered. Candidates had to tick the correct statements about variation. The majority of candidates knew at least two correct statements and in particular that variation can be caused by the environment.

8b) This was not as well answered as 8a, with most candidates who scored knowing that the production of new medicines depends upon diversity.

8c) This was a free response question about sustainability. Those candidates who gained credit were usually able to describe an example of a sustainable product.

8d) This was poorly answered by the majority of candidates with many using examples such as dinosaurs or cutting down trees.

# A221/02 – Twenty First Century Science Biology A (B1, B2, B3) Higher Tier

**General Comments**

The paper was accessible to the majority of candidates. The free-response items are still challenging for many candidates at the higher level. However, the most able candidates provided clear responses, presented in a logical order and based on a sound understanding of the concepts involved. A number of candidates continued to use the space below the dotted lines provided for answers.

Questions did not appear 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 items. Relatively few candidates changed their responses by crossing out initial attempts, particularly for objective questions involving the ticking of boxes. Candidates appeared to have sufficient time to complete the paper and the number of 'nil responses' was very limited.

**Comments on Individual Questions**

1(a) Most candidates completed this question on genes successfully.

1(b)(i) Again, many candidates were able to respond correctly but some did select recessive rather than the correct response of dominant.

1(b)(ii) Most candidates correctly identified the 50% chance but some did, unfortunately, choose 25%.

1(c) Many candidates were able to identify all three responses correctly. However, some did select the first option rather than the second.

1(d)(i) Candidates tended to explain the link between the dominant allele and this trait, without considering the inheritance pattern. Others chose to estimate the % patterns of inheritance from the two parents.

1(d)(ii) Most candidates did not find any difficulty with correctly identifying Jane and Wendy.

2(a) An appropriate set of symptoms of cystic fibrosis was correctly selected by many candidates. Most tended to refer to the mucus produced and to chest infections or problems with breathing. A few candidates confused the symptoms with those of Huntington's disorder.

2(b)(i) Many candidates correctly identified statement 6. No clear pattern of responses could be identified for alternatives.

2(b)(ii) Most candidates correctly identified statement 2.

2(b)(iii) Statements 1 and 5 were often correctly chosen by candidates but some chose statement 5 alongside an incorrect statement.

2(b)(iv) Many candidates correctly identified statement 2.

2(c) A number of candidates were able to link the decision about testing or aborting the foetus with the wider impact on parents, other family members and on the unborn child.

3(a)(i) Many candidates did not correctly identify statement 8. No clear pattern of alternative responses could be determined.

3(a)(ii) Many candidates correctly identified statement 3.

3(a)(iii) Many candidates correctly identified statement 5.

3(a)(iv) Many candidates correctly identified statement 1.

3(a)(v) Many candidates correctly identified statement 2.

3(a)(vi) Some candidates correctly identified statement 6. No clear pattern of alternative responses could be determined.

3(b) This item generated some variation in the responses obtained. Many candidates were able to make a clear link between the different testing stages. Others focussed primarily on blind or double-blind trials. References to the use of placebos were ignored and did not affect the outcome of marks allocated.

4(a) Most candidates completed this question on changes in genes successfully.

4(b) Many candidates identified statements 4 and 7 as the two correct statements. Some candidates unfortunately selected the first statement.

4(c) Although many candidates correctly identified the three events contributing to the formation of a new species, some included either biodiversity or sustainability in their chosen responses.

5(a) Many candidates completed this question on variation successfully. Some selected the second rather than the first statement in the table of responses.

5(b) Although many candidates correctly identified the final two statements in the table, some chose earlier statements. No clear pattern of alternative responses could be determined.

5(c) Some candidates were challenged by this item. They did not appear to be aware of the definition of sustainability as outlined in the specification. There was a tendency to focus on recycling and/or maintaining a stable environment.

5(d) Many candidates chose the Dodo as the named example of a species which is now extinct due to human activity. Some candidates chose other interesting examples, including the Sabre-Toothed Tiger and Tasmanian Wolf. Unfortunately, some candidates appeared to misread the instruction for this item. Such candidates gave examples of species which are vulnerable to extinction in today's world.

# A222/01 – Twenty First Century Science Biology A (B4, B5, B6) Foundation Tier

**General Comments**

The candidates seem to have made good use of their time. There was no evidence of candidates running out of time.

