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GCSE

Additional Science A

Twenty First Century Science Suite

General Certificate of Secondary Education **J631**

Report on the Units

June 2010

J631/R/10

Oxford Cambridge and RSA Examinations

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GCSE Additional Science A 21st Century (J631)

REPORTS ON THE UNITS

Chief Examiners' Report

As in the spring examination series, the papers for A215-7 have changed from using solely objective style questions to a mix of objective and free-response questions. Again, this resulted in a drop in the mean marks compared to previous series in which the papers comprised wholly objective questions.

Examiners noted that a large group of candidates left the free response questions blank. Centres are reminded that those candidates who have practised responding to every question, no matter how minimal their knowledge, always score significantly more than candidates who leave questions blank.

The open nature of free-response questions meant that many candidates found it hard to express their ideas coherently, or to use technical terms correctly – even though the same candidates showed their mastery of ideas and terminology in objective style questions.

Candidates should be reminded to pay particular attention to the ways in which different objective style questions should be answered. In questions where lines are to be drawn between boxes, it is important to draw the correct number of lines. In questions that instruct candidate to pick ticks against a specified number of responses, it is important not to exceed this number.

As in previous years, examiners felt that some candidates who had been entered for the Higher Tier paper would have been far more able to show their ability, and to gain a higher grade, if they had been entered for the Foundation Tier paper instead.

There was no evidence that shortage of time was an issue. Almost all candidates completed each question paper, and items located at the end of the papers were seemingly answered to the same level of success as those towards the start.

Finally, it is important to note that many examiners commented on the impressive nature of some of the answers they saw. There were examples of lucid, well thought out explanation that were a real pleasure to read.

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

General Comments

This was the first paper of the June season to have free response questions. This lowered the mean mark only slightly, suggesting that centres have taken some trouble to make their candidates aware of the need for precision and clarity in their writing. However, candidates earned a significantly smaller proportion of the marks on free response questions than objective ones. In particular, too many candidates failed to fully understand the context of the question, often appearing to answer questions which had not been asked.

Comments on Individual Questions

1 Part (a) was, as intended, an easy start to the paper, with the majority of candidates earning both marks. Part (b) was not objective, so candidates had to rely on their ability to communicate their answers. Very few candidates earned both marks. Most mentioned sweating, with no attempt to give any more relevant detail, such as the need for receptors or that it is the evaporation of the sweat which produces the cooling. As usual, there was a significant minority of candidates who wanted blood vessels to rise to the surface of the skin.

2 This question was about breathing. It also appeared on the Higher Tier paper, so it was harder for weak candidates to earn the marks. The majority of candidates earned no marks at all for recalling the name of a process for part (a), but performed significantly better in part (b) where they had to describe a process by selecting statements. Part (c) proved to be easier than expected, with only the weakest candidates failing to recognise why constant body temperature is important.

3 Only half the candidates earned the mark for part (a) about changes in the concentration of blood plasma, irrespective of their ability, suggesting that most of them were discounting "stays the same" and then guessing. Part (b) involved a written response about reabsorption in kidneys, with too many candidates giving answers that were too unclear or imprecise to earn some of the marks. Some weak candidates appeared to be confusing reabsorption with digestion. Part (c) proved to be almost as hard, with many candidates earning no marks at all.

4 This was the first of the chemistry questions, testing candidates about Group 1 elements. The vast majority earned the mark for part (a)(i), so were able to use the periodic table effectively. Part (a)(ii) proved to be harder, with only a minority of candidates able to relate the atomic mass and atomic number with the numbers of protons and electrons. The majority of candidates could identify the correct reason for the ordering of the elements in the periodic table for part (b). Many found the ionic equation hard, with only half of the strongest candidates earning the mark. Parts (c) and (d) were about the reaction of lithium with water, with many candidates only earning one of the two marks available. Oxygen was a popular incorrect answer for the word equation, as was catching fire for the reaction outcomes.

5 This question was about chlorine. Only half of the candidates knew that chlorine was added to water to kill microbes for part (a). Many of them incorrectly stated that the chlorine removed dirt. Too many candidates gave impractical answers to part (b) about avoiding the dangers of chlorine. Responses which used safety spectacles or special clothing failed to earn the mark. Very few candidates managed to get even some of the state symbols correct in the equation, suggesting that they were unfamiliar with them, with a tenth of the candidates declining to have a go at all. Too many candidates lost the mark in part (d) by writing sodium chlorine instead of chloride.

6 This was the first of the physics questions. It also appeared on the Higher Tier paper, so was not expected to prove especially easy for Foundation Tier candidates. Many strong candidates earned both marks for their calculation of the work done in part (a), but only a small minority earned any marks at all for the free response question of part (b). Many candidates failed to demonstrate any understanding of the relationship between work and energy, usually by confusing them with force, weight and momentum. Few knew about air resistance, friction or their role in transferring kinetic energy to heat energy.

7 Although many candidates earned one mark for part (a), only a minority earned both, with too many assuming that mass was a vertical force. Most candidates could correctly identify how to calculate momentum for part (b). Part (c) was about the behaviour of the ball at constant speed, with only half of the candidates identifying the correct distance-time graph in (ii) (the horizontal line was a very strong distractor) and most failing to identify the correct statement in (i).

8 This question was about forces and energy transfers when hitting a ball with a bat. Almost all candidates correctly identified the direction of the force in part (a), but only managed to earn half of the marks about the forces in the interaction pair. The majority insisted that the force of the bat on the ball had to be greater than the force of the ball on the bat. However, it was good to find that half of the candidates could earn both marks for completing the sentences about energy transfers for the ball in flight.

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

General Comments

It was pleasing to see so many of the questions where candidates selected correct answers being answered with the correct number of ticks or rings. It suggests candidates were well prepared for this style of question. Where the performance was not as good as in some previous sessions it seemed that candidates were in general less well prepared for the free response style questions where they had to construct an answer for themselves. It will be increasingly important for candidates to be prepared to write good answers to free response questions.

There was a printing error in the equations offered at the start of this paper which led to the appropriate equation for Q7b being omitted. Despite this a good number of candidates were able to correctly answer the question, perhaps as many as might have been expected to do so given the difficulty of the question. It was not possible to discern any adverse effect on the candidates of this error.

As with some previous series, there were some indications that a number of candidates might have benefited from entry to the foundation tier rather than to this paper. A few were unable to score any marks at all in the free response questions, and managed only a low score overall. They might well have managed a better grade with less discouragement from so many questions they were unable to complete.

Comments on Individual Questions

1(a) asked candidates to recall that oxygen moves into cells by diffusion, and it was pleasing to see that most were able to do so. **1(b)** asked them to apply knowledge about concentration gradients and diffusion and most scored at least 1 mark for completing at least one of the sentences correctly. It was particularly pleasing to note that the majority of candidates correctly answered **1(c)**.

