RECOGNISING ACHIEVEMENT

GCSE

Additional Science A

Twenty First Century Science Suite

General Certificate of Secondary Education **J631**

Examiners' Reports

June 2011

J631/R/11

Oxford Cambridge and RSA Examinations

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Chief Examiners' Report

Almost all candidates completed each question paper, and items located at the end of the papers were answered with the same level of success as those towards the start. The majority of candidates performed well. They, and the staff who helped them to prepare, should be congratulated. There were examples of lucid, well thought out answers that were a real pleasure to read.

Candidates' ability to follow the instruction on how to answer each question showed a distinct improvement. There were far fewer examples of the wrong number of responses being given for a question.

Although the free response questions were more likely to be left blank than the other questions, several examiners noted that this was less of a problem than in January. As before, it was noticeable that even very weak candidates who did attempt these questions often gained partial credit. Those candidates who had been given practice in ordering their thoughts and then communicating them in writing were able to score very well.

Centres are reminded of the importance of this practice. Question papers for the new specification to be examined next year will have considerably more, and longer, free response items than at present.

Marks on all papers were awarded across a wide range, demonstrating appropriate differentiation. In general candidates were entered for the correct tier though, as one senior examiner has pointed out, the small minority of Higher Tier candidates who earned marks in single figures would have had a much more enjoyable exam experience had they taken the Foundation Tier.

A215/01 Twenty First Century Additional Science A (B4, C4, P4) Foundation Tier

General Comments

Generally candidates performed well on this paper. Most appeared to be entered for the correct tier. This was pleasing.

Candidates should be aware that the marking is done from scanned images of their scripts. Consequently, if candidates change their minds, any alterations must be made clearly and unambiguously.

The level of difficulty was appropriate for the ability range and most questions were accessible to candidates across the ability range. The majority of candidates generally performed well and marks were awarded across a wide range, demonstrating appropriate differentiation. Scores typically ranged from the low teens to the high thirties.

Most candidates correctly followed the instructions in the questions and most made their responses appropriate to the number of marks available. Some, however, did not read the questions carefully enough.

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

Comments on Individual Questions

Q1
This question was a gentle start to the paper and most candidates demonstrated good understanding, scoring well overall.

Q1(a)
This question was generally well answered and candidates scored consistently well here.

Q1(b)
This question was again well answered by most of the candidates.

Q1(c)
Although generally well answered, kidney was a common mistake on this question.

Q1(d)
Most candidates correctly chose 34^{o}C but a significant minority picked 42^{o}C, showing they knew the answer was an extreme but confused hypothermia with hyperthermia.

Q1(e)
This question allowed candidates to demonstrate good knowledge of hypothermia, with a large number scoring at least 2 marks. 3 marks were rarely scored. A significant minority again confused hypothermia and hyperthemia and suggested ways of cooling the patient down. Most candidates made a good attempt at this question with very few not attempting it at all.

Q2(a)
Most candidates gained the mark on this question but a significant number only circled one option. This demonstrates the need for candidates to read the question carefully and understand what they have to do be fore answering the question.

Q2(b)
This question discriminated very well between the candidates. Salt was usually correctly joined, but water and sugar were often the wrong way around.

Q3(a)
Nearly all candidates correctly identified the speeding up aspect of the answer, and most knew it was proteins that speed up chemical reactions. A minority though it was carbohydrates.

Q3(b)
This was answered very well and demonstrated good understanding of this aspect.

Q3(c)
Again a well answered question leading to good scores on this aspect. A number of candidates missed out on full marks as the two correct answers only scored one mark.

4(a)
This question was well answered although iron oxide was a common wrong answer, suggesting that candidates should be reminded to read the question carefully.

4(b)
The first mark for understanding the lower reactivity being the cause of the reduced glow was a mark that many candidates got. Linking this to the iodine being less reactive was not seen as often. Candidates should be encouraged to try and develop explanations as much as they can in the space provided. The number of marks is a good guide as to the detail required in an answer.

4(c)(i)
A common mistake was to say "keep it safe" rather than explaining the reasons for storing the sodium under oil. Again candidates should be encouraged to write about detailed science when "explain" is used as a command word.

4(c)(ii)
Common mistakes included $NaCl_2$, Nacl and NACL. These cannot be accepted and candidates should be encouraged to make very clear the difference between capital letters and lower case letters when they write their answers.

4(c)(iii)
A surprisingly large number of candidates chose the molecule that could have represented water rather than the much simpler diatomic molecule.

5(a)
This question was a very good discriminator and only the better candidates gained both marks on this question. Candidates are now very used to this style of question and almost always make their answer consummately clear even when they have changed their minds on the answer. Candidates and Centres should be commended on this.

5(b)
This question was well answered by most candidates and clear understanding was demonstrated.

5(c)
Candidates answered this question in many different ways and many gained credit. The most common mistakes were having ions with the same charge touching each other, or just repeating the given pattern on the page but not connecting the all of the ions together. Some candidates failed to draw four more ions.

6
This question was generally well answered and although some candidates mixed up the spectra and thought some of the sodium lines where missing. Candidates are reminded of the importance of reading the question and making sure it is fully understood before answering it.

7(a)(i)
Candidates performed very well on this question. This is very pleasing as in previous exams they have struggled with the idea of forces and direction.

7(a)(ii)
Again most candidates performed very well and chose the correct answer of 5. The most common mistake was to add the three forces and arrive at 15.

7(b)
Many candidates got one mark on this question but struggled to gain the second for the reason for the ball slowing down: gravity was a common mistake. If candidates failed to gain any credit in this question it was usually due to saying the ball increased in speed first and then slowed down – this was despite the **after** in the stem of the question being in bold. Candidates are reminded to pay particular attention to **emboldened** words.

8(a)
This question was well answered and many candidates gained credit. This is again pleasing as calculations have been a weakness in the past and are now becoming a strength.

8(b)
This calculation was carried out well and most candidates gained credit for 200. 40 and 8 were the most common mistakes. Centres are reminded that rearranging an equation is not required at foundation level.

8(c)
Candidates appeared to be very familiar with interpreting distance time graphs and most gained credit for this question. Congratulations should be passed on to Centres as this is becoming a strength.

8(d)
Momentum and forces has been a weakness in past exams but this question was answered very well and candidates and Centres should be pleased with the improvement in this area.

9(a)
This was answered well and most candidates could pick out the correct use of the equation.