The paper was well attempted with few blank spaces.

Candidates found it difficult to write longer answers. They often contradicted themselves when writing more than one sentence.

**Comments on Individual Questions**

1a Candidates didn't appreciate that the substances had to be filtered out initially in order to allow reabsorption to occur. Few candidates scored both marks.

1b The multiple choice nature of the question meant it was accessible to all candidates, with many correctly understanding that alcohol makes the urine more dilute and increases the volume.

2a   Many candidates wrote about the job of enzymes rather than saying what they were. The word 'protein' was a rarity. Candidates seemed to think that enzymes are alive in some way rather than just chemical molecules. Many candidates knew that enzymes were involved in speeding up but did not write about reactions.

2b Candidates found it difficult to use the lock and key model to describe why an enzyme only works with a particular molecule. Simply saying that the enzyme is the lock and the substrate is the key was not enough. Some knew that one fitted into the other but did not make a comment about the shape.

2ci Most candidates gave 20 which is the correct answer.

2cii Most candidates achieved at least one mark

 2ciii Many candidates are still writing 'they die'. The answer was "denatured" or "stops working". The answer needed to refer to the enzyme not the reaction.

3ai Homeostasis was known by many but the spelling was not always correct.

3aii Many candidates just described how the heat loss/gain were achieved rather than answering the question about keeping body temperature constant.

3aiii Again, many candidates didn't appreciate what the question required from them, preferring to explain how the body tried to use the corrective actions - sweating etc. They failed to score marks because they failed to link the site with the temperature detected.

4a The role of genes in cell specialisation was well known by candidates.

4b Many candidates wrote enzymes rather than hormones.

4c There were many muddled answers. Some candidates seemed to think that phototropism was another name for photosynthesis. Many put things like "lean" towards the light but few said

in order to get **more** light. Quite a number knew about plant hormones but again could not equate it to the need for increased light. Very few candidates gained credit for "increased photosynthesis".

5a This is a question that has been asked many times in various formats. However a disappointing number of candidates scored the mark.

5b In order to score both marks, all five answers had to be correct and many candidates scored two marks. Less than four correct answers scored zero marks.

6a Many candidates muddled mitosis with meiosis. Egg splitting was a common incorrect answer.

6bi Many candidates scored two or three marks and would not use the word 'separate' twice even though they were clearly told each word may be used once, more than once or not at all.

6bii Most candidates correctly stated that there are 23 chromosomes in each gamete.

6biii This question produced some very confused answers. Quite a few candidates got the answer correct and then attempted to elaborate more and then got the answer wrong. Literacy weaknesses prevented some candidates from gaining marks with many quoting "meeting" rather than "fusing" or simply ignoring the gametes entirely. Most marks were for '46'.

7a Hiding from predators in order to survive was very well answered.

7b Very few candidates scored the mark for this question. Brain was not selected by candidates; brain and spinal cord were both needed to score the mark.

7c This was another well answered question.

8a Front, back, left, right, cerebellum were all incorrect answers to this question. A few candidates wrote cortex which was insufficient for the correct answer cerebral cortex.

8b The definition of memory was well known.

8c Most candidates selected the option about "speed of impulses" rather than the option "are more likely to transmit impulses than others".

9a The structure of the motor neurone was not known by many candidates.

9b Many candidates wrote about the lack of protection aspect of the sheath and damage to the neuron. Few got any marks.

9c Most candidates knew that the gap between two neurones is the synapse.

# A222/02 – Twenty First Century Science Biology A (B4, B5, B6) Higher Tier

**General Comments**

It was a pleasure to see so many candidates do well on this paper. There was no sign that any did not have enough time to complete the paper.

There was a significant number of candidates who struggled due to poor English skills. This was evident from the number who mis-interpreted the word "detected" in Q1. It was also evident in the written responses which hinted at relevant knowledge but which were too poorly expressed to gain credit.

The performance of the candidates seemed broadly equal across each of the units B4, B5 and B6, although there were areas of weakness in each module. General knowledge of homeostasis seemed stronger than that of the particulars of water balance. In B5, understanding of the cell cycle was rare. In B6, recall and understanding of the events in synaptic transmission were weak.

With the greater emphasis on written responses in the new specification papers it might help some future candidates if consideration is given to which tier they are entered for. A number of candidates were ill suited to this higher tier paper.