2(a) required candidates to explain differences between active transport and diffusion. Many candidates seemed ill at ease with the need to construct a written answer which covered the concentration gradients in each type of movement and the difference in energy requirements. Perhaps more preparation for answering this style of question would help future candidates. **2(b)(i)** asked candidates to recall that ADH is released by the pituitary and was well answered. In **2(b)(ii)** the candidates had to first link the effects of alcohol and ecstasy to the effects on ADH production, which tended to be well done for the first mark. The ADH production then had to be linked to the effects on the urine, and this tended to be less well answered, perhaps reflecting some confusion about the action of ADH.

3(a) needed candidates to recall where the blood temperature sensors are located, and even allowing brain as well as hypothalamus on the mark scheme not all candidates were able to score this mark. **3(b)** was poorly answered because many candidates expressed the idea that blood vessels move closer to the surface in vasodilation.

4(a) needed the response of Brenda. While there were hardly any offers of more than one name, there seemed to be a fairly even distribution of wrong responses suggesting that perhaps candidates were guessing rather than demonstrating knowledge. **4(b)(i)** was fairly well answered, but the extended writing in **4(b)(ii)** tended to be poorly presented. Few candidates gave the expected response in terms of ions and their freedom to move, and more emphasis on this idea might help in future. **4(c)(i)** saw most candidates score at least 1 mark for getting two of the columns correct. **4(c)(ii)** was particularly poorly done. Some candidates offered a symbol equation rather than the word equation asked for, and if this was not correct in all respects could not score the mark. The most common error was to omit hydrogen as one of the products, so even those who correctly named lithium hydroxide did not always gain credit on this question.

5(a)(i) tested the correct use of state symbols, but the majority of candidates did not score both marks. **5(a)(ii)** asked candidates to spot that OCl^- would complement Na^+ but again most were unable to do so. **5(b)(i)** asked for a balanced equation, and it was disappointing to see so few candidates able to complete this. It might be that those who were unable to offer the correct symbols for the species for even 1 mark would have been better entered for the Foundation tier paper. **5(b)(ii)** was better answered than 5(b)(i), but still a majority of candidates did not manage the correct pattern of decreasing activity across the table.

6(a) asked candidates to apply the equation for work done being the product of force and distance. Many scored at least 1 mark, but there were signs that some candidates were unable to correctly multiply 600 and 200. Perhaps more practice in using numbers of this magnitude would help in future. In **6(b)** many scored one of the two marks by suggesting that the missing energy ends up as heat, but it was rarer to see the response that work had to be done against counter forces such as friction or air resistance. This would be a good idea to revisit in future revision.

7(a) asked the candidates to identify both friction and reaction as forces acting on the bowler's foot from the floor. It was much more common for only one of the two marks to be scored, with mass and weight being common incorrect answers. It was pleasing to see few errors due to the wrong number of words being ringed however. **7(b)** required candidates to rearrange the equation change in momentum = force x time. Despite a printing error leading to the omission of this equation from the front of the exam paper it was pleasing to see a good number of candidates choose 40N. **7(c)(i)** was well answered by most candidates, but **7(c)(ii)** was much less well answered as few seemed to work out that the average speed would be less than the initial speed since the ball is slowing down.

8(a) was perhaps disappointingly poorly answered given the emphasis on interaction pairs in the teaching programme. Candidates in future need to be clear about reactions being equal in size and opposite in direction. **8(b)** was a little better answered with many candidates ticking at least one of the bottom two boxes. Again it was pleasing to note that the vast majority of candidates ticked the correct number of boxes, suggesting that centres have done a good job in preparing them for this style of question. **8(c)** was better answered, with a good proportion of candidates getting 20m. **8(d)** was however poorly answered, particularly when compared with the distance-time graphs in 7(c). Possibly candidates need more practice in either using speed time-graphs or in discriminating between distance-time and speed-time graphs.

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

General Comments

An overall impression is that candidates were generally clear about their subject knowledge. Most of the paper was well attempted but produced a lower mean mark than that of June 2009.

This was the first June paper where there were longer response questions rather than all objective style.

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. A small number failed to score marks because it was not clear what their response was, e.g. Q5c the answer was not always on the line.

Questions usually indicate the number of responses required. It was noticeable that some candidates gave either more responses than needed (and consequently lost marks for correct answers) or fewer responses in which case they were depriving themselves of possible marks. This was particularly noticeable in Q1b.

Candidates should be aware that the marking is done from scanned images of their scripts and are marked online. Consequently, if candidates change their minds, any alterations must be made clearly and unambiguously. It is better if the candidates follow the instructions given as to how and where to answer the questions, however any unambiguous indication of the correct answer gained credit.

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 un-attempted. However in the free response questions it was clearly different.

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

1 (a) Candidates started with a free response answer and most of them did fairly well. They scored a mark for the rain falling and many had the idea of the salt being carried away somehow. Few wrote about rivers or streams, but erosion featured in many answers.

1 (b) This is a question where many candidates did not follow instructions. They were told to draw one straight line from what water is made of to the forces between water particles. A significant proportion drew more than one line and consequently scored zero even if one of their many lines was correct.

1 (c) (i) Few candidates did not score here.

1 (c) (ii) Almost all candidates got this correct.

1 (d) The nitrogen cycle proved difficult for many candidates. Decomposer was a popular wrong answer.

2 (a) The first (conducts electricity) and third (malleable) options were correct and many scored both marks. Few candidates did not score here.

2 (b) (i) The correct answer was 40% and fewer than half worked this out correctly.

2 (b) (ii) Quartz was correct and candidates did slightly better here.

2 (c) (i) Very few candidates knew how to describe electrolysis.

2 (c) (ii) Almost none of the candidates knew that the cathode was where the aluminium metal formed. This was the first time when almost half the candidates made no attempt to answer.

3 This was one of the lowest scoring questions on the paper.

3 (a) Although very low scoring nearly all candidates gave an answer in each gap.

3 (b) The answer was 9 Ω but few candidates could work this out.

3 (c) The positioning of the voltmeter in the circuit proved too difficult for most candidates. Many drew the symbol correctly but in the wrong place. A few drew a rectangle instead of a circle. Again nearly a quarter left this answer blank.

4 (a) The candidates knew the functions of the battery, resistor and ammeter and this question scored 2 marks for most of them.

4 (b) Another free response question, omitted by some. There was no mark for repeating the question (the ammeter reading increases). A low scoring part of the paper.

4 (c) Most candidates could work out the ammeter reading (4).

5 (a) Iron and copper were the correct answers. About half scored both marks. Some put them the wrong way round scoring zero, but many scored 1 mark for copper. A common error for iron was rubber.

5 (b) Missed by some but 230 V a.c. as known by many.

5 (c) Candidates could not answer this question. Those who worked out the answer as 24 scored 1 mark if they wrote it in the correct place but only very few candidates knew the units (Watts)

6 This was the other low scoring question. Many left it blank.

6 (a) Those who answered it, slotted in the words given to them in the question anywhere whether the sentence made sense or not. Clone was the term which most commonly scored a mark.

6 (b) The answers that would have scored were a correct reference to light or photosynthesis but few marks were scored.

7 (a) About 50% of candidates scored 1 mark for getting one or two lines correctly drawn.

7 (b) Only 26% of candidates worked out that there were 24 chromosomes in each new cell.

7 (c) **(i)** The candidates knew that chromosomes ware found in the nucleus.