9(b)
This question was found to be difficult by most candidates. Many thought the kinetic energy (KE) and gravitational potential energy (GPE) were changing , but then said the GPE was increasing and KE decreasing as she fell to ground. Some candidates seemed a little side tracked by momentum and forces so usually gained little if any credit. It was very rare to see a candidate's answer that suggested either energy was conserved or that GPE was being transferred into KE. Again the use of the command word "explain" suggests that candidates need to include detail in their answers.

A215/02 Twenty First Century Additional Science A (B4, C4, P4) Higher Tier

General Comments:

There was no sign that candidates lacked sufficient time to complete the paper, although some questions were not attempted by all.

Some candidates performed very well. They and the staff who helped them prepare should be congratulated. As in the previous session, the most consistent area for improvement lay not in subject knowledge but with the technique required to answer the questions which asked for a more extended response. Many candidates dropped marks in these questions through poorly constructed answers which showed some signs of candidates starting to write before they had thought out the answer they wished to give. This led to marks being dropped in self-contradictory responses or in seemingly confused and rambling sentences.

Not all of the candidates entered were of a high enough standard for the Higher tier paper. It is possible some of this group might have achieved a higher grade on the Foundation tier.

Comments on Individual Questions:

Q1(a) asked candidates to recall that enzymes are proteins which speed up chemical reactions, and the great majority were able to do so.

Q1(b) asked for an explanation of a graph of rate of reaction v temperature, and again the great majority selected the correct option, line B.

In **Q1(c)** the correct options to ring were decrease, denatured and shape. Most scored at least 1 mark by getting two of these correct, and a good number scored both marks. Some responses were completely wrong, which might perhaps suggest that these candidates should have entered the Foundation paper.

Q2 would ideally have elicited responses about water moving into the red blood cells across the partially permeable membrane by osmosis for three marks. Some candidates gave well thought out responses which were clear and concise, but a number of responses were spoiled by confused references to the partially permeable membrane of the blood vessel, or to the red blood cells diffusing, or to the cells themselves moving by osmosis. Many of these responses may have been improved by the candidates thinking through their answer before starting to write it.

Q3 tested that candidates understood the concentration difference in diffusion. Most answered this correctly, and many who were wrong went for the wrong concentration difference, at least demonstrating some understanding that diffusion involves a concentration difference.

Q4(a) proved challenging for the majority of candidates. The correct responses of hypothalamus, hypothalamus and vasoconstriction were all required for the mark. The most common error was to say that blood temperature is detected by receptors in the skin rather than in the hypothalamus, so it may be helpful to emphasise this to future candidates.

Q4(b) asked for recall that antagonistic effects allow a more sensitive response. This seemed to catch out even some of the most able candidates, and is a point that might be stressed in future teaching.

Q5(a) asked for recall that urine concentration is controlled by antidiuretic hormone. Many scored with the acceptable response of ADH, although it would be good to see more candidates take care to use capital letters in abbreviations like this.

Q5(b) asked for recall that ADH is released from the pituitary gland, and was well answered.

Q5(c) asked for a description of how alcohol would affect ADH production and hence the urine produced. Of the free response questions on the paper this was possibly the best answered, with most candidates able to score at least one of the marks available. Many were limited to one mark through being confused about the link between less ADH and more dilute urine.

Q6(a) required candidates to enter the numbers 2, 3 and 2 to balance the symbol equation for the reaction of iron with chlorine. Only the more able were able to do this, and the lack of a clear pattern in the wrong responses suggests there was a large amount of guessing taking place.

Q6(b) asked for recall that at room temperature chlorine is a gas, bromine is an orange colour and iodine is a solid. Even after allowing the colour of bromine to be described as red or brown only about a third of candidates scored this mark, with confusion over the states of chlorine and iodine being the most common error.

Q6(c) asked for the chemical formula for sodium chloride and it was pleasing to see the majority use NaCl rather than nacl or NACL.

Q7(a) called on candidates to match atoms or ions to their electron arrangements, and the great majority scored at least 1 mark. This was often for matching Br after Br^- had been given.

Q7(b) was about dissolving potassium bromide crystals in water. Some were able to spot that ions will move randomly through the solution, but few were able to link this with the statement that ions stay as ions. As in previous sessions there was confusion as to when ionisation takes place.

Q7(c) asked candidates to add four more ions to a diagram. Many were able to do so, although a significant number of candidates lost the mark through failing to keep their circles the same size as the ones already given, so accidentally ending up with + touching or adjacent to +.

Q7(d) asked how to demonstrate that potassium bromide is ionic, and only the most able were successful in doing so. Many scored one of the two marks for making some suggestion that the key test would be for electrical conductivity, but it was disappointing to see so few go on to describe either melting or dissolving the ionic solid. Perhaps this might be stressed to future candidates.

Q8 required candidates to access information from the Periodic Table. The correct answers were F-, Na+ and P. The most common error was to simply write F, Na and P with no charge symbols offered at all. While this still scored 1 mark it would appear that candidates demonstrated a poor understanding of ions or how to represent them.

Q9 presented two spectra and asked for a comparison of the experimental one with the standard sodium spectrum. It was expected that answers would be that the sample contained sodium and also another substance besides. Very few candidates were able to express this clearly for both marks, and it was much more common to score only the mark for saying sodium was present. Perhaps more practice in interpreting spectra would help a number of candidates.

Q10(a) required the correct substitution of data into the equation for Kinetic Energy which was given at the front of the examination paper. The majority of candidates are to be praised for achieving this correctly.

Q10(b) asked how the gravitational potential energy and kinetic energy of a runner would change as she began to drop after jumping a hurdle. There was a great deal of confusion in the responses offered, with a significant number of candidates insisting that gravitational energy had to increase as she dropped to the ground. Another common misconception was to muddle the notion of gravitational energy with gravitational force. The interchange of gravitational and kinetic energy was rarely appreciated.

Q11(a)(i) called for the correct identification of forces acting on a croquet ball as it was struck. Many were able to offer the correct answer of A,C,D for the mark. Part(ii) was less well answered, as many failed to appreciate that the force from the mallet was the same as the resultant force on the ball. It was not uncommon to see 15N offered as an answer instead of 5N, clearly suggesting that candidates were opting to add the three forces from part (i) while ignoring the vector nature of forces.

Q11(b) required calculation of the time the mallet was in contact with the ball by rearranging the correct equation given at the front of the examination paper. It was heartening to see nearly half of all candidates perform this correctly.

