

Biology A

Twenty First Century Science Suite

General Certificate of Secondary Education J633

Examiners' Reports

June 2011

J633/R/11

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

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

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Chief Examiner's Report

Overall, the candidates taking the Biology papers in this session performed extremely well with the free response questions proving to be the most challenging. 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. It was intended that candidates should feel that they had a positive experience in taking the examinations.

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 impenetrable. Schools are well advised to enter weaker candidates for the foundation tier where they are more able to demonstrate their knowledge and understanding.

However most candidates found the papers accessible and demonstrated sound knowledge and understanding of the course content. Most candidates had been well prepared by their centres and due to the fact that questions towards the end of the papers were answered equally as well as questions at the beginning of the paper, 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.

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.

The use of questions that required extended answers proved to be challenging for many candidates. All too often candidates answered a question by re-writing it before starting their answer. This resulted in two problems for the candidates; running out of space in which to answer the question; then thinking 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 exam papers. However, there were many examples of imprecise answers which could not be given credit and which suggest centres need to concentrate on training candidates to read questions carefully and avoid the use of "they" and "it" in their answers. These skills will be needed even more so for the exams in the new specification.

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, the chances are that they would have salvaged at least one of the marks available for the question.

Candidates, particularly at foundation had a tendency to leave some questions blank that 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 and marked online. Candidates who write out 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 ramp up the degree of difficulty of higher tier questions, candidates are not always told how many correct responses are required. The more astute candidate 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. However, certain aspects continue to be demanding and challenging for candidates and the spread of marks over the cohort is sufficient to allow secure differentiation between grades.

The skills assessment component of each of the above specifications is weighted at 33% and it was still evident that some centres were not developing the underlying skills, knowledge and understanding of Ideas about Science in their candidates before an assessment took place.

Few Centres this year included details of how each of the tasks used for assessment had been introduced and presented to candidates. This information is important in helping moderators to support centre marking. Where centres did not provide this information, moderators could not always support the marks that were awarded, increasing the likelihood of mark adjustments

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.

Please ensure that your staff are encouraged to read these reports. They are available on line at www.ocr.org.uk

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

General Comments:

The paper was accessible to the majority of candidates. The free-response items have continued to be challenging for many candidates at the foundation level. The most able candidates provided clear responses, presented in a logical order. A number of candidates continued to use the space below the dotted lines provided for answers. This approach did not necessarily increase the marks awarded. In general, candidates showed a sound knowledge and understanding of inheritance, immunity and some ideas about science. Candidates did, however, show the least confidence in the areas of Huntington's disorder, coronary blood vessels and natural selection.

There did not appear to be many errors caused by the misinterpretation of the instructions or rubric.. Many candidates completed all items and appear to have been well-prepared for this paper. Some candidates changed their responses by crossing out initial attempts, particularly for objective questions involving the ticking of boxes. This was generally clear and did not prevent candidates from obtaining marks. Candidates did not seem to run out of time and the number of 'nil responses' was limited.

Comments on Individual Questions

Q.1 (a) Many candidates responded well to this question and completed the sentences correctly. No alternative pattern of errors was identified.

Q.1 (b) Most candidates correctly noted genes, alleles or chromosomes as the important link between the characteristics of offspring and their parents. Some candidates were unable to achieve full marks due to confusing explanations involving gametes and/or pairs of genes.

Q.2 (a) There was a tendency for some candidates to identify overall problems with movement for sufferers of Huntington's disorder. Many successfully described lack of memory and the inability to coordinate movement.

Q.2 (b) A common and correct response described the influence of the environment on height. Few candidates recognised the dominant allele for Huntington's disorder or the need for a combination of many genes for inheritance of height.

Q.2 (c) (i) (ii) It was unfortunate that some candidates gave the same response to both questions, failing to recognise the difference between a couple planning to have a child and a couple who are already pregnant. However, many candidates did very well with this combination of questions and obtained full marks.

Q.2 (d) (i) The concept of genetic testing was recognised by many candidates.

Q.2 (d) (ii) Although many candidates successfully recognised Jane, some were distracted by the comment from Stella.

Q.3 (a) Many candidates coped very well with the list of options and obtained full marks. However, some were tempted to choose hair or fingernails.

Q.3 (b) The sentence completion provided an appropriate scaffold for many candidates, who proceeded to obtain full marks. Relatively few candidates failed to score any marks for this item. No clear pattern of alternative responses was identified.

Q.3 (c) The calculation did not present a problem for many but some candidates incorrectly selected the 85 hours and 20 minutes option.

Q.4 (a) Very few candidates scored marks for this question. There were some who correctly identified the need for oxygen in order for the heart to function. Some gave confusing responses, describing the need for the coronary blood vessels if a person loses a lot of blood.

Q.4 (b) Although this question appeared to be understood in relation to the instruction to draw the relevant lines, many candidates selected incorrect boxes for the related 'function'. Some linked valves to the function of allowing the blood to flow more easily.

Q.4 (c) Many candidates coped very well with this question and identified all four people correctly. Some were tempted to repeat the names and may have been distracted by the instruction provided.

Q.5 (a) This question was generally well answered. A pattern of alternative responses was not identified.

Q.5 (b) Candidates did well to use the terms given in order to construct a response. However, there was a tendency for some to simply put the terms into sentences without a biological link. It was encouraging to see some references to survival of the fittest and to the link between survival and the opportunity to reproduce.

Q.5 (c) Many candidates were able to identify the differences between natural selection and selective breeding.

Q.6 (a) Relatively few candidates selected plasma glucose/sugar regulation as an example of hormonal communication but many were able to select the relevance of hormones in development, puberty, menstruation (often described as periods) and pregnancy. Some candidates were distracted by the term communication and described scenarios when people talk to each other.

Q.6 (b) Most candidates were able to determine that the larger human brain gave a better chance of survival. An alternative pattern of responses was not identified.

Q.6 (c) It was surprising to observe that many candidates struggled with this question. They were not able to identify the nervous communication route. There was some confusion regarding the central nervous system and its position in the sequence.

Q.7 Many candidates were able to select the correct answers. Some failed to recognise the statement about an observation that agreed with a prediction but correctly identified the increase in confidence in the explanation.

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

General Comments:

Candidates performed well on this paper and were well prepared for the examination. There was no evidence that any of the candidates ran out of time.

Candidates should be aware that this is mainly a multiple choice style of question paper and that, if there are any questions that they cannot answer, they should at least try to eliminate incorrect responses and then take a guess at the correct answer.

Candidates should also be aware that some multiple choice responses require more than one response and that the number of responses required does not always match the number of marks available. All too often candidates changed their responses by scribbling their corrections over the top of their original response. This often resulted in lost marks as examiners were unable to determine which letter the candidate intended to use. Candidates should be instructed to completely cross out incorrect responses and write the new response after their initial crossed out response and not write over the top of it.

Overlap questions with the foundation tier were questions 2a, 2b, 2ci, 3, 4, and 9.

Comments on Individual Questions

Question No. 1

Part (a) proved to be an easy start to the paper with most candidates being awarded the mark for correctly identifying proteins and enzymes.

Part (b) was also answered well by many candidates. Interestingly, less able candidates performed almost as well as more able candidates on this question. This could be because an element of guesswork was involved by some candidates.

Parts (c) (i) and (c) (ii) discriminated much better, with more able candidates identifying the correct chromosomes and correctly referring to a correct hormone and its role in sex determination.