7 (c) **(ii)** A high scoring question.

8 (a) Candidates did not know what meristems do. A poor scoring question.

8 (b) This was much better. The candidates knew that meristems cause an increase in height of the plant shoot.

9 (a) A few left this blank but many got the correct order of bases. (GTCA)

9 (b) **(i)** This was not as well answered as Q7ci which required candidates to know where chromosomes are. They did not know where proteins are made.

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

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

As in previous years, a small minority of candidates scored so few marks that it was completely impossible to make any judgement about their true ability level. Had these candidates been entered for the foundation tier paper it is quite possible that they would have gained a higher grade than they did.

1 (a) Candidates were not required to give details of the water cycle, but instead use information from the diagram to suggest how the oceans become saltier.

Most candidates scored the first mark for stating that salt is in the rocks, but found it much harder to describe how the salt gets into the water. Able candidates realised that the salt dissolves, whereas others used a more general description such as 'the salt is carried by the water' and so did not get credit.

While the able candidates clearly had a secure understanding, it is interesting to note that many others have only a tenuous grasp of the process of evaporation. Examiners did not give credit for statements about the sea evaporating unless there was a clear indication that salt was left behind. There were many who indicated that the salt evaporates along with the water.

The very weakest candidates often referred to the salt as a form of air pollution which was washed out of the atmosphere by the rain.

1 (b) Many candidates suggested that there would be weak forces of attraction between water molecules, fewer realised that the molecules would be small. 'Giant structure of ions' and 'weak forces of repulsion' were common choices.

1 (c) Candidates often showed signs of considerable thought on this question, with much crossing out – fortunately the answer to be marked was clearly indicated in general. Candidates often correctly opted for CH_4 as the possible indicator of life on another planet, but all options were chosen at some stage.

2 (a) Many candidates identified the two statements which made a correct explanation of electrical conductivity in metals, and almost all could identify one of the statements. Common wrong choices were Carolyn [metals contain negative ions] and Alistair [heat can move through a metal].

2 (b) Most candidates discussed the conductivity of overhead power cables, though if weight was mentioned it tended to be as an afterthought rather than as the major reason for the use of aluminium.

2 (c) Most candidates could see that the ore would contain 40% oxide. The most common mistake was to suggest 20%.

2 (d) The description of electrolysis tended to be known by the most able candidates only. However, the wrong answers often tended to be 'using an electric current to purify a compound', which showed a significant level of understanding.

2 (e) There was considerable confusion over why carbon dioxide might be produced during the electrolysis of aluminium oxide, though many candidates were able to score one of the two marks.

2 (f) Many candidates were able to identify the correct equation for the electrode reaction which produces aluminium, including a significant number of the weaker candidates. Unsurprisingly, the incorrect responses tended to involve 3Al.

3 (a) While the most able candidates knew that the resistance of a thermistor increases with decreasing temperature, many others reversed this answer and suggested that temperature increases with decreasing resistance.

3 (b) Many candidates correctly chose the value of the resistance to be 9 Ω. The most common incorrect choice was 5 Ω.

3 (c) Most candidates knew the symbol for a voltmeter, and many knew that voltmeters should be connected in parallel. Able candidates went on to draw their voltmeter in parallel with the correct component.

4 (a) Many candidates understood the nature of voltage and were able to score the first mark. There was some misunderstanding at all levels of ability over what happens to the battery in a circuit as another resistor is added in parallel.

4 (b) This misunderstanding also showed up in a universal inability to calculate the current before and after the switch was closed. A total current of zero was very often chosen. Examiners wondered if the candidates forgot to look at the circuit as a whole and instead used a default reasoning that any open switch must mean a zero current in the circuit.

4 (c) Most candidates found the calculation very difficult, and there was a high omit rate. The candidates who did gain the first mark often did so for the calculation, and the second mark tended to be most often awarded for identifying the total resistance as 12 ohms.

The second mark was for the explanation. Candidates who claimed that the current was split or shared between the resistors were not eligible for this marking point. Other candidates often lost the mark through confusion between voltage, resistance and current.

5 (a) Very few candidates showed any understanding at all of how a transformer functions. A few realised that magnetism was involved, but almost nobody discussed change in magnetic field or used the term induction.

5 (b) However, many candidates could calculate the voltage across the secondary coil of the transformer.

5 (c) The calculation of the electrical output over a week was again well done, though candidates of more moderate ability found this harder than the previous calculation.

6 (a) Candidates scored the full range of marks on this question, and clearly showed their different levels of understanding.
Most candidates gained a mark for realising that the cutting is a clone.
Candidates also realised that the unspecialised cells are in the cutting at the start, but did not always go on to say that they could develop into xylem cells or any other specific type of cell. The term 'specialised cells' was often used, but not in any context. A significant number thought that that the xylem cells develop into unspecialised cells.
Hormones were often referred to in the correct context, linking the hormone with growth.

6 (b) This question was generally well answered. Some candidates failed to score as they wrote about the Sun rather than about light, or discussed positive phototropism in terms of improved growth without mentioning light at all.

7 (a) Candidates could often identify one of the processes which happens only in mitosis, but had considerable difficulty in identifying the second one.

7 (b) **(i)** The more able candidates were often able to suggest 'gamete' or 'sex cell' as the product of meiosis. However, the incorrect answers usually showed that the candidate clearly understood the general context of the question, with zygote and embryo being very common.

7 (b) **(ii)** Most candidates realised that the number of chromosomes in each cell produced by meiosis is not linked to cell size. Any confusion in this area was mainly shown by the weakest candidates.

7 (c) **(i)** Candidates of all abilities were uncertain whether genes are activated or deactivated as an organism develops.

7 (c) **(ii)** However, the concept of stem cells was well understood.

8 (a) Completing the base pairing exercise was very well done. Weaker candidates often got the second and third base correct but got the fourth base wrong, even though it should have been identical to the second.

8 (b) While many candidates could identify one correct statement about the significance of base pairing, very few were able to find the second.

8 (c) Many candidates gained the first mark for realising that statements B and C were to be discarded, and more able candidates went on to put the remaining statements into the correct order.

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

General Comments

Some areas of this paper were very well answered and it was pleasing to find very few rubric errors indeed. The relatively recent introduction of free response questions, where candidates had to frame an answer for themselves, seemed to offer problems to most and more practice and rehearsal of how to approach answering these questions might be helpful in future. Some of the areas where candidates did poorly with the written answers were ones where there was credit for an element of recall. More might have been expected to score marks with these than turned out to be the case, as with Q3a (see detailed comments below).

Comments on Individual Questions

1(a) asked candidates to show they knew the difference between noise and modulation by correctly joining boxes. While a good number were able to score both marks, it was perhaps more common to see candidates gain only one of these marks.

In **1(b)(i)** there was a degree of confusion apparent in whether waves were transmitted or absorbed.

1(b)(ii) was a free response question which was poorly attempted. Many of those who scored one of the two marks did so through making a reference to waves, but few went on to describe waves cancelling each other out. Perhaps more emphasis on the nature of interference might help future candidates.

In **2(a)** the calculation of wave speed was well done.

