OCR
RECOGNISING ACHIEVEMENT

GCSE

Twenty First Century Science

General Certificate of Secondary Education

Science A J630 Biology A J633 Chemistry A J634 Physics A J635

Report on the Units

June 2007

J630/J633/J634/J635/R/07

Oxford Cambridge and RSA Examinations

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REPORTS ON THE UNITS

Report on the Units taken in June 2007

A211/01 – Twenty First Century Science A (B1, C1, P1) Foundation Tier

General Comments

The paper was well attempted and produced a high mean mark. Centres are reminded that questions on A211 will all be objective in style.
Candidates should be aware that the marking is done from scanned images of their scripts. Consequently, if candidates change their minds, any alterations must be made clearly and unambiguously. Any marks that are ambiguous – possibly made with the intention that the examiner could give credit for either of two possible responses, where only one is correct – will ***not*** gain credit on this paper.

The level of difficulty was appropriate for the ability range and all questions were accessible to candidates across the ability range. The majority of candidates generally performed well and marks were awarded across a wide range, demonstrating appropriate differentiation. Scores ranged from the low teens to the high thirties.
Some candidates were clearly able to demonstrate that they had a thorough understanding of the specification. There was evidence that some candidates were unable to show their true ability due to lack of knowledge in some aspects of the specification.
Most candidates correctly followed the instructions in the questions and most made their responses appropriate to the number of marks available. Some, however, did not read the questions carefully enough.
All candidates seemed to have made good use of their time. There was no evidence of candidates running out of time. A few weaker candidates did not complete the paper due to lack of knowledge, not lack of time.

Comments on Individual Questions

Q 1 (a) Many candidates scored 3 marks here, but the inclusion of the word 'centre' confused many candidates. Crust, mantle & core were frequently chosen as the correct words, but not always attached to the correct label.

(b) Many candidates scored 2 here; many scored at least one mark. Some only ticked one box.

Q 2 (a) (b) Generally badly done. Very few candidates scored two marks. In (b) it seemed to be pot luck as to which answer was chosen.

(c) Most candidates scored 2 marks here; however the boxes were not always clearly joined. Where changes had been made it was difficult to work out which were the intended answers.

Q 3 (a) Most candidates scored 2 marks, only a few scored one mark, and only a handful scored zero usually for using C twice.

(b) Poorly answered, each of the other choices were equally as common as the correct answer 'hydrogen'.

(c) Only a few candidates gave the correct answer of nuclear fusion. Photosynthesis was a much more popular answer, but frequently no response was given.

Q 4 (a) The correct combination was hydrogen followed by oxygen. All possible words were used in all combinations. Most scored one mark.

(b) High scoring question with many candidates scoring both marks.

(c) Many candidates knew that energy used per person was less by using a bus.

Q 5 (a) (b) Few candidates scored 2 marks here, but those that did often lost the mark in (b), because they seemed to be under the impression that once a name had been used once, ie Barry, it could not be used again and hence used another incorrect name in answer to part (b).

(c) Well answered overall. Most candidates could correctly read the values from the graph, fewer gave the correct answer in part (iii).

Q 6 (a) Less candidates scored two here than expected with many linking sulfur dioxide with making surfaces dirty.

(b) Mixed responses here with many not shading the sulfur atom or failing to draw the diagram carefully enough to ensure that the circles touched, although quite a high % of candidates gained 2 marks.

Q 6 (a) Less candidates scored two here than expected with many linking sulfur dioxide with making surfaces dirty.

(b) Mixed responses here with many not shading the sulfur atom or failing to draw the diagram carefully enough to ensure that the circles touched, although quite a high % of candidates gained 2 marks.

Q 7 (a) (b) Candidates fell into two categories here. Those that knew their work generally scored full marks on this section, and a surprisingly high number managed to do so. However there were also many candidates who got the answers totally wrong and only managed the odd mark through pure luck. Sexually and asexually were often reversed. Words and letters seemed to be used randomly.

Q 8 (a) (b) Generally well answered.

(c) Many candidates scored 2 marks here, few scored 3. However, many of those scoring two marks only got **two** names correct. Those that managed to get **three** names in the correct place still only scored two marks although they had more correct answers. Some candidates wrote down names more than once. This scored zero for that name even if on was correct.

Q 9 (a) (b) A surprisingly large number of candidates were able to score all 4 marks here and few scored zero. Many lost marks because they seemed to think that 2 & 3 were gametes and hence only a single letter a or A was given, suggesting that these candidates had learnt the work without really understanding it.

A211/02 – Twenty First Century Science A (B1, C1, P1) Higher Tier

General Comments

The paper was well attempted and produced a good spread of marks. Centres are reminded that questions on A211 will all be objective in style.
Candidates should be aware that the marking is done from scanned images of their scripts. Consequently, if candidates change their minds, any alterations must be made clearly and unambiguously. Any marks that are ambiguous – possibly made with the intention that the examiner could give credit for either of two possible responses, where only one is correct – will ***not*** gain credit on this paper.

The level of difficulty was appropriate for higher tier candidates and all questions were accessible across the ability range. The majority of candidates generally performed well and marks were awarded across a wide range, demonstrating appropriate differentiation. Scores typically ranged from the low teens to the high thirties.
Some candidates were clearly able to demonstrate that they had a thorough understanding of the specification. There was evidence that some candidates were unable to show their true ability due to lack of knowledge in some aspects of the specification.

Most candidates correctly followed the instructions in the questions and most made their responses appropriate to the number of marks available. Candidates should be aware that the number of answers selected need not match the number of available marks. A significant minority of candidates did not read the instructions carefully enough and therefore responded incorrectly.

All candidates seemed to have made good use of their time. There was little evidence of candidates running out of time. A few weaker candidates did not complete the paper due to lack of knowledge, not lack of time.

Q 1 (a) Candidates generally cope well with this type of sequencing question and this was no exception. Most candidates scored two marks on this question.

(b) Candidates had free response for this question and a wide range of responses were seen. Most candidates seemed unaware of how the Sun produces energy, despite this being directly stated on the specification. Many candidates referred to photosynthesis or burning in their answers.

(c) Many candidates confused the age of the solar system with the figure for the Big Bang. For weaker candidates the choice was almost at random here.

Q 2 (a) Some candidates did not seem to pick on the phrase ‘caused by’ in this question. The most common answer with weaker candidates was ‘Crust’. The arrows on the diagram may have triggered some candidates’ incorrect responses.

(b) More able candidates picked up on the change of units required from the specification in this two step calculation. This raised the difficulty of the question considerably, but produced good discrimination.

(c) This question was well answered, with most candidates scoring at least one of the two marks. Candidates seem to be able to identify statements which are data, showing that they have experience of this type of exercise.

Q 3 (a) (i) This question showed good differentiation. At the low ability end the choice was almost random, whereas more able candidates were able to interpret this original context successfully.

(a) (ii) Most candidates picked up the second marking point with far fewer scoring the first point.

(b) This question was tackled well by the majority of candidates with many scoring full marks.

Q 4 (a) Most candidates could correctly complete the table showing the alleles. There was evidence that candidates had been well prepared here.

(b) The vast majority of candidates could correctly identify 50% as the correct answer. For those that failed to do so the choice seemed a random pick.

(c) This question was generally well answered, although some weaker candidates felt that they should choose from the list provided for part (d) of this question.

(d) This posed problems for many candidates and knowledge in this area was weaker than expected at this level.

Q 5 (a) Weaker candidates could not answer this question with many choosing the third or fourth options in place of the expected answer.

(b) Candidates should be encouraged to use a pencil, ruler and rubber to answer this style of question. Many candidates provided ambiguous answers due to scribbling over original answers when making alterations. Those that answered clearly tackled the question well.

Q 6 (a) As both answers needed to be correct for one mark, most candidates failed to score hear. Better candidates got at least one of the answers correct.

(b) Weaker candidates failed to choose the correct answer here. There was evidence throughout this question that some candidates did not feel that they could use the same letter more than once.

(c) Most candidates could score one mark here by providing any two from the three correct answers.

Q 7 (a) Most candidates could identify one of the two correct people. Weaker candidates were distracted by Kate's statement.

(b) There was evidence again here of candidates being reluctant to choose the same person twice, with Kate again as the most common wrong answer.

(c) This question was well answered by the vast majority of candidates.

Q 8 (a) This question showed excellent differentiation, with only the stronger candidates scoring well. A wide range of incorrect responses were seen, with carbohydrates being one of the most common.

(b) (i) This question was surprisingly only well answered by the most able.

(b) (ii) This was incredibly poorly answered even by the most able candidates. Candidates must be able to demonstrate knowledge of these basic reactions as detailed in the specification.

(c) A wide variety of drawing styles were seen here. The need to balance the number of particles was only picked up by the brightest candidates. Again, drawing with a pencil helps if a mistake is made and needs to be corrected. It should be emphasised to candidates that contact between drawn particles is interpreted as representing a bond between those particles.

(d) Many candidates only ticked one box here. As two correct ticks were required for one mark, many candidates failed to score on this question.

Q 9 (a) There was evidence of a significant number of candidates without a calculator here. Those that did have a calculator usually performed well. We allowed a mark for a correct calculation treating the 102 reading as an outlier.

(b) It should be emphasised to candidates that the upper and lower values should be given when asked for a range (e.g. ‘102 to 125’ as opposed to ‘23’).

(c) Many candidates scored only one of the two marks here, with the second and fourth answers distracting in equal measure.

A212/01 – Twenty First Century Science A (B2 C2 P2) Foundation Tier

General Comments

This is one of the papers for Science A which is part of the Twenty First Century Science Suite. This paper, with the higher paper, uses objective style questions throughout. They examine the knowledge and understanding in the topics of Keeping Healthy, Material Choices and Radiation and Life.

There was a broad range of marks with some candidates being able to answer all the questions well. Most candidates attempted all the questions and there was no evidence that there was a shortage of time.

Candidates had greater difficulty with questions on ideas about science than they did with those on science explanations.

Comments on Individual Questions

Q 1 This question on materials was intended as a straightforward start to the paper.

(a) Most candidates answered these questions correctly.

(b) Candidates were not clear about the factors considered in a Life Cycle Assessment. Many gained one mark for recognising the significance of the disposal of the plastic but few knew that they should also include the energy used in making the plastic.

(c) Few candidates gained both marks for this question. Many ticked the two boxes relating to the disposal of plastics with few realising that growing plants was sustainable.

Q 2 This question was a common one with the higher paper.

(a) Many candidates were uncertain why the fishing line had to be tested 6 times with ‘fish having different masses’ and ‘to make sure it is a fair test’ being the common wrong answers.

(b) Many candidates could not work out reasons that explained why the 5 kg outlier was measured. Few candidates scored 0 marks but most only scored 1.