Question No. 2

Most of this question was overlap with the foundation tier, so less able candidates should have found this question more accessible. This proved to be the case, with most candidates scoring well on parts (a), (b) and (c) (i).

Part (a) discriminated well. Credit was given for stating that Huntington's disorder is caused by a dominant single gene, or that height is caused by several genes and is affected by the environment.

In part (b) more able candidates gave the answer of deciding whether or not to have children. Some candidates failed to read the question and referred to termination which was not credited until part (c) (i).

Part (c) (ii) was not overlap and proved to be more challenging. Good answers referred to the seriousness of the disorder, the age of the parents, financial implications, available treatments or moral, religious and ethical issues.

Question No. 3

The whole of this question was overlap with the foundation tier. It thus proved to be an accessible question for most candidates.

In part (a) almost half the candidates managed to score at least one of the two marks.

Part (b) was well answered with over three quarters of candidates scoring all three marks and very few candidates scoring zero or one mark.

Part (c) was more discriminating showing that less able candidates have difficulty with simple mathematical tasks. Approximately two thirds of candidates managed to give the correct answer of 2 hours and 40 minutes.

Question No. 4

The whole of this question was overlap with the foundation tier.

This question was not well answered. Less able candidates thought that the heart needed blood to be able to pump it around the body and even some of the more able candidates simply stated that the heart also needed oxygen. It was very rare to see any reference to the thick walled nature of the heart which prevents oxygen diffusing to all the muscle cells of the heart. It is clear that this is one section of the specification that deserves more attention.

Question No. 5

Part (a) should have been an easy start to the question but a third of candidates failed to score. Credit was given for bacteria and fungi.

Part (b) discriminated well. One third of candidates failed to score any marks at all and less than 10% of candidates scored all three marks. Good answers included mutation causing some bacteria to become resistant to the antibiotic. These bacteria survive and reproduce to produce more resistant bacteria.

Part (c) was more accessible with most candidates referring to ideas about safety or side effects.

Question No. 6

This question was answered well by many candidates.

In part (a) (i) and (a) (ii) most candidates scored both of the marks. It was not until (a) (iii) that the less able candidates failed to score. More able candidates referred to rapid changes not giving sufficient time for organisms to evolve to fit the new environment. Even more able candidates often only scored one of these two marks.

Part (b) required a more extensive answer from candidates. Good answers gave a credible example and clearly explained what was meant by direct and indirect human activity. For example, hunting the Dodo scored the direct activity mark and destroying the habitat of the Giant Panda scored the indirect activity mark.

Question No. 7

Very few candidates failed to score at least one mark on this question. Most candidates scored three marks with only the most able scoring all four. Candidates would be well advised to read the question concerning using the names of the people discussing ideas about science. For the second answer credit was given for stating the answer as either Mary or Peter.

Question No. 8

Part (a) in particular was not well answered. Credit was given for each correct row but only the most able scored both of the marks.

Part (b) proved to be more accessible with most of the candidates scoring at least one of the two marks.

Question No. 9

This was an overlap question that provided an easy end to the paper. Most candidates correctly identified statements two and three as being correct and scored both of the marks.

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

General Comments:

Most candidates performed quite well on this paper. Their answers to the range of questions demonstrated that they had been well prepared over the range of topics covered by the specification. There was no evidence that any of the candidates ran out of time.

The format of the questions has changed. Candidates should be made aware that the question paper contains a number of multi-choice style questions which candidates are advised at least to make an attempt to answer. They are advised to try to eliminate incorrect responses and then to take a guess at the correct answer. With the longer, free response questions candidates need to ensure that they write sufficient points to cover the number of marks allocated.

Comments on Individual Questions

1(a) This question began with a definition of Homeostasis where candidates had to fill in the 2 missing words to complete the definition. It was pleasing to see that candidates had been taught this well and many were able to score at least one of the two marking points.

1(b) This section was particularly well answered.

1(c) Most candidates followed the instructions for this question well. The most common correct response being : “receptor” to “detects stimuli”

2(a) Most candidates knew at least one way that the body replaces water lost with eating and drinking being the most common responses. More able candidates knew that respiration also provided water.

2(b) It was evident that candidates knew at least one function of the kidneys. Candidates are reminded to read the stem of the question as **two ticks** were required for **one** mark.

2(c) This was well answered .

3(a) Candidates demonstrated that they knew which descriptions were appropriate for enzymes.

3(b) This section was not particularly well answered. Many candidates had described keys fitting into locks. They had not discussed the active site of an enzyme or how substrates fit into enzymes after colliding with them.

4(a) This was particularly well answered.

4(b) Many candidates did not score on this section. Responses were spread across all of the answers offered.

4(c) This section was not particularly well answered. Candidates confused their use of the words gametes/parent/zygote and thus failed to score.

5(a) Many candidates knew that the genetic code was held in the nucleus, however fewer knew that proteins were produced in the cytoplasm. The main incorrect response was membrane.

5(b) Some candidates knew about the structure of the DNA molecule. Some candidates failed to score as they had circled more than one response in each column.

6(a) Many candidates did not realise that the unspecialised cells in the root tip was meristem. Many repeated unspecialised cells from the stem, whilst the other common wrong answer was stem cells.

6(b) This was well answered by candidates with the main distracter being enzymes

6(c) Some candidates knew that roots were the plant organ that grew from the cut surface, however many candidates wrote leaves/stem .

6(d) Most candidates attempted this question The main distracter was photosynthesis.

6(e) Candidates who failed to score on this question had not used "more light" or "increased photosynthesis". Most candidates who scored on this question received credit for their reference to growth.

7(a) Many candidates scored one mark on this question. The most common right answers were B & D.

7(b)(i) This calculation was well answered, the most common wrong answer being 95.

7(b)(ii) Few candidates knew that the function of the fatty sheath was insulation, many had written protection. It is important that candidates read the stem of the question as many wrote increases speed.

7(c) Only the most able candidates knew that the gap between two neurones was called a synapse.

8(a) This was a well answered question. Most candidates scored at least one mark and many scored two.

8(b) Many candidates thought that they were being asked to describe the structure of the brain and drew a labelled diagram of the brain. Many candidates simply wrote "brain scan" rather than, for example, MRI scan and therefore failed to score.

9 This question was only answered correctly by a minority of candidates. Many repeated the three ideas in the stem of the question without adding any detail to them.

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

General Comments:

In general, the paper was accessible to the majority of candidates. The free-response items continue to be challenging for many candidates and, for this paper, some found them difficult to complete. The most able candidates provided clear responses, presented in a logical order. Such candidates used the scaffold of the stem to good effect. The number of candidates using the space below the dotted answer lines appeared to be relatively few. Candidates showed a sound knowledge and understanding of thermoregulation, mitosis / meiosis and cell specialisation. Candidates showed the least confidence in the areas of the lock and key model for enzymes, the effect of alcohol on urine production and events at the synapse.

The majority of candidates appeared to respond well to the instructions or rubric. The candidate scores ranged from 2 to 40 out of a maximum of 42 marks, demonstrating a wide range of performance according to the knowledge and understanding of candidates. Many candidates appear to have been well-prepared for this paper and completed all items. Almost all candidates did not seem to run out of time and the number of 'nil responses' was limited.

Comments on Individual Questions

Q.1 (a) Most candidates were able to select either Lucy or Liz or both. No pattern emerged in relation to the selection of other characters in this question.