2(b) asked for the recall of some definitions of wave properties, and some degree of confusion was apparent in the answers offered.

This carried into **2(c)** where changes in the amplitude of a sound wave as it travels seemed to cause difficulty. The idea that the speed of a wave is constant while it is in the same medium did not appear to be well understood by the candidates, and so might be reinforced in future.

3(a) would score one mark for naming refraction and another for describing why it happens. Some candidates were able to recall the name of the process but very few were able to talk about the light slowing down in the glass.

3(b) was evidently very difficult for the candidates to complete accurately, it being very rare to see four wavefronts drawn closer together on the right hand side. It may be that not having the awareness that the light slows in the glass, the candidates could not then apply a knowledge of the wave equation to this situation to work out that the wave fronts would be closer together.

After this, it was pleasing to see so many candidates score at least one and often both of the marks in **3(c)** for placing electromagnetic waves correctly in the spectrum.

4(a) was fairly well answered, but a significant proportion of the candidates failed to appreciate that acid formulae contain H.

4(b) was particularly well answered.

4(c) was less well answered, with the most commonly given incorrect answer being that the oxide turns into a gas.

4(d)(i) was not well answered, suggesting that many of the candidates were unfamiliar or uncomfortable with chemical formulae.

4(d)(ii) was also poorly answered, and taken with 4c suggests that possibly more practice with the reactions of acids would be of benefit to candidates.

5(a) was particularly poorly answered, with most of the incorrect responses coming to grief with an insistence that the impure acid would be weaker than the pure acid.

In **5(b)** many scored one mark for suggesting the use of indicator and looking for colour change, but few showed any awareness of using a pH meter and taking a reading directly from it for the second mark.

It was pleasing to see **6** so well answered. Most candidates scored in part a for A and B, with very few if any getting only one of the correct letters – incorrect responses tended to be completely incorrect.

6(b) was generally correctly answered.

6(c) was the part which caught out those who scored two of the three marks.

7(a) required the candidates to ring both retrieval and storage for one mark. A number did give storage without giving any other response and so did not score the mark.

Most candidates scored at least one mark in **7(b)**, with the most common error being to give the wrong number to complete the first sentence. It may be that more practice with understanding large numbers would help here and in other parts of 21st Century Science and Additional Science.

In **7(c)** a surprising number of candidates opted to suggest that neurons move around to form new pathways.

8(a) saw nearly all of the candidates give the two ticks asked for, and many of those placed at least one of their ticks in the bottom two boxes for one of the marks. There did seem to be some confusion over the basic nature of reflex responses here.

It was pleasing to see a good number of candidates correctly label the motor and sensory neurons in **8(b)(i)**.

8(b)(ii) was poorly answered. A major part of this seemed to be the difficulty candidates had in composing an answer which clearly demonstrated their knowledge of reflex arcs and this despite a fairly broad mark scheme, which gave credit for mentioning electrical impulses passing along neurons as well as for describing the general structure of the arc. Future candidates will probably need more practice in framing answers to this type of question.

9(a) saw a surprising number of candidates fail to recognise language as the cerebrocortical function from the list given.

9(b) saw one mark scored for MRI scans more often than any other correct response, but overall many candidates were at a loss to offer much that was sensible here.

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

General Comments

This paper required candidates to provide some of their answers in extended prose. Although this did not prevent some candidates from gaining almost all of the marks, it did reduce the mean mark for the paper quite substantially.

Candidates lost marks in two ways with these new questions. Either they did not understand what they were required to do and answered a question of their own devising, or simply could not express themselves clearly enough to earn the marks.

As always, a substantial minority of candidates would have earned the same grade but had a more enjoyable exam had they been entered for the Foundation Tier instead.

Comments on Individual Questions

1 This question also appeared on the Foundation Tier paper, so it was expected to provide candidates with an easy start to the paper. The majority of candidates earned most of the marks, with only part (c) providing any sort of challenge. Too many candidates wanted the speed as well as the amplitude to decrease as the wave travelled.

2 This question proved to be harder, with the majority of candidates earning only half of the marks. Only strong candidates earned both marks for part (a), with weak candidates often not using the word modulate where it was necessary. Part (b)(i) was well answered by the majority of candidates, with many losing the mark through not using a ruler or failing to draw a continuous line from the transmitter to the reflector and back to the receiver. Part (b)(ii) was very poorly answered by most candidates. The incorrect answers often showed a change of frequency as well as phase on reflection at the wall, suggesting that candidates are unfamiliar with adding waves to show interference effects. Part (b)(iii) required candidates to identify two correct statements about interference to earn the mark - as expected, only the strong candidates could do this.

3 Candidates found this question about light considerably easier than the previous one. The majority were able to earn both marks for the pairing exercise of part (a), and also managed to earn two marks for their written account of what happened to the properties of the wave as it entered the glass. Candidates found part (c) the easiest of all, despite the fact that they had to recall three regions of the spectrum to earn a single mark.

4 Not only was this the first chemistry question, it also appeared on the Foundation Tier paper, so it was intended to be easy for Higher Tier candidates. In practice, because of its free response nature, the vast majority of candidates found it hard to earn more than one mark out of the four available. For part (a), few candidates realised that an impure acid would be both cheaper and still do the job of attacking the metal. Most candidates assumed that the impurities would help the acid do its job better or dilute the acid so that it corroded the metal less. Most candidates earned a mark in part (b) for their description of the use of an indicator solution, but only a small minority were aware of pH meters - perhaps they had never seen them used as part of the course?

5 Strong candidates earned many marks for this question about reaction rates and interpreting data, but weak candidates did not.

6 Part (a) of this question about acids and alkalis proved to be unexpectedly difficult, with only a minority of candidates able to correctly identify the two alkalis. Similarly, although many candidates could state one of the products of the reaction in part (b), few could state all three - water was frequently omitted. As expected, writing down a balanced symbol equation proved to be easy for strong candidates and impossible for weak ones. Too many candidates lost marks by having capital L in Cl or failing to make their subscripts small enough.

7 This was the first of the biology questions. It also appeared on the Foundation Tier paper and its objective nature allowed the majority of Higher Tier candidates to earn most of the marks. Part (a) proved to be the hardest, as candidates had to identify both correct terms to earn the mark. Parts (b) and (c) were much easier, but too many candidates were unwilling to allow brains to contain billions of neurons.

8 This question was about responses to stimuli. The vast majority of candidates earned both marks in the pairing exercise of part (a)(i), but only strong candidates could correctly complete the sentence about conditioned reflexes for part (a)(ii). However, despite requiring free writing, it was good to find that many candidates were able to earn at least two marks for their answers about simple reflexes. Weak candidates often assumed that the fly was equipped with a brain which could learn new responses, but was powerless to act against its simple reflexes.

9 This question about the operation of a reflex arc proved to be quite discriminating. Candidates had to identify the correct statement in a pair, then sequence them to describe what was going on. Weak candidates often earned no marks at all, whereas strong candidates usually earned all of them.

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

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

There appeared to be a slightly higher incidence of questions which were not attempted this year. However, all questions which were attempted showed that the candidate was able to interact with the question in a meaningful way.