**Comments on Individual Questions**

1ai was well answered, most offering "homeostasis" rather than "thermoregulation".

1aii was generally correctly answered. A number of incorrect responses went into irrelevant detail of how heat might be lost or gained.

1b was well answered by able candidates. It was not uncommon for marks to be lost here through vague language failing to make it clear which temperature was being detected by which receptor.

2a required both eating food and respiration for the mark. A good many candidates who failed to score did get the idea of food but offered incorrect responses like 'soaking in the bath' for the respiration point.

2b Most candidates scored one mark rather than two on this question. The most frequent error was to tick the box to say that urea excretion increases rather than stays the same. The idea of concentration seemed to be misunderstood.

2c called for the recall of "pituitary gland" and this detail of homeostasis was reasonably well answered by the candidates.

3a was particularly well answered, with few incorrect responses seen.

3b saw many score two marks, but there were some very poor responses where candidates were unable to express themselves clearly.

4a was generally well answered. Some responses showed confusion about the difference between DNA and chromosomes.

4b was better answered, with many gaining at least one mark for getting four of the five rows correct.

5a was another question where many candidates gave vague or poorly expressed responses which were difficult to give credit for. Some candidates failed to score because they thought that auxin was attracted to light, or that it inhibited growth. Some responses were so general as to be restatements of the question, and so did not score.

5b called for the recall of "meristem", and was perhaps not as well answered as might have been expected for a straightforward question.

6ai seldom gave three marks; candidates seemed uncertain of the different events in the cell cycle.

6aii called for the identification of D and E as mitosis, and was very poorly answered. Candidates were unclear as to the difference between mitosis and the rest of the cell cycle.

6b was encouragingly well answered, with most candidates getting the true/false/true pattern correct.

7a was generally well answered, with the axon and fatty sheath being correctly identified on the diagram.

7b was particularly well answered, and it was also pleasing to see the majority of candidates showing their working. This was clearly down to good preparation by Centres.

7c was not particularly well answered, although able candidates gave very clear and concise correct responses. A number of candidates had learned that insulation was part of the function of the fatty sheath, but went on to lose the mark through talking about the axon getting too cold.

7d was fairly well answered, the most common wrong response being sensory neuron which suggests that perhaps candidates were careless in reading the question.

8a was encouragingly well answered, with only a minority of candidates including option F in their sequence and so losing both marks.

8b saw some muddled expressions from candidates. Some candidates who failed to score still tried to apply some scientific understanding by arguing that diffusion could only proceed in one direction, from high to low concentration.

8c was again well answered, and some of the non-scoring responses included one of the two correct boxes being ticked.

9ai was not very well answered. Common mistakes were to say memory is defined by being short or long term, or to refer to storage without retrieval of information.

9aii was answered much better, although some greater care might have been shown in spelling "cerebral".

9b was very well answered, with hardly any responses showing a tick outside of the three correct boxes.

9c did not score for the majority of candidates. One or other of the correct responses of Daniel and Emma were offered alone, or along with one of the incorrect responses.

9d saw the great majority of candidates offer at least one of the correct responses of D and G.

# A223/01 – Twenty First Century Science Biology A (Ideas in context plus B7) Foundation Tier

**General Comments**

Candidates' performance this year was broadly similar to 2011. Candidates were confident and there were very few questions left blank. There was no indication that time was an issue, candidates seem to have answered all the questions they could on the paper. The paper discriminated well and allowed all candidates to demonstrate their knowledge and understanding.

Centres had clearly spent time preparing candidates for question 1 based on the pre-release article. Candidates were familiar with the content and made reference to it in their answers and were also well prepared for the percentage calculation.

Candidates showed poor understanding of the circulatory system. Genetic modification and understanding of respiration was patchy.

**Comments on Individual Questions**

**1a** Many candidates knew and could describe the term alien invader.

**1b** Quite a few candidates misunderstood the effect of alien invaders on biodiversity, referring to numbers of one species declining or one species replacing another.

**1ci** This was well answered by nearly all candidates.

**1cii** Most candidates correctly interpreted the information from the maps and could state that the harlequin ladybirds were spreading quickly.

**1d** Again candidates showed they were well prepared and understood why the introduction of insects from Japan to control knotweed was not likely to damage the environment.