Q.1 (b) Very few candidates recognised that the enzyme and substrate must collide in order to recognise each other (fit together) in relation to their shape. Some candidates were confused describing an enzyme fitting into an active site, without referring to the substrate molecule.

Q.2 (a) Almost all candidates correctly identified glucose as the unusual component of urine but some did choose urea or salts.

Q.2 (b) The pituitary gland was correctly chosen by most candidates.

Q.2 (c) This question led to some confusion for a number of candidates. They struggled to express the impact of alcohol on urine production. Although some appreciated that the volume of urine produced increases they were unsure of the link with ADH production. The reference to relative terms was limited.

Q.3 (a) Hypothalamus was identified by many candidates but some were tempted to choose cerebral cortex or the pituitary gland.

Q.3 (b) Many candidates did well with this question. They used the support provided by the sentences to good effect.

Q.3 (c) Although many realised that heat stroke is based on an increase in body temperature, it was clear that they did not understand that such an increase was uncontrolled. A number of candidates provided symptoms or a description of heat stroke when an explanation had been asked for.

Q.4 (a) It was encouraging to see that many candidates realised that the meristem had the role outlined in this question. Some candidates were unsure and wrote 'stem cells'. No clear pattern of alternative responses emerged.

Q.4 (b) (i) The activity of auxin was often used to respond to this question but some did correctly define auxin as a plant hormone.

Q.4 (b) (ii) This question was based on the impact of auxin on root formation in a cut stem, not directional growth as described by some candidates.

Q.4 (c) Many candidates had a good understanding of the overall benefit of phototropism but they failed to use relative terms to describe the changes in light absorption and photosynthesis. Some candidates only described phototropism as a process.

Q.5 (a) This question was answered well by many candidates. No clear pattern of alternative responses (ticks) was recorded.

Q.5 (b) Most candidates gave good answers to this question. They used the numbers of chromosomes provided in the stem to articulate a clear answer. The importance of fertilisation and the fusion of the two gametes were understood by many.

Q.6 (a) Many candidates recalled that the 8-cell stage is critical to embryo development. Some referred to 16 cells.

Q.6 (b) A number of candidates failed to give three ticks in the boxes provided. This prevented them from obtaining full marks, although they tended to correctly identify the first and third statements.

Q.6 (c) Some candidates incorrectly chose specialised rather than unspecialised for the first response. The term clone was not used by many, with a tendency to refer to cells at this point. Some candidates correctly identified genes in the space provided for the third response but others incorrectly described cells or chromosomes.

Q.7 It was very encouraging to observe such clear and effective descriptions of neuron pathways and learning new skills. The concept of new pathway formation and strengthening pathways in response to repetition was understood by many. However, some candidates attempted to construct sentences incorporating the terms given, without an appreciation of the process involved.

Q.8 (a) Some candidates gave correct responses such as 'simple' reflex but many struggled to recall this and similar terms. This prevented them from obtaining the mark allocated, even though they provided some interesting examples.

Q.8 (b) Many did well with this item. Errors were more likely in the first statement about the use of the bell as a stimulus. This was not anticipated.

Q.8 (c) Some interesting examples of increasing the chance of survival were correctly given. Many referred to brightly-coloured insects and the feeding patterns of birds.

Q.9 (a) It was surprising to see that many candidates struggled with this item. The link between B, F and A was more likely to be correctly identified, rather than the earlier steps in this process.

Q.9 (b) Some candidates attempted to describe diffusion without using the correct term. Others used terms relating to transmission and others incorrectly gave 'osmosis' as a response.

Q.9 (c) Many candidates were able to conclude the paper with two correct responses. Some failed to obtain the first mark but many obtained full marks for this item. No clear pattern of alternative response was identified.

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 2010. Candidates were confident and attempted most questions there was no indication that time was 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. However, few candidates could suggest answers relating to proof or understood the possible effects of sources of funding on scientists.

Comments on Individual Questions

Q.1 (a) This was well answered with many candidates gaining full marks for picking out scientific evidence that the anti-wrinkle cream worked.

Q.1 (b) Again this question was very well answered. Only candidates who included "fibrillin" in their answer lost the mark here.

Q.1 (c) The idea that the photograph could have been edited in some way was relatively common but few candidates picked up on the idea that one result is not enough to form a confident conclusion.

Q.1 (d) Few candidates scored full marks here. The idea of bias was inherent in the best answers but many candidates thought the scientists could have been bribed or falsified their results.

Q.1 (e) Candidates showed good knowledge and understanding of the article here and most gained one mark and many both marks.

Q.1 (f) (i) was answered correctly by the vast majority of candidates.

Q.1 (f) (ii) Answers to this question were often vague and in many cases too poorly expressed to gain credit.

Q.1 (g) Most candidates gained credit for the idea of staying out of the Sun but few went on to suggest the use of sun creams.

Q.2 (a) Many candidates had clearly learned the equation for photosynthesis well and even those who failed to gain marks were putting water, oxygen and glucose into the equation but in the wrong places.

Q.2 (b) That chlorophyll absorbs light energy was well known but very few candidates knew that this energy is used to split water molecules.

Q.2 (c) This question discriminated well with the best candidates gaining all three marks. Most candidates scored a mark for light and many knew that carbon dioxide is a limiting factor. Far fewer recalled the importance of temperature.

Q.2 (d) This question was poorly answered with many references to “driving cars” without mentioning the burning of fossil fuels. Deforestation was known by only a tiny minority of students.

Q.3 (a) Most candidates recognised that people were worried about ethical considerations.

Q.3 (b) Very few candidates gained credit here. Where marks were awarded it was usually for knowing that DNA was extracted from white blood cells.

Q.4 (a) (i) and (ii) were generally poorly answered. Candidates often answered “respiration”. More knew that heart rate increased, though very few gained both marks. That the energy from respiration is used to make muscles contract was not well known. “Expansion” and “better respiration” were common mistakes.

Q.4 (b) Another question where poor expression hampered many candidates. However, most gained a mark for the idea that Jessica’s exercise programme would not be the same every day and the better candidates recognised that blood pressure varies between individuals.

Q.4 (c) Only the best candidates gained two marks here; most could add lactic acid but few could add energy as well.

Q.5 (a) The great majority of candidates knew the Sun to be the ultimate source of energy for nearly all organisms.

Q.5 (b) Although many candidates clearly knew that autotrophs gain their energy from the Sun, surprisingly few linked this to photosynthesis or food production.

Q.5 (c) (i) Only the better candidates gained the mark here and very few at all gained a mark for (ii), suggesting that more practise is needed in these types of calculations.

Q.5 (d) A difficult question which discriminated well, with only the better candidates gaining two or more marks. Movement was the commonest correct response with other answers being much less frequently found.

Q.6 (a) This question discriminated well but some candidates lost marks because it was unclear which structures they intended their arrows to be pointing to.

Q.6 (b) This proved to be a difficult question with very few candidates gaining both marks. Usually one mark was given, with a reference to allergies being the most common correct response.

Q.6 (c) Most candidates gained credit for the idea that some exercise programme would be given but few went on to say that this would be regular or that progress would be monitored. A frequent wrong answer involved a description of RICE.

Q.7 (a) This question discriminated well with the best candidates gaining all three marks and most candidates gaining at least one mark, usually for red blood cells carrying oxygen. Imprecise answers such as white cells “fighting infection” were not credited and many candidates were very unclear about the function of platelets.