Q11(c) called for the first and fourth boxes to be ticked, to demonstrate understanding of how friction slowed the movement of the ball. Most were able to score at least 1 mark by getting one of the boxes correct. Candidates rarely lost a mark through ticking more than two boxes. Centres are to be congratulated that so many now carefully follow the instructions on this type of question.

Q12(a) gave more information than required to calculate the momentum of a runner, which was 300kgms-1. Many managed to do this correctly, showing some good mathematical skill as well as judgement of the relevant physics.

Q12(b) needed a straight line to be drawn through the point 0,0 for the first mark, and also passing through the point 10,50 for the second mark. A significant number of candidates might have improved their chances of scoring marks in this question by using a ruler to draw their line, or by ensuring that they drew only one line. Few freehand efforts were sufficiently accurate to be able to give them credit.

Q12(c) needed the responses that kinetic energy remained constant, a force from the ground pushes him in the direction of his motion, and gravitational energy increases steadily over time. Fewer responses scored both marks for this than scored both marks for the preceding graph, but there seemed less confusion about the idea of gravitational potential energy in this context than was evident in responses to 10b. Perhaps more practice with the increasingly significant style of question 10b would benefit future candidates.

A216/01 Twenty First Century Additional Science A (B5, C5, P5) Foundation Tier

General Comments

The overall impression is that candidates were clear about their subject knowledge in B5, C5 and P5.

The paper was well attempted and candidates seemed to have made good use of their time. There was no evidence of candidates running out of time.

The candidates are still finding the longer response questions more difficult than the objective style.

Candidates correctly followed the instructions in the questions and most made their responses appropriate to the number of marks available. Candidates are giving the correct number of responses whereas in previous examinations they were not.

Fewer candidates are not reading the questions carefully enough.

A few weaker candidates did not complete the paper due to lack of knowledge, not lack of time. The number of "No response" answers was variable. In the objective questions very few sections were not attempted. However in the free response questions it was clearly different.

Comments on Individual Questions

Q1(a)
Many candidates knew the formula of lead sulphide as PbS.

Q1(b)
This is the first of the longer answers and candidates did not score well. Nobody scored both marks and few scored one mark. Most candidates wrote about the quantity of lead in modern ores. This did not score as they were given this information in the question. The answer should have been about the amount of impurities and why there was less lead.

Q1(c)
The candidates were given the reactants and the products and they were required to rewrite them as a word equation. A substantial number could not do this. About 1 in 10 did not attempt this question.

Q1(d)
There was a lot of information for candidates to read but many candidates scored at least 2 marks. Only a few candidates got all four marks for a totally correct answer.

Q1(e)
The candidates could link the property of the lead to how this made it useful. More scored one or both marks.

Q1(f)(i)
The correct answer was 47% and many candidates worked this out correctly.

Q1(f)(ii)
This is the second of the longer answers and candidates were able to score some marks here. This could be because of the guidance given by the bullet points. There was no mark for gas for the answer to the first bullet point but bubbles, fizzing, smell or a correct colour scored a mark. Lead at the bottom also scored as did reference to either substance being associated with the electrodes.

Q2(a)
The switch was circled correctly by most candidates.

Q2(b)
The function of the electrical components was well known by the candidates.

Q2(c)
Many candidates used the terms energy and charge correctly in their answers.

Q3(a)
The idea that resistors in a series circuit have the same current was well known by this cohort of candidates.

Q3(b)
In this section only half of the candidates knew that voltage was another word for potential difference.

Q3(c) (i) and (ii)
Both calculations were poorly done. Few candidates scored here. The answers were 6 (V) and 18(V) respectively.

Q3(d)
The rate of delivery of energy to the circuit (power) was not well known.

Q4(a)
Completing the sentence about moving the magnet into the tube was poorly done with very few candidates scoring both marks.

Q4(b)
Over half of candidates scored 1 mark usually for knowing that increasing the number of turns of wire would increase the reading on the ammeter.

Q5(a)
This question has been asked many times in different ways and still less than half of candidates get it all correct.

Q5(b)(i)
Nucleus was the answer expected and over half of candidates were correct. Chromosomes and genes were also acceptable answers.

Q5(b)(ii)
In this question less than one in five candidates gave a correct answer. The expected answer was cytoplasm but ribosome was also accepted.

Q6(a)
Candidates answers were varied with all letters seen, however about half of them gave a correct answer of B. A significant number of candidates gave 78 which was incorrect as 78 is in every row.

Q6(b)
Another longer answer. Over three quarters of candidates did not score in this question. There was much confusion about why the puppy's cells have chromosomes from both parents. Mitosis and meiosis were totally confused. During gamete formation the chromosome number is halved and then at fusion of the gametes the number doubles/ returns to the normal. This was often reversed by the candidates.

Q7(a)
This was a question where candidates did not answer the question asked but answered a question from previous papers. It does not ask about cloning or growing new plants. The powder contains hormones which help roots to grow.

Q7(b)
By drawing one line correctly, over half of the candidates scored one mark. Many scripts had the meristems not developing into different cells and the xylem and phloem differentiating, rather than the other way round.

Q7(c)
The way in which animals and plants grow , having some cells which continue to divide by mitosis, was known by about two thirds of candidates.

Q7(d)
Many candidates knew that chromosomes separate during mitosis.

A216/02 Twenty First Century Additional Science A (B5, C5, P5) Higher Tier

General Comments

The examination discriminated well. All candidates appeared to have time to complete the paper and candidates were entered appropriately for this tier.

Examiners reported seeing some very good, very well-written scripts. This is especially pleasing in the light of the imminent changes to the examination which will be introduced with the new specification.

Comments on Individual Questions

1(a)
This question discriminated well. The most able candidates had no difficulty in balancing the chemical equation, while others chose 2, 2, 2. The weakest candidates were much more uncertain and often put chemical symbols into the boxes.

1(b)
Candidates who were prepared to show their working were very likely to score one of the marks for calculating the formula mass of lead sulfide. Those who did not show working usually gained no credit, and a small minority of candidates were able to perform the calculation correctly.

1(c)
The most common incorrect choice of response was that Roman ores did not contain impurities.

1(d)
The most able candidates showed an excellent understanding of structure and bonding in silicon dioxide and sulfur dioxide. The most common incorrect response was to suggest that silicon dioxide had ionic bonding.

1(e)
Most candidates gained credit for discussing recycling of the lead, and the more able candidates went on to use information from the pie chart to gain the second mark. Alternative answers often included importing lead, electrolysis and sometimes lead pencils!