1 (a) The simple explanation of why people in the UK will no longer be able to receive analogue signals after 2012 enabled grade F candidates to show their ability, and this question worked well.

1 (b) Almost all candidates realised that a wave trace would be the best way of showing the difference between analogue and digital signals. Most candidates had a least a partial understanding of the waveforms and were able to score the mark for an analogue signal. More able candidates went on to get the second mark for the digital trace. A few candidates put the two traces the wrong way round, some did not attempt the question at all.

1 (c) Many candidates were able to score the middle two marks here, and the most able went on to score all four.

1 (d) Candidates often had an intuitive grasp of how to calculate the speed of sound and gave the correct answer, gaining full marks. As in previous years, it was evident that the formal statement of how the calculation had been carried out was a separate, and higher level, task to that of performing the calculation itself. Many candidates who got the right answer claimed that they had divided frequency by wavelength. Some concentrated on the word ‘speed’ and ignored the terms frequency and wavelength, and claimed that the two numbers represented distance and time.

1 (e) (i) This question was common with the higher tier paper and so was aimed at more able candidates. However, even the most able had difficulty in suggesting that terrestrial TV signals are not significantly absorbed by the atmosphere. Several candidates suggested that radio waves would go faster than other waves. There were also some suggestions that radio waves would do less harm to the atmosphere.

1 (e) (ii) This question was also common with the higher tier paper. Many candidates knew that microwaves are used to carry signals from satellites, though infra-red, gamma and DTB-S were common alternatives. The effect of the ionosphere on preventing radio wave signals was appreciated by the most able candidates only. A significant number of candidates did not attempt this question.

1 (e) (iii) This question was also common with the higher tier paper. Few candidates realised that satellite dishes are made of metal because of the ability of metals to reflect microwaves, as mentioned in Specification Statement 6.3.7. ‘It attracts the signal’, ‘it is magnetic’, ‘it works better’ were common responses.

2 (a) The calculation was generally well attempted.

2 (b) **(i)** Most candidates were aware that the genes are to be found in the nucleus of the cell. Answers such as 'DNA' and 'chromosomes' were equally acceptable. Candidates less sure in their knowledge often went for 'zygote' as an answer.

2 (b) **(ii)** All candidates with a reasonable understanding of biology knew that there are four different bases in genes. Unsurprisingly, numbers around 23 were the most common wrong answer, though 8 and 2 also came up quite frequently.

2 (b) **(iii)** Almost all candidates correctly chose proteins as the specific substances produced in a specialised cell. The more able candidates were also aware that many genes are inactive in specialised cells, while others tended to choose 'fertilised' as their most common response.

2 (c) Most candidates were able to suggest some form of therapeutic use of stem cells, and many also referred to the generation of cells or tissues. A minority of candidates specifically limited their arguments to plants. A significant number of candidates did not attempt this question.

2 (d) **(i)** This question was common with the higher tier paper and so was intended to be more difficult. The most able candidates were sometimes able to fill in the mitosis column and gain the first mark. However, the meiosis column was much more difficult, with only a few correct answers.

2 (d) **(ii)** This question was also common with the higher tier paper, and tended to be well answered. However, some candidates appeared to have not read the question carefully enough and instead of describing how the zygote is formed they discussed what happened to the zygote after formation.

2 (d) **(iii)** Most candidates realised that there would be 46 chromosomes, though the answers 23, 24, 2 and 8 were also common.

3 (a) Most candidates realised that nitric acid is the parent acid for sodium nitrate, and more able candidates could also give hydrochloric acid as the parent acid of zinc chloride. However, answers such as 'chloric acid' and 'chlorine acid' were common, and also sulfuric acid, phosphoric acid and even substances such as zinc.

3 (b) Most candidates could name carbon dioxide as the gas in the equation. A few missed the significance of the instruction to name the gas, so gave its formula instead. A minority of candidates did find this question difficult, with answers such as hydrogen or magnesium chloride. As the symbol equation was given in the previous line it is perhaps not surprising that cobalt came up as a suggestion every now and then. This did have the merit of showing a thoughtful, if rather desperate, interaction with the question.

3 (c) **(i)** Most, but by no means all, candidates could state that the mass went down. As this was designed as a level G question examiners did not penalise candidates who went on to give an erroneous value for the decrease.

3 (c) **(ii)** That the mass went down because a gas was given off was surprisingly poorly understood. There were a few answers in terms of evaporation, which examiners did not credit, and many others in terms of 'there is a reaction'.

3 (c) **(iii)** Most candidates realised that the reaction stopped after 60 seconds. However, a small minority included the time after the reaction and suggested figures such as 120, 135 and 140 seconds.

3 (c) **(iv)** While many candidates knew how to speed up a reaction, this question exposed a lot of partly understood concepts. Examiners were looking for concentration, surface area or temperature arguments, so while answers such as 'use more of either reactant' were not penalised, they did not gain credit. Some candidates clearly realised that the size of the carbonate lumps was important, but suggested that the size be increased. A few candidates realised that the concentration should change, but did not say in which direction. Use of a catalyst was credited, as we do not expect candidates to know which reactions are commonly catalysed. Some candidates may have had difficulty in expressing their understanding of the concept of concentration, so suggested using an acid which is 'less dilute' – which was given credit.

3 (d) **(i)** The safety aspect of reacting sodium with acid was well understood.

3 (d) **(ii)** A minority of candidates did not attempt this question. There is a suspicion that it was the concept of a flowchart that might have been the stumbling block, as all candidates who did give an answer did make use of the flowchart to decide the method of making sodium salts. The titration option was correctly chosen by many, though a sizeable minority missed the information in the question stem that sodium oxide and sodium carbonate are very soluble in water, suggesting the 'react with acid and filter' option.

3 (e) This question was common with the higher tier paper. Able candidates had no difficulty in choosing a suitable copper compound to react with the acid, and often referred to filtration and evaporation. However, even they had trouble in clearly describing more than two stages in the preparation of clean, dry crystals. Weaker candidates often specified copper, or even copper sulfate, as a starting material and mostly got a mark for filtration. A surprisingly large number of candidates did not attempt this question.

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

General Comments

Candidates made good use of the pre-release material, referring to it in their answers. 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.

In general, candidates performed better in the short answer question parts. Questions with two or three marks often only scored a single mark. Many candidates did not make enough clear points to access all the marks in multi-mark questions. In many cases, candidates did not use scientific vocabulary to answer questions. At higher tier, candidates are expected to answer using scientific terminology. The pre-release material gives an indication of the areas that will be tested in the examination. Candidates need to be able to answer questions using vocabulary appropriate to the contexts being tested.

This question paper provides information to help candidates with 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. Candidates need to be reminded to keep referring to the pre-release material. Information they need to answer many of the questions can be found there. Also, a list of formula is given at the front of the paper (for example the relationship needed for Q 1d). 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 do not refer to the bullet points and so omit parts of the answer, losing valuable marks.

Comments on Individual Questions

1 (a) (i) A lack of precision in the way that candidates answered this question caused many to fail to score. Stating that radio waves can travel ‘through the atmosphere’ is a direct restatement of the question, which candidates need to avoid. The marking point that examiners looked for was an understanding that radio waves are not absorbed as they travel.