Q.7 (b) There were few fully correct answers and it would seem that this area is poorly understood by foundation tier candidates.

Q.7 (c) Although most candidates knew that giving the wrong blood transfusion was not advisable few candidates gained the mark for explaining that it would result in blood clotting. Many candidates just stated that the blood would not be used rather than explaining why.

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

General Comments:

Candidates performed well on this paper and were well prepared for the examination. There was no evidence that any of the candidates ran out of time.

Question 1 was based on the pre-release material "Anti-wrinkle cream causes stampede at the shops." The rest of the questions were based on the Unit B7.

All too often candidates changed their responses by scribbling their corrections over the top of their original response. This often resulted in lost marks as examiners were unable to determine which letter the candidate intended to use. Candidates should be instructed to completely cross out incorrect responses and write the new response after their initial crossed out response and not write over the top of it.

Overlap questions with the foundation tier were Q.1 (b), Q.1 (c) and Q.2.

Comments on Individual Questions

Question No. 1 Pre release

Part (a) (i) did not prove to be an easy start to the paper. Good answers stated that the whole cream had been tested rather than individual ingredients. Surprisingly part (a) (ii) that required the same knowledge was well answered by almost all candidates. The most common answer was to test each individual ingredient separately, but answers that said remove one ingredient at a time and then test the cream were also credited.

Part (b) was overlap with the foundation tier and was answered equally well across the ability range. Numerous answers were credited including digitally enhancing the picture, some other factor could be responsible, a time period was not given and the sample size was too small.

Part (c) was also overlap and most candidates scored one of the two marks. Any ideas of bias or the scientist fearing loss of funding were credited.

Most candidates scored one mark on part (d) (i) but failed to score the second mark. This was possibly because the question did not ask for two different answers. However the fact that the question was worth two marks should have given the candidates a very big clue. Credit was given for independent testing, the idea of evidence or proof, the idea that it was the same test that was used on medicines or that it was published in a journal. Part (d) (ii) proved to be accessible to most candidates and was very well answered. It was clear that teachers had spotted this as a potential question and had prepared candidates well. Part (d) (iii) was also answered well with candidates stating that additional cream provided no extra benefit.

Part (e) proved to be a more testing question with almost half the candidates failing to score. Credit was given for damage to fibrillin and reduced elasticity.

Question 2

This was an overlap question with the foundation tier.

Part (a) was successfully answered by almost all candidates. This proved to be an easy start to a more difficult question.

Part (b) proved to be more challenging. A decision was taken not to penalise candidates for the incorrect use of the word energy, e.g. "they make their own energy". This was done because "energy" appeared elsewhere in the paper and there was the danger of candidates being penalised for the same mistake more than once. However it is a dangerous practice for candidates to misuse the word "energy". They need to know that it cannot be made but only transferred. Good answers included the fact that autotrophs make their own food using energy from the Sun by the process of photosynthesis. However it was all too rare to see such an answer.

Part (c) (i) discriminated well. Most candidates either scored two marks or nothing. Candidates need to be taught that they must show their working out. This way, when they make a mistake, there is the possibility of scoring at least one of the two marks available.

Part (c) (ii) proved to be even harder with only about a quarter of candidates scoring the mark.

Part (d) was a QWC (Quality of Written Communication) question and one mark was awarded to candidates who wrote a clear and understandable answer. Scientific credit was given for answers that included energy being lost as heat, movement, decay, waste, and uneaten food. Sound was also credited even though the amount of energy lost by this method would be very small.

Question 3

Part 3 (a) was a good discriminator. Most candidates scored at least one mark. Credit was given for storage, glucose being soluble but starch not, and reference to the osmotic effect glucose would have on the cell.

Part (b) was not well answered. Most candidates failed to score a single mark. Those candidates that said the process required energy and that the movement was from a low to a high concentration scored both marks.

Part (c) was also a difficult question. Many candidates failed to fully understand what was happening in the graph and simply guessed at different limiting factors. Credit was given for carbon dioxide, light and temperature in that order.

Question 4

Part (a) discriminated well. Most candidates scored at least one mark on this question. For symbiosis, credit was given for either stating a close relationship between two organisms, or for stating that both organisms benefit from the relationship. For commensalism candidates had to state that one organism gains but the other is unaffected.

Part (b) was well answered and most candidates scored both of the marks.

In part (c) candidates tended to score three marks or nothing. Credit was given for any feature on a named parasite and then an explanation of how the feature benefited the parasite. Most candidates named a tapeworm with suckers to help it attach to the gut wall.

Part (d) (i) discriminated well with only the most able scoring both marks. Only answers that described symptoms were credited, for example pain, shortness of breath, tiredness or swelling.

Part (d) (ii) proved to be slightly more difficult, with answers scoring both marks being those that referred to recessive or co-dominant and the idea that only some of the red blood cells were affected.

Question 5

In part (a) any three clearly described differences were credited. However any reference to MORE oxygen or MORE lactic acid did not score. Any reference to oxygen debt also failed to score.

Part (b) was well answered with most candidates having a clear understanding that additional oxygen was required to break down the lactic acid. This scored two marks.

Question 6

Part (a) produced mixed responses with a fair amount of guessing taking place. Approximately a quarter of candidates scored all four marks with few failing to score any marks at all.

Part (b) (i) was well answered with credit being given for each of the genotypes and a third mark for the possible combinations.

Part (b) (ii) proved to be an easy end to the paper with most candidates scoring both marks. However candidates that wrote down the genotypes instead of the blood groups A and B did not score.

A229/230 Principal Moderator's Report – Skills Assessment

GCSE Science A, Additional Science A, Biology A, Chemistry A and Physics A

General Comments:

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

The Skills Assessment component of each of the above specifications is weighted at 33% and it was still evident that some centres were not developing the underlying skills, knowledge and understanding of Ideas about Science in their candidates before an assessment took place.

Structure of the report

Vertical black lines in the margin throughout this report highlight important areas of concern, advice and guidance by the moderating team

This report is divided into the following sections

- Section 1: Administrative issues
General comments
Annotation
Internal moderation
Type and context of work of assessed work
Nature of practical work
Candidate helpsheets and teacher review of coursework
Plagiarism
- Section 2: Assessment and marking framework
Calculating the Strand mark
Marking strands I and P in Data Analysis and Investigations
OCR cover sheet for candidates' work
- Section 3: Data Analysis
- Section 4: Case Studies
- Section 5: Investigations
- Section 6: Final comment

Section 1: Administrative issues

General comments

Few Centres this year included details of how each of the tasks used for assessment had been introduced and presented to candidates. Those Centres that did not provide this information meant that on occasions moderators could not support the marks that were awarded by the Centre. This did lead to mark adjustments in some cases.

Annotation

Most candidates' work was annotated with the use of the assessment criteria codes eg I(b)6, at the appropriate point in candidates' work showing where the marks were awarded. However, in far too many cases the annotation was a very generous interpretation of the criteria and sometimes completely incorrect.

Internal moderation

Effective internal moderation ensures that candidates are placed in the appropriate order of merit. If the order is felt to be unsound because marking is inconsistent between different teachers the Centre may be required to provide further samples of work and possibly re-

mark the work of all their candidates. There were still too many incidences of unsatisfactory internal moderation reported by the moderating team this year.