(c) Calculation of a mean value was well done though a minority did not follow the instruction about taking out the outlier and gave the wrong answer of 12 kg.

Q 3 This question was well answered. Many candidates gained full marks.

(a) A few candidates named two fibres and therefore lost the mark.

(b) Most candidates knew the order of processing crude oil to make polymers.

Q 4 Whilst many candidates answered this question correctly some were confused between electromagnetic radiation and particle emissions. The answers alpha and beta were not uncommon in both parts of the question.

(a) Some candidates gave the answer ‘radio waves’ showing that they did not know the direction of increasing energy.

(b) This question was well done.

Q 5 The start of this question was well answered but few candidates had a clear understanding of risk and benefit.

(a) Well answered though a few candidates did not notice that it was two methods of sun protection described in the article.

(b) The answer to this question was well known.

(c) More able candidates were able to answer this question. Weaker candidates did not attempt it or suggested one of the main gases of the troposphere.

(d) Answers to this part were confused. In part (i) many listed Aran or Tony with Sara or Julie so losing one mark. In part ii Julie, who believed the risk outweighed the benefit, was the common wrong answer.

Q 6 Parts of this question were common with the higher paper. Very few candidates gained full marks on this question.

(a)(b)(c) All five names appeared in all the answers in these questions. Candidates had insufficient knowledge of issues about global warming. Many did not understand the ideas of consequence and correlation.

(d) This question was well answered. Those candidates who gave the wrong answer mainly chose ‘There may have been hotter summers before his dad was born.’

Q 7 This question gave the full range of scores.

(a) Many candidates did not know that bacteria reproduce asexually. They gained two marks on this question choosing two correct answers and other bacteria.

(b) Some candidates did not know how to calculate the answer to part (i), with ‘Six’ being the common wrong answer. Fewer could work out the answer to part (ii). Many just doubled the answer to part (i).

Q 8 Parts of this question were common with the higher paper.

(a) This was well answered. The few candidates who gave the wrong answer usually believed that being on medication and being admitted to hospital were lifestyle factors.

(b) With no cue in the question to the number of answers a few candidates lost marks by ticking one or three boxes. The increase of average body mass of men which is more likely to increase the death rate was the most common wrong answer.

(c) This was well answered. Some candidates thought that living outdoors would lower the death rate.

Q 9 Candidates found it difficult to gain full marks on this question.

(a) Many candidates mixed up antibodies and microorganisms in the answer.

(b) Few candidates knew that new vaccines may be no better than existing treatments was reason for proper trials.

A212/02 – Twenty First Century Science A (B2 C2 P2) Higher Tier

General Comments

The paper was well attempted and produced a high mean mark.

Candidates should be aware that the marking is done from scanned images of their scripts. Consequently, if candidates change their minds, any alterations must be made clearly and unambiguously and that statements such as 'Please mark the red lines not the blue ones' do not help the Examiner.

Comments on Individual Questions

Q 1 This question was a common one with the foundation paper

(a) Most candidates knew the best reason for repeating the test 6 times but some did not think beyond the idea of making it a fair test.

(b) Almost all candidates had some idea how the outlier could have happened and so scored at least 1 mark here, with most scoring both. The commonest incorrect choice was 'too few masses put on line'.

(c) The majority of candidates successfully calculated the mean value with only a few neglecting to omit the outlier.

Q 2 Most candidates scored at least 2 for this question, with few achieving maximum marks.

(a) Most candidates correctly identified the statements concerned with sustainable development, with the commonest error being that it just meant making less, usually in place of the idea of making just enough for everyone.

(b) (i) Many candidates were able to identify what made the fibre sustainable, with the majority scoring at least one mark here.

(b) (ii) Very few candidates identified all 3 uses of energy which applied to both the fibres, mostly due to ticking 2 boxes only. It is important that candidates realise that when the number of responses is not specified that they consider all options available to them and that the number of responses required may not match the number of marks available.

Q 3 Candidates knowledge of the methods of changing the properties of polymers was very varied and they found this question challenging. Most were able to apply the rubric correctly.

Q 4 Parts of this question were common with the foundation paper. It produced a spread of marks with few candidates scoring less than 2.

(a) The majority of candidates were able to identify the 2 statements concerned with the consequences of global warming, scoring both marks. The statement about forest fires producing more carbon dioxide was the most common incorrect response.

(b) A significant number of candidates were not able to pick out the identification of a correlation. There was a variety of incorrect responses although the statement saying that the climate is changing due to global warming was probably the most frequent.

(c) Only the better candidates were able to identify both greenhouse gases here, showing a lack of knowledge of greenhouse gases beyond carbon dioxide.

(d) Only a small minority of candidates did not identify the need for more than a single case to base accurate assumptions on. Those candidates who gave the wrong answer mainly chose 'There may have been hotter summers before his dad was born.'

Q 5 This question produced a spread of marks.

(a) Candidates realised that Sara had identified the risk but many did not see that she felt that this was outweighed by the benefit and so chose the first statement instead.

(b) Many candidates misunderstood the rubric in this question and tried to link all the statements with explanations in spite of the use of bold type to emphasis that one statement should be so linked. Most candidates who followed the rubric correctly were able to recognise that the ALARA principle would recommend that sun beds should never be used because there was a risk and no need to use them. A small number felt you should only use them when you were going on holiday because you had to use them in spite of the risk.

Q 6 The majority of candidates scored well on this question, especially parts (a) and (b).

(a) Most candidates understood that you could reach the same temperature by increasing the power and reducing the time or by decreasing the power and increasing the time.

(b) Only a small number of candidates thought that the screen mesh was to stop the glass from cracking rather than to reflect microwaves.

(c) The candidates found this part more challenging as it required some understanding of the transmission of waves and the effect of distance on the energy received as well as an understanding of the link between photon emission and time. The idea that power output depended on the total number of photons emitted was often given as a response suggesting that the term "power" was not understood. Understanding the term power would automatically direct the candidate to idea that it is the photons emitted per second that is important.

Q 7 Parts of this question were common with the foundation paper and it was largely well answered by the higher candidates.

(a) Candidates were able to identify the reduction in smoking and the availability of better drugs as the reasons for the fall in death rates for men. The use of genetic testing was the commonest error.

(b) Only the weaker candidates were unable to identify a lower fat diet as the best explanation for the lower death rate from heart disease in non-industrialised countries.

Q 8 This question produced a wide spread of marks.

(a) Most candidates identified 2 of the statements which explained the need for further trial with a significant number able to identify all 3.

(b) (i) Candidates struggled to recall the name placebo for a treatment which looks like a drug but actually contains no drug. It was encouraging to see pupils who did not know the word having a guess at sensible alternatives by making suggestions such as “blind trial” but a significant number left it blank.

(ii) Correct identification of the 2 statements explaining why dummy treatments were used was rare.

(iii) Most candidates understood the difference in the use of dummy treatment in open, blind and double-blind trials.

(c) (i) Most candidates identified at least one of the vaccination risks which would cause more disease than it would prevent.

(ii) This question was intended to stretch the more able and all candidates found it difficult to interpret the statements. Answers correctly identifying the 3 statements which together indicated that the risks outweighed the advantages for boys were rare.

A213/01 – Twenty First Century Science A (B3 C3 P3) Foundation Tier

General Comments

This was the first occasion on which A213/01 was available. Candidates seemed well trained to answer the objective style questions set. There were very few examples of candidates failing to follow instructions and consequently few ambiguous answers. There was also an encouraging lack of "no response" answers, where this was the case it was often when questions required calculations and may reflect candidates not having a calculator with them. As in January, the Ideas about Science questions were generally well answered.

Comments on Individual Questions

Q 1 Part (a) (i) weaker candidates often answered fossils here and (ii) proved difficult with most candidates answering enzymes rather than DNA. In part (b) an encouraging number of candidates correctly answered both (i) and (ii) correctly with many others gaining one mark.

Q 2 This 'Ideas about Science' question was well answered. Over 80% of candidates gained a mark for (a) and nearly 80% for (b) with only the weaker candidates not recognising the importance of evidence in the acceptance of explanations.

Q 3 Most candidates correctly identified the Central Nervous System from the diagram. However, there were many poor answers to part (b), even if the correct words from the list were chosen they were often put into the flow chart in the wrong order. This was disappointing as this is familiar biology from previous specifications.

Q 4 This question was common with the higher tier. Less than half the candidates correctly calculated the percentage in part (a) and for part (b) few students understood why the calculation of percentages is useful. In part (c) many candidates failed to identify humans hunting for food as a direct cause of extinction often seeing this as natural.

Q 5 Nearly all candidates gained full marks for part (a). In part (b) although many candidates knew that organic farmers carried out crop rotation many didn't recognise that manure is a form of fertiliser and seemed to think that organic farmers don't use any kind of fertilisers. Part (c) was well answered with over 70% of candidates gaining two marks.

Q 6 All candidates scored highly on this question with over 90% scoring full marks.

Q 7 Only the weakest candidates failed to recognise that the article referred to type 2 diabetes in part (a) and to correctly calculate that 15% of diabetics had type 1 diabetes. Part (b) was well answered by all candidates. In part (d), the talking heads, most candidates scored one mark but relatively few two or three, the question did not differentiate well. Parts (c) and (d) were common with the higher tier.

Q 8 In part (a) most candidates labelled the fuel correctly. However, there were few completely correct answers and much apparent confusion between turbines, generators and transformers. Carbon dioxide and less commonly carbon monoxide were identified correctly in part (b) by all except the weakest candidates. In part (c) a surprisingly large number of candidates thought that nuclear fuel and natural gas were renewable energy sources.

Q 9 Part (a) was common with higher tier, most candidates correctly identified that ionising radiation kills the cell but many then thought that cells could either repel or white blood cells engulf radioactivity. Both parts of (b) were answered well by all candidates.

Q 10 Part (a) was common with higher tier, here most candidates gained one mark but their second answers eg “a few centimetres of lead” showed they may not have really understood the science. In part (b) candidates found it difficult to read the correct information from the graph even though the majority of them answered (ii) correctly and so presumably knew the definition for half life.

A213/02 – Twenty First Century Science A (B3 C3 P3) Higher Tier

General Comments

This was the first occasion on which A213/02 was available; candidates were clearly well prepared for this style of paper and there were very few examples of candidates failing to follow instructions and very few question left unanswered. Questions focussing on Ideas about Science were generally well answered. The paper was well done by most, with fewer than 5% of candidates getting less than 17 marks out of the 42 available on this paper and nearly half scoring more than 26.

Comments on Individual Questions

Q 1 This question was common with the foundation tier. Most off the candidates correctly calculated the percentage in part (a) and for part (b) 57% could identify the reason why the calculation of percentages is useful. In part (c) a significant minority of candidates failed to identify humans hunting for food as a direct cause of extinction, often seeing this as natural.

