RECOGNISING ACHIEVEMENT

GCSE

Additional Science A

Twenty First Century Science Suite

General Certificate of Secondary Education **J631**

OCR Report to Centres

June 2012

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

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

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

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

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

CONTENTS

General Certificate of Secondary Education

Additional Science A (Twenty First Century Science) (J631)

OCR REPORT TO CENTRES

Overview

The majority of candidates performed well. They, and the Centres that helped them to prepare, should be congratulated. There were examples of lucid, well thought out answers that were a real pleasure to read. However, candidates who are operating at Grade C or below but are entered for the Higher Tier would have had a much more enjoyable exam experience had they taken the Foundation Tier.

Some candidates had problems in structuring their answers to the free response questions, and sometimes contradicted themselves.

As always, candidates should take special care in reading the question. In the pressure of the examination it is very easy to make mistakes of interpretation, which can then severely limit the number of marks available to the candidate. Centres are recommended to train candidates in strategies such as highlighting significant words to enable the candidates to identify the thrust of each question.

A215/01 Modules B4, C4, P4 (Foundation Tier)

General Comments

The paper was well attempted by candidates. Although many struggled with the free response questions, few candidates were unable to attempt them although many just wrote anything they knew about the topic without addressing the question. Poor English resulted in some candidates losing more marks than should have been the case. Very poor handwriting and spelling made some responses difficult to interpret.

Comments on Individual Questions

1 **(a)** Candidates found it difficult to explain the function of the three parts of the incubator. The sensor was best understood with most candidates realising that it measured the temperature but most struggled to explain the effector. Some confused the working of the incubator with the functions of the baby and described the baby's response to temperature changes.

(b) Most candidates knew that bodies lose heat by sweating although a few chose shivering instead.

2 **(a)** **(i)** Very few candidates understood that glucose is reabsorbed by the blood after it has been filtered by the kidneys. Most thought that it remained in the urine.

(ii) Only the better candidates identified both salt and urea as being the other two chemicals filtered from the blood by the kidney.

(b) Most candidates could correctly identified the effect on the urine of three of the given factors but many seemed to expect that there would be two increasing the concentration and two decreasing it. The most common error was to think that exercise would make the urine more dilute.

3 **(a)** The effects on the body of exposure to the cold were well understood with most candidates scoring all 3 marks.

(b) Explanations of the effect on the body of returning to normal temperatures were usually confused and simplistic. A few candidates realised that his body temperature would now rise and some understood that there was an optimum temperature for the enzymes to function. Many candidates simply repeated the stem of the question by stating that the enzymes would function better or described actions that would be taken to bring his body temperature back to normal.

4 **(a)** The colour of salt crystals was correctly described by most candidates but a surprisingly high number thought they were blue.

(b) Most candidates knew that putting sodium in a flame would give a colour, often recalling that it would be yellow although this is not required by the specification. Line spectra were much less well understood and answers referring to the lines present were rare.

(c) Most knew that solutions of sodium chloride conduct electricity but only the best candidates identified molten sodium chloride as the only other conducting state. Solid sodium chloride conducting was a popular choice.

5 **(a)** Most candidates were able to successfully estimate a sensible melting point for sodium using the information given.

(b) **(i)** About half the candidates understood that the number of protons equals the number of electrons with the mass number of 23 being the most common incorrect response given.

(ii) 'Neutrons' was correctly chosen as a component of the atom by the majority of candidates but many thought that atoms were made up of molecules.

(c) Most candidates understood that it would be the electron in the outer shell that would be lost when the sodium atom ionised. The most common misconception seen was loss from the second shell to give 2.7.1 instead of 2.8.

(d) The correct formula for sodium hydroxide was not well known with $NaOH_2$ appearing frequently.

6 **(a)** Although most candidates were aware that a fume cupboard was the best safety precaution when using chlorine gas, a surprising number ticked two boxes.

(b) Most candidates could correctly identify the hazard symbol for 'harmful' but a significant number chose the 'corrosive' symbol instead.

(c) The correct sequence of reactivity of the halogens was given by most candidates although a few listed sodium halides instead.

(d) There were few correct word equations given in spite of all the required information appearing in the stem of the question. For those candidates who attempted to write out a symbol equation few could balance it.

7 **(a)** The majority of candidates were able to either recall the relationship between change in momentum, force and time or to use the information sheet to select the correct calculation for change in momentum.

(b) Candidates showed a good understanding of the effects of braking on the forces acting on the car.

(c) Explanations of how seat belts, crumple zones or air bags work to keep passengers safe were usually restricted to ideas of reduction of injury should there be a crash. Correct science was rarely seen with few references to momentum or force. Some candidates attempted to explain that the time of the impact had increased but wrote phrases which gave the impression that the opposite was happening.

8 **(a)** Most candidates understood that the friction acted in the opposite direction to the force and so could successfully choose the correct arrow.