1(f)
Candidates were clearly aware of the idea of metal structure containing a 'sea' of something, but were less certain of what that sea consisted of. Consequently response C, electrons in a sea of ions, was a common response.

1(g)(i)
Most candidates found it difficult to write the symbol of the bromide ion. However, almost all knew that it should be based on the symbol Br with a charge, with only the weakest candidates using an incorrect element symbol. The most able candidates gave the correct charge on the bromide ion, with the rest mainly suggesting Br^{2+} or Br^{2-}.

1(g)(ii)
This question discriminated very well. Almost all candidates realised that the two ions travel to opposite electrodes, but the correct direction was a good indicator of ability.

2(a)
Candidates found this surprisingly difficult, with many candidates scoring zero. The most easily obtained of the two marks was for knowing that it was a current going through the ammeter. However, many assumed that it is charge which is induced rather than voltage.

2(b)
The vast majority of candidates knew that one way to increase the reading would be to increase the number of turns of wire. More able candidates also realised that moving the magnet more quickly was the other factor.

3(a)
The current through different components in a series circuit was well understood.

3(b)
Most candidates had the idea of electrons moving through wires, though a significant minority then lost this mark by stating that atoms were also moving through the resistor. The collision with atoms was discussed by able candidates. The last marking point was for the idea of energy transfer or for the collision between electrons and atoms making the atoms vibrate. Weaker candidates often gave a partial explanation such as collisions *creating* heat/energy. As this last part was intended to distinguish the most able candidates from the rest, explanations in terms of friction did not gain credit.

3(c)
There was a lot of confusion over this power calculation. Most candidates divided the voltage by the current instead of multiplying them. Centres are reminded that the basic relationships are all given inside the front page of the exam paper.

4(a)
The circuit diagram was well drawn by all but the least able candidates. Examiners were looking for correct symbols, and this latter group sometimes lost credit for showing the symbol for the lamp as an empty circle.

4(b)
Most candidates knew that it is the battery which pushes the charge around the circuit and that the movement of charge is a current. The really able candidates realised that in an open switch it is the resistance which is high. Most of the rest suggested that the open switch would have a high charge.

4(c)
Most candidates knew that when the switch is open the charge will not flow. The most common alternative was the potential difference across an open switch is reduced to zero – an answer which appeared across the ability spectrum.

5(a)
This question was well attempted. The most common misconception was to add the chromosomes from both parents.

5(b)
Most candidates were clearly familiar with gamete formation and with fertilisation, and were aware that at some stage the chromosome number was halved. Examiners got the impression that levels of understanding were much higher than levels of expression and use of terminology, so references to sex cells combining to make a gamete, or chromosomes splitting to make a zygote were of necessity penalised.

6(a)
Most candidates knew that the genetic code is found in the nucleus, and many knew that proteins are found in the cell cytoplasm. Candidates were often able to correctly identify three of the responses, but only the most able scored all four marks.

6(b)
This question was also attempted enthusiastically by the vast majority of candidates. Weaker candidates appeared to misunderstand the thrust of the question and discussed inheritance or adaptation for survival. More able candidates were able to discuss gene switching, and the most able also linked different genes to the protein/coat colours.

6(c)
This was well answered by the more able, with 23 and 25 tending to be common incorrect alternatives.

7(a)
Answer B was the most common incorrect response.

7(b)
Many candidates knew that the side of the shoot with more auxin would grow more, but the diffusion of the auxin was more difficult. A common choice was the first response, that the auxin stopped all the light on one side.

7(c)
Most candidates correctly chose photosynthesis to complete the sentence.

7(d)
Reuben was a very common wrong answer.

A217/01 Twenty First Century Additional Science A (B6, C6, P6) Foundation Tier

General Comments

There were no indications that candidates lacked sufficient time to complete the paper. However, a small number may not have been well prepared for the questions which required some extended writing since they made no response to these questions but answered most of the rest of the paper. Yet more offered poorly structured and at times self contradictory answers where extended writing was required, so this would seem a good area to develop for future candidates.

Broadly speaking the candidates seemed to perform equally well across the Physics, Biology and Chemistry sections of the paper, although there were some consistent weaknesses in each area. These are outlined in the detailed comments on the questions.

Comments on Individual Questions

Q1(a) asked candidates to identify that interference was taking place at the microphone.

Q1(b) asked candidates to show three wavefronts at right angles to the ray line after reflection. Most had the idea to show three wavefronts after reflection, but sloppy drawing in showing irregular spaces between the waves or not placing the reflected wavefronts at right angles cost many candidates at least one of the marks. Another not infrequent error was to show curved wavefronts as though diffraction was taking place. Perhaps candidates were a little unsure of the underlying physics they were trying to represent on this occasion.

Q1(c) usually yielded at least one mark, although many did confuse the definitions of speed and frequency.

Q2(a) required x-rays to be placed correctly in the electromagnetic spectrum between ultraviolet and gamma rays. Some candidates correctly filled all of the blank boxes, for which there was no extra credit. A number placed x-rays in the second box from the left end, which might suggest that they had relied on learning the electromagnetic spectrum by rote with the most energetic forms to the left.

Q2(b) required the words "speed" and "space" inserted in that order to complete the sentence. It was surprising to find a substantial number of responses which were completely wrong, while most scored at least 1 mark. It was slightly more common to score the single mark for "space" in the second gap than for "speed" in the first gap. Possibly a stress on the basic properties of electromagnetic radiation in revision would help some of these candidates.

Q2(c) was a question requiring extended writing. The answers were often confused and rambling, and so candidates often did well to score one of the key points that the tooth absorbed the x-rays and that the x-rays striking the film changed its colour. It seemed clear that candidates would do better on this style of question with more practice in structuring their thoughts.

Q3(a) asked for recall that digital code uses only one and zero as symbols. Many went for the wrong option of plus and minus.

Q3(b) had three marks available for recalling that radio transmitters modulate, that some noise is picked up as the waves travel and that the receiver converts the pattern of radio waves into sound. Many scored at least 1 mark from this, but it was a little disappointing that more did not score all of the marks.

Q4(a) saw most candidates give the correct responses Niall and Beth, although a number did opt for the distracter Ammaar ("If you can remember it for five minutes you'll remember it next week")

Q4(b) asked for recall of a function of the cerebral cortex apart from memory. Acceptable responses were language, speech and intelligence, but a great many responses opted for more automatic responses such as breathing or balance which did not score this mark.

Q4(c) was about means used to investigate the functions of the cerebral cortex, and while a few responses showed good awareness of the specification content and went for MRI scans, most responses were too vague e.g. use x-rays.