Q 2 More able candidates could realised that Lamarckism was abandoned because only genetic variation can be passed on I (a). In (b) a surprising number did not come up with the expected response for Darwin's idea (natural selection) with range of sometimes entertaining but alas not creditworthy responses, such as 'Darwin's monkey theory' or 'Darwin's big idea.' Most candidates scored 2/3 on part (c), with the hardest part proving the last option of the table, whereby giraffes feeding on low shrubs in times of shortage would support the explanation that long necks are not caused by selection resulting from competition for high food.

Q 3 Candidates were mostly completely successful in the earlier two parts of this question on competition between grey and red squirrels, with the point of difficulty arising in the lat part, where only the most able quarter of the candidates were able to identify that the higher energy demands of grey squirrels will result in a supply of smaller seeds favouring the reds.

Q 4 This question was common with the foundation tier. Stating the correct percentage in (a) was almost universally correctly, but only the most able were able to allocate all the 'talking heads' statements about type 2 diabetes to the true/false column, with the most difficult statement being 'Your body stops responding to your own insulin.'

Q 5 In (a), most but by no means all candidates could classify starches and proteins as polymers and also state that sugars were carbohydrates; in (b) only A-grade candidates were able to identify the protein and the carbohydrate from molecular diagrams of parts of their chains, together with part of a hydrocarbon.

Q 6 Just under half of the candidates could identify all the different processes in the nitrogen cycle in this question. Confusion occurred between nitrifying and denitrifying bacteria for many.

Q 7 This question, about the advantage and disadvantages of GM crops, was well answered, with two-thirds of the candidates correctly assigning the 'talking heads' to the correct category, and nearly all the remainder misplacing just one, classifying (in approximately equal numbers) either 'pollen from GM crops may pollinate wild plants' or 'pesticides produced within the plant may pass down the food chain' as advantages.

Q 8 This question was common with the foundation tier, except for part (b)(iii). In (a) virtually all candidates could correctly identify materials which beta radiation could penetrate. In part (b), most candidates could read the correct information from the graph and identify the definition for half life, but only half would identify the mass of strontium-90 remaining after two half-lives in (b)(iii).

Q 9 The first part of this question proved very unsuccessful, with only one candidate in six correctly identifying the two factors responsible for reducing the risk to healthy cells: they recognised that healthy cells received a smaller dose, but for the second point most thought that the central placement of the cancer cells in the beam was correct, while it should have been the rotation of the source around the patient. In part (b) 40% could identify the two consequences of gamma radiation striking a living cell, with a further 50% missing 'it becomes cancerous' and preferring 'white blood cells engulf the radiation' or 'the cell repels it.' About one-third could recognise the sievert as unit for radiation dose – the symbol Sv or any multiple of sub-multiple of sieverts was acceptable, including any mis-spelling which was clearly intended to be sievert.

Q 10 This question proved demanding for many candidates, with only one in ten picking all five correct words from the list. Some were clearly unhappy about using 'neutron' twice, while others confused the name of that subatomic particle with proton or electron. Virtually all candidates recognised that the U-235 nucleus is unstable and that the process is called fission rather than fusion.

A214/01 – Twenty First Century Science A: Ideas in Context Foundation Tier

General Comments

The Foundation Tier paper is intended for candidates who are operating at grade C or below. Questions 1 (c) (i) (ii) (iii), 2 (a) (i) (iii) (d) (i) (ii) and 3 (e) (f) were shared with the Higher Tier and tested to grade D and C standard. Few candidates performed well on these questions. The remaining questions were almost always targeted at grades G, F and E standard. In general questions targeted at G/F/E will require information provided in the passage or simple recall to answer. Questions targeted at C/D will usually require candidates to draw on more knowledge and understanding from beyond the passage.

It was a pleasure to see most candidates attempting most questions. Candidates appeared to have sufficient time to complete the paper. The candidates used their time well; with very few part questions left blank and most of those on the C/D standard questions. There was little evidence to suggest candidates had been incorrectly entered for the tier.

Overall the performance of candidates was a little disappointing, resulting in a slightly lower mean mark for the paper than was expected. This is a common effect with a new specification with a different style of assessment and is taken into account when setting grade boundaries. However there was also evidence of candidates who were not familiar with the pre-release material. The nature of the exam assumes that candidates are very familiar with pre-release material and have had opportunities to discuss and have explained words and concepts that they are unfamiliar with. It is in the nature of the pre-release material – frequently adapted from newspaper articles – that there will be technical terms, and occasionally non-technical words also, which would be unfamiliar to candidates and it is therefore essential that those are clearly explained before the examination is sat. Candidates who have not worked through the pre-release material with the support and guidance of their teachers are at a considerable disadvantage in this paper.

There was some evidence of weakness in expressing scientific ideas using appropriate scientific vocabulary. The consequence of this was that the answers often lacked precision and were ambiguous. It is important for all questions that candidates try to make specific scientific points, using scientific vocabulary, rather than broad generalised statements.

Comments on Individual Questions

Q 1 (a) Most candidates scored well on this question. The mark for 'annoying' idea was most frequently given. The most common error was to say the alarm let you know when there was a problem, which is true of all alarms and did not address the particular feature of the continuous beeping with this alarm.

(b) Part (i) was generally well answered with most candidates giving a contribution to global warming answer, unfortunately a significant minority wrote a paragraph about global warming and did not give a second reason. The non-renewable nature of fossil fuels was given less often. In part (ii) only about half the candidates were able to name an energy source that did not produce carbon dioxide, the most common responses were ‘solar’ and ‘wind’.

(c) This question was targeted at C/D candidates.
Candidates performed badly on parts (i) and (ii), many misunderstanding what was required for part (i) and giving answers related to other aspects of the plant rather than the sludge pipe. Few candidates had a clear understanding of ‘dose’ and over a quarter did not attempt part (ii).

Part (iii) was answered well by many candidates, the most common correct responses were ‘thick; leaded glass windows’ and ‘remote mechanical arms’.

(d) This question was intended as a simple test of understanding of half-life and about half the candidates chose the correct response of a half.

Teacher’s tip
At foundation tier questions are often designed to assess candidates understanding of scientific terms, for example ‘dose’ and ‘half-life’.

(e) Most candidates correctly identified April in part (i), but part (ii) proved much more difficult, with answers fairly evenly spread between all three possibilities.

Q 2 (a) Parts (i) and (iii) of this question was targeted at C/D candidates.
In part (i) few candidates correctly gave the failure of other scientists to replicate the results here. The most common errors were 'there was no data to prove findings' and other references to the subsequent investigation. Candidates who gave both replication and data arguments did receive the mark.
Part (ii) was correctly answered by most candidates. The most common error was to suggest that he had no data.
The most commonly scored mark in part (iii) was the idea of everything being right or correct. It was less common to have any explanation of validation in terms of some form of checking. Few candidates scored both the marks.

(b) Very few candidates were able to give the names of two body cells in part (i). By far the most common error was to give stem cells as an example, other errors were ‘nucleus’ and ‘embryonic cells’
In part (ii) Some candidates scored for marks by describing the idea of unspecialised, but almost none used the word. The common error was to give a use for stem cells.
About half the candidates scored a mark in part (iii) often giving examples of diseases that could be ‘cured’. Limb replacement was a common incorrect answer.

(c) Part (i) was answered correctly by nearly all candidates. However part (ii) proved far more challenging with few correctly identifying the ethical statement, with the most common error being ‘Maria’. In part (iii) most candidates correctly identified Tom as the beneficiary, but commonly suggested ‘injecting insulin’ as the risk instead of the development of tumours.

(d) This question was targeted at C/D candidates.
Only the stronger candidates gave a correct response, usually ‘rejection’ in part (i). Often weaker candidates answers were too vague referring ‘matching’ or being recognised.
Very few candidates were able to correctly answer part (ii) common errors were 'they are removed to make insulin-producing cells' (from flow diagram) and they would start to develop into an embryo or baby.

Q 3 (a) Most candidates answered part (i) correctly, some missing the mark with the too vague answers referring to ‘taste’ or ‘flavour’.
In part (ii) better candidates gave excellent answers which compared relative sweetness linked this to quantities required and then to energy content. Many candidates gained the relative sweetness mark, however if the sweetness idea was missed candidates rarely scored a mark.

(b) Many candidates had difficulty interpreting the graph. It was pleasing to see nearly all described the link between variables, using the variable names. However the labelling of the x-axis caused some confusion to many candidates and it was common to have the risk of diabetes linked to age, rather than BMI. The weaker candidates even linked obesity to age.

(c) This was well answered by most candidates, with symptoms and consequences I identified from the pre-release material. Occasional candidates confused the symptoms and consequences. Weaker candidates gave a range of symptoms, often related to diet or obesity rather than diabetes.

(d) In both parts of this question about half the candidates gained the mark. In part (i) the most common error referred to levels of sweetness rather than the 'natural' idea. A significant minority gained a mark by referring to the unpleasant side-effects of aspartame. In part (ii) many candidates simply repeated the question saying it was ‘unhealthy’.

(e) This question was targeted at C/D candidates.
Where the mark was scored it was usually from the rats are different to humans argument. The most common error was simply to suggest there was not enough evidence. About a fifth of the candidates left this blank.

(f) This question was targeted at C/D candidates.
About a quarter of candidates made no attempt to answer this question. Weaker candidates simply referred to ‘14 cans’, better candidates identified the 40 mg per kg as the key data, but very few managed to explain what to do with the data. Most candidates who attempted the question gained the Quality of written communication mark.

Teacher’s tip
Candidates should be encouraged to attempt any question with a Quality of written communication mark. These marks can be obtained even when no content mark has been gained, provided the candidate has attempted to address the question. The question can be identified by the number of marks in the form [n + 1] at the end of the part question.

(g) Examiners were looking for the idea that the title was linked to the content of the passage. A common error was to say the title made you want to read the passage, without any reference to the content.

A214/02: Twenty First Century Science A: Ideas in Context Higher Tier

General Comments

The Higher Tier paper is intended for candidates who are performing at or above grade C. Questions 1 (b) (i) (ii) (iii), 2 (a) (i) (iii) and c (i) (ii), and 3 (b) (c) were shared with the Foundation Tier and these questions, together with 2 (a) (iv) & (b) (i) and 3 (a) tested to grade D and C standard. Other questions were intended to be more demanding. In general, questions targeted at C/D will usually require candidates to draw on knowledge and understanding from beyond the passage while those targeted at B/A/A* will require candidates to demonstrate those skills to a greater degree.