**1ei** Most students gained full marks here although there were some long winded methods used to calculate 75% of 600.

**1eii** This question proved more demanding with many candidates failing to link the information that the number of alien species had increased to ideas about how this would affect the probable range.

**1eiii** There was a misunderstanding on the part of many candidates regarding answers to this question and 1f. Often candidates effectively gave answers to 1f here, in 1eiii, and *vice versa*.

**1f** Better candidates could pick out ways in which alien species cause harm. Weaker candidates merely quoted from the article.

**2a** The majority of candidates knew that they needed to add "oxygen", "glucose" and "water" to complete the equation. Those who failed to complete the equation correctly tended to put oxygen in as a reactant.

**2b** Most candidates gained at least one mark on this question with the first two stages of photosynthesis being particularly well known.

**2ci**. Many candidates failed to gain a mark by simply referring to "more cars" or "more pollution" rather than giving an explanation in terms of increased burning of fossil fuels.

**2cii** Not many candidates linked the question to ideas about limiting factors or seemed to understand that with increasing $CO_2$ levels, photosynthesis would increase.

**2d** This proved to be a difficult question with many candidates giving examples of synthetic polymers such as nylon, with few quoting proteins or enzymes.

**3a** Most candidates knew the meaning of the term parasitism.

**3b** Candidates struggled to suggest adaptations of parasites other than the tapeworm suggesting this was the only one they had been taught. As the tapeworm was the example provided, candidates answered this question poorly.

**3c** Very few candidates gained two marks here for a full description although many understood that the parasite had to adapt to changes in the host to survive.

**4a** Candidates generally attempted this question and tried to use the key terms provided.  Some candidates discussed human blood cells showing they had not read the stem of the question with understanding. However, very few candidates really understood or could describe the process of genetic modification.

**4bi/ii/iii** Economic and ethical implications were better recognised than social implications.

**4c** This question was well answered with candidates generally knowing at least one example of a use of genetic modification although the production of antibiotics was a powerful distractor.

**5a** A good proportion of candidates fully understood the effect of exercise on respiration but there was some confusion between energy and oxygen with some candidates seeming to use the two interchangeably and a surprising number thought muscles needed more protein to be able to contract.

**5b** That lactic acid was involved was recognised by many candidates. However, only the best candidates correctly completed the equation; there was much crossing out and addition of oxygen to the equation.

**6a** This question was attempted by most candidates but few got it right. Succinctly describing double circulation proved a problem for many, with many references to an oxygenated/deoxygenated side of the heart. Other candidates seemed to think that the heart has two pumps, or that one side pumps to the brain and the other side to the rest of the body.

**6bi** Not many candidates recognised the structure as a valve or could go on to gain marks for 6 b) ii).

**6c** This proved to be the most difficult question for candidates, with only a small minority referring to the role of 'tissue fluid' or mentioning diffusion. Very few candidates scored any marks, and if they did it was for reference to diffusion.

**7a** Most candidates knew where the synovial fluid is in a knee joint.

**7b** Nearly all candidates could suggest appropriate lifestyle and medical history questions.

**7c** Most candidates could link their answers in 7b to making either a correct diagnosis or providing an appropriate treatment although relatively few did both and so limited their marks.

**7d** There were many vague answers about "getting to know each other better"; these were not specific enough to gain the mark.

# A223/02 – Twenty First Century Science Biology A (Ideas in context plus B7) Higher Tier

**General Comments**

Most candidates seemed to be well prepared for this paper and made a very good attempt at answering the questions.

However the trend for candidates to write outside the allocated areas is increasing. All too often candidates write in any white space that they can find. 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 that is on the increase. Due to the fact that these scripts are marked electronically, examiners do not see the whole page 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.

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**

**Question1**

Parts (a) (bi) (bii) and (biii) were overlap with the foundation tier paper.

1a This was an easy start to the paper and a wide range of responses were accepted. Creditable answers included reference to the number, variety, or range of different species living in an area. Both variation between and within species was accepted but answers that repeated the question and referred to the "range of biodiversity" did not score.

1bi The vast majority of candidates performed this calculation well. Clearly Centres had 'question spotted' this as a possible question and prepared their candidates accordingly. This was a good use of the pre-release material.