Q5(a) had three marks available for selecting the options spinal cord, sensory neurons and synapses. Most candidates scored at least one of these marks, but few demonstrated a sound understanding of the structure of the nervous system by scoring all three marks.

Q5(b)(i) asked which part of a diagram of a motor neuron represented the axon, and was much less well answered than bii which asked which label represented the fatty sheath. There has to be a suspicion that some were guessing that the sheath was the outer part without really understanding the structure of the neuron.

Q5(c) called for extended writing to describe the main features of a reflex arc. It was notable that those candidates who offered a well structured answer which went in order from receptor to effector scored two if not all three marks while less well structured answers were fortunate to score one or at most two marks.

Q6 was about a woodlouse relying on simple reflex actions. The correct responses were stimulus and dealing with a new situation.

Most candidates were able to score at least one of the marks, most commonly for stimulus. It may be that there was limited appreciation of the limitations of behaviour based on simple reflex actions.

Q7 had two marks available, one for saying the flour particles were smaller than the wheat grains, and the other for saying that that reaction was quicker. It was pleasing to see a few responses on a higher level score through a correct discussion of the greater surface area in the flour. The most common stumbling block was for responses which failed to make any comparison between the reactions of flour dust and wheat grains e.g. simply to state that the particles are small in flour dust rather than to say that they are smaller.

Q8(a) called for a list of chemicals to be correctly assembled into reactants and products to form a word equation. It was interesting that more than might have been originally expected found this difficult, one common error being to list both calcium carbonate and calcium chloride on the same side of the equation.

Q8(b) asked for the identification of calcium chloride as the salt formed in the reaction. Even some who had failed to score in 8a managed to score this mark.

Q8(c)(i) was surprising for the number of responses which failed to realise that the pH of acid had to be 1 from the list given.

8(c)(ii) called for both universal indicator and pH meter for the mark. A significant proportion of wrong responses took one of the correct options along with litmus paper, but nearly all answers at least gave the required two ticks.

8(d) required recall that neutral pH is 7, a fact encountered for most even before commencing GCSE studies. It was a little disappointing to find a significant proportion of wrong answers to this question.

Q9(a) was particularly poorly answered, the majority of candidates seemingly unaware of what state symbols are and attempting to balance the equation with numerals of chemical symbols. Even those who did have a notion of what state symbols are frequently failed to score the mark by using (aq) where (l) was required. Well done to the few who did score this mark.

Q9(b) has three marks on offer for realising that the impurities would be separate, that a solid might be separated from a liquid by either filtration or evaporation, and that this should be done after reaction 1 which placed the titanium in a liquid form. It was perfectly acceptable to say that the separation should be done before reaction 2. As before, many responses were poorly thought out and vaguely expressed. Marks were generally limited to one or two out of the three available. There was an appreciable difference in the organisation of the responses which did score all of the marks in comparison to the majority of responses.

Q9(c) required a ring around the second option to show how to calculate the percentage of titanium oxide in the ore. This question was not well answered by the majority.

Q9(d) had two independent marks for selecting the correct hazard symbols for toxic and oxidising, which were the first and last diagrams of the line of five presented in the question. A substantial minority scored both marks, but it was most common to score one or the other. Again virtually all of the responses had at least ringed the correct number of options, which was pleasing to see.

A217/02 Twenty First Century Additional Science A (B6, C6, P6) Higher Tier

General Comments

This paper had a printing error in the graph for Q9(b)(ii). An erratum notice was emailed to all centres instructing candidates to cross out Q9(b)(ii) and not to answer it. This question was NOT marked and the maximum possible total mark for this paper was therefore 41.

Most candidates appear to have been entered for the correct tier, although those few who earned marks in single figures would have had a much more enjoyable exam experience had they taken the Foundation Tier instead.
Candidates found it easier to demonstrate their understanding of science with the objective questions. When it came to free response questions, too many candidates tried to say too much in a single sentence, making it difficult for the examiners to be quite sure that the candidate was trying to say. Perhaps candidates have not had enough practice at writing explanations in science?
It was noticeable that candidates found it much easier to earn marks for the Physics and Biology questions than for the Chemistry ones.

Comments of Individual Questions

Q1
This question also appeared on the Foundation Tier paper. As expected, most candidates were able to earn the majority of the marks. Part (a) proved to be the more challenging of the two questions, with "plus and minus" being a very popular incorrect choice.

Q2
The majority of candidates correctly identified interference as the cause of the observed phenomenon for part (a). Part (b) proved to be more challenging, with too many candidates failing to draw their wavefronts with the same wavelength as the incident wave. Candidates who used a ruler for drawing their lines as well as measuring the spacing were much more likely to gain the mark. The calculation of part (c) was straightforward for strong candidates, but the need to transpose the formula was clearly beyond weak candidates. Many candidates struggled to define a wavelength for part (d), with many not making it clear that the word length in their answer was referring to a distance rather than a time.

Q3
This was the last of the physics questions and the hardest. It started off easily, with the majority of candidates able to correctly place infrared and ultraviolet in the electromagnetic spectrum for part (a). Part (b) was very poorly answered by most candidates, regardless of their ability. However, the majority of candidates were able to correctly identify the method of image formation for X-rays in part (c). Part (d) differentiated well, with weak candidates leaving a blank space and strong candidates getting the correct answer. "Light" was a very popular incorrect response.

Q4
This was the first of the Biology questions. It also appeared on the Foundation paper. As expected, it proved to be mostly straightforward for the majority of Higher Tier candidates. Almost all candidates earned both marks in part (a) about memory function, but part (b) was much more challenging. Weak candidates would suggest anything for another function of the part of the brain which deals with memory; but only strong candidates gave the correct answer. Part (c) discriminated even better, with large numbers of weak candidates suggesting that studies of patients with Alzheimer's could be used to find out more about the brain and memory. However, many candidates were able to suggest two different techniques for memorizing information in part (d).

Q5
Although most weak candidates struggled to earn any marks at all for part (a) (despite the multiple-choice style), most strong candidates earned all of the marks. The hardest mark to earn was the one concerning the number of neurons in the brain. Part (b) was much less discriminating, with the vast majority of candidates able to correctly identify the two correct statements about conditioned response.

Q6
Although weak candidates were able to correctly identify the first step in transmitting an impulse across a synapse, only the strongest candidates were able to provide the complete correct sequence.