(b) **(i)** Many candidates were unable to correctly calculate the momentum in spite of being given the relationship at the start of the paper. Every mathematical combination of the figures given appeared. A significant number of candidates did not attempt this question.

(ii) Most candidates thought that momentum rather than temperature would increase as the block was pulled at a steady speed across the table.

(c) Only the weakest candidates were unable to identify the correct point on the graph for (c) (i) and most realised that the graph showed a positive correlation between mass and friction. A few thought that the graph showed no link between mass and friction.

9 **(a)** About half the candidates were able to correctly calculate the average speed as 10 ms^{-1} but answers of 20, 5 and even 0 appeared regularly.

(b) The majority of candidates were unable to correctly sketch a velocity time graph for the ball after the bounce. Some were able to identify the initial and final velocities from the information given but then sketched curves or lines which reached a peak in the middle. The quality of lines drawn was often poor with wobbly and 'multiple' lines frequently seen, some tolerance was permitted for a free hand line but most went beyond what could be considered acceptable.

(c) The relationship between the height of the ball after the bounce and its gravitational potential and kinetic energies was generally well understood although many candidates got them the wrong way round.

A215/02 Modules B4, C4, P4 (Higher Tier)

General Comments

There were no indications that any candidates had insufficient time to complete the paper.

In the main, candidates seemed to perform equally well across the Biology, Chemistry and Physics sections of the paper. In each subject there were areas of weakness, such as enzyme action, chemical symbols and equations, and the idea of momentum.

Where there were questions requiring an extended response there was a low incidence of candidates offering no response at all. This is likely to be due to good preparation by Centres, who are to be congratulated on this.

Comments on Individual Questions

1 (a) (i) asked candidates to indicate what happens to glucose after it has been filtered in the kidneys. A number of candidates gave true statements which did not answer the question eg “it is used for energy”. While reference to active transport was not required to gain the mark, it was pleasing to see some candidates mention it.

(ii) required the candidates to recall that both salt and urea are also filtered at the kidneys. No marks were scored if one of the correct options was chosen along with an incorrect one. Virtually all candidates followed the rubric and made two choices.

(b) was about the effect of different factors on urine concentration. Options A, C and D should go in the left hand box, and B in the right hand box. Most responses had B in the correct place, but with one of the others on the right hand side as well, perhaps suggesting that candidates were strongly tempted to have two options on each side. It was extremely rare to see complete confusion with all of the options in the wrong boxes, and virtually all candidates spotted that drinking lots of water makes urine more dilute (B).

(c) (i) required recalling that ADH is released from the pituitary gland, and this was very well answered.

(ii) was about working through the effects of Ecstasy on ADH and urine production. The correct order of the correct statements is ECA. A few responses had the correct letters in the wrong order, and so did not score. Many had one or more of the letters wrong.

2 (a) called for candidates to reason that dehydration would cause sweating to stop, and that cessation of sweating in a hot environment would lead to a rise in body temperature. The most commonly scored marking point was “dehydration” and it seemed that only the most able were successful in scoring all three marks.

(b) required recall of sponging with water and fanning as the correct treatment for heat stroke. Both were required to score this mark, a lot of responses had sponge with water and a second wrong option perhaps hinting at incomplete recall of the necessary facts.

3 **(a)** called for recall of the term “active site”. This was generally well done, although some candidates did offer “synapse” as their response. There may have been a temptation to do this for those who had not carefully read the labels already on the diagram.

(b) was another question calling for some reasoning, this time to explain why enzymes do not work so well above optimum temperature. Many responses gained credit by including the term “denature” but many of these could have gained more credit by going on to give detail either of how changes to the shape of the active site would affect the reaction, or of how denaturing is permanent. As always, a proportion of the candidates gave confused responses about which is the lock and which is the key – this is an area worth stressing to future candidates.

4 **(a)** required candidates to work out a value for the melting point of sodium from information supplied. Very few got this wrong by giving too high a figure, the great majority of incorrect responses gave too low a value.

(b) was better answered by more able candidates, who correctly matched proton number to electron number and realised that the missing particle is neutron.

(c) was not well answered. As in previous sessions candidates seemed to have a poor grasp of the chemical formula for sodium hydroxide. It was particularly disappointing on this higher tier paper to see so many responses including S for sodium.

5 **(a)** most candidates gained credit for the colour of the flame when sodium is present, only a minority showed any awareness of spectral lines.

(b) was a series of six true/false options for 2 marks, which showed that many candidates were ill at ease with the idea that ions will separate when sodium chloride dissolves. This area was also weak when assessed in previous sessions, so ionic behaviour continues to be a useful area to concentrate on with future candidates.

(c) was very poorly answered, with few candidates able to work out that the charge on the phosphate ion is 3-. This may be related to weakness in interpreting chemical formulae (see 6c below).

6 **(a)** saw some candidates get chlorine, bromine and iodine in the correct order, but a number of responses were marred by reference to sodium chloride etc.