1bii Many candidates then went on to score the mark for realising that due to the increase in numbers, the student's lower end of the range of 600 was now too low and in order to be realistic, should be higher.

1biii This proved to be a more testing question with only the more able candidates scoring both of the marks. Good answers referred to damage to the food web and then went on to qualify what that damage might be. Credit was also given for any reference to human health.

1biv Most candidates managed to score at least one of these marks. A wide range of answers were acceptable, including; difficulty in counting, too big an area, cannot find them all, and an idea that the numbers of species were constantly changing. Answers that implied that the numbers of a population within a species was constantly changing did not score.

1ci Most candidates understood the meaning of biological control. The most common reason for failing to score was the assumption that pesticides were part of biological control methods. Good answers referred to the introduction of a predator, to prey on the pest species.

1cii Most candidates performed reasonably well on this question scoring at least one of the marks. Good answers included the damage that might be done to the food chain and then went on to qualify that answer with an explanation or an example.

**Question 2**

2a This question discriminated well across the range with candidates scoring from zero to three marks. Good answers referred to chlorophyll absorbing energy from the Sun and using the energy to convert water and carbon dioxide into glucose and oxygen. Many candidates still fail to appreciate that energy can only be transferred and not made. Another common error was that the Sun provides chemical energy. Credit was given for the correct use of formulae.

2bi A wide range of answers were accepted for this question and approximately one third of candidates scored both marks. Credit worthy answers included cellulose, protein, enzymes, amino acids, fats, chlorophyll and, to provide energy for respiration.

2bii Over one third of candidates failed to score on this question. This should have been a relatively easy two marks. Credit was given to the idea that starch was insoluble, therefore would 'stay put' and not exert an osmotic effect. The reverse argument was also credited for glucose.

2c This proved to be quite challenging with only the most able candidates scoring all three marks. Good answers named the process as active transport, and then stated that energy was required to move the minerals against a concentration gradient.

**Question 3**

3a The majority of candidates performed well on this question with many scoring both marks. Credit was given for stating that the condition was caused by a recessive faulty allele and that this caused changes to the haemoglobin molecule, or the shape of the red blood cells. The most common reason for failing to score was to simply state that it changed the shape of blood cells. As this could equally have applied to white blood cells, the answer was not credited.

3b This question was marked quite leniently and credit was given for tiredness and pain even if they appeared in a list of unrelated symptoms. Candidates should be warned that a 'scatter-gun' approach to answering questions is not to be encouraged. Credit was however given for other correct symptoms such as pale skin and cold hands and feet.

3c This question resulted in marks being awarded across the full range from zero to three. Most candidates scored the first marking point for stating that sickle cell anaemia gave some protection form malaria. Many candidates then went on to state that this improved chances of survival and thus increased the possibility of reproducing and passing on genes. The final mark was awarded for explaining how this affected the population or gene pool. Credit was also given to any candidates who explained that a single allele gave some protection and only a mild form of sickle cell anaemia.

**Question 4**

This question was overlap with the foundation tier paper.

4a This question proved to be harder than anticipated. Candidates should be able to recall the simple steps in the process but this appears not to be the case. Many candidates were confused with the terms and many thought that a vector was in fact the gene.

Good answers referred to extracting the gene, using a vector such as a virus or plasmid, to transfer the gene into a rice cell or nucleus. It was pleasing to see a few more able candidates referring to restriction enzymes and ligase to cut and join the DNA when selecting and transferring the gene. Credit was also given for correct ideas about replication of the gene.

4bi This proved to be an easy question with the vast majority of candidates identifying Anita as the correct answer.

4bii This also proved to be fairly easy with most candidates identifying Jane as the correct answer.

4biii This proved to be the most testing of the three questions with just over half the candidates identifying Peter as the correct answer.

**Question 5**

5a The majority of candidates scored one or two marks on this question. Credit was given for stating that ATP can store energy obtained from respiration. Credit was also given to those candidates who went on to say what the energy in ATP could be used for e.g. muscle contraction.

5bi This question was answered well by almost all candidates. Credit was given for stating that this was anaerobic respiration, that it occurred in the absence of oxygen and that lactic acid was produced as a by-product. The most common error was not to state that it occurred in the absence of oxygen but that oxygen had to be repaid in the oxygen debt. This was not what the question was asking and thus failed to score the mark.