1 (a) (ii) Many knew that microwaves are used to send signals from satellites. Some candidates gave incorrect answers such as X-rays or even optic fibres. Most knew that the signal had to be able to travel through the ionosphere.

1 (a) (iii) Most candidates did not know that metals reflect signals and that this is the reason for their use for receiving dishes. Many focussed on the ability of metals to conduct electricity which, while true, is not relevant for this use.

1 (b) This longer answer was well attempted, with many students gaining half marks. Most knew that digital signals are '0s and 1s' and that a poor signal has picked up noise. Fewer were able to discuss the effects of amplification on noise for analogue signals and few could discuss the reasons why noise is more easily removed from digital signals.

1 (c) This question proved very challenging for candidates. Few knew that ghosting was caused by signal reflection. Many discussed signals 'becoming weaker as they travel'.

1 (d) Candidates showed good examination technique here by attempting this calculation even if they did not know the formula. This formula was given in the 'Useful Relationships' page at the front of the paper. Candidates should be reminded to check for a formula there if they do not remember it.

1 (e) Most candidates knew that the wave is reflected off the internal surface of the optic fibre. The most common reason for not scoring was to include many multiple reflections with angles of incidence that would not reflect but would lead to loss of light through the walls of the fibre.

2 (a) **(i)** Candidates were not clear where and when mitosis and meiosis happen. Most candidates did not score any of the two available marks.

2 (a) **(ii)** Most gained at least one mark for knowing either that the two processes need sperm or that IVF happens 'outside the body'.

2 (b) Most used the pre-release information to find that 80 babies per 1000 were born by IVF. In this case, the question had reminded them to look there by stating 'Using the information in the article…'.

2 (c) **(i)** Vague wording cost some marks here. Answers such as 'an identical thing' did not score. Better answers referred to the genetic material in the cell (eg 'DNA' or 'chromosomes') being identical.

2 (c) **(ii)** Again, two bullet points were given to help candidates remember what to include in their answer. Many knew that specialised cells have 'a particular job' or 'produce particular proteins' but some did not give a response to the second bullet point, which asked about genes in specialised cells. Again, this implies that some candidates are not taking enough time to make sure that they have read the question properly.

2 (c) **(iii)** The production of protein in cells is a challenging specification area for many candidates. This is a very high level concept. Some excellent answers in terms of the detailed mechanism of protein synthesis were seen, but most candidates found this question too difficult. Some candidates showed confusion between genes, bases and amino acids, for example talking about the proteins containing bases or the genes being a sequence of amino acids.

3 (a) The candidates wrote very confused responses to this part question. Where a question demands a multi-mark answer, candidates need to take a minute to arrange their ideas before committing them to paper. Many did not refer to the pre-release material for help in selecting the chemical to react with the sulphuric acid, hence giving 'copper' which lost an easy first mark. In describing the method, candidates often confused the order of their steps. Some did not answer the third bullet point to explain how to dry crystals. A common misconception is that filtration removes crystals directly from a dilute solution, without any reference to evaporation of water. The quality of written communication mark was usually scored, but some candidates did not use full sentences with capital letters at the start or full stops at the end.

3 (b) Most gave either a fully correct or a good attempt at the formula for magnesium sulfate. Fewer knew that the other product of this reaction is hydrogen. 'Water' was a common incorrect response.

3 (c) (i) This question was intended to be an easy introductory question to interpretation of the graph. However, many students did not realise that the mass loss was due to a gas given off. Answers such as 'evaporation' were common.

3 (c) (ii) The word 'rate' was emboldened in the question stem. However, many candidates did not answer in terms of rate, but instead talked about the fall in mass. Better answers discussed rate decreasing and then the reaction stopping after 60s. Many omitted to answer the second bullet point, which asked for an explanation. Those who attempted an explanation often suggested that the magnesium carbonate was used up, despite the information that some magnesium carbonate was left at the end of the experiment (this was written in the question stem). Both of these common faults suggest that candidates are not taking enough time to read the question carefully before beginning to answer.

3 (d) (i) About a third of the candidates correctly calculated the percentage yield. The theoretical yield was provided in this case, so the calculation should have been straightforward for higher tier candidates. Most correctly calculated the actual yield (1.5 g) but did not know how to use this to calculate a percentage.

3 (d) (ii) The most common error here was to give a vague response that did not meet the question. Again, words were given in bold in the question stem to help candidates to structure their answers, they were asked how and why the percentage yield would be wrong. Common answers talked vaguely about wet crystals 'affecting' the yield, without saying whether it would increase or decrease.

Principal Moderator's Report

Skills Assessment Report 2010

Specification	Code	Skills Assessment
Science A	A219/01	Practical Data Analysis and Case Study
Additional Science A	A220/01	Practical Investigation
Biology A	A229/01	Practical Data Analysis and Case Study
	A230/01	Practical Investigation
Chemistry A	A329/01	Practical Data Analysis and Case Study
	A330/01	Practical Investigation
Physics A	A339/01	Practical Data Analysis and Case Study
	A340/01	Practical Investigation

General Comments

The number of candidates being entered for this specification continues to be very large and the balance between the specifications continues to shift slightly towards a higher entry for the separate sciences compared to Science and Additional Science. The sampling procedures have been modified and streamlined this year in the light of new guidance from the Joint Council for Qualifications (JCQ).

As the interpretation and application of the assessment criteria has improved it is not surprising that the there has been an increase in the percentage of candidates achieving certain aspects of the assessment criteria. However, whilst there has been improvement in some areas, other aspects of the criteria continue to be demanding and challenging for candidates and the spread of marks over the cohort allows secure differentiation between grades.

This report will highlight those areas where there has been improvement and also those where there is still significant opportunity for development. The reports from 2008 and 2009 will still be available online at www.ocr.org.uk to provide further detailed guidance.

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

Administrative issues

General comments

Those Centres that responded to the early introductory letter to establish an email contact between the Centre and the moderator improved the efficiency and effectiveness of the moderation process and this was much appreciated by moderators. However, there were still too many Centres who did not send the paperwork and coursework samples promptly by the OCR deadline. Centres that followed the advice on the checklist included with the introductory letter and provided all the relevant information, in particular details of how each of the tasks used for assessment had been introduced and presented to candidates, greatly facilitated the moderation process and helped moderators to support the marks awarded by the Centre.

Annotation

Too often there was little or no indication of how marks had been awarded. The minimum notation acceptable is to use the assessment criteria codes, eg I(b)6, at the appropriate point in candidates' work. For Case Studies it was noted that where Centres provided further commentary this was particularly helpful. Suitable annotation makes it more likely that the moderator will be able to support the mark awarded. However, it is important that annotations accurately reflect the criteria. In some cases, it was noted that the annotation was a very generous interpretation of the criteria and occasionally 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 more incidences of unsatisfactory internal moderation reported by the moderating team this year.

Type and context of assessed work
In line with guidance from the Joint Council for Qualifications (JCQ), coursework can be submitted for as many specifications as it is valid for. In the case of Twenty First Century Science, this means that it has to match both type (ie Data Analysis and Case Study or Practical 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. Please note that if the same piece of coursework is requested for moderation in more than one specification, then it must be photocopied and put into the appropriate coursework sample package.