(b) was well answered by the more able candidates, but a number dropped the mark by writing iodide rather than iodine. This may have been carelessness, or it may point up an area for further practice with future candidates.

(c) called for writing a balanced symbol equation. The majority of candidates seemed unaware of the meaning of Br_2, and so failed to balance the equation correctly. A significant number of candidates made fundamental errors, such as introducing new species on the right hand side of the equation.

7 **(a)** was not well answered, showing that the majority of candidates were unable to rearrange the equation linking force and change of momentum given at the front of the exam paper.

(b) was better answered, many candidates realising counter force is greater than driving force in this scenario.

(c) clearly called on candidates to use ideas about momentum to explain how a crumple zone reduces the force on the occupant of the car. Responses often displayed confusion about momentum being taken away or slowed down or absorbed. There was further weakness in some cases in trying to relate the crumple zone to forces without using momentum in the answer at all. Some of the difficulties may have been with the use of language, but it would seem that some misunderstanding of the equation tested in part a is also evident from the responses to this question.

8 **(a)** called for the directions of three forces to be identified. Where this mark was not scored it was often through reaction or friction being in the wrong direction.

(b) called for the identification of two correct statements. It was pleasing to see virtually all candidates stick to just two ticks.

Most scored at least 1 mark here for saying that Bill transfers energy to the block by doing work on it.

(c) **(i)** had the correct option of 1.35J, but it would seem that most candidates simply guessed a response as there was no clear pattern to the incorrect responses. There was no evidence of the graph being mis-read from the few candidates who did make marks on the graph to read off the force.

(ii) was in contrast much better answered, showing some appreciation of momentum.

9 **(a)** asked the candidates to work out the average speed, and many candidates were able to correctly determine it was 10m/s.

(b) should have been answered with a straight line from (2.0,-15) to (3.5,0) and some of the candidates who realised this still failed to score both marks because they did not use proper equipment to draw a good single straight line. This is an area which candidates have been weak on in previous sessions, and is another useful area to work on for future candidates.

(c) required the terms increases and decreases to be inserted into the sentence in that order, and many of the candidates did indeed do so.

A216/01 Modules B5, C5, P5 (Foundation Tier)

General Comments

This is a legacy GCSE Additional Science paper. The paper was of similar format to previous sessions and had questions with a similar demand. The candidates have produced a good overall performance and it was encouraging to see that they were able to demonstrate their knowledge of the three areas being tested. Improvements are needed in the way that candidates express themselves in the questions that involve written explanations.

Comments on Individual Questions

1 **(a)** The most common error was the reversal of the positions of oxygen and nitrogen.

The gases hydrogen and water vapour also made frequent appearances.

(b) The argon symbol was usually correct, but Centres need to emphasise the necessity of ensuring that the second capital letter in carbon dioxide should be close to the size of the first one and subscripts should be clearly so.

(c) Although most candidates obtained one mark for small (molecules) or weak (forces), gaining the third mark for ease of separation was extremely rare.

2 **(a)** Candidates rarely gained a mark for their explanation and references to the physical dangers involved were extremely rare.

(b) **(i)** This is not a well-known part of the syllabus and was frequently omitted by candidates.

(ii) Most candidates did not know how to begin to write a word equation, often having lead oxide as a product.

(iii) "It is a dense metal" was the most common error.

(iv) The term reduction was very rarely seen with candidates offering deoxygenation or even oxidation.

3 **(a)** This question was a good discriminator but many candidates gave the reciprocal of the answer.

(b) Resistors in parallel circuits is not well known and there were many "no responses" to the question. Quite a few candidates lost marks by referring to a current increase of 0.7A instead of 0.07A.

4 **(a)** Many candidates think that the UK mains supply is d.c.

(b) This part was well answered.

(c) Again well done, with "decreasing the weight by removing the iron" being the most common error.

5 **(a)** Calculations of electrical energy were usually correct.

(b) The necessity of showing all working needs to be emphasised.

Some candidates gave 1.80 as their answer, but since they forgot the £ sign it was not possible to award the mark. The answer 180p was expected.

(c) Usually correct.

(d) Far too many candidates opted for an answer without a factor of 100 in it.

(e) Usually correct.

6 **(a)** Most candidates know where DNA is found.

(b) Most candidates know DNA is carried to where proteins are made.

(c) Amongst those candidates gaining only one mark, the most common error was giving “genes” as the answer to “during the growth part of the cycle”.

(d) Quite well done considering the higher difficulty level of this mitosis question.

7 **(a)** Very few candidates gained both marks for sequencing the statements about reproduction in bears.

(b) This question was not well done at all with most candidates giving 37 as their answer.

8 **(a)** Candidates found this question very difficult with most scoring zero and the “no response” rate was high. A common error was to contradict themselves in the same sentence eg “plants have meristems but animals have unspecialised cells”.

(b) **(i)** Most candidates confused photosynyhesis with phototropism.