It was a pleasure to see most candidates attempting most questions, although many found the space allocated per question inadequate. Most candidates appeared to have sufficient time to complete the paper, although a small number did not seem to have quite enough time to complete the last two parts of question 3 to a good standard. Many candidates gave superficial or inappropriate responses to questions, suggesting that these candidates would have been better suited to the Foundation tier paper where marks are available for writing down information provided in the passage or simple recall of knowledge from the course.

Overall the performance of candidates was disappointing, resulting in a significantly lower mean mark for the paper than was expected. This is a common effect with a new specification with a different style of assessment and is taken into account when setting grade boundaries.
However there was also evidence of candidates who were not familiar with the pre-release material. The nature of the exam assumes that candidates are very familiar with the pre-release material and have had opportunities to discuss and have explained words and concepts that they are unfamiliar with. It is in the nature of pre-release material – frequently adapted from newspaper articles – that there will be technical terms, and occasionally non-technical words also, which would be unfamiliar to candidates and it is therefore essential that those are clearly explained before the examination is sat.
Candidates who have not worked through the pre-release material with the support and guidance of their teachers are at a considerable disadvantage in this paper.

There was some evidence of weakness in expressing scientific ideas using appropriate scientific vocabulary. The consequence of this was that the answers often lacked precision and were ambiguous. It is important for all questions that candidates try to make specific scientific points, using scientific vocabulary, rather than broad generalised statements.

Teacher's tip
Many of the questions on this paper can be used as the basis for discussion and learning in relation to ideas about science, while at the same time giving practice in the style of question used in this part of the exam.

Comments on Individual Questions

Q 1 (a) This question was poorly answered in general. Successful candidates were able to explain the ALARA principle in their own words and realised that the alarm was not an example of ALARA. The majority of candidates restated the definition of the acronym from the question stem, gaining no credit, and those that did try to explain ALARA usually explained the precautionary principle instead.

(b) Candidates performed disappointingly on parts (i) and (ii), which was an overlap question with A214/01, with many misunderstanding what was required for part (i) and giving answers related to other aspects of the plant rather than the sludge pipe. Incorrect factors chosen in part (i) were allowed in part (ii), as the mistake had already been penalised.
Part (iii) was answered well by many candidates; the most common correct responses were 'thick; leaded glass windows' and 'remote mechanical arms.'

(c) Better candidates showed understanding of the nature of exponential decay, while weaker candidates tended to multiply the half-life by 10 to compare with the stated time of 250 000. It is worth commenting that in the objective-style paper A213 most candidates showed an understanding of half-life which candidates for this paper – many of them doubtless the same ones – could not do in this less structured format.

Teacher's tip
When half-life data are given in a question of this type, candidates should attempt repeated halving to see what happens to some arbitrary starting quantity, eg starting with 100% will drop to 0.098% after ten half-lives. This should prompt able students to realise that this is not zero (nor will it ever be) but that it is reduced to a small fraction of the original.

(d) Better candidates gained both marks by relating the terms 'high level' 'intermediate level' and 'low level' to the activity of the wastes, and then to the risk they pose to workers and members of the public.

(e) More successful answers clearly chose one of the three waste-disposal methods listed and gave advantages and disadvantages of that method. Very few candidates addressed the 'can we?/should we?' aspect of the question at all. Weaker responses confused different aspects of different disposal methods, frequently equating 'send into the Sun' with 'send out from Earth to wander about the Solar System'.

Q 2 (a) Parts (i) and (iii) of this question was targeted at C/D candidates.
In part (i) most candidates correctly gave the failure of other scientists to replicate the results here. The most common errors were 'there was no data to prove findings' and other references to the subsequent investigation. Candidates who gave both replication and data arguments did receive the mark.
Part (ii) was also targeted at C/D candidates. Most gained one mark, with few gaining marks for both 'publishing in journals' and 'presenting at conferences'.
In part (iii), better candidates gained both marks, for the idea of everything needing to be correct and the explanation of validation in terms of some form of checking. Less successful candidates scored the former only.
Part (iv), on the pressure felt by Huang's juniors to donate eggs, was well answered.
Part (v), targeted at A and A* candidates, was less successful, with most candidates able to suggest only one reason for a shortage of donated eggs.

(b) Part (i) performed similarly to (a)(v), for similar reasons, with only one candidate in ten able to give two reasons for banning human cloning. Two marks were also earned by those who gave a reason and then explained it in some detail. Part (ii) was more successful; two-thirds of the candidates could give a reason for broadening the HFEA committee to include non-scientists.

(c) This overlap question was targeted at C/D candidates. Most candidates gave a correct response, to part (i), either in terms of avoiding rejection or of having the same DNA.
In part (ii), only one candidate in four successfully identified the onset of specialisation, with common errors related to production of insulin (from the flow diagram) and starting to develop into an embryo or baby.

Q 3 (a) In part (i), two-thirds of all candidates recognised that the sample in the bar chart was not representative of the population as whole; weaker responses showed a lack of understanding of the variables in the chart, eg 'the graph is only for obese people'.
In part (ii), the best candidates recognised the problems of conducting such a survey, with variation across the country, or the difficulty in getting truly obese people to participate in such a survey, or questioned the assumed simple relationship between BMI and obesity. Weaker answers showed lack of understanding of sampling, and expressed a need to test the entire population.

(b) Most candidates identified the fact, in (i), that the results needed to be qualified because the tests were carried out on rats, and not humans, but only the strongest gained all three marks in part (ii), where it was necessary to identify 'burns fat' as the link, to give some indication of the experiment that had been done to compare fructose and glucose, and to comment on the result which had been obtained.

(c) This question was targeted at C/D candidates.
About a quarter of candidates made no attempt to answer this question. Weaker candidates simply referred to '14 cans', better candidates identified the 40 mg per kg as the key data, and the best indicated that this figure needed to be combined with other information (either the body mass or the contents of a drink gained the mark) to assess how much one might drink each day.
Most candidates who attempted the question gained the Quality of Written Communication mark, which was awarded for any logically consistent answer of at least two statements.

Teacher's Tip
Candidates should be encouraged to attempt any question with a Quality of Written Communication mark. These marks can be obtained even when no content mark has been gained, provided the candidate has attempted to address the question. The question can be identified by the number of marks in the form [n + 1] at the end of the part question.

(d) Few candidates gained three marks in this question, for comparing properties of all three sweeteners. A common response was to choose one sweetener and to justify the choice by stating the disadvantages of the other two, which gained two marks.

Report on the Units taken in June 2007

GCSE Science A 2007

Centre Coursework Report: A219

General Comments:

This has been the first year for the presentation of coursework for the new specification, Science A. It has clearly been an overall rewarding if not demanding experience for all Centres. Teachers and students have responded with enthusiasm and interest and much effort has gone into preparation and organisation.

Those Centres who were one of the Pilot Centres of the precursor for this specification have obviously learnt a great deal and have benefited from it and those who did not have this experience had more new ground to cover. However, the number of Centres who had to have their marks adjusted was small and this reflected the hard work done by all teachers to ensure that they understood and could apply the new assessment procedure. New Centres are advised to refer to the Principal Moderator report for the Pilot course Science E, particularly the comments regarding Investigations in Additional Science (General) to help them in the introduction of the corresponding assessment vehicle in Additional Science A.

The coursework model for Science A involves the submission of both Data Analysis and Case Study. These assessment vehicles provide a valid assessment of the particular skills and competences imbedded in Ideas about Science which are an essential feature throughout the specification. These key skills and competences have been carried forward from the Pilot into the new specifications with some further clarification and development.

One moderator per Centre was assigned to moderate the Data Analysis and Case Study and this will continue for Additional Science and the Separate Sciences when these become available next year. The same moderator was also allocated to those Centres presenting candidates for the Pilot course this year to ensure continuity and ease of communication.

Administration

The majority of Centres presented their coursework samples efficiently and effectively. The best centres included

- The MS1 sheet or other OCR approved method clearly showing the total marks awarded.
- A spreadsheet showing the rank order and teaching sets of candidates
- The centre authentication sheet (CCS160)
- Candidates work stapled in the left-hand corner with the appropriate OCR front cover showing the details of the mark breakdown.
- Details of how each of the tasks used for assessment had been introduced and presented to candidates and any further supporting material.
- Annotation on candidates' work in the sample showing where and why the marks were awarded.
- Documentation with contact name, phone number and e mail address for the person responsible for administration of the sample of coursework.
- Details of internal standardisation procedures

However, a significant minority did not appear to give enough care and attention to administrative aspects to ensure that their candidates received the correct total marks and for the moderation to proceed smoothly.

The following were the most common problems:

- arithmetical mistakes on candidates' work
- errors in transcription to the MS1 form
- mark changes to candidates' work at the internal moderation stage not being carried forward to the MS1 sheet.
- missing front record cover on candidates' work
- poor annotation showing where the marks were awarded, in particular in Case Studies; in Data Analysis those Centres who used a simple coding, such as I(a) 4, helped the moderation process considerably to identify where the evidence could be found to help moderators confirm Centres' judgements.
- minimal description of how tasks were introduced to candidates
- little information about internal moderation procedures
- the occasional missing certificate of Centre Authentication.

Moderators also commented that unfortunately there were a significant number of Centres which did not send promptly the mark lists and samples. Also on occasions it was difficult for moderators to make rapid contact with the person who was responsible for the administrative paperwork to sort out any problems and this slowed the moderation process.

Supervision/administration of coursework

There were instances when the moderating team found evidence that coursework had been annotated by teachers to indicate how it could be improved in specific and detailed ways. The following quotes are from a document about coursework produced by the Joint Council for Qualifications and Centres are advised to consult this document for further detail.

"Candidates should be clear about the criteria they are expected to meet in their coursework. Any explanation or interpretation should be general and not specific to the candidate's work."
"Teachers may review coursework before it is handed in for final assessment provided that advice remains at the general level. Generally one review would be expected to be sufficient to enable candidates to understand the demands of the assessment criteria."
"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."
"Once work is submitted for final assessment it may not be revised: in no circumstances are 'fair copies' of marked work allowed".

Best fit model of marking.
Most Centres applied the model correctly. The award of marks is based on the professional judgement of the science teacher, working within a framework of descriptions of performance which are divided into **strands and aspects.** Within any one strand, each aspect of performance should be considered in a **hierarchical** manner and the pattern interpreted by a 'best-fit' judgement to give a mark for that strand. However, some Centres did not appreciate that **all** aspects of performance of a given strand must be assessed and then a 'best fit' mark selected. For example, if a candidate achieves zero marks for one aspect then this must be taken into account when arriving at the strand mark. A few Centres just counted the highest mark for any aspect to arrive at the strand mark. In the following example some Centres would record 6 marks (the highest mark) or 5 marks (the average of 6 and 4) rather than the correct 3 marks.