Type and context of assessed work

Following guidance from the Joint Council for Qualifications (JCQ), coursework has to match both type (eg Data Analysis and Case Study or Investigation) and context (ie Biology, Chemistry or Physics) as appropriate for the specification concerned. Only a few Centres did not meet these requirements this year. As a reminder, if the same piece of coursework is submitted for more than one specification then it must be photocopied and put into the appropriate coursework sample package.

Nature of Practical work allowed for assessment

Coursework submitted for Data Analysis and Investigation must involve candidates having personal first hand experience of collecting data in a practical experiment. **Coursework which does not fulfil this requirement cannot be submitted for assessment.** Computer simulations or sole use of teacher demonstrations are not acceptable substitutes.

In the Investigation, marks awarded for Strategy (S) and Collecting Evidence (C) Strands must be based on an individual's contribution and not on a shared approach or shared class data or data from other secondary sources.

Candidate helpsheets and teacher review of coursework

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. **This is not acceptable practice.** The Joint Council for Qualifications (JCQ) have published appropriate guidelines and Centres are required to consult and abide by this <http://www.jcq.org.uk/attachments/published/1260/14.%20Coursework%20ICC%201011.pdf>

Teachers may review coursework before it is handed in for final assessment provided that advice remains at the general level. Having reviewed the candidate's coursework it is not acceptable for teachers to give, either to individual candidates or to groups, detailed advice as to how the work may be improved. Examples of unacceptable assistance include detailed indication of errors or omissions, advice on specific improvements needed to meet the criteria, the provision of outlines, paragraph or section headings, or writing frames specific to the coursework task(s).

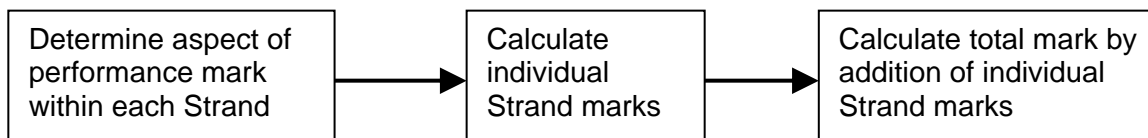
Candidate helpsheets of the generic type which are applicable to any task are allowed and whilst helpful for lower achieving candidates can restrict the opportunities for those higher achieving candidates. There was evidence that some Centres were providing helpsheets which rather than giving broad headings to guide their candidates were providing a very detailed breakdown of points and leading questions involving particular words or phrases in the mark descriptions which went beyond the spirit of teacher support and guidance. In these cases Centres sometimes awarded marks when candidates repeated the same words and phrases without demonstrating any understanding. Marks had to be adjusted in these situations.

Plagiarism

Quoting from the same JCQ document as previously mentioned, "Candidates must not copy published material and claim it as their own work. If candidates use the same wording as a published source, they must place quotation marks around the passage and state where it came from. **Candidates must give detailed references even where they paraphrase the original material**". There was evidence that in some cases, particularly in the Case Study, candidates were not following these procedures. "These actions constitute malpractice, for which a penalty (eg disqualification from the examination) will be applied".

Section 2: Assessment and marking framework

A significant number of Centres are still not following the correct procedure for calculating the Strand mark from the appropriate aspect of performance marks and are being required to re-mark all their candidates' work.



Determination of the Aspect of performance marks

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. Where performance significantly exceeds that required by one description, but does not sufficiently match the next higher one, the intermediate whole number mark should be given if available. Thus, the level of performance in each aspect is decided. 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.

Calculation of the Strand mark

(a) Three aspects of performance per Strand

Where there are three aspects per Strand the following examples illustrate how to convert aspects of performance marks into Strand marks. **Add the three aspect marks together, divide by three and round the answer to the nearest whole number.**

Example	Marks for the three aspects in a strand	Formula to be applied	Mark to be awarded for the strand
1	(a) = 4, (b) = 4, (c) = 3	$[(a)+(b)+(c)] / 3$	= 3.66 round up = 4
2	(a) = 3, (b) = 4, (c) = 3	$[(a)+(b)+(c)] / 3$	= 3.33 round down = 3
3	(a) = 4, (b) = 3, (c) = 1	$[(a)+(b)+(c)] / 3$	= 2.66 round up = 3
4	(a) = 3, (b) = 3, (c) = 0	$[(a)+(b)+(c)] / 3$	= 2.0 = 2
5	(a) = 2, (b) = 3, (c) = 0	$[(a)+(b)+(c)] / 3$	= 1.66 round up = 2

(b) Two aspects of performance per Strand (B and C of the Case Study)

From experience it is best to consider both strands B and C together when arriving at the final strand mark for each.

If **both** B and C average to $(N + \frac{1}{2})$, then one should be rounded up and the other rounded down.

eg B(a)4(b)5 and C(a)5(b)6 then Strand B = 4 and C = 6 giving a total of 10 marks.

If **either** B or C averages to a whole number (N) and the other to $(N + \frac{1}{2})$, the $\frac{1}{2}$ **could be rounded up or down on the basis of professional judgement**
 eg B(a)4(b)6 Strand B = 5; C(a)5(b)6 Strand C = 5.5 which could be recorded as either 5 or 6 marks depending on judgement giving a total of 10 or 11 marks for these two strands taken together

Marking Strand I aspect (a)

This aspect involves awarding credit for processing the data which has been collected to display any patterns. This may be done either graphically or by numerical processing whichever is most appropriate in a particular Data Analysis or Investigation. If there is some evidence for both approaches, then both should be marked and **the better of the two recorded on the candidate coversheet but not both marks.**

Marking Strand P aspect (b)

The first row is concerned with recording quantitative data, the second row deals with the use of conventions and rules for showing units or for labelling in tables and the third row deals with the recording of qualitative data. Most investigations involve the collection and recording of quantitative information and in these cases, the aspect mark will be determined by averaging the mark in the first and second rows only, ignoring the third row completely. For those rare investigations which include qualitative evidence only, the mark for Aspect b should be based on the average of the second and third rows only. Where averaging results in half marks, professional judgement should be used to determine the best fit mark of the two alternatives. Once the mark for aspect (b) has been decided, it can be combined with the marks for (a) and (c) to provide the average and the mark for the strand.

For example, in an investigation providing **quantitative** evidence

Aspect of performance			Strand P mark
P(a)	7	7	6
P(b)	(i) 6	5	
	(ii) 4		
	(iii) n/a		
P(c)	7	7	

Candidate coversheet

All marks must be recorded on the OCR coversheet which is attached to candidates' work. A number of Centres did not use the latest format of the OCR cover sheet or in a very few cases did not use or fully complete a coversheet at all.

Section 3: Data Analysis

General comments

Centres are reminded that candidates must have personal firsthand experience of collecting data by performing a practical experiment. The data that they collect can be supplemented by further data from, for example, incorporating a class set of results. It is helpful if the data that is collected by the candidate themselves is clearly identified. **Work which is based purely on teacher demonstrations, computer simulations, given sets of results etc is not acceptable.**

It is most important that candidates record and present the data that they have collected and not just plot a graph or do numerical calculations without the inclusion of a data table in their report. It would also be helpful if candidates or teachers included the method that they used to collect data so that marks for E(b) could be more securely supported.

The same Strand I and E assessment criteria are used in investigations and the same marks for I and E from investigations can be submitted for Data Analysis in another specification **provided the subject context is appropriate for that specification.** If this is the case, Centres are required to indicate this on the appropriate coversheet and include appropriate photocopies of the work in both samples.