5bii This question was only answered correctly by the more able candidates. The required answer was to state that less energy was released by this type of respiration, but a common failure was to simply repeat the previous answer and say that lactic acid was produced. This response did not score as the question asked for "one other disadvantage".

5biii This question was also only answered correctly by more able candidates. Good answers referred to being able to respire in oxygen deficit conditions.

**Question 6**

This question was overlap with the foundation tier paper.

6a This question proved to be more difficult than anticipated. This was often a result of candidates being unable to express themselves clearly. Often responses were muddled and difficult to interpret. Good answers simply stated that blood went through the heart twice on each circulation of the body.

6bi Just over half the candidates scored both marks for this question. Credit worthy answers stated that the structure was a valve and that it prevented the backflow of blood. Common errors stated that it was either an atrium or a ventricle and that it pumped blood around the body.

6bii This question clearly asked "where else in the circulatory system" i.e. meaning other than the heart. Failing to spot this resulted in some candidates simply stating "the other side of the heart" and thus failing to score. The required answer was in the veins.

6c This was the most common question that had a 'no response'. Another failing was that candidates did not read the question carefully and started their answer from the heart or lungs. This resulted in insufficient space being available for them to answer the question. Good responses included reference to the production of tissue fluid, diffusion and how the oxygen left the blood and entered the cells. Credit was also given for Quality of Written Response.

**Question 7**

7a The most common error was for candidates to simply repeat the question. Examiners were instructed not to credit such answers. Good answers included the doctor forgetting or unable to

remember, or that if the doctor was absent or referred the patient to specialists, they would also need a copy of the patient's records. Vague and imprecise answers were not credited.

7b Most candidates scored one mark for this question for stating a factor that made the process more reliable e.g. take the temperature several times or take the temperature at the same time each day or on the same part of the body. Few candidates managed to score a mark for making the process more accurate such as use a clinical thermometer or a thermometer with more precise or smaller increments.

# Moderation Report on GCSE Biology A

## General Comments

This is the last year of operation of this specification and it has clearly been a most rewarding experience for the teachers and students involved. It has also been a pleasure for the moderating team to see the imaginative ideas that teachers have developed to engage their students and inspire them to show the best of their skills in the assessment. **For next summer, tasks will be set by OCR under the new Controlled Assessment procedures and Centres must check the new unit entry codes and other requirements.**

There has been a continued improvement in a number of areas in the interpretation and application of the assessment criteria. However, certain aspects have continued to be demanding and challenging for candidates and the spread of marks over the cohort is sufficient to allow secure differentiation between grades.

## Section 1: Administrative issues

Whilst the majority of Centres have excellent administrative procedures in place there were still a significant number who caused the moderating team a considerable amount of extra work to ensure that candidates were credited with the correct marks.  Few Centres included details of how each of the tasks used for assessment had been introduced and presented to candidates and this meant that on occasions moderators could not easily find the evidence to support the marks that were awarded by the Centre.

Most candidates' work was annotated with the use of the assessment criteria codes, however, in a number of cases the annotation was a very generous interpretation of the criteria and sometimes completely incorrect.

There was evidence that some coursework from a small minority of Centres had been reviewed and annotated by teachers giving candidates specific guidance about how to improve their marks. Another example of unacceptable assistance included the use of helpsheets giving detailed task specific points and leading questions involving particular words or phrases in the mark descriptions.

There was evidence that in some cases, particularly in the Case Study, candidates were copying and pasting information from websites without acknowledgement and referencing of the source. This action constitutes malpractice, for which a penalty may be applied.

## Section 2: Assessment and marking framework

A significant number of Centres were still not following the correct procedure for calculating the Strand mark from the appropriate aspect of performance marks and were required to re-calculate or re-mark their candidates' work. Each aspect of performance should be considered in turn, comparing the piece of work first against the lowest performance description, then each subsequent higher one in a hierarchical manner until the work no longer matches the performance description. There was a tendency for some Centres to award marks on the basis of candidates matching one high level aspect of performance description within each Strand without ensuring that the underpinning descriptions had been matched.

## Section 3: Data Analysis

### General comments

Those candidates who understood and used the terminology and concepts related to Ideas about Science, such as 'correlation and cause', 'outliers', 'reliability', 'accuracy', 'best estimate' and 'real difference' found it easier to match the performance descriptions of the criteria and gain higher marks.