Strand	Aspect of performance	Level of performance related to mark scale									Mark for Strand
		0	1	2	3	4	5	6	7	8	
I	(a) graphical or numerical processing of data							✓			3
	(b) summary of evidence					✓					
	(c) explanations suggested	✓									

There was a tendency for some Centres to award marks on the basis of candidates matching one performance description rather than treating the descriptions in a hierarchical way.

Although the marks awarded for individual aspects within one strand often varied between moderator and Centre, very few Centres required mark adjustments to bring them into line with national standards.

Data Analysis

General comments

The majority of Centres clearly understood the information included in the specification about the nature of the Data Analysis task that can be used for assessment purposes. **Candidates must have personal firsthand experience of collecting data by performing a practical experiment.** Candidates then analyse and evaluate this data and are assessed against the criteria in the specification. 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 etc. is not acceptable. Centres which do not fulfil this requirement will put the marks of their candidates in jeopardy. Therefore it is very important that Centres include details of how the task was presented to their candidates. The better Centres introduced their candidates to the data task, involved them in discussion of the procedures and apparatus which helped particularly in the evaluation stage rather than those Centres who just presented candidates with a 'method' sheet. It is also important that candidates record and present the data that they have collected and not just plot a graph or do numerical calculations without any reference to the original data.

This part of the assessment tests' candidates understanding of Ideas about Science, particularly IaS 1, 2, and 3. Those candidates were used the language and concepts related to IaS, such as 'correlation and cause', 'outliers', 'reliability', 'accuracy', 'best estimate', 'real difference' found it much easier to match the performance descriptions of the criteria and gain higher marks.

In strand I, compared to the current Sc1.2 criteria, there is an increased demand in the assessment of graphical/numerical skills and of the ability to summarise evidence. A similar, but less marked, effect occurs in strand E. This increased demand resulted in a greater spread of marks, reflecting the different abilities of candidates, gave clearer differentiation and consequently more secure grading. Of course, grade boundaries were chosen to take account of this difference in marking.

The same Strand I and E assessment criteria are used in investigations in Additional Science and the same marks for I and E from investigations can be submitted for Data Analysis as well. From the experience of the Pilot Centres many candidates appeared to be better placed to make realistic evaluations of their procedures and data collected through an investigation rather than through a standalone data analysis experiment. However, in the case of weaker candidates, the data collected was often poor in quality and quantity so that they found interpretation difficult.

Therefore in these cases data collection activities involving whole class participation were generally the most successful. In this type of activity, the whole class can be involved in the planning stage with each candidate taking some measurements, so that they are familiar with the practical difficulties involved. The total body of data collected can be very large, so that there is plenty for candidates to say about accuracy, validity and reliability.

Data Analysis tasks

pollution surveys;	habitat surveys
osmosis;	river surveys
fitness studies;	enzyme studies
stopping distances of bicycles;	breaking strength of hair
stretching materials under load;	impact strength of plastic bags
comparing shellfish length and mass;	comparing thermal insulators
resistance of a wire;	objects falling through water

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

Strand I: Interpreting data

I(a): Most candidates used bar charts/graphs to illustrate and process the data that they had collected rather than a numerical analysis. However, some Centres did not appreciate the nature of the 'dotted line' dividing aspect (a) into two, graphical or numerical. Candidates can be assessed on graphical **and/or** numerical processing of data as appropriate and the higher mark can be used in the assessment of this aspect.
It was pleasing to see that the majority of candidates discussed the range covered by repeat measurements and showed the range bars on their graphs. However, in many cases the graphical work presented by candidates was lacking in one or more of the following points: care of presentation, correctly labelled/scaled axes, correctly plotted points and accuracy in the best fit line. Computer-generated graphs are acceptable but it was noticeable that the best fit line was not always correctly produced or the axis scale was not correct or appropriate.
Some Centres were giving 7 or 8 marks for graphs which were not warranted. Centres must recognise that to be awarded 7 or 8 marks an indication of the spread of data through scatter graphs or range bars **in addition** to those requirements for 6 marks is required

The following guidelines might help to clarify the assessment of aspect (a) but it is not intended to be comprehensive and to cover all eventualities.

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

I(b): The match to I(b)4, 'identifying trends in the data', was well appreciated but few candidates derived a formal/quantitative relationship to ensure a secure match to I(b)6. For example, the candidate notes that as 'the concentration is doubled the rate doubles', or the candidate calculates slopes/gradients and then makes some formal relationship between them and the variable studied. Candidates appeared to find it easier to express relationships when dealing with continuous variables. In those experiments which only involved categoric or discrete variables candidates generally made simple comparisons of arbitrarily chosen pairs of results without bringing out any overall conclusion. Aspect (b) at the highest level builds on and extends

that found in the current Sc1.2. It requires candidates to review any limitations to their conclusions by considering such things as the scatter in the data, any overlapping range bars between data points, 'real differences' and values of the best estimate.

I(c): Most candidates could secure a match to I(c) 4 by explaining their conclusion using scientific ideas. Introducing scientific knowledge at this mark level is proving more demanding than the comparable level in the current Sc1.2 model. However, there was some generous marking when matching to I(c)6 and I(c)8 in terms of the depth and quality of the scientific knowledge and understanding shown. In general terms, 6 marks would be expected to be awarded of an explanation at about the grade C standard and that at 8 marks of the grade A standard.

Strand E: Evaluation

The importance of considering the accuracy and reliability of data and its consequent evaluation is an essential feature of this course. There was sufficient evidence to see that this objective had been addressed by the majority of candidates and marks of 3 to 6 for this strand were common.
E(a): candidates are expected to comment on their procedures and to describe improvements or alternative ways to collect their data. Many candidates suggested possible improvements although they were not always of sufficient quality to be creditworthy eg 'use a more accurate balance', 'do it with a computer' or 'measure the length of a resistance wire with a micrometer'. without any further justification or explanation. Many candidates discussed improvements to their practical procedures, E(a)6, but failed to discuss the limitations of their procedures E(a)4. The E(a)4 aspect of performance is really the 'gatekeeper' to access the higher marks.

E(b): Candidates generally recognised outliers being present although they did not always clearly identify them on their graphs or in the text of the report. Fewer candidates brought together a discussion of the general pattern in their results, closeness of data to best fit line for example, and the scatter in the data as a basis for assessing accuracy and reliability. 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 rather generously awarded and this aspect was poorly addressed by candidates. 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. In addition for 8 marks, weaknesses in the data should be identified eg a limited range or not enough readings at certain values, or degree of scatter too large or variable, and suggest in detail what more data could be collected to make the conclusions more secure.

Case Studies

General comments

Case Studies have been a very successful aspect of the course and have drawn a most positive and enthusiastic response from candidates of all abilities.
Case Studies are used to assess candidates understanding of all aspects of Ideas about Science (IaS), but particularly IaS 4, 5 and 6. The purpose of the Case Study is to encourage candidates to use their knowledge and understanding of the IaS to make judgements when presented with issues with conflicting views. Where candidates were able to use the language and concepts related to IaS, such as 'peer review', 'replication of evidence', ' reasons why scientists disagree', 'precautionary principle', 'ALARA', 'risks and benefits', 'technical feasibility and values' they found it much easier to match the performance descriptions of the criteria and gain higher marks.

Case Studies are always best formulated in terms of a question to provide a focus in an area of controversy in which either the quality of the scientific evidence or the actions that should be taken in a particular situation are in doubt. For example, 'Is it safe to use your mobile phone?' rather than just 'the mobile phone'. A question will encourage candidates to look for different opinions and views, and to consider the evidence base for claims or the reliability of sources. Studies which were presented as questions to answer were always more effective than those which simply **described** a topic. The Case Study is not a report on a topic but a critical analysis of a controversial issue.

Choice of subjects for Case Studies

Some Centres gave all their candidates the same title whereas others allowed a broader range of choices. In general the latter approach was more successful. However, some titles made it difficult for candidates to link in science ideas at a suitable level and Centres need to monitor closely what their students are doing.
However, whatever arrangements were adopted it was clear that students showed a sense of 'ownership' of the study, and even very weak students managed to produce coherent reports.

Case Study titles included

Aspects of diet eg "Is obesity inherited?" Is the Atkins diet good for you?"
Food additives – are they good or bad?
Should GM crops be allowed?
Should parents be allowed to have designer babies?
Stem cell research – to spare a life or save a life?
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?
Should smoking be banned in public places?
Is there life on other planets?
Does motor traffic cause asthma?
Was Litvinenko a radioactive hazard to others?

Assessment

The assessment criteria, both in presentation and content, have been modified significantly from that used in the Pilot course to clarify and sharpen up those particular areas of assessment that Centres found difficult.
It is useful to look at the appropriate pages in the C21 textbook about Science Explanations and the Ideas about Science that are appropriate for each Case Study to give an indication as to what to expect before marking candidates' work.

For example:
B1 You and Your Genes: 'genetic engineering'; 'designer babies' etc. Pages 34/5
C1 Air Quality: any pollution related Case Study. Pages 62 & 63
P1 The earth in the Universe: 'What killed the dinosaurs?' etc. Pages 90 & 91
B2: Keeping Healthy: 'diets'; 'MMR' etc. Pages 118 & 119
C2 Material Choices: 'sustainability related' Pages 146 & 147
P2: Radiation and Life: 'mobile phones'; 'sunbathing' Pages 174 & 175
B3: Life on earth: 'evolution'; 'extinction' Pages 202 & 203
C3: Food Matters: 'organic farming'; 'diet' Pages 230 & 231
P3: Radioactive materials: 'radiation'; 'future energy needs' Pages 258 & 259

Report on the Units taken in June 2007

In general candidates achieved higher levels of performance in Strands A and D compared to B and C. The majority of candidates presented their work using good IT skills but the substance and quality of the work did not always match the high standard of presentation. However, a number of Centres did produce work which was quite outstanding and was a pleasure to read and moderate. The more successful candidates described the relevant science needed to understand their chosen topics, and took care to evaluate sources and compare different views. Weaker candidates tended merely to download information from the internet without much attempt to comment, qualify or discuss it.

It would be most helpful for moderation if more annotation or commentary was provided for each candidate in the sample selected so that the moderator could support the Centre's marks. In many cases only the final mark awarded was recorded.

Strand A: Quality of selection and use of information

A(a): The key aspect here is for candidates to use sources of information to provide evidence for **both sides** of their case study. Websites from the internet were by far the most common source but many referred to their course textbook and their own class notes to collect information. Few candidates attempted to assess their sources in terms of reliability which meant that very few candidates were awarded 4 marks for this aspect. For example, was the source of information from a scientist, had the information been published in a reputable journal and therefore been 'peer reviewed', was it just a headline from a tabloid newspaper, was it from a pressure group etc.