(ii) However, most candidates usually got his part of the question correct.

A216/02 Modules B5, C5, P5 (Higher Tier)

General Comments

The difficulty of this paper appeared to be appropriate for the candidates for whom it was intended.

There were some excellent responses to the long answer questions although some candidates simply repeated the stem of the question. The lack of skill with the carrier language was a large determining factor in the number of marks awarded to many candidates in long answer questions.

There was no problem with the time allocated for the paper.

There were very few No Responses but a few candidates did not even attempt some of the multiple choice questions which needed only a tick in a box or a ring around an answer.

Comments on Individual Questions

1 **(a)** Many candidates failed to include a response to the first bullet point and did not state how the risk was created. Others had difficulty in identifying who was at risk and made vague statements about the environment. Weaker candidates simply copied the information from the boxes. There were some excellent clear concise responses gaining all 3 marks.

(b) **(i)** A few candidates did not know what state symbols were despite one being done for them. Most gave the correct state symbol for sulphur dioxide, but many were unsure of the state symbols for the other two substances.

(ii) Lead sulphide and oxygen were common incorrect entries in the equation. Some candidates tried to use symbols and some a mixture of words and symbols.

(iii) Most candidates obtained this mark. The most common incorrect response was 'it is a pollutant'.

(iv) Very few candidates scored this mark. The common response was some variation of 'de-oxygenation'.

(v) Most candidates attempted balancing this equation. It differentiated well.

(c) Many candidates were unable to do this calculation – there were significant numbers of No Responses.

2 Some candidates scored full marks, but many confused the bonding *within* the molecules with the bonding *between* molecules. The relative reactivity of nitrogen and oxygen was often mentioned.

3 A common mistake in this question was for the candidate to draw three lines, but many candidates scored 1 or 2 marks.

4 **(a)** Many candidates correctly calculated the resistance to 40 ohms; but 0.07ohms was a common incorrect answer.

(b) Candidates scoring here did so usually with a single, one mark, creditworthy response although three marks were available. Many said that the total resistance would increase as resistors were added in parallel.

5 **(a)** This question was generally well answered. The most common incorrect statement chosen was 'd.c. can only come from batteries'.

(b) **(i)** Most of the candidates who lost this mark did so by choosing 'copper' instead of 'iron'.

(ii) There were many correct responses and no pattern in incorrect ones.

(c) There were very few correct responses. Candidates failed to spot the units used in the question and responded with 2A instead of 2000A.

6 **(a)** **(i)** Many candidates got this question correct – with 'power shower' being the common.

(ii) 804 was a very common incorrect response here. 96 also appeared frequently.

(b) **(i)** Metal, magnet, steel and rubber were all seen as incorrect responses but there were many correct answers.

(ii) Many correct answers with no pattern in incorrect responses.

(iii) Many candidates were able to calculate the energy wasted in the transformer correctly. Common incorrect responses were 19.6 and 490.

7 **(a)** Most candidates answered this question correctly.

(b) Those candidates scoring 1 of the 2 marks usually did so with the first two boxes correct.

(c) There were many correct responses to this mitosis question. The most common incorrect answer chosen was 'the new cells are genetically different.'

(d) The full range of marks were awarded for this question although there were some No Responses. The most common mark was 1 for the idea of the code of bases. Few candidates appreciated that it is the order of amino acids that determines the protein. Many copied the information from the stem of the question.

8 **(a)** Many candidates scored two marks. Those scoring 1 usually did so with 'many of its genes inactive:'

(b) Candidates scoring just one mark here usually did so with the first two boxes correct.

9 **(a)** Nearly all candidates chose 'Michael' but many added 'Adele'.

(b) Few candidates scored this mark; many ringed 'auxin' but did not ring 'hormone' as well.

(c) As with Q3 many candidates drew three lines despite a clear instruction to 'Draw one line to join ..... '..

A217/01 Modules B6, C6, P6 (Foundation Tier)

General Comments

There were no indications that candidates lacked sufficient time to complete the paper. Candidates found it easier to demonstrate their understanding of science with the objective questions. A small number may not have been well prepared for the questions requiring extended writing since they made no response to these questions despite answering most of the rest of the paper (this was particularly noticeable with the overlap question 6c concerning the neuron and reflex arc).

Comments on Individual Questions

1 This question on sound waves and their properties was poorly answered especially (a) (ii) and (c) where two answers were required and frequently neither were correct.

2 (a) & (b) The majority of candidates correctly identified the position of microwaves in the electromagnetic spectrum but were less accurate in deciding that it was the frequency of the wave which increased. Part (c) was the first free response question and there was some confusion between the object, the microwave oven and the microwaves which were emitted. However most candidates showed an understanding of how food is cooked by microwaves and the need for protection from them. There were quite a few references to heat waves and the weaker candidates even thought that the light inside the oven was responsible for providing heat.