The majority of candidates at nearly all levels repeated their measurements when performing practical tasks. However, they did not necessarily appreciate the reasoning behind such practice and often those results which were clearly outliers were included in calculating averages and incorporated into conclusions. It was very rare to see that a candidate had performed further repeats to replace the outlier to ensure that the data is reliable and of the best quality. Plotting rough graphs as the data is collected may help candidates to identify outliers as they are collected.

### Strand I: Interpreting data

Whilst many candidates now plot all their data and often include range bars, the quality of graph drawing often shows lack of care in plotting the points accurately or using suitable scales and labelling axes correctly or drawing a line of best fit accurately and carefully. Many graphs were given high marks when one or more of these aspects were not of the accepted quality.

The match to I(b)4, 'identifying trends or general correlations in the data', was well appreciated. However, many candidates referred to 'positive correlation' which only merits 4 marks rather than the 6 marks which was often awarded. For 6 marks candidates should derive a more quantitative statement using their data to show what happens when, for example, concentration or lengths are doubled and noting the direct proportionality between variables.

Most candidates could secure a match to I(c)4 by explaining their conclusion using scientific ideas. However, there was still some very generous marking when matching to I(c)6 and I(c)8 in terms of the detail and quality of the scientific knowledge and understanding shown.

### Strand E: Evaluation

Those candidates who used sub-headings such as 'Evaluation of procedures', 'Evaluation of data', 'Confidence level of conclusion' were more likely to focus on each area in turn and be more successful in their overall evaluation.

Most candidates could identify limitations or problems in their procedures to match E(a)4 although in many cases comments were limited to human error rather than systemic experimental ones. A number of the suggestions for improvements were not of sufficient quality to securely match E(a)6.

The majority of candidates generally identified a data point as an outlier either in the table of results or on a graph with range bars to match E(b)4, but only the better candidates provided an explanation of why a particular result had been chosen. The majority of candidates now regularly draw lines of best fit and range bars on their graphs but many of them do not make the connection to reliability and accuracy when discussing their data.

Marks for E(c) were often very generously awarded and this aspect still continues to be poorly addressed. Better candidates referred back to their conclusion in I(b) expressed in either qualitative or quantitative terms and used their discussion in E(a) and E(b) to link them all together in establishing the appropriate level of confidence.

**Section 4: Case Studies**

**General comments**

The Case Study is a critical analysis of a controversial scientific issue in which candidates use their knowledge and understanding of Ideas about Science. Those candidates who were able to use the language and concepts related to IaS, found it much easier to match the performance descriptions of the criteria and gain higher marks.

In general, candidates continued to perform better in Strands A and D compared to B and C. Higher achieving candidates described the relevant science needed to understand their chosen topics and produced high quality, clearly structured, well resourced and illustrated reports involving critical analysis and individual thought with considerable personal input. It was this latter aspect of personal analysis and evaluation which often differentiated candidates in terms of level of performance. Lower achieving candidates relied too heavily on copying and pasting information from sources without the appropriate level of individual analysis and evaluation.

**Strand A: Quality of selection and use of information**

The majority of candidates included a bibliography of sources with the majority from the internet at the end of their reports with complete references to the exact URL address of the webpage. Only the better candidates provided some information about the nature, purpose or sponsorship of the site. Candidates were still not very good at clearly showing where sections of text were directly quoted. Better candidates also included references within the text to show the source of particular information quoting the specific author and then explaining why it was chosen and how it contributed to the arguments being compared.

**Strand B: Quality of understanding of the Case**

Only the most able candidates could integrate their scientific knowledge and understanding with the claims and opinions reported in their studies or extend the scientific knowledge base to more advanced concepts. Reporting was too often still at the 'headline level', simply repeating claims without looking behind the headline for the underlying science and/or evidence. Candidates who were awarded 6 marks referred to the evidence base of the various claims and opinions providing generally quantitative information from research studies. Candidates obtaining 7 or 8 marks looked more critically at the quality of the evidence. They used terms like 'reliability' and 'accuracy' when considering data, they looked at the strategies involved in collecting the data and they also compared the reliability of data between sources.