A(b): It was pleasing to see that the majority of candidates included a bibliography of sources at the end of their reports and most provided full and detailed references to any websites that had been used and not just to the homepage.

A(c): Most candidates used the material from their sources in a selective way but only the better ones re-structured the information to make their own case. Candidates were not very good at showing clearly where sections of text were directly quoted. Use of quotation marks, or use of a different font or colour highlighting were some of the methods used by the better candidates. Furthermore, only the better candidates included references or specific links within the text to show the source of particular information or opinions. One candidate wrote a short sentence at the bottom of the appropriate pages describing the reliability or bias nature of the sources quoted on that page – a simple but very effective way.
Far too many candidates just provided a collection of 'cut-and-paste' extracts with the minimum of candidate editorial and input. A number of candidates handed in full print-outs of the information from each of their sources and this was not necessary or beneficial. Some candidates gathered information from self-constructed questionnaires which also added to the pool of material for their Case Study, but occasionally this distracted them from the underlying science and scientific evidence.

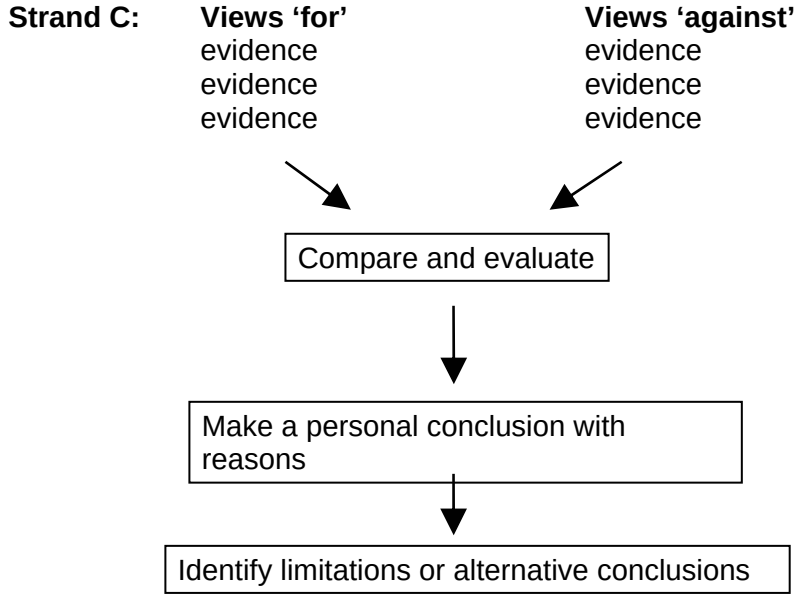
Failure to discuss reliability and failure to indicate within the text where particular pieces of information or opinions had come from prevented many candidates from being awarded 4 marks in this strand.

Strand B: quality of understanding of the Case

In simple terms this strand assesses candidates' ability to consider the claims and opinions they have collected from their sources and to describe and explain the underlying relevant science and to recognise and evaluate the scientific evidence on which the claims were based (IaS 1, 2 and 3).
B(a): This aspect assesses candidates' ability to show what they know and understand of the relevant science in their Case Study. Candidates generally responded with enthusiasm but the studies were often short of information about the basic scientific knowledge and understanding

which underpinned the topics chosen. Candidates should be advised to describe basic KS3 or KS4 ideas about the topic as well as any new information they discover, to provide a scientific basis for the opinions they develop in strand C. They should have in mind a target audience of intelligent Year 9 students. For example, in the many variations of the popular 'Genetically Modified Food' case study, a brief introduction to what genes are, followed by a clear definition of what is meant by genetic modification would have been helpful. In 'power generation' case studies, there should be explanations of the nuclear fission process and the nature of the nuclear waste and the associated disposal problems.
Better candidates built on this foundation of relevant science and were able to use this knowledge to explain the scientific basis of the claims and opinions that they had found in their sources. Weaker candidates often reported at the 'headline level', simply repeating claims without looking beyond the headline for the underlying science.
B(b): This aspect focuses on candidates' ability to recognise and evaluate the scientific evidence that any claims and opinions are based on. For 4 marks candidates must be able to recognise and distinguish relevant scientific content and data in their sources. Candidates obtaining 6 marks went further and showed awareness of where the data had come from eg an experiment, a collection and review of existing data, a computer simulation etc. Candidates obtaining 8 marks look more critically at the quality of the evidence. They used terms like 'reliability' and 'accuracy' when considering data, they looked at the design of experiments and the issue of sample size and they also compared the reliability of data between sources. Although most candidates were able to some extent discuss and evaluate the data that they had personally collected in their practical data analysis experiment, in the context of the Case Study the vocabulary and use of terms from Ideas about Science were not used very frequently. Many candidates included tables/bar charts/graphs of relevant data but did not use or comment sufficiently on the information presented. The scientific evidence on which claims and opinions were based was not considered in any detail by the majority.

Strand C: quality of conclusions
In this strand candidates should consider aspects of IaS 5 about actual and perceived risks and the ALARA principle and in IaS 6 about how society should respond.
The aspects for Strand C can be summarised in the following simple flowchart



Major points for and against a particular view were listed by the majority of candidates. The better candidates were able to compare and evaluate the evidence, describe their own viewpoint or position in relation to the original question and justified this by reference to the sources. There

should be evidence that the sources used have been compared to check for consistency and to identify areas of conflict or disagreement. There should also be evidence that the underlying science has been used to try to resolve any differences.

Several candidates scored less marks than they were probably capable of, particularly in quality C, because they simply chose to report information about their topic, without any real consideration of the scientific evidence they were based on. Opinions from a variety of sources were often quoted but without reference to the source or to the evidence that the claims were based on. Although most candidates made an effort to give two different views in their studies, these were rarely compared, and conclusions often seemed to lack any clear basis in the evidence shown. This approach rarely leads to marks above 4 or 5.

Strand D: quality of presentation

D(a): It was pleasing to see that the majority of reports included headings and/or sub-headings to provide the necessary structure. The better candidates included a table of contents and numbered the pages in their report to help guide readers quickly to particular sections. Those reports which were presented simply as *PowerPoint* printouts achieved good marks in this aspect but often lacked sufficient detail for high marks in the other strands. However, those which had notes to accompany each slide were much more successful in obtaining higher marks.

D(b): Suitable diagrams and graphics should be incorporated as appropriate to clarify difficult ideas and encourage effective communication but the visual impact was often variable. Too often images were decorative rather than informative. Of course many textbooks include decorative rather than always informative images and this may be a source of confusion for some candidates. A mixture of both is usually the best route to provide an interesting and informative report. Rather too little use was made of diagrams, charts, tables or graphs as compact ways of conveying large amounts of information, or to visualise difficult concepts. The best candidates always made good use of explanatory diagrams by referring to them and using the information that they contained.

Final comment

All members of the moderating team remarked on the care and effort put in by teachers to provide varied opportunities and motivating contexts for their candidates to achieve the best results in this new assessment framework. We would like to record our thanks and appreciation for a good job, thoroughly well done.

The importance of cluster group meetings, attendance at 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 on ww.gcse-science.com are all available methods to improve the awareness and understanding of this new assessment programme. It is highly advisable that staff have time during the year for internal standardisation meetings to share and develop expertise in the Science Department.

2007 Grade thresholds for A219

	Grade threshold								
Component	**Max. mark**	**A***	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Data Analysis and Case Study	16 + 24 = 40 marks	35	30	25	21	17	13	10	7

The grade thresholds have been decided on the basis of the coursework that was presented for award in June 2007. It should be noted that this was the first cohort of candidates to take these new assessments. Thus, the threshold marks will not necessarily be the same in subsequent awards. Some adjustments may be expected as experience with the criteria grows, and a wider range of Centres becomes involved.

A221/01 - Biology A (B1, B2, B3) Foundation Tier

General Comments

Most candidates performed well. It was clear that many had been well prepared for the examination and managed to complete all of the questions in the time allowed. Candidates would be well advised to read carefully, and then answer the question as stated. Some candidates lost marks because they failed to read the question particularly where multiple responses were required. While examiners will make every attempt to mark correct responses, even when displayed in ways other than asked for by the question, candidates should always attempt to follow instructions in order to ensure they gain the maximum number of marks deserved.

Comments on Individual Questions

Q 1 This question was intended as an easy start to the paper and was intended to give candidates confidence in what for many was a new style of questioning.
Part (a) was well done with most candidates identifying nucleus as the correct answer.
Part (b) proved to be more challenging with many scoring at least two of the marks. Many candidates were unclear about the difference between chromosomes and DNA.
In part (c) (i) most candidates correctly identified one chromosome from each pair as being the correct answer and in part (b) (ii) many went on to gain the full three marks by identifying that the genetic information was carried in the nuclei of both the eggs and sperm.

Q 2 Part (a) was well answered but common misconceptions were that headaches and nosebleeds were a symptom of cystic fibrosis. Most candidates correctly identified food not being digested properly and frequent chest infections as the two correct symptoms.
Part (b) was also well answered but many candidates thought that the mother was responsible for passing on the cystic fibrosis genes. Presumably this response was caused by confusion with the inheritance of Down's syndrome.
Part (c) proved more challenging for many candidates with only the most able scoring three marks. Common errors included writing a single allele in each box and failing to put the ring around the correct combination. Candidates would also be well advised to make their writing clear in questions of this type so that examiners can distinguish between upper and lower case letters. 'F' was deliberately chosen to make marking this question clearer but far too many candidates lost marks because it was impossible to distinguish between upper and lower case letters.

Q 3 Most candidates answered this question well drawing lines to connect the correct boxes. However candidates should be made aware of the fact that if they draw two lines from or to any single box, they will lose the mark, even if one of the lines is correct.
In part (b) most scored both marks by correctly identifying digest and antibodies as the correct answers. Antibiotics proved to be a common misconception for the second answer.
Part (c) proved to be more challenging with only the more able obtaining the correct sequence.

Q 4 Most candidates managed to score at least two of the three marks in part (a) and correctly identified a low salt diet, regular exercise and stopping smoking as the answers. Candidates should be advised to read all questions carefully as some candidates failed to spot that three responses were required and in giving only one correct answer, lost two valuable marks.
Part (b) was well answered with most candidates scoring both marks.

Q 5 This proved to be a challenging question, but those students who spent time examining the information were rewarded with five marks. Many able students correctly identified the height of the skeleton as data, the second and third statements as explanations, and the fourth and fifth statements as neither data nor explanations.
In part (b) (i) many identified the limited food as being a possible factor leading to the evolution of a small size, but living in caves proves to be a common wrong answer.
Part (b) (ii) was well answered with most candidates identifying small brain size and small body size as the correct answers.