Q7
This was the first of the Chemistry questions. It was poorly answered by most candidates. As always, even strong candidates struggle to fill in the correct state symbols for part (a) - there appeared to be a strong reluctance to using the symbol (g) twice, so (aq) was often set against chlorine. Many candidates struggled to express themselves clearly for part (b), with only a small minority earning all three marks. Too many ignored the list of bullet points in the question and tried to answer all three parts at once, often leading to a confused answer which earned very few marks. It seems that most candidates were unable to visualise what was going on in the series of reactions, not appreciating that in the liquid phase, solid impurities would be easy to remove by filtering. Most candidates fared little better in part (c). Most could explain the function of a catalyst, but were mystified as to why it should appear on both sides of the word equation for the reaction. Many suggested that the catalyst did not take part in the reaction and lost the mark accordingly. Some strong candidates earned both marks for their balanced symbol equation of part (d), but the vast majority earned none at all. This is surprising since the reverse equation for the combustion of hydrogen to make water must be the most familiar one in all chemistry!

Q8
Few candidates realised that the increased surface area of the flour increased the chances of successful collisions with oxygen molecules in the air, thus increasing the rate of reaction. Those who did mention an increase of surface area often used the word particle for both the dust and the molecules, making it very difficult to decide what they were saying. Perhaps Centres should encourage candidates to stick to precise scientific terms, such as atom and molecule, when writing about particles.

Q9
It was unfortunate that a printing error in part (b)(ii) meant that the question could not be answered. This part of the question was therefore ignored for all candidates. The word equation of part (a) proved to be very difficult for the majority of candidates - few remembered that carbon dioxide and water are produced when a carbonate reacts with an acid. A minority of candidates realised that the pH of an acid is not a reliable indicator of its amount for part (c), but about half could identify the correct statement about hydrochloric acid for part (c). Finally, only a minority of candidates could correctly identify the nitrate ion for part (d).

A218/01 Twenty First Century Additional Science A (Ideas in Context) Foundation Tier

General Comments

This paper includes a pre-release booklet. It is expected that teachers help candidates to prepare for this examination by reinforcing the ideas that are covered in the units that are linked to the pre-release material. It is also expected that candidates use the material, referring to it in their answers.

The examination discriminated well, all candidates appeared to have time to complete the paper, and candidates were entered appropriately for this tier. Examiners were encouraged by the fact that most candidates had clearly read and made appropriate use of the insert material. Few candidates left any questions blank. This is very encouraging, as the change to the new specification will see the introduction of more questions which involve continuous prose.

Comments on Individual Questions

Q1

This question was well attempted. Most candidates could read the information off the graph correctly for part (a). The most common errors were to read the height as 3550 metres, and the time as 3.5 seconds. Most candidates could also decide which diagram showed the forces on the rocket for part (b).

Part (c) discriminated well, with more able candidates realising that the two forces acting as a counter force were gravity and air resistance. Weaker candidates sometimes answered 'thrust' here, forgetting the statement in the stem that the thrust is the driving force.

Part (d) also discriminated well, with able candidates correctly calculating the change in momentum. The most common mistake was to divide the mass by the velocity. As usual, some candidates appeared not to have brought a calculator to the exam. However, examiners were impressed at the willingness of many such candidates to use approximation techniques rather than leave the question blank.

In part (e), the relationship between gravitational potential energy and kinetic energy for a falling object created a lot of confusion. Most candidates realised that the question was about kinetic energy and gravitational potential energy, but got their answers the wrong way round. There were very few mentions of chemical energy and almost none of 'force'.

Part (f) was much more difficult. The first part required candidates to explain how the rocket engine makes the rocket move. Candidates who did no more than copy out sections of the text were able to score a low level mark for discussion of exhaust gases coming out at high speed, but examiners were looking for a clearer level of understanding before awarding further credit. Many candidates obviously had a good intuitive understanding, but were unable to express their ideas clearly enough for the examiners to be certain of that understanding. It was not enough just to mention the terms 'thrust' and 'change in momentum', examiners were looking for more detail before they could award credit.

In (f)(ii), the idea that the rocket would have zero momentum at the top of a vertical flight was poorly understood by even the most able candidates. This was one of the few questions which had a significant omit rate.

Q2

The first part was very well answered. Almost all candidates could identify functions of the cerebral cortex from the text, though the instruction to just give two functions was often ignored. The most able candidates also knew that the gap between neurons is a synapse, with other candidates suggesting microscopic gaps, pathways, serotonin and cerebellum. However, the fact that a nerve cell is like any other cell in that it possesses cytoplasm and a membrane was not appreciated by candidates at any level of ability. Naming two types of neuron was also beyond the ability of all but some of the most able candidates. It was not uncommon to see 'membrane' and 'gland' being used from the list above.

By contrast, the cloze exercise in 2(b)(iii) discriminated very well, with most candidates able to score one of the marks and more able candidates scoring all three. The terms "impulse" and "stimulated" tended to be correctly selected, but many suggested that the signals were chemical rather than electrical.

The knowledge that the spinal cord is part of the central nervous system discriminated well in 2(c). Weaker candidates often suggested 'spine', which did not gain credit.

The percentage calculation in 2(d) caused problems for most candidates, including the more able.

Examiners reported that the standard of written communication for 2(e) was high, with the vast majority of candidates able to express themselves clearly. More able candidates scored credit for their scientific understanding as well as their communication skills. Weaker candidates tended to select uncritically from the text without considering how that material was relevant to the question. These candidates tended to give descriptions of how information was **remembered** rather than use the model to explain how and where it might be **forgotten.**

In part 2(f) most candidates were able to suggest what happens to neuron pathways as people grow older.

Q3

In part 3(a) many candidates were able to score one mark for identifying the method of extraction of two of the metals. It was usually the most able candidates who could correctly identify all four.

Most could identify an environmental problem of copper mining from the text for 3(b). However, the task in 3(c) of explaining why the amount of waste rock is much greater than the amount of copper it contains proved to be very difficult. Many rewrote information from the question without taking it any further. Lots just said 'more waste than copper'.

In part 3(d), most answers were couched in general language "reuse it" rather than making use of the information in the flow diagram to help them, and so did not realise that sulfuric acid can be recycled by reacting it with more malachite. This was one of the few questions which had a significant omit rate.

Most candidates could say that heat energy is used in the blister process for 3(e), and the most able went on to say that electrical energy is used for electrolysis. Unfortunately there were many weaker answers which did not identify which process was being discussed.