3 (a) & (b) Most candidates earned a mark for understanding that radio waves pass through air without being absorbed. However the term 'modulates' was less well understood. Part (c) proved particularly difficult for the majority of candidates who only gained a mark for reference to the signal strength becoming weaker as the distance increases.

4 This was the first of the Biology questions.

(a) Required knowledge of a simple reflex.

(b) Candidates demonstrated a reasonable understanding of the parts of the nervous system.

(c) A good understanding of memory function was shown.

5 This question was usually answered well. Confusion over the actual number (billions) of neurons being the most common error.

6 **(a)** This was an overlap question and weak candidates struggled to earn any marks. It was often not attempted. The details of a reflex arc were not known. It was commonly assumed that it includes a pathway to the brain. However, it was encouraging to see references to the insulating properties of the myelin sheath, even if these, at times, referred to temperature rather than speed of conduction.

(b) As is often the case when two correct answers are required for the mark, one answer is correct and the other incorrect. Few candidates appreciated that a hormone secreting cell is also an effector.

7 The first of the Chemistry questions.
(a) & (c) It was pleasing that most candidates can recognise the meaning of symbols on bottles and the end of a reaction by the 'fizzing' stopping.

(b) Candidates struggled to recognise the gas evolved from adding hydrochloric acid to a carbonate and with naming the salt formed even though its name was provided in the question. A common error was to name it sodium chloride. Perhaps a misunderstanding of the word 'salt'.

(d) Very few candidates attempted this question but those that did were usually correct.

8 **(a)** Most candidates chose the correct equation.

(b) The majority of candidates recognised that time was an important factor but were less successful in describing when it should be measured. Only a few candidates referred to the 'volume of gas evolved' or the 'change in mass of the reactants' as examples of what could be measured.

(c) Occasionally this question was not attempted. Few candidates gained full marks with the most common error being an incorrect vertical level.

(d) Few candidates gained full marks often choosing to grow their crystals after all the water had gone and also thinking that zinc sulfate would be left behind on the filter paper even when the question states that there is a solution of zinc sulfate.

A217/02 Modules B6, C6, P6 (Higher Tier)

General Comments

Although the majority of candidates seem to have been entered for the correct tier, there were some who clearly could not cope with the level of difficulty. Weak candidates whose best grade is not going to be more than C should always be entered for the Foundation Tier paper. It should not affect the grade that they earn, but it would definitely give them a more enjoyable examination experience.
Candidates still struggle to earn marks for even the simplest free-response questions, suggesting that they do not practice this skill enough as part of the course. Weak candidates often fail to use scientific vocabulary in their answers, leading to ambiguities which can lose them marks.

Comments on Individual Questions

1 This question also appeared on the Foundation Tier paper, so was designed to be easier than the other Physics questions. Nevertheless, only about half of the candidates were able to identify the correct way of calculating the frequency of the wave from its oscilloscope trace. Similarly, only a small minority of candidates knew that the speed of sound was independent of its frequency. Many candidates could not identify the correct description for a longitudinal wave, but stronger candidates knew that sound waves could not pass through a vacuum. A surprising number of candidates thought that sound could not travel through solid objects.

2 It was good to find that many candidates were able to place microwaves and infra-red in their correct places in the electromagnetic spectrum. Fewer knew that the components of the spectrum were arranged in order of increasing frequency; intensity and radioactivity were popular wrong answers. Candidates struggled to earn many marks for the free response part of the question, either because they didn't know what interference was or were unable to write down unambiguous answers with the correct technical terms.

3 Most candidates struggled to earn any marks at all for this question about digital communication. Very few candidates chose to end the first sentence with the term modulated, often preferring to use the terms diffracted, transmitted or reflected. Only a minority of candidates knew that radio waves are useful for communications because they are not absorbed by air; most favoured the idea of diffraction in all directions. The last part of the question required a free response from candidates. Although some knew that the on-off nature of digital communication was the secret behind the high quality of their transmissions, candidates often failed to mention that the noise was picked up in transmission but cleaned up in the receiver.

4 This question also appeared on the Foundation Tier paper. Many candidates failed to use enough correct vocabulary to earn the marks in their free-response explanation of reflex arcs. As always, many thought that the insulating properties of the fatty sheath were thermal rather than electrical, and a disappointing number of candidates thought that reflex arcs involved the brain. Many failed to mention the word impulse, using less precise terms such as message or signal instead. For many candidates, an apparent lack of planning meant that their answers were confusing and badly ordered. Only a minority of strong candidates could identify hormone secreting cells as being controlled by motor neurons; retina cells were a popular incorrect answer.

5 This second Biology question was completely objective, so most candidates did not have to think about expressing themselves clearly. However, many did not do very well. Only half could identify the advantages of reflex actions for simple organisms or reasons why complex organisms can learn new skills. Similarly, only a minority of candidates knew about the role of long-term memory in learning a new skill, or how memories can be triggered by associations.