Q 6 This was another challenging question. Only the most able candidates scored full marks. Common errors included not understanding the difference between receptors and effectors or simply trying to guess the correct response. This is part of the specification that candidates would be well advised to spend time learning.

Q 7 This question was generally well done. Most correctly realised the number of otters had increased in part (a) (i) and also identified England as the country with the fewest places where otters could be found.
In part (b) most candidates scored at least one mark with many correctly realising that other plants and animals will be affected and they may provide us with a valuable resource in the future.

Overall most candidates performed well on this paper.

A221/02 - Biology A (B1, B2, B3) Higher Tier

General Comments

This is one of the papers for Biology A, part of the Twenty First Century Science Suite. The paper uses objective style questions throughout and examines the knowledge and understanding of the topics of You and Your Genes, Keeping Healthy and Life on Earth. The paper was well answered by most and there was no evidence of candidates' running out of time.

Comments on Individual Questions

Q 1 (a) (i) This question was generally well answered but confusion between F and f symbols was seen on a few papers. Most candidates took pains to make their intentions clear.

(ii) Most candidates knew the homozygous combination was correct but many indicated FF instead of ff for the cystic fibrosis combination.

(b) The disadvantages were well known but candidates found giving advantages more difficult.

Q 2 (a) Commonly seen errors were the use of 'pathogens' and occasionally 'antibiotics' instead of antibodies.

(b) The majority of candidates scored at least 2 marks and a significant number scored all three.

(c) (i) Almost all candidates correctly chose response B 'The flu virus can change'. The second response was more varied with a significant number of candidates choosing an incorrect response.

(ii) A common error was entering the same letter in both sides of the table. This occurred most commonly with response E.

Q 3 (a) This question was generally well answered with the most common error being to choose box 2 'no side effects' instead of box 3 'serious side effects'.

(b) (i) Many candidates only ticked 2 boxes when there were three correct responses.

(ii) This question discriminated well, being targeted at the highest achieving candidates, only the best candidates answered correctly.

Q 4 (a) Many candidates found difficulty in recognizing an explanation. This is an area of 'Ideas about Science' which should be addressed by Centres.

(b) (i) Most answered well but a few candidates chose 'living in caves'.

(ii) The examiners found evidence of some candidates making random choices.

Q 5 Many candidates believe nerve impulses to be instantaneous and some are of the opinion that hormonal responses last forever.

A321/01 - Chemistry A (C1, C2, C3) Foundation Tier

General Comments

This is one of the papers for Chemistry A which is part of the Twenty First Century Science Suite. This paper, with the higher paper, uses objective style questions throughout. They examine the knowledge and understanding in the topics Air quality, Material choices and Food matters.

There was a broad range of marks with some candidates being able to answer all the questions well. Most candidates attempted all the questions and there was no evidence that there was a shortage of time.

Comments on Individual Questions

Q 1 Parts of this question were in common with the higher paper.

(a) Most candidates were able to interpret the given data and answer all parts of this question.

(b) Very few candidates knew that both carbon dioxide and nitrogen oxides dissolved in rain water. Disappointingly many said these gases are deposited on surfaces or lost into space.

(c) Most candidates had learned the proportions of gases in the air and this question was well answered by most.

Q 2 (a) Most candidates knew that hydrocarbons are made up of carbon and hydrogen atoms.

(b) Many candidates misinterpreted this question and drew lines from each of the right hand boxes to one of the atoms. Of those who drew only one line from each atom very few knew that water was the combustion product of hydrogen.

(c) Both parts of this question were well done. Some weaker candidates lost the mark for the sulfur dioxide molecule because they drew it with the oxygen atoms touching: either putting the atoms in the wrong order or drawing it as a triangular shape.

Q 3 (a) Most candidates knew how to control type 1 and type 2 diabetes and that type 2 diabetes usually occurs in those over 50. However many were unaware that people with type 2 diabetes do not respond to their own insulin.

(b) This was well done with the answers taken from the article.

(c) A small number of candidates lost marks because they did not use examples from the article.

(d) Most candidates gained one mark on this question. They did not know that decisions about risk need to take account both of the chance of it happening and the consequences if it did.

Q 4 (a) Most candidates were able to give the job of a preservative but fewer knew that an emulsifier allowed oil and water to mix together.

(b) In both parts of this question a number of candidates lost marks because they only gave one answer though both questions asked for two. A significant number of candidates did not recognise that synthetic fertilisers could not be used by organic farmers.

Q 5 (a) All parts of this question were well done. In part iv most candidates could pick out one reason why measurements are repeated but did not understand well enough to pick both.

(b) Most candidates did not have a clear understanding of Life Cycle Assessment and found it difficult to pick out the information explaining why the LCA's of polyethene and paper were different. Very few candidates knew how plasticizer changes the properties of polyethene. Almost all of those who gave the wrong answer thought it would make the polyethene stronger rather than softer.

Q 6 (a) This question was well done though some candidates gave the names of two natural fibres instead of synthetic ones. Also a number of candidates thought silk was a synthetic fibre.

(b) Both parts of this question were well done by almost all candidates.

(c) Many candidates answered this correctly though some did not check the properties of cotton given in the table.

(d) Almost all candidates answered this correctly.

A321/02: Chemistry A (C1, C2, C3) Higher Tier

General Comments

All candidates made a good attempt at this paper, with few questions left blank. Many candidates showed good knowledge and understanding across the unit topics combined with a sound grasp of concepts involved. Others showed a more patchy ability to recall and apply knowledge and ideas. It was clear that a small number of candidates would have gained a more fruitful experience from sitting the Foundation tier.

When presented with a number of statements some candidates were not clear about the number that they were required to choose. In some cases this number is stated, whilst in other questions it is not. For both of these styles, though more commonly for the latter, a number of candidates chose an incorrect number of responses. In some places some candidates clearly had not appreciated instructions in the rubric, leading to a loss in marks.

Though the majority of candidates' answers were clear and easy to mark, some had made extensive crossing out. This can be difficult to mark on scanned scripts.

Comments on Individual Questions

Q 1 Most candidates showed some knowledge of diabetes. Many of the more able candidates gained most or all of the marks for this question.

(a) This question discriminated well across the ability range, with most candidates gaining at least one mark, but only the most able scoring full marks. The most common error was to think that in type 1 diabetes the body no longer responds to its own insulin.

(b) More able candidates generally answered question (i) correctly. Many weaker candidates did not realise that two of the statements are correct.
In (ii) only the more able chose the two correct statements. Few candidates chose only one statement, but many chose one correct and one incorrect.

Q 2 Most candidates could interpret the information on the ingredients label, and could make sensible deductions about organic farming methods.

(a) This question caused problems only for weaker candidates. The majority chose both substances, vegetable oil and water, correctly. A few candidates chose only one substance.

(b) The majority of candidates chose both correct statements to gain the mark in (i). The most common error, generally seen only for the weakest candidates, was to choose both incorrect statements. Few chose only one statement.
In (ii) again few candidates chose only one answer, and the majority chose the correct two. The most common incorrect answer was 'lime'.

(c) A large majority of candidates gained the mark in (i), with very few choosing one statement instead of two. A small number of weaker candidates chose one correct and one incorrect statement, the latter more commonly 'Manure does not contain the essential nutrients that are provided by synthetic fertilisers'.
Question (ii) discriminated well in the upper half of the ability range. Most of the more able candidates scored both marks, whilst most of the weaker candidates gained one. A number of the weakest candidates only chose one statement.

Q 3 Most candidates interpreted that data well to gain a number of marks in this question.

(a) Almost all candidates showed a good understanding of the data provided. Most gained both marks in question (i) and the single mark available in (ii). Only the weakest candidates made errors, which showed no distinct pattern.
More able candidates generally gained the mark in (iii). A common error amongst weaker candidates was 'Cars are the main cause of air pollution', perhaps chosen without consideration of the data.
The mark in (iv) was gained by a large majority of candidates, with only the weakest choosing incorrectly.

(b) This question caused considerable confusion for many candidates. The rubric instructed that they should 'join one box for each of the lists A, B and C' but many candidates joined all three boxes from each list. As a consequence these candidates gained no marks. A minority of candidates followed the rubric. Most of these gained one or two marks, but very few scored all three. Only a small number of candidates knew that the 'nitrogen and oxygen from air react with each other'. Many incorrectly chose 'nitrogen from petrol reacts with oxygen from air' in list A. The most common scoring choice for a single mark was 'nitrogen monoxide is formed in the engine' in list B.

(c) Surprisingly only a minority of the more able candidates knew that carbon dioxide and nitrogen oxides 'both dissolve in rain water'. The most common incorrect response was 'They are both used by plants in the process of photosynthesis', though both of the other distracters were seen often.

Q 4 This was a challenging question that provided good discrimination amongst more able candidates.

(a) The majority of candidates correctly recognised these compounds as hydrocarbons. Only the weakest candidates did not gain this mark. Common incorrect answers were carbohydrates and hydroxides. Some candidates did not attempt this question.

(b) Most of the more able candidates correctly suggested carbon dioxide and water to gain both marks. Many weaker candidates gained just one mark, with only the weakest failing to score. Common incorrect responses were carbon, carbon monoxide, hydrogen, hydrogen dioxide. A few did not attempt this question.

(c) The most common answer was a single correct carbon dioxide molecule drawing on the right of the equation, scoring one mark. Many weaker candidates drew diagrams with more than two oxygen atoms, or with oxygen atoms touching, so losing this one mark. Only the most able candidates included a second carbon monoxide molecule on the right, and most of these also included a second carbon monoxide molecule on the left to gain all three marks. Candidates who wrote the number 2 in front of the appropriate diagrams instead of drawing second diagrams were given credit.

Q 5 Some parts of this question provided excellent discrimination across the ability range.

(a) Most candidates correctly suggested 'outlier' or 'anomaly', with a variety of spellings, to gain the mark in (i). Common answers from weaker candidates included 'extreme' and 'incorrect'.
Most candidates could calculate the mean as 240 to gain the mark in (ii). A minority of candidates incorrectly used all seven results, whilst some weaker

candidates wrote down a jumble of figures with no answer. It was clear that a small number of candidates did not have access to a calculator.
Some candidates made no attempt to answer one or both parts of this question.

(b) Most candidates realised in (i) that this time all seven results were used because 'All of the results fit into a narrow range'. Some weaker candidates showed their lack of understanding by choosing 'The scientists used fair testing this time'.
In (ii) only the more able realised that the experimental conditions were kept the same 'To make sure that the type of poly(ethene) was the only variable likely to affect the outcome'. Many of the weakest candidates thought this was 'To make the tests easier to carry out'.
Question (iii) was a good discriminator across the ability range. Only the most able could identify both correct statements. No pattern was observed amongst choices of the distracters.