Data Analysis tasks.

There was a continuing variety of data tasks seen by moderators such as

Resistance of a wire	Stretching elastic bands, springs
Osmosis	Pendulum
Respiration of yeast	Cooling curves
Parachute drops	Clotting of milk
Crater impact	Bouncing of squash balls
Rates of reaction	Pulse rate and exercise
Effect of water depth on a 'tsunami'	

Centres are encouraged to be innovative but must consider the science that might be required to explain any conclusion drawn by the candidates. As in all assessments of this type, Centres should match the task to the ability and expectations of the candidates involved.

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', '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 repeat their measurements when performing practical tasks which is most encouraging. However, many candidates do 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 so that marks for E(b) can be awarded and that their conclusion maybe more clearly and confidently established gaining credit in both I(b) and E(c).

Strand I: Interpreting data

I(a): Most candidates analysed their data using bar charts or graphs to illustrate and process the data that they had collected rather than a numerical analysis. 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, using suitable scales and labelling axes correctly and 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 and more scrutiny is needed by Centres.

As a reminder the following guidelines provide more guidance about what is required but it is not intended to be comprehensive and to cover all eventualities.

- I(a) 4 – simple charts, bar charts
- I(a) 5 – a dot-to-dot graph or axes not labelled or incorrectly plotted point(s) or poor quality best fit line
- I(a) 6 – graph with correctly plotted points, correctly labelled and scaled axes and correctly drawn best fit line.
- I(a) 7/8 – **in addition to the requirements for 6 marks** candidates must show evidence of awareness of uncertainty in data eg range bars, scatter graphs.

If candidates use a numerical approach to analyse their data it is expected that candidates will be able to correctly calculate averages from repeat readings for 4 marks, do more complex calculations such as calculate percentage differences for 6 marks and for 8 marks calculate gradients from graphs or use simple statistical methods. Those candidates who have drawn a poor line of best fit on their graph but succeeded in calculating a gradient correctly may be awarded up to 5 or possibly 6 marks.

Some candidates included range bars when plotting bar charts and were wrongly awarded 8 marks. At best this approach might merit 5 marks. The same standards apply when marking computer-generated graphs ie they must be correctly sized and scaled with suitable grid shown and with the appropriately sized plotting points. However, it is generally better for candidates to hand draw their own best fit line.

Centres are reminded that only one single mark must be used for I(a), either that for graphical or that for numerical work but not both when determining the overall Strand I mark. Further information about the award of marks for numerical approaches is contained in the 2008 Report.

I(b): The match to I(b)4, 'identifying trends or general correlations in the data', was well appreciated and most candidates could summarise the patterns in their data with a suitable qualitative statement. However, candidates were often given 6 marks with little evidence to support this award. Many candidates referred to 'positive correlation' which only merits 4 marks. 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.

Very few candidates matched the requirements for I(b)8. Candidates should review any limitations to their conclusions by considering such things as the scatter in the data, overlapping range bars between data points, 'real differences' and values of the best estimate and can the best fit line be accurately defined. Candidates who have derived a quantitative relationship should consider what effect the position of the best fit line might have if the scatter in the data is taken into account.

I(c): Many candidates introduced their experiment by describing any related background theory even if it wasn't all relevant to the particular experiment they were doing. Candidates are better served if they link their conclusion directly with the appropriate scientific explanation that applies. 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. It is not just a few key words that must be considered but the actual meaning and correctness of a candidate's explanation of their conclusion that must be judged when arriving at the final mark.

Strand E: Evaluation

The majority of candidates achieved between 3 or 5 marks for this strand, showing improvement in E(a) and (b) but less so in E(c). Those candidates who used the appropriate IaS vocabulary and the knowledge and understanding of IaS 1 invariably achieved higher marks. 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.

E(a): The E(a)4 performance description is the 'gatekeeper' to access the higher marks. It requires candidates to identify any limitations or problems in their procedures that they encountered during their practical work. However, in many cases comments were limited to human error rather than systemic experimental ones. Candidates should then consider the limitations that they have identified and suggest suitable improvements to match E(a)6 and 8. A number of the suggestions made were not always of sufficient quality to be creditworthy eg 'do it with a computer' or 'repeat my measurements more times' without any justification or explanation.

E(b): The majority of candidates generally identified a data point as an outlier either in the table of results or on the graph 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 when discussing reliability and accuracy of their data. A limited number of candidates used more objective ways of assessing reliability and accuracy using simple statistics such as variations of the Q test procedure. Candidates' attempts to explain anomalous results were often generously marked and it is important to mark the **quality** of what has been written and not the fact that just **something** has been written.

E(c): Marks were often very generously awarded and this aspect still continues to be poorly addressed. This aspect involves bringing together the discussion about the reliability of the data collected and the procedure to establish a level of confidence in the conclusion. 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. Those candidates who had expressed a conclusion in quantitative terms had more opportunity to provide a more detailed analysis and evaluation to access the higher marks.

For the award of 6 marks, candidates should bring together a discussion of the accuracy and reliability of their data and the precision of the apparatus they have used to establish a level of confidence in their conclusion. Further support for this can come from awareness in I(b) about the limitations in the conclusion. In addition for 8 marks, weaknesses in the data should be identified eg a limited range or not enough readings at certain values, or degree of scatter too large or variable, and suggest in detail what more data could be collected to make the conclusions more secure for the particular variable under investigation.

Some candidates used other data from secondary sources to support or otherwise their conclusion. Some candidates recognised that their conclusion can only apply to the range of values that were studied because outside this range, for example, the rate is bound to slow down as one of the chemicals gets used up, the rubber band will eventually break, more exercise cannot always mean that pulse rate continues to increase.

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, such as 'peer review', 'replication of evidence', 'correlation and cause' 'reasons why scientists disagree', 'precautionary principle', 'ALARA', 'risks and benefits' found it much easier to match the performance descriptions of the criteria and gain higher marks.

Most candidates title their Case Study in terms of a question and collect appropriate evidence to illustrate both sides of a case. However, the analysis and evaluation of such evidence to derive a personal conclusion is still proving very demanding for the majority.

Many Centres provided a short list of appropriate Case Study titles for their candidates to choose from thus allowing them to select one which is the most appealing on an individual basis. It is important that titles for case studies do provide the necessary focus for candidates and don't just illicit a yes/no response but encourage a more thoughtful response with possible suggestions of future action. Those Centres who allow a more open selection of topic must closely monitor their candidates' choice to ensure that it is appropriate and firmly embedded in a scientific context with opportunities to gather evidence both 'for and against'. Surprisingly many candidates did not make full use of the relevant information and material in their student textbook often preferring to use only material from the internet.

A number of familiar examples were seen again this year but some such as 'Should smoking be banned in public places?' were seen much less frequently as their relevance diminishes.

Some examples of Case Study titles included this year –

- Should human cloning be allowed?
- Are mobile phones bad for your health?
- Is nuclear power the answer to our energy needs?
- Should we spend more developing alternative energy resources?
- Is the MMR jab safe?
- Is global warming natural or man-made?
- Is sunbathing safe?
- Does pollution from traffic cause asthma?
- What killed the dinosaurs?

The approach adopted by candidates who presented case studies on the following issues seemed to provide limited access to the higher levels of the assessment criteria.