6 This was the last of the Biology questions, and for many of the candidates the first part of it turned out to be the hardest. The majority of candidates were unable to select the correct sentences describing the operation of a reflex action. Of those who could select the correct ones, only half managed to get them in the right order. The rest of the question proved to be much easier, with many candidates able to earn full marks.

7 The majority of candidates were able to correctly state the name of the salt produced in the reaction, and complete the balanced symbol equation for it. However, only strong candidates knew that acid solutions always contain hydrogen ions.

8 It was good to find that almost half of the candidates were able to calculate the relative formula mass correctly. However, only a minority of those were able to use this to calculate the mass of zinc sulfate. Indeed, a substantial number of candidates provided no answer at all, suggesting a general weakness in their understanding of this type of calculation. The final part of the question was about the links between particle concentration and reaction rate. Too many weak candidates failed to read the rubric correctly and tried to link every box on the left to every box on the right. Although most candidates knew that adding a catalyst made the amount of product rise more rapidly than before, only a minority realised that the final total amount of product remained unchanged.

A218/01 Ideas in Context (Foundation Tier)

General Comments

Candidates were entered appropriately for this tier and appeared to have time to complete the paper. It was again encouraging that candidates were clearly referring to the written articles to help frame their answers. However, candidates appeared to be less discriminating than in previous years in the way that they selected the material and also in their ability to add to their answer by bringing their own knowledge to bear.

This year there were fewer of the Biology and Chemistry questions left blank than in the previous year. Some were still left blank in the Physics section, though even here there were fewer than the year before. Examiners did notice that the general quality of responses to the Physics section was markedly lower than for the rest of the paper. Examiners also noted that neither of the calculation questions were well attempted.

Comments on Individual Questions

Question 1

Candidates were clearly comfortable with the concept of homeostasis and most were able to bring their own basic knowledge into their answers.

Most candidates could extract appropriate information from the article, so in Q1[ai] were able to identify the core temperature for the onset of hypothermia. To gain credit in this part, candidates had to use the information in the table rather than give a temperature range. In 1[aii] the advantage of shivering was well understood, with many candidates realising that heat is generated. Candidates expressed themselves lucidly, so were able to gain credit for both the understanding and also for the Quality of Written Communication. One of the marking points was for the role of muscles in this process, and some candidates managed to score this mark.

Most could define homeostasis in 1[aiii]. If candidates did miss a crucial part of the definition, it was likely to be that of the *maintenance* of a constant environment. Even those who could not define the term showed clear understanding of the context and wrote about receptors, effectors, and negative feedback. That temperature receptors are found in the skin was well understood, and some candidates knew that the temperature receptors for the blood are in the hypothalamus.

In Q1[b] the vast majority of candidates correctly matched the temperature to the stage of hypothermia but, unsurprisingly, the percentage calculation caused enormous problems. A small number of candidates who got the calculation wrong were able to show sufficient working to gain credit. Most of the wrong answers were not accompanied by any working at all so these candidates debarred themselves from any chance of the mark. Centres should remember that examiners are looking for opportunities to give credit, not to take it away.

The last two parts of question 1 were common with the higher tier paper. Most explanations of why wet clothes increase the risk of hypothermia were along the lines of ‘wet clothes give you hypothermia because they are wet on your skin and make you feel cold’. While these answers did not contain enough scientific understanding to be awarded credit, examiners were encouraged that even the weakest candidates engaged meaningfully with the question. A few candidates were able to get credit for discussing heat loss, but very few mentioned evaporation.

Similarly, there was much meaningful engagement shown in part [d] by the large number of responses that quoted the symptoms of severe hypothermia rather than explain why it is so dangerous. Candidates who discussed reduced enzyme function gained credit, though there were many incorrect suggestions that the enzymes were denatured under these conditions.

Question 2

Most candidates could interpret the table and state that iodine has the highest density in Q2[ai], and some went on to tie the information about melting points to their knowledge of the Periodic Table. Weaker answers sometimes discussed boiling point or reactivity.

Questions 2[bi] & [bii] were common with the higher tier paper. Recall of the colours and states of halogens was well attempted by the more able but, as in previous years, many candidates did not appear to recognise the terms. A sizeable minority left this question blank. More candidates were able to extract suitable information from the article to suggest why a spillage of chlorine would be so much more hazardous than one of bromine, and also to discuss health problems in Q2[biii].

Almost all candidates were able to identify the hazard symbol in Q2[ci]. Examiners regretted that they could not give any credit to the candidates who gave very sensible answers but described the hazard in their own words “it burns the skin” but without using the term word “corrosive”. While the use of gloves was commonly understood to be a sensible safety precaution for handling bromine, there were large numbers of generic rather than specific responses for the second precaution. Answers such as “tie hair back”, “work tidily” or “wash hands” were not enough to gain credit.