**Strand C: Quality of conclusions**

Most candidates could sort the information that they had gathered into views 'for and against' and were awarded 4 marks in C(a). Better candidates started to compare similar aspects in both their 'for and against' list and were awarded 6 marks. The best candidates built on this foundation and provided detailed comparisons and evaluation demonstrating considerable analytical and evaluative skills. When making their conclusions, the best candidates described their own viewpoint or position in relation to the original question justifying this by reference to the sources and to the evidence that the claims were based on. Many candidates simply chose to report information about their topic, without any real analysis of the scientific evidence and incorporation of personal decision making.

**Strand D: Quality of presentation**

The majority of reports included headings and/or sub-headings (2 marks), a table of contents and numbered pages (3 marks) to help guide readers quickly to particular sections. Those candidates who in addition presented a report which had a coherent, logical and consistent style were awarded 4 marks. More candidates now include informative images but only the best candidates refer to and use the information to clarify difficult scientific ideas and improve effective communication.

**Section 5: Investigations**

Rates of reaction, resistance of a wire and osmosis were still the most common investigations seen from Centres.

**Strand S: Strategy**

Although there was evidence of candidates doing preliminary work, it was often the case that candidates from the same Centre used the same quantities of materials, the same apparatus and technique and identical ranges and values of the same variables. This clearly indicated that limited individual decision making had occurred. The best candidates performed preliminary work and used the data collected to inform and develop the main experiment. These candidates considered what factors or conditions might affect their results which usually involved a brief review of the relevant scientific theory supported by one or two simple practical experiments to compare the magnitude of the different effects and ease of experimentation. This allowed candidates to decide which factor it would be best to study and also provide evidence which could contribute towards credit for C(a) and C(c).

Many candidates provided a list of appropriate apparatus for their investigations but had not linked it to their preliminary work and not indicated why the apparatus had been selected in preference to alternative equipment.

The complexity of a task, S(a) depends on the demand and challenge involved in the approach adopted by the candidate and too often 7 or 8 marks were awarded for straightforward approaches to the task. 'Resistance of a wire' investigations were frequently over marked in this aspect.

**Strand C: Collecting data**

It was pleasing to see that the majority of candidates used suitable ranges of the appropriate variable to study and appreciated the need to repeat their measurements to obtain a wide range of data. However, a discussion of the factors to control was often rather limited for C(a) and only the better candidates described in detail how the factors had been controlled and monitored during the experiment.

There was continuing evidence this year that candidates were doing preliminary work to establish the range of values of the appropriate variable to be used C(b). However, although some candidates presented their results in a table they did not use the results to explain how it informed their main method. Too often, candidates did not consider their results as they were being collected so that obvious outliers were either ignored, or included without comment when calculating average values. It was very rare to see that a candidate had performed further repeats to replace the outlier to ensure that the data was reliable and of the best quality.

From inspection of results tables it was pleasing to see that candidates were taking more care and data was generally of good quality. However, there was little evidence of candidates performing preliminary work which involved making decisions about adapting  the type of apparatus or method to ensure the collection of the most accurate and reliable data (C(c)).

**Strands I and E**

In general candidates achieved their poorest marks in these two Strands. For more details see the comments in the Data Analysis section.

The Twenty First Century Science model for Investigations aims to give credit for candidates who process their results, look for patterns and then suggest explanations using their scientific knowledge and understanding. Very often candidates did not link their conclusions with their scientific explanations I(c).

**Strand P: Presentation**

This Strand was generally fairly and accurately marked by Centres. Spelling, punctuation and grammar were sound and the majority of candidates' reports were well structured and organised. However, experimental methods were rather briefly described and lacked sufficient detail. Diagrams of apparatus were not always included and although data was generally accurately recorded and presented in appropriate tabular form, units were occasionally incorrect or missing.

**Section 6: Final comment**

All members of the moderating team recognise the considerable effort needed by Centres in assessing and presenting candidates' work for moderation. We would like to record our thanks and appreciation for a thorough and professional job carried out by the majority of Centres.

The structure of Case Studies, Data Tasks and Investigations has been modified in the new specifications in the light of the new regulations for Controlled Assessment. Training for the new model is on-going and details are available in the OCR Training Handbook. There is further guidance about the interpretation and application of the new assessment criteria on the website www.ocr.org.uk.

This seems an appropriate opportunity to thank centres for the care taken each year in presenting work in such a well organised manner, and to wish you continued success with the new Controlled Assessment.

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