Nature of Practical work
The Data Analysis and Practical 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 Practical 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.

In the Data Analysis an individuals' data can be supplemented with additional data from secondary sources to enable assessment of Strands I and E.

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 document.

www.jcq.org.uk/attachments/published/315/ICE%20Coursework%202007%20FINAL.pdf

The following quotes are from this document:

"Teachers may review coursework before it is handed in for final assessment ... ... provided that advice remains at the general level, enabling the candidate to take the initiative in making amendments …". "Having reviewed the candidate's coursework it is not acceptable for teachers to give, either to individual candidates or to groups, detailed advice and suggestions as to how the work may be improved in order to meet the assessment criteria. 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 help sheets of the generic type which are applicable to any task are allowed. Whilst helpful for lower achieving candidates these can restrict the opportunities for higher achieving candidates. There was evidence that some Centres were providing help sheets 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. Centre marks could not be supported by moderators 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. The JCQ document goes on to say: "These actions constitute malpractice, for which a penalty (eg disqualification from the examination) will be applied".

Assessment and marking framework

Calculating the Strand mark

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.

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. 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.

Three aspects of performance per Strand
Where there are three aspects for each of the Strands (which applies to all Strands except Strands B and C of the Case Study) the following examples illustrate how to convert aspects of performance marks into Strand marks.

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

Two aspects of performance per Strand (B and C of the Case Study)
From experience it is often best to consider both strands B and C together when arriving at the final strand mark for each. For example, if B(a) = 4, B(b) = 3, C(a) = 4 and C(b), then it would be appropriate to award B = 4 by rounding up and C= 3 by rounding down (or vice versa), for a total of 7 marks for these two strands taken together.

This approach provides a balanced consideration of each aspect of performance involved in each strand and allows the marker to build up a profile of strengths and weaknesses in the work. Comparison of teacher and moderator judgements in each aspect allows easy identification of where a Centre marks too severely, too leniently or where marking is inconsistent. This allows moderators to make far more constructive reports back to Centres.

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 Practical Investigation. If there is some evidence for both approaches, then both should be marked with **the better of the two being counted (but not both marks)**. Some Centres counted both marks which produced an incorrect aggregate for the Strand.

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 Practical Investigations are of a quantitative nature and will provide evidence for the first and second rows. In these cases, the aspect mark will be determined by averaging the mark in these two rows only, ignoring the third row completely. For those rare investigations which include qualitative evidence but no quantitative evidence, 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 so the best fit 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	

Sub-dividing aspect (b) in this way allows flexibility in marking the recording of data without allowing aspect (b) to dominate the mark for the whole strand.

Candidate coversheet
All marks must be recorded on the OCR cover sheet 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 a cover sheet at all.

Data Analysis

General comments
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. Work which is based purely on teacher demonstrations, computer simulations, given sets of results or similar is not acceptable.

Many Centres used whole class practical activities as a basis for Data Analysis exercises and this clearly worked well. Therefore it is very important that Centres include details of how the task was presented to their candidates eg briefing sheets etc. The better candidates included a description of their experimental method, their own results table and the class data set which made the marks awarded for evaluation easier to support.

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 Practical Investigations and the same marks for I and E from Practical Investigations can be submitted for Data Analysis in another specification **provided the subject context is appropriate**. Many Centres used this opportunity to obtain the optimum marks for their candidates. In these cases, Centres must indicate this on the appropriate coversheet and also include copies of the work in both samples which are sent to the moderator, if the same candidate is selected.

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	Stopping distances of bicycles
Cooling curves	Clotting of milk
Crater impact	Bouncing of squash balls
Rates of reaction	Pulse rate and exercise

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’, 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, 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 average calculations 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 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 so that marks for E(b) can be awarded and their conclusion may be 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 carrying out a numerical analysis. Whilst many candidates now plot all their data and often include range bars, the quality of graph-drawing often shows a lack of care in plotting the points accurately, using suitable scales, labelling axes correctly and drawing a line of best fit accurately and carefully. Many members of the moderating team felt that the standard of graph-drawing had certainly not improved since last year. 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.

The following guidelines provide more guidance about what is required but they are 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 line of best fit.
- I(a) 6 – graph with correctly plotted points, correctly labelled and scaled axes and correctly drawn line of best fit.
- 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 such as box and whisker plots. 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 for hand-drawn graphs 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 line of best fit

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 whether 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 was not 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 much 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 really 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. Many candidates suggested possible improvements to match E(a)6 although they 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, 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 range and 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, as well as detailed suggestions about 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 could only apply to the range of values that were studied because outside this range, other factors may act. For example, in chemical reactions the rate is bound to slow down as one of the chemicals gets used up, rubber bands that are stretched will eventually break, more exercise cannot always mean that pulse rate continues to increase etc.

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', and '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 but many still tend to present a report describing a topic rather than collect evidence for both sides of a case and use their own judgements to derive a personal conclusion. There is, of course, not always a right or wrong answer in these controversial issues and marks are awarded for the way that the candidate has presented and argued the case.

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, rather than just eliciting a yes/no response, 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?
MRSA – is hospital the best place to be when you are ill?
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 could be regarded as plagiarising material and risk incurring 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 the better 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, should 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 are appropriate. 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 were given. For 4 marks it is expected that candidates include some information about the nature, purpose or sponsorship of the website. Candidates should also be encouraged to 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 Twenty First Century Science specifications about Science Explanations and the Ideas about Science, and also the published OCR exemplars to know in advance about 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

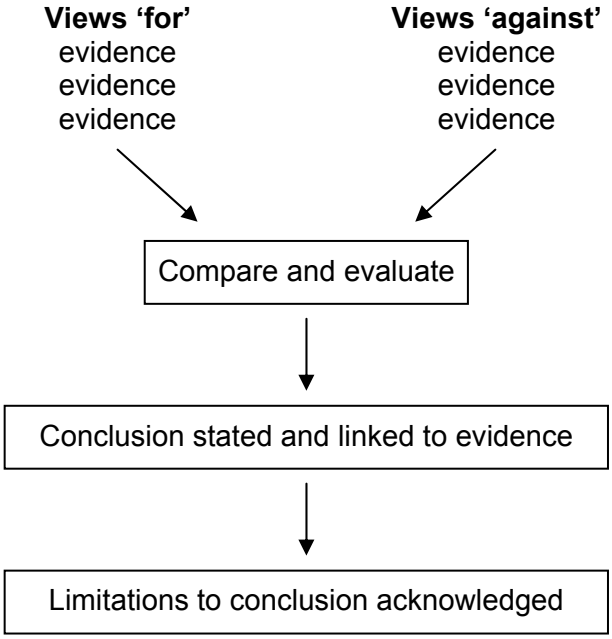
science from the student book. The seventh or eighth mark will come either for applying and integrating this correctly to the case, or for finding and explaining some additional science related to their Case Study.

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 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. 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, considering its significance, importance and reliability and using their own judgement to arrive at a suitable conclusion on a controversial issue. There was evidence that many candidates were not using and applying their Ideas about Science sufficiently, particularly IaS 5, to warrant the higher marks in this strand.