- Is organic food best?
- Aspects of diet eg "Is obesity inherited?"
- Should animal testing be allowed?

Assessment

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. Those candidates who did not acknowledge their sources either when they copied and pasted information or when paraphrasing original material are guilty of malpractice and can incur a significant penalty. Those reports which were presented simply as PowerPoint printouts almost always lacked sufficient detail to access the higher marks.

Strand A: Quality of selection and use of information.

There was continuing evidence of improvement in the marks awarded for this strand compared to last year.

A(a): Candidates must select and use sources of information to provide evidence to support both sides of the argument in their case study. They must select relevant extracts to quote directly and then in their own words explain what its relevance and importance is to the developing arguments in the report. It was this latter aspect that only the very best candidates were able to show.

If no sources are credited then a maximum of 1 mark will be allowed by moderators. Higher marks require that sources represent a variety of different views or opinions and it is quality rather than quantity which separates the award of 2 or 3 marks. Many candidates who were awarded 4 marks incorrectly often made token reference to reliability but did not explain why they thought their sources were reliable. Those candidates who used the language and ideas from IaS 4 eg ideas about peer review, the nature of the source or the status of the author were much more likely to secure the top mark.

A(b): The majority of candidates included a bibliography of sources at the end of their reports. Candidates who identified their sources using incomplete references eg website homepages would be awarded 2 marks. If only one or two incomplete references are given then one mark should be awarded and if no references are given then zero marks. For 3 marks candidates included complete references to the exact url address of the webpage and when referencing books, the title, author and page references would be required. For 4 marks it is expected that candidates include some information about the nature, purpose or sponsorship of the site. It is also to be encouraged that candidates record the date when they accessed the information from an internet site.

A(c): Candidates were still not very good at clearly showing where sections of text were directly quoted. Use of quotation marks, use of a different font or colour highlighting, were some of the methods used by the better candidates. The better candidates also included references within the text to show the source of particular information or opinions quoting the specific author and then using, for example, numerical superscripts linking to detailed references in the bibliography. Credit is given, not so much for the quotation itself but for the comment made by the candidate to explain why it was chosen, and how the candidate thinks it contributes to the arguments being compared in the study.

Failure to discuss reliability of the sources, failure to fully indicate and reference quotations and failure to indicate the relevance of the quotations selected in the study prevented many candidates from being awarded 4 marks in this strand.

Strand B: quality of understanding of the Case.

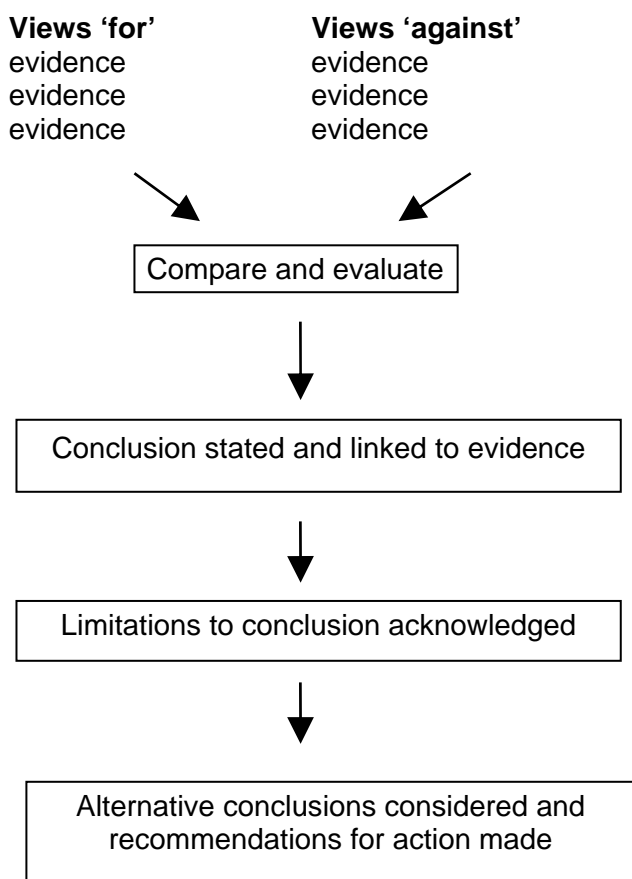
The majority of candidates described the relevant background science in the introduction to their case studies. However, it was only the most able who could integrate their scientific knowledge and understanding with the claims and opinions reported in their studies or extend the scientific knowledge 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. It is useful before marking candidates' work to look at the appropriate pages in the C21 textbook about Science Explanations and the Ideas about Science and also the published OCR exemplars to know in advance what material should be included. The most successful Case Studies are usually closely related to topics in the course and it can be taken as a general guide that 6 marks in B(a) requires all of the relevant science from the student book. The 7th or 8th mark will come either for applying and integrating this correctly to the case, or for finding and explaining some more additional science related to their Case Study.

Aspect B(b) focuses on candidates' ability to identify, report and evaluate the scientific evidence that any claims and opinions are based on. Most candidates were able to recognise and extract relevant scientific content from their sources and were awarded 4 marks. 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 look 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. For many 'life-science' studies, for example the popular MMR study, the evidence is largely drawn from epidemiological studies and good candidates should be looking for evidence of factors such as sample size, or how subjects were selected to evaluate the importance of the evidence. Even strong candidates tended to rely too much on summaries of conclusions rather than describing the evidence base.

Strand C: quality of conclusions

Strand B gives credit for the level and detail of the relevant science described and for reporting the associated evidence underpinning the various claims and opinions. Strand C awards credit for candidates who provide individual input comparing and evaluating the evidence and, using their own judgement, arrive at a suitable conclusion on a controversial issue. There was evidence that many candidates were not using and applying their Ideas about Science, particularly IaS 5, sufficiently to warrant the higher marks in this strand.

Those Centres who guided their candidates to organise their reports with the following headings in mind and to encourage them to develop their critical skills invariably achieved higher marks.



An approach adopted by a number of candidates this year was to copy and paste significant amounts of information from articles on both sides of the case. In most cases, the only comment added by the candidate was a short paragraph headed 'evaluation', but which was usually just a summary of the content. This warranted lower marks than centres had awarded.

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, many candidates referred to the evidence that they had gathered and were awarded 4 marks in C(b) whereas those who omitted any reference were limited to 2 marks. Better 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. Far too often the conclusion was limited and too brief. Alternative conclusions should be considered where appropriate and recommendations for action in the future should also be included. 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

D(a): The majority of reports included headings and/or sub-headings (2 marks) to provide the necessary structure. There was a definite improvement in this aspect and the better candidates included a table of contents and numbered the pages in their report (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.

D(b): Many candidates only included images which were decorative rather than informative and therefore failed to clarify difficult scientific ideas and improve effective communication. If there are no decorative or informative images included then zero marks is awarded. If one image is included, a decorative front cover or other low level attempt to add interest then one mark is appropriate. Two marks would be awarded for the inclusion of decorative images only or perhaps for the minimal use of informative images. Three marks would be given for including a variety of informative illustration eg charts, tables, graphs, or schematic diagrams and 4 marks if this is fully integrated into the text, referred to and used. Too often downloaded images from the internet were not clear, too small and not referred to in the text.

D(c): The assessment of the use of scientific terminology and the level of spelling, punctuation and grammar was generally very fairly assessed by Centres.