Able candidates knew that the copper ions have a positive charge in 3(f), with many weaker candidates suggesting that it the charge is negative. The term electron was used instead of electrolysis even though it was not in the list of choices. Far fewer chose the term 'electrolyte' from the list to describe the liquid in the electrolysis cell. 'Indicator' was, surprisingly, the most common suggestion.

Malleability was well known for 3(g), though melting point was often suggested.

Finally, in 3(h) most candidates got at least one mark, usually for 'copper running out' idea.

A218/02 Twenty First Century Additional Science A (Ideas in Context) Higher Tier

General Comments

This paper includes a pre-release booklet. It is expected that teachers help candidates to prepare for this examination by reinforcing the ideas that are covered in the units that are linked to the pre-release material. It is also expected that candidates use the material, referring to it in their answers. Some of the candidates did not appear to have made full use of the information available to them, which reduced the quality of their answers. Some candidates did not appear to have used the pre-release material as a guide to revision, and did not recall some of the specification learning objectives that link to the concepts discussed in the articles. Candidates who made full use of the pre-release material scored very highly.

Candidates need to be reminded to keep referring to the pre-release material as they answer questions. Also, a list of formula is given at the front of the paper (for example the relationship needed for Q 1d). Candidates did not always realise that the formulae that they needed were given there and so some used incorrect formulae in their answers. Finally, the stems of the question give information directly relevant to each answer. For longer answers, the question often has a bulleted list of points that need to be addressed to access the marks. These lists are designed to help candidates to structure their answers. Some candidates did not refer to the bullet points systematically and so omitted parts of the answer.

There were few unanswered questions; most candidates making an attempt at every question on the paper.

Some candidates gained only very low scores. The higher tier paper is designed to discriminate between higher grades. Candidates who are predicted grades at D or those who are working in the lower ranges of a C grade would be better served entering the foundation tier paper.

Comments on Individual Questions

Q1(a)(i)
Most candidates scored some marks for describing how exhaust gases make a rocket move. Many correctly identified the idea of 'thrust' from the pre-release material, and many were able to discuss opposing forces acting. Some more able candidates discussed ideas about equal and opposite forces or increasing momentum.

Q1(a)(ii)
Very few candidates realised that the momentum is zero at the highest point. Most attempted to carry out a calculation.

Q1(b)
Just less than half the candidates correctly used the graphs in the pre-release material to identify the time during which the velocity was greatest. The easiest graph to look at is the one that shows the change in height.

Q1(c)
Most candidates scored a single mark for correctly stating "as the fuel burns the mass of the rocket decreases". Fewer made a correct link with the idea of this leading to a greater velocity. More able candidates discussed the outcome of the same force or momentum acting on a lighter object.

Q1(d)(i)
The relationship needed for this question is given in the list of Useful Relationships on page 2 of the question paper. Not all candidates seemed to realise that these relationships are available. The first mark was for correctly identifying 3750m as the highest vertical distance that the rocket reached. This information needed to be extracted from the height graph in the pre-release material. Candidates who extracted this information usually showed the correct relationship to lead to an answer of 30N, gaining two marks.

Q1(d)(ii)
This question proved very difficult for candidates, with very few scoring any marks. Again, the relationship that the question demands is given in the pre-release material and candidates who selected the correct relationship gained a single mark. Most, however, did not use the Useful Relationships page and so could not quote the relationship.

Q1(e)
About a fifth of candidates recognised that the other force of the interaction pair acts on the Earth. The air and the rocket were the commonest incorrect answers selected.

Q2(a)
Most candidates knew that the spinal cord was the other main part of the central nervous system, but 'spine' and 'backbone' were common incorrect answers.

Q2(b)
Most candidates were able to name the two main types of neuron.

Q2(c)
The quality of answers was very variable. The main problem seemed to be the difficulty in using precise language. Most realised that the impulse is transferred via a chemical, but some gave incorrect ideas such as the chemical being released 'by the synapse'. Most knew that the chemical crossed the gap but did not identify the receptor on the second neuron. They gave vague answers that did not score, such as 'it goes to the other side'. The best answers used the necessary vocabulary such as neurotransmitter, receptor, binds, absorbed, reabsorbed and impulse. Candidates using more basic vocabulary did not make their points clearly enough to sore.

Q2(d)
Most candidates knew how to calculate a percentage, but at higher tier it is expected that candidates can handle rounding of calculated values, including recurring values. In this question, a recurring 6 needed to be rounded. Most candidates did not round this correctly, giving 6.6 as an answer, gaining a single mark, rather than 6.67, which gained 2.

Q2(e)(i)
Similarly to in 2c, the language that candidates used was often too vague for marks to be scored. The correct answer identified the storage and retrieval of information. Vague answers such as 'remembering' or 'holding on to memories' or 'accessing what you know' were not credited.

Q2(e)(ii)
Both marks could be scored by a direct lift of the correct information from the pre-release material. Candidates who correctly identified the relevant sentences scored two marks. However, many candidates discussed the problems with short term memory as ageing happens but did not mention balance at all. Such answers did not score.

Q2(e)(iii)
Most candidates gained some marks here. The key to the answers is the diagram that shows how memory functions (in the pre-release). The commonest error was to explain the diagram, in terms of how memory is transferred between sensory, short term and long term memory. Although not incorrect, this explanation alone could not score because it does not explain the changes that happen as we age. To score marks, candidates needed to discuss how the function of the brain changes due to rehearsal and reinforcement becoming more difficult as neurons deteriorate. Many candidates did not discuss the problems that this causes, but merely described how memory operates. The QWC mark was not always scored. A high number of candidates did not start their sentences with a capital letter and some words that were given in the question were spelled incorrectly.

Q3(a)
Only about a fifth of candidates knew that electrolysis is needed to extract more reactive metals.

Q3(b)
Candidates confused the idea that 'there is not much copper left' with the idea that even when ores are found, the ores contain very small percentages of copper. Answers that only implied that we are running out of copper did not score, because this does not explain why, when copper is mined, there is such a high proportion of waste rock.

Q3(c)
Again, it was often vagueness in the answers that cost marks here. 'It is reused in the process' does not explain how the acid is recycled – this is just a different way of saying 'it is recycled' which is what the question asks. Better answers gave a more specific idea of where the acid was reused e.g. 'to react with the ore'.

Q3(d)
Most candidates correctly stated that the blister process uses heat, but fewer gained marks for the electrolysis. Many candidates said 'the electrolysis process uses electrolysis' which did not score. Better answers discussed the need for large amounts of electrical energy.