Those Centres who had 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.



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); 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

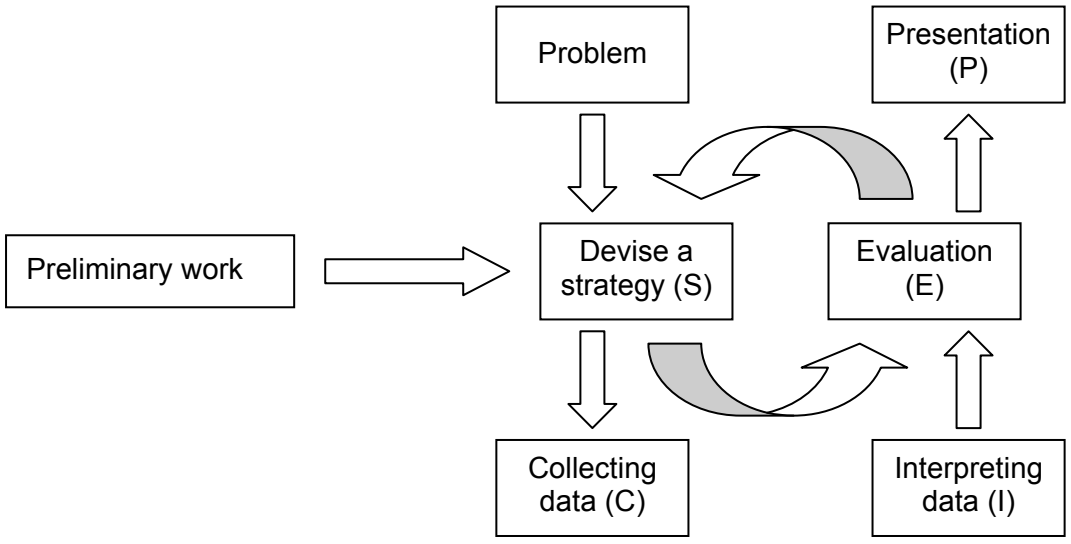
D(a): The majority of reports included headings and/or sub-headings (2 marks) to provide the necessary structure. There was a definite improvement in this aspect and the better candidates included a table of contents and numbered the pages in their report (3 marks) to help guide readers quickly to particular 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.

Practical Investigations

There was continuing evidence this year that Centres were moving away from the previous Sc1 methodology to investigations and a more open ended exploratory approach was being developed. The importance of candidates doing preliminary work to inform the strategy of the main experiment was clearly being recognised and encouraged.



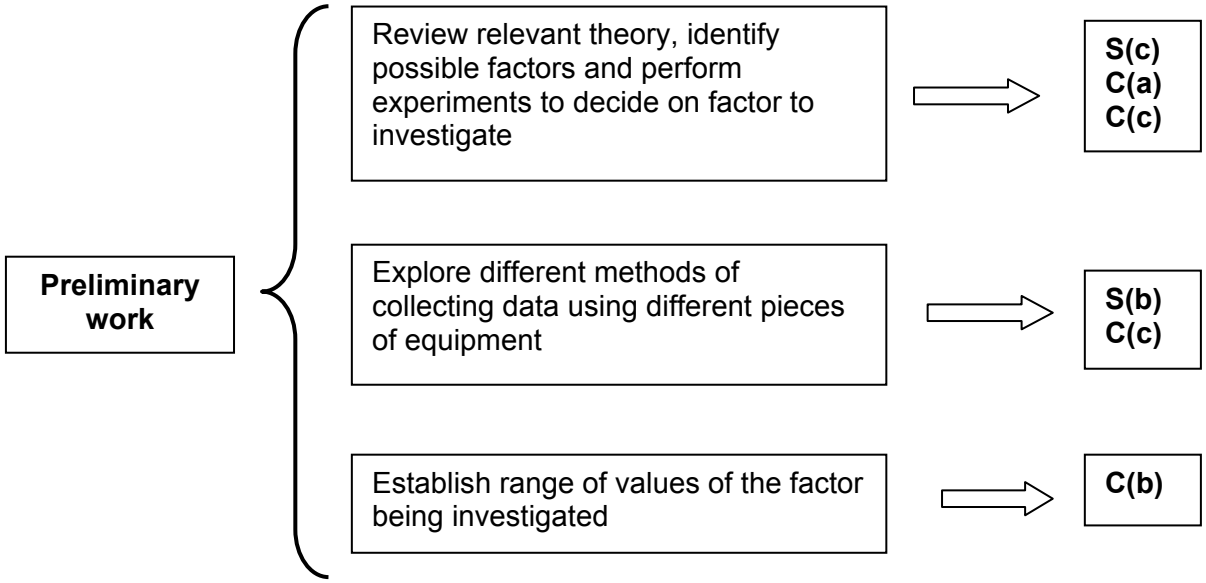
From an assessment point of view the 'performance descriptions' should be used to reflect the quality and performance of candidates' work, rather than a formal/legalistic interpretation of particular words and phrases. There were a number of examples where credit had been incorrectly given for the inclusion 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.

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.

Strand S: Strategy

Centres were generally matching candidates' work correctly to the 6 mark performance description but higher marks were being very generously awarded.

The intention is to encourage a more independent approach to investigations and the mark awarded for the aspect, S(c), should reflect the 'value added' by the candidate, beyond the initial teacher stimulus. To justify high marks in S(c) candidates should show independent thinking and the importance of preliminary work cannot be over emphasised in the introductory phase of an investigation; the appropriate amount of time must be given to this aspect.



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).

High marks cannot be supported unless the Centre has provided details of how the task was presented to candidates (eg copies of briefing sheets etc.) or moderators, after inspecting different scripts in the sample, can see that candidates had freedom of choice between different approaches and apparatus. In too many cases moderators noted that candidates had identical ranges and values of the same variables without any further discussion or justification indicating

that limited individual decision making had occurred, yet high marks were still being awarded. This necessitated 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 carried out but it was clear that candidates had not really understood why they were doing it.

Many candidates provided a list of appropriate apparatus for their investigations but had not linked it to their preliminary work or indicated why it 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 to find the best way to collect good quality data. 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 choose from 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 them during the experiment. Weaker candidates often stated that 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 candidates' access to the higher marks of 7 or 8 in aspects (b) and (c). There was more 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 the type of apparatus, equipment and method to choose, to ensure the collection of the most accurate and reliable data [C(c)]. Preliminary work was often simply a shortened version of the main experiment with no attempt to use it to decide on a technique.

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 followed the previous Sc1 approach to investigations and used scientific knowledge to make predictions about the outcome of the investigation at the beginning of the investigation whereas the Twenty First Century Science model 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); 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 this 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.

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).
Attendance at cluster group meetings and OCR INSET meetings both in- and out-of house, using the OCR consultancy service for checking marked scripts, consulting and using the teacher guidance booklets and exemplars on www.ocr.org.uk are all available methods to improve the awareness and understanding of the assessment procedure. It is highly advisable that staff have time during the year for internal standardisation meetings to share and develop expertise in the Science Department.

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