In Q[2d] many candidates were able to score one of the marks for the word equation, and the more able scored both. Confusion between endings was common, eg sodium iodine instead of iodide. There were many references to sodium bromide.

In Q2[e] counting the number of electrons in a chlorine atom allowed grade F candidates to demonstrate their ability compared to grade G candidates. Candidates at the higher end of the spectrum showed their ability by correctly giving the electron arrangement.

Question 3

Candidates were nowhere near as comfortable with the Physics component as they were with the other two. They found the calculation in Q3[a] even more difficult than the one in Q1[bii], with most dividing the large number by the small number.

While a minority did not attempt parts b and c, examiners noted that the omit rates were lower than has happened in some previous years. Some candidates did gain credit by suggesting suitable changes to the generators for Q3[b], though references to step-down transformers were not allowed.

In Q3[c] many candidates recognised that cables lost more power, and a minority realised that the figures for the two sets of transformers should be included. A few candidates realised that energy is lost in the cables of the National Grid in the form of heat, but mentions of resistance were rare.

The voltage of the mains supply in Q3[d] was known by many. Fewer could state that the supply is alternating, with many suggestions that the mains supply uses digital current.
Q3[e] was common with the higher tier paper, so candidates’ difficulties here were to be expected, and a significant minority did not attempt this question. There was much confusion between motors and transformers. Many suggested that the coils or the whole generator rotated. Mentions of magnetic field or of induction were rare.

A218/02 Ideas in Context (Higher Tier)

General Comments

Candidates made good use of their time. There were few unanswered questions; most candidates making an attempt at every question on the paper. Some candidates do not tailor their answers to fit the number of marks allocated to each question and hence do not make enough separate, clear points to access all of the marks available.

The standard of answers was variable, with some 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 may have more opportunity to show their knowledge and understanding by taking the foundation tier paper.

1 (a) (i) Most candidates did not identify two effectors. Most gave examples of what happens during temperature homeostasis eg shivering or vasoconstriction.

(ii) Most candidates knew that the hypothalamus acts as a processing centre and/or sends impulses to effectors. However, many answers talked in vague terms about 'receiving temperature information from the body'. Fewer candidates correctly identified that data about temperature comes from skin receptors or that the hypothalamus detects blood temperature.

(iii) Many answers were too vague to score, stating that negative feedback stops us getting too cold or too warm. Better answers discussed the reversal of change to a steady state.

(b) Some very good answers described the movement of blood to vital organs and away from the skin surface. However, other answers incorrectly discussed heat, rather than blood, leaving the extremities and linked the heat loss to the paler colour. Some candidates incorrectly discussed blood vessels moving away from the surface of the skin, some discussed vasoconstriction of capillaries.

(c) (i) Just over half of the candidates correctly selected and processed the data to give the correct percentage. Most knew how to go about doing the calculation but incorrectly added the individual values.

(ii) Again, most candidates knew how to calculate the mean, but made arithmetical errors in doing so, resulting in most failing to score for this question.

(d) This question was not well answered. A common error was to answer from an 'everyday experience' rather than a scientific viewpoint. Answers such as 'wet clothes make you feel colder' or even 'wet clothes will freeze on your body' were common. Better answers focussed on the heat loss caused by evaporation of the water.

(e) Just over half of the candidates gained at least one mark, usually for a comment that more heat is lost. The link to enzyme activity was not always made with most candidates giving vague answers about your body 'slowing down' or becoming too cold to function normally.

2 **(a)** **(i)** About a third of candidates gained at least one of the available two marks. A very common misconception was that electrons move when a solution of an ionic compound conducts electricity.

(ii) Most candidates correctly balanced the equation, but many found the state symbols problematic. There was confusion about the states of the two halogens and many gave (l) rather than (aq) for the state of the solution.

(iii) Both products needed to be correct for one mark. Many candidates correctly named one product, but only about a third of candidates named both.

(b) **(i)** Most candidates gained at least one mark, usually for the correct colour and state of chlorine. Many thought bromine was a gas. There was also confusion about the colour of bromine, with 'purple' being a common, incorrect colour.

(ii) Answers leading to one or two marks were very common. Both key ideas were well understood. However, many candidates only gave one reason for chlorine being more hazardous, even though the question clearly asked for two.

(c) This question was well answered, with over sixty percent of candidates gaining at least partial credit for comparing the electron structures of sodium and potassium.

(d) **(i)** Just over half of the candidates gained a mark for correctly identifying the relative reactivity of the two halogens.

(ii) All three properties had to be mentioned to gain this mark. Commonly, candidates did not use the data in the table but discussed other properties e.g. reactivity. Some candidates omitted one of the properties and only discussed the other two.

3 **(a)** Most candidates gained at least one of the available marks, with the full range of marks being seen. Most knew that the magnet spins inside the coil and that this is involved in induction. Some stated that this 'induces a current' but other, very good answers correctly discussed varying magnetic fields and electromagnetic induction of a voltage. Some misunderstood the diagram and described the action of a motor rather than a generator, believing that an ac input was causing the magnet to move.