Q3(e)(i)
Most candidates knew what 'oxidised' means, but some did not clearly show the idea that there is a reaction involved. Answers which said 'oxygen is added to sulfur' were given a mark, but 'mixed with sulfur' does not show that candidates understand that there is a reaction and so such answers were not awarded a mark.

Q3(e)(ii)
Most candidates gave the correct formulae for copper and sulfur dioxide, but very few balanced the equation correctly. Some altered the formula of copper to make the equation balance e.g. Cu_2.

Q3(f)
Only about one in ten of candidates knew that copper ions gain two electrons during electrolysis. Many discussed 'gaining ions' or 'losing their charge'.

Q3(g)
This part question was poorly answered. Most candidates knew that electrons move when electricity is conducted, but many thought that this happened both in metals and in solution. Only the most able candidates discussed the movement of ions in solution. Some gained 'easy' marks for recognising that metals conduct when they are solid, or that metals contain 'free' (delocalised) electrons.

A220 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).

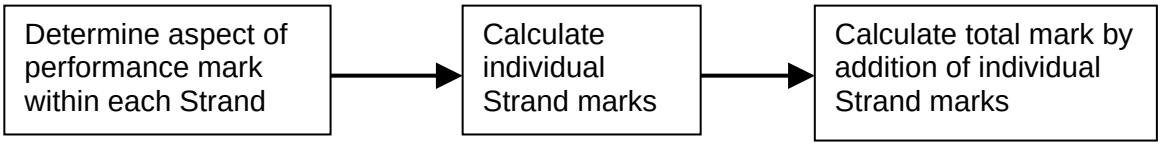
Candidate helpsheets of the generic type which are applicable to any task are allowed and whilst helpful for lower achieving candidates can restrict the opportunities for those higher achieving candidates. There was evidence that some Centres were providing helpsheets which rather than giving broad headings 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 + ½), 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 + ½), the ½ **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 (ii) 4 (iii) n/a	5	
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.

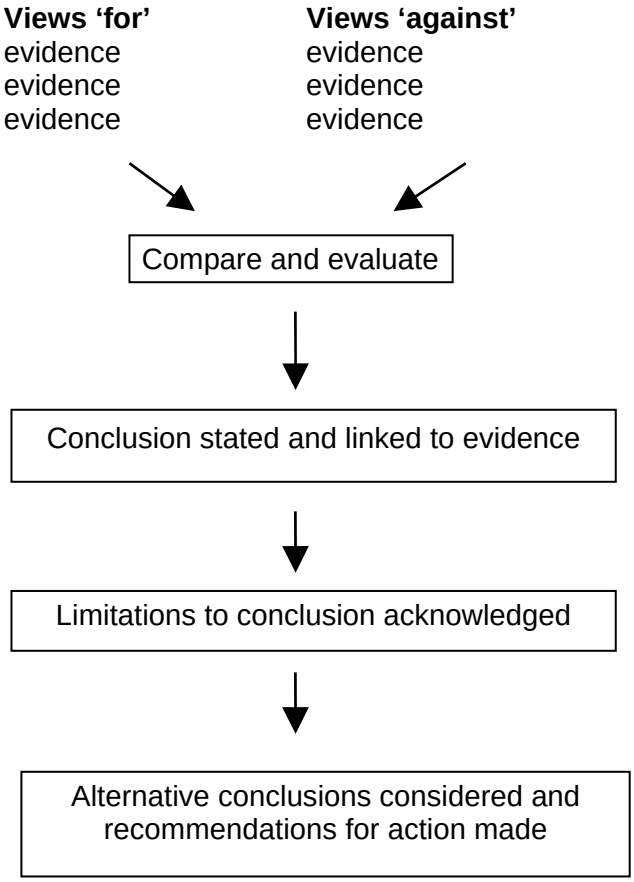
The majority of candidates described the relevant background science in the introduction to their case studies. However, it was only the most able who could integrate their scientific knowledge and understanding with the claims and opinions reported in their studies or extend the scientific knowledge 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

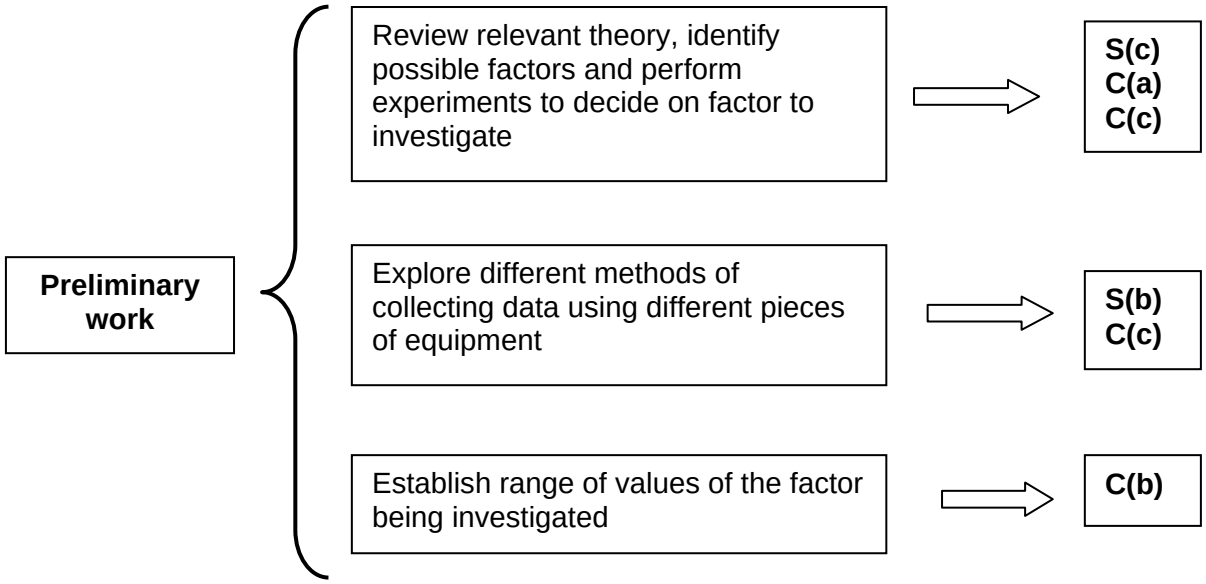
Rates of reaction, resistance of a wire and osmosis were still the most common investigations seen from Centres. However, there was evidence that other topics were being developed by more Centres who had gained confidence from previous years, for example, stretching of plastics and other materials, exercise 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.

	Grade threshold								
Component	**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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