Section 5: Investigations

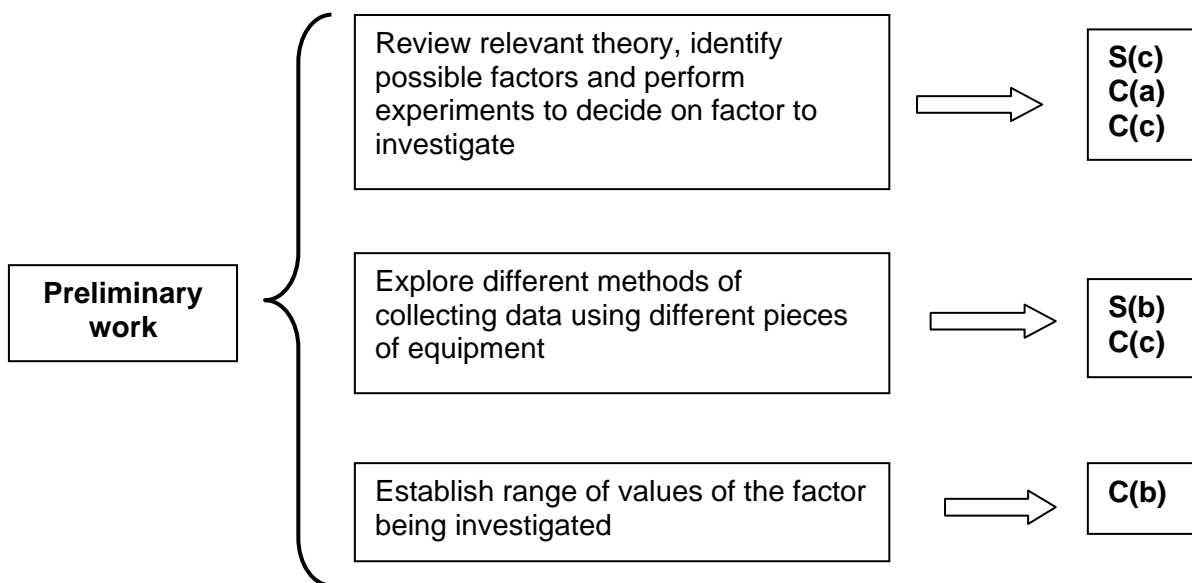
Rates of reaction, resistance of a wire and osmosis were still the most common investigations seen from Centres. However, there was evidence that other topics were being developed by more Centres who had gained confidence from previous years, for example, stretching of plastics and other materials, exercise and fitness routines, efficiency of wind turbines, objects rolling down slopes or ski jumps, electrolysis, investigations involving titration and electromagnets.

From an assessment point of view the 'performance descriptions' should be used to reflect the quality and performance of candidates' work rather than a formal/legalistic interpretation of particular words and phrases. There were a number of examples where credit had been incorrectly given for the inclusion of a key word or phrase but on reading the context in which it was written it was clear that the candidate had not understood or appreciated the correct meaning.

Strand S: Strategy

The importance of preliminary work cannot be over emphasised in the introductory phase of an investigation and the appropriate amount of time must be given to this aspect. Many Centres were clearly encouraging a more open ended exploratory approach and it is essential for

moderation if centres provide details of how the tasks were presented to candidates (eg copies of briefing sheets etc.)



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 necessitating a downward adjustment to the marks for S(c) in a number of Centres. Where candidates had been given the opportunity to show autonomy they performed well across many of the Strands.

It is important for candidates to record their preliminary data and to use it to inform and develop the main experiment. Often preliminary work appeared to provide just a limited extra set of results and did not shape the investigation in any way. Sometimes preliminary work was done but it was clear that candidates hadn't really understood why they were doing it.

Candidates should consider what factors or conditions might affect the results they will get. This will usually involve 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 will allow candidates to decide which factor it would be best to study and also provide evidence which can 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 they had been selected in preference to alternative equipment. Those candidates who exerted some choice over the apparatus they used were in a better position to achieve higher marks in S(b) and also when evaluating their procedures and methods in E(a). Candidates need to explore different methods and choose between different pieces of apparatus and adapt as appropriate to find the best way to collect good quality data C(c). Some candidates provided very simplistic justifications and Centres are reminded that it is **quality** of response in this context that is being rewarded. Many Centres provided a fixed, limited set of apparatus for candidates to use and this did not allow candidates the flexibility to try various approaches to obtain the best quality data set.

The complexity of a task, S(a), represents an overall judgement about the way a candidate has approached the task. Therefore two candidates doing the same investigation might approach it differently and therefore achieve different marks. Complexity depends on the demand and challenge involved in the approach adopted by the candidate and includes such indicators as the

familiarity of the activity and method, the skills involved in making observations or measurements, single or multi-step procedures, the nature of the factors which are varied, controlled or taken into account, the precision of the measurements made and the range, accuracy and reliability of the data collected. 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 by inspection of the results table could any evidence be found. Better candidates described in detail how the factors had been controlled and, even more importantly in some cases, monitored during the experiment. Weaker candidates often stated factors such as pH, surface area, current or temperature were kept the same but failed to explain how this was actually done or monitored. Often room temperature was mentioned as being the 'variable controlled' in rates of reaction or resistance investigations which was not the key 'temperature' variable involved.

Preliminary work is essential because if done properly it can allow access to marks of 7 or 8 in aspects (b) and (c). 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. Centres are reminded again that it is the quality of response and its relevance that is rewarded and not just that preliminary work has been done so 'jumping through hoops' is not sufficient criteria for success.

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. Plotting rough graphs as the data is collected may help candidates to identify outliers as they are collected which can contribute towards credit for E(b), towards defining the trend in the results more clearly, I(b), and for an improved level of confidence in the conclusion E(c).

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.

Many candidates still introduced their investigations with a significant amount of background theory which was not always relevant but more importantly was not used to explain the particular conclusion that the candidate had derived from the investigation. The C21 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) and detailed explanations using relevant scientific theory are best left until they are needed in Strand I.

Some candidates provided further comment about the confidence level E(c) in their conclusions in terms of how close the agreement was to their predictions using scientific theory. Some candidates whilst investigating the effect of length on the resistance of a wire plotted appropriate data and calculated resistivity and compared with data book values.

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.

However, there appeared to be an increase in **errors in calculating the Strand marks for candidates** which resulted in considerable extra work for both moderators and centres (please consult the administrative issues section in this report).

There is further guidance about the interpretation and application of the assessment criteria and also illustrative coursework exemplars on the website www.ocr.org.uk. It is highly advisable that staff have time during the year for internal standardisation meetings to share and develop expertise in the Science Department.

The structure of case studies, data tasks and investigations has been modified in the new specifications for teaching from September this year, 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.

2011 Grade thresholds for Data Analysis and Case Study combined and Investigations for the different specifications.

Component	Grade threshold								
	Max. mark	A*	A	B	C	D	E	F	G
Data Analysis and Case Study	16 + 24 = 40								
Investigations	40								

Previous reports from 2008, 2009 and 2010 will still be available online at www.ocr.org.uk to provide further detailed guidance.

The grade thresholds have been decided on the basis of the coursework that was presented for award in June 2010. The threshold marks will not necessarily be the same in subsequent awards.

Some adjustments may be expected to maintain consistent standards across all the OCR Science specifications.

Geoff Mines (Principal Moderator) on behalf of the Moderating Team 13.7.11

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