(b) About two thirds of candidates gained at least one mark. Some understood that the amplitude would increase. Most understood that the frequency would increase, but did not always draw this as being exactly double (the mark scheme was generous in the 'error margin' allowed as this was difficult to draw). Few answers clearly showed both increasing.

(c) **(i)** Most candidates correctly stated that the energy is lost 'as heat' but few were able to describe how the heat is generated in the cable. Some thought that electrons strike into each other, rather than the idea that they are colliding with the positive ions in the metal lattice.

(ii) Many repeated the information in the article but did not clearly discuss the idea that energy is lost when the distance travelled is large, or that most of the demand for electricity is in the south.

(d) This question was very challenging, with very few candidates selecting and correctly manipulating the data to give the correct answer.

A220 – Skills Assessment

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

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

Section 1: Administrative issues
Whilst the majority of Centres have excellent administrative procedures in place there were still a significant number who caused the moderating team a considerable amount of extra work to ensure that candidates were credited with the correct marks. Few Centres included details of how each of the tasks used for assessment had been introduced and presented to candidates and this meant that on occasions moderators could not easily find the evidence to support the marks that were awarded by the Centre.
Most candidates' work was annotated with the use of the assessment criteria codes, however, in a number of cases the annotation was a very generous interpretation of the criteria and sometimes completely incorrect.
There was evidence that some coursework from a small minority of Centres had been reviewed and annotated by teachers giving candidates specific guidance about how to improve their marks. Another example of unacceptable assistance included the use of helpsheets giving detailed task specific points and leading questions involving particular words or phrases in the mark descriptions.
There was evidence that in some cases, particularly in the Case Study, candidates were copying and pasting information from websites without acknowledgement and referencing of the source. This action constitutes malpractice, for which a penalty may be applied.

Section 2: Assessment and marking framework
A significant number of Centres were still not following the correct procedure for calculating the Strand mark from the appropriate aspect of performance marks and were required to re-calculate or re-mark their candidates' work. Each aspect of performance should be considered in turn, comparing the piece of work first against the lowest performance description, then each subsequent higher one in a hierarchical manner until the work no longer matches the performance description. There was a tendency for some Centres to award marks on the basis of candidates matching one high level aspect of performance description within each Strand without ensuring that the underpinning descriptions had been matched.

Section 3: Data Analysis

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

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

Strand I: Interpreting data

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

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

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

Strand E: Evaluation

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

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

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

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

Section 4: Case Studies

General comments

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

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

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

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

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

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

Section 5: Investigations
Rates of reaction, resistance of a wire and osmosis were still the most common investigations seen from Centres.

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

Many candidates provided a list of appropriate apparatus for their investigations but had not linked it to their preliminary work and not indicated why the apparatus had been selected in preference to alternative equipment.
The complexity of a task, S(a) depends on the demand and challenge involved in the approach adopted by the candidate and too often 7 or 8 marks were awarded for straightforward approaches to the task. 'Resistance of a wire' investigations were frequently over marked in this aspect.

Strand C: Collecting data
It was pleasing to see that the majority of candidates used suitable ranges of the appropriate variable to study and appreciated the need to repeat their measurements to obtain a wide range of data. However, a discussion of the factors to control was often rather limited for C(a) and only the better candidates described in detail how the factors had been controlled and monitored during the experiment.
There was continuing evidence this year that candidates were doing preliminary work to establish the range of values of the appropriate variable to be used C(b). However, although some candidates presented their results in a table they did not use the results to explain how it informed their main method. Too often, candidates did not consider their results as they were being collected so that obvious outliers were either ignored, or included without comment when calculating average values. It was very rare to see that a candidate had performed further repeats to replace the outlier to ensure that the data was reliable and of the best quality.
From inspection of results tables it was pleasing to see that candidates were taking more care and data was generally of good quality. However, there was little evidence of candidates performing preliminary work which involved making decisions about adapting the type of apparatus or method to ensure the collection of the most accurate and reliable data (C(c)).

Strands I and E
In general candidates achieved their poorest marks in these two Strands. For more details see the comments in the Data Analysis section.
The Twenty First Century Science model for Investigations aims to give credit for candidates who process their results, look for patterns and then suggest explanations using their scientific knowledge and understanding. Very often candidates did not link their conclusions with their scientific explanations I(c).

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

Section 6: Final comment
All members of the moderating team recognise the considerable effort needed by Centres in assessing and presenting candidates' work for moderation. We would like to record our thanks and appreciation for a thorough and professional job carried out by the majority of Centres.
The structure of Case Studies, Data Tasks and Investigations has been modified in the new specifications in the light of the new regulations for Controlled Assessment. Training for the new model is on-going and details are available in the OCR Training Handbook. There is further guidance about the interpretation and application of the new assessment criteria on the website www.ocr.org.uk.

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

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553