(c) The requirement in (i) for two correct choices to be made for one mark decreased the facility of this question. More able candidates had little difficulty, but many weaker candidates chose one correct and one incorrect. Only a few of the weakest candidate chose two distracters.
In (ii) the majority of candidates gained both marks. Most of those who scored only one mark correctly chose 'made from crude oil' and 'made from trees', but there was no observable pattern to the incorrect choice this was paired with.

Q 6 Only the most able showed sound knowledge of polymer structure.

(a) Unlike question 3b, here candidates were required to join lines from each box in each column. The vast majority did this with little difficulty, gaining all three marks. A number of weaker candidates changed their answers several times, resulting in a mass of crossed out lines. A few of these even re-drew the boxes below to make their answer clear. Only the weakest candidates made errors, with very few of these failing to score one mark.

(b) Only a small number of the more able candidates knew that 'Plasticizer molecules reduce the forces of attraction between polymer chains' to gain the mark in (i). A common error was 'Plasticizer molecules make extra links in the polymer chains'.
Very few candidates gained even one mark in (ii). A minority of the more able candidates suggested one correct answer from an increase or decrease in crystallinity or chain length, or cross-linking of the polymer to gain a mark. Very few made two correct suggestions. Common errors amongst the more able were omission of the idea of an increase or decrease in their answers. References to changes in density were not given credit. Weaker candidates commonly suggested removal of plasticizer. A significant number of candidates did not attempt this part of the question.

A331/01: Physics A (P1, P2, P3) Foundation Tier

General Comments

The paper was well attempted and produced a high mean mark, with fewer than 5% of candidates getting less than 20 marks out of the 42 available on this paper and nearly half scoring more than 30.

Candidates should be aware that the marking is done from scanned images of their scripts. Consequently, if candidates change their minds, any alterations must be made clearly and unambiguously. Comments such as 'please mark the pencil lines not the ink ones' are impossible for markers to interpret. Any marks that are ambiguous – possibly made with the intention that the examiner could give credit either of two possible responses, where only one is correct – will not gain credit on this paper.

One source of confusion to candidates occurred where the number of correct responses was not indicated. Instructions such as 'Put a tick in the box next to the best description' or 'Put ticks in the two correct boxes' are clear, but if the instruction is 'Put a tick next to each correct statement' it is not possible to deduce the number of such statements from the mark allocation, and the candidate must make an independent decision on each statement. This was a source of error on question 10 (b) (i).

Comments on Individual Questions

Q 1 Most candidates correctly labelled the section through the Earth with few silly errors such as the core not in the centre.

Q 2 Most candidates could confidently link the astronomical object to their descriptions, but only the best could link to their sizes. They did not need to remember these, just to rank then in order of their sizes, together with realising that a light year was very big compared with a kilometre.

Q 3 Most candidates could identify one statement justifying Albert's statement, but only the best could identify two.

Q 4 Parts (a) and (b) of his question were common with the higher tier. It was encouraging that a majority of candidates chose the correct option in (b), as parallax is a tricky concept. Part (c) had a significant minority of candidates who thought that some nearby stars have galaxies in orbit around them, but most scored at least 2/3 on this part.

Q 5 60% of the candidates correctly linked the boxes to show the penetrating properties of alpha, beta and gamma radiation; others frequently showed confusion between alpha and beta radiation.

Q 6 This question was common with the higher tier. Part (a), seeking an outlier in the table of data, was indicated correctly by 27% of candidates. The Principal Examiner acknowledges that Idea about Science 1: Data and their limitations is not highlighted at the start of Units P1, P2 or P3, and so should not really have been examined in this module, although it is to be expected that virtually all candidates for this paper would also have been entered for Chemistry Unit 1, where this Idea about Science is thoroughly treated. The remaining parts of this question, involving an understanding of the nature of significant and reliable data, were better answered, indicating that the candidates generally had a good understanding of the concepts involved.

Q 7 This question, about production of electrical power, was not well answered. Although most candidates could link the energy sources to their disadvantages, very few were able to identify the stages in the nuclear power station correctly. Better candidates chose the correct word for the spaces in part (c).

Q 8 Min part (a), most candidates were able to identify at least one of the arrows indicating electromagnetic radiation being transmitted, absorbed and reflected, with a substantial number (40%) getting full marks. Those who could do part (a) completely correctly generally identified the correct consequence of global warming in part (b) also.

Q 9 Most candidates found this question easy, with 7% getting full marks in part (a) and virtually everyone getting part (b) completely correct.

Q 10 This question was common with the higher tier. The first part proved straightforward, with 80% of the candidates gaining full marks, but part (b), with the ‘taking heads’ discussing risk, proved much harder. In (b)(i) candidates were not told how many boxes to tick, and most ticked two correct ones (Abul and Beth), missing Clive, who also clearly recognised the risk. (This issue is discussed in the third paragraph of the general introduction above.) In (b)(i) also, anyone choosing David gained no marks for this part. Part (b)(ii) was much more successful because, even though candidates were not told how many boxes to tick, there were in this case two correct answers for the two marks. Accordingly, two-thirds of all candidates gained both marks.

A331/02: Physics A (P1 P2 P3) Higher Tier

General Comments

Candidates performed well on the paper with a high mean mark and less than 10% scoring under half the marks and a third scoring over three quarters of the marks. Only a few candidates were inappropriately entered for this higher tier paper. Approximately half the marks on the higher tier paper are targeted at grade C/D.

In general candidates coped well with questions designed to address the Ideas about Science aspects of the specification.

Candidates should be aware that the marking is done from scanned images of their scripts. Consequently, if candidates change their minds, any alterations must be made clearly and unambiguously. Comments such as 'please mark the pencil lines not the ink ones' are impossible for markers to interpret. Any marks that are ambiguous – possibly made with the intention that the examiner could give credit either of two possible responses, where only one is correct – will not gain credit on this paper.

On the higher tier differentiation is often achieved by giving less guidance on the number of responses required. In other words asking for the candidate to 'put a tick next to each correct statement' rather than 'put a tick next to the two correct statements'. Candidates are then required to make their own decision about how many responses are required. Please note the number of marks allocated is NOT a guide to how many ticks would be required. There was evidence that some candidates were mistakenly assuming the number of marks equalled the number of ticks required. Similarly if no instructions are given about whether responses may be repeated, the candidate should not assume they cannot. This appeared to be an issue for some candidates in question 5(a).

Comments on Individual Questions

Q 1 This question was common with the Foundation paper. By far the majority of candidates correctly answered this question, the only difficulty being in part (b)(ii) where many candidates only gave two responses, with the most common omission being Clive.

Q 2 Part (a) differentiated well at the top end of the ability range as intended. Weaker candidates had difficulty interpreting the graph of transmission against photon energy for the atmosphere. They tended to use 4 different letters, suggesting they had not read the instructions carefully. A fairly common error was to suggest that visible light for communication with satellites and space probes. In part (b) most candidates scored 1 mark for selecting two correct responses, with only a few scoring 2 marks for all three correct responses. The most common error was to tick only two boxes.

Q 3 Most candidates were comfortable with the photon model for light. The most common misconception was the idea that photons lost energy as they travelled.

Q 4 This question was common with the foundation paper. Part (a), seeking an outlier in the table of data, was indicated correctly by 68% of candidates. The Principal Examiner acknowledges that Idea about Science 1: Data and their limitations is not highlighted at the start of Units P1, P2 or P3, and so should not really have been examined in this module, although it is to be expected that virtually all candidates for this paper would also have been entered for Chemistry Unit 1, where this Idea about Science is thoroughly treated. The remaining parts of this question, involving an understanding of the nature of

significant and reliable data, were answered well, although some weaker candidates thought that because the means were the same the amount of radon gas was the same, indicating a weak understanding of what a mean is.

Q 5 Candidates' knowledge of nuclear power generation was weak. In part (a) many appeared unable to identify the functions of the parts of the power station, The most difficult was identifying where radioactive waste was produced. Nearly all candidates could classify the statements about using nuclear power. In part (c) very few candidates scored well. Commonly storage tanks were not considered at risk from earthquakes and in part (ii) burying under the ocean beds proved a very strong distracter.

Q 6 Parts (a) and (b) of this question were common with the Foundation paper. Candidates scored well on all aspects of this question, demonstrating a pleasing ability to reason, using their knowledge. In part (c)(i) the idea that stars fade over time was a strong distracter for weaker candidates.

Q 7 Candidates generally showed a good understanding of how scientific theories develop, with Wegner's work as an example. Weaker candidates reversed D and F in part (a).In part (c) the most common error was spreading at 1m per year. The solidification of molten magma at oceanic ridges proved a strong distracter, for strong candidates, as an explanation of the cause of sea floor spreading.

General Certificate of Secondary Education
Twenty First Century Science (Specification Codes J630, J633, J634, J635)
June 2007 Assessment Series

Unit Threshold Marks

Unit		Maximum Mark	a*	a	b	c	d	e	f	g	u
A211/01	Raw	42	n/a	n/a	n/a	33	28	24	20	16	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A211/02	Raw	42	35	30	25	20	15	12	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A212/01	Raw	42	n/a	n/a	n/a	33	28	24	20	16	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A212/02	Raw	42	37	33	28	24	19	16	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A213/01	Raw	42	n/a	n/a	n/a	31	27	23	19	15	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A213/02	Raw	42	37	31	25	20	16	14	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A214/01	Raw	40	n/a	n/a	n/a	22	17	12	8	4	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A214/02	Raw	40	25	20	15	10	5	2	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A219/01	Raw	40	35	30	25	21	17	13	10	7	0
	UMS	100	90	80	70	60	50	40	30	20	0
A221/01	Raw	42	n/a	n/a	n/a	33	29	25	21	17	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A221/02	Raw	42	41	38	33	29	24	21	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A321/01	Raw	42	n/a	n/a	n/a	30	25	20	16	12	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A321/02	Raw	42	36	31	25	20	13	9	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a
A331/01	Raw	42	n/a	n/a	n/a	32	28	24	20	16	0
	UMS	34	n/a	n/a	n/a	30	25	20	15	10	0
A331/02	Raw	42	35	30	25	21	15	12	n/a	n/a	n/a
	UMS	50	45	40	35	30	25	23	n/a	n/a	n/a

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks).

	Maximum Mark	A*	A	B	C	D	E	F	G	U
J630	300	270	240	210	180	150	120	90	60	0
J633	**Not Aggregating in June 2007**									
J634										
J635										

The cumulative percentage of candidates awarded each grade was as follows:

	A*	A	B	C	D	E	F	G	U	Total No. of Cands
J630	0.6	8.1	26.6	49.8	70.4	84.3	92.9	97.0	100	13632

For a description of how UMS marks are calculated see;
http://www.ocr.org.uk/exam_system/understand_ums.html

Statistics are correct at the time of publication

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