OCR
RECOGNISING ACHIEVEMENT

GCSE

Science A

Twenty First Century Science Suite

General Certificate of Secondary Education **J630**

Examiners' Reports

January 2011

J630/R/11J

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

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

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

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

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

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

CONTENTS

General Certificate of Secondary Education

Science A (Twenty First Century) (J630)

EXAMINERS' REPORTS

Chief Examiner's Report

Candidates for this January series of examinations showed that their Centres have prepared them well, but a substantial number of candidates still omit free-response questions, even though they have scored well in the objective questions, and are thus writing off one-third of the available marks. Candidates who do attempt these more demanding questions – even weaker candidates in the Foundation Tier papers – have usually scored marks, so it may be that lack of confidence is a factor in not attempting questions where free writing is required. As non-objective questions will be in the majority on papers in the new specifications (for all awarding bodies, not just OCR), and some of these will be 6-mark free-response questions, it is essential that all candidates develop strategies for tacking these questions.

Centres are generally choosing the appropriate tier of examination for their candidates, but there are still a number entered for the Higher Tier who find it inaccessible.

Examiners reported far fewer problems with legibility of scripts during this session (although some candidates' writing is exceedingly hard to decipher); use of appropriate black pens, which scan well, seems now almost universal; and there were fewer examples of candidates not following the instructions in the question. This does make it much easier to award them marks!

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

General Comments:

The paper was well attempted by most candidates and produced a similar range of marks to the previous two sessions. Most candidates obeyed the rubric, answering the questions in the way requested, but there were quite a few who omitted the free-responses questions. It was also pleasing that there were few candidates who wrote in pen or pencil that could not scanned electronically, and where changes were made to answers, these changes were clear.

It was encouraging that most candidates entered for this foundation tier examination made an attempt at the free-response questions.

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

Comments on Individual Questions

Question No.

1. (Chromosomes) In (a), most candidates could identify two of the three terms correctly; in (b), most recognised that the brothers have more identical alleles than any comparable outsider; and (c) proved harder, with only about one-third of candidates recognising the sex chromosomes.

2. (Inherited conditions) In (a), the Punnett square proved difficult for all but the best, with many not realising that the third column for cystic fibrosis required a genotype (Bb) rather than the word 'carriers' copying the corresponding entry for Huntington's disorder. Most gave good answers to reasons for and against gene therapy in the free-response (b), but some gave unspecified 'not ethical' or 'against religion' comments without explaining that the use of embryos was the contentious aspect.

3. (Cloning) Part (a)(i) was generally well done (helped by the diagram). The free-response part (b) was less successful than the comparable 2(b), and attracted similar vague reasons for disapproving of the research.

4. (Car exhausts) Many could identify the molecules well in (a), and almost all could read the graph correctly in (b)(i). Part (b)(ii) required candidates to extract information from one graph, and then use it in reading off the second graph, which proved difficult for most.

5. (Power stations and particulates) Most candidates could identify two of the three gases in (a). Most gained 1 mark in the free-response (b)(i) (to explain why the value indicated had been ignored) by stating it was an outlier, but did not clarify what made it an outlier. Identifying the mean (with the outlier removed) proved harder than expected, but most could correctly identify the range. The free-response (c) (the environmental effect of sulfur dioxide) generally gained one or two marks out of three, for naming 'acid rain' and giving a named effect.

6. (Wegener). The majority gained one out of two for identifying evidence supporting Wegener in (a), but the free-response (b) asking for reasons why geologists did not accept his theory often attracted superficial and even flippant answers. 'He was a meteorologist, not a geologist' was the most frequent good response seen.

7. (Space research) In (a), a surprising number thought that life had been found on other moons or planets in the Solar System, apart from Earth. The free-response part (b) was poorly answered: many gained a mark for writing just 'Big Bang' but others went further and then lost that mark by describing it in terms of gas and dust clouds condensing – there was general confusion between the origin of the Universe and the origin of the Solar System and the Earth. The difficulty in predicting the end of the Universe was answered well less frequently, usually in terms of inadequate data.

8. (Italian earthquake). This was generally well answered, although many candidates in (c)(i) found it hard to identify the data that the technician had used to make his prediction.

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

General Comments:

The paper was well attempted with very few candidates not answering questions. There was no evidence of candidates being short of time, the last questions being as well answered as the first.

The objective questions were well answered with candidates showing experience of these types of questions and rarely mis-reading the instructions. The free response questions proved to be more difficult and here there was some evidence of candidates not reading the questions carefully but providing stock answers - for example Q2b was often answered in terms of screening embryos or fetuses rather than working adults.

The paper provided a good spread of marks and showed good differentiation.

Comments on Individual Questions:

Question No.

1ai That chromosomes are located in the nucleus was well known as was that genes are sections of a DNA molecule, a common wrong response here from weaker candidates was "chromosomes" which does show some confusion.

b Most candidates knew that males were XY and that the Y chromosomes determines that an embryo will develop as a male. However, that a gene on the Y chromosome causes the testes to develop was less well known; common wrong answers were "cell" and "chromosome" from weaker candidates and from stronger candidates "testosterone".

ci This proved to be a difficult question with only the best candidates scoring both marks. There was much confusion about the process of PGD, many candidates thought embryos were taken from the mother's uterus, and many candidates failed to use the best terminology referring to the embryo as a fetus, baby or even child. Where marks were gained it was often for the idea that the embryo could be tested for genetic disorders or for gender.

cii This question also proved difficult with only the strongest candidates suggesting ethical reasons or that PGD is reserved for diagnosis of genetic disorders, some candidates knew that use of PGD to choose a daughter is illegal in the UK. Many candidates answered in terms of cost or risk of miscarriage.

2a This question discriminated well with most candidates showing they understood that individuals had two copies of each gene and that they were familiar with dominant and recessive alleles. A common error was not to fill in the genotype of carriers of cystic fibrosis.

2b Another question that proved difficult with very few candidates gaining full marks. A surprising number of candidates simply wrote about the ethics of abortion, about the risk to pregnant mothers, or about individuals not wanting to know if they were going to develop a disorder later in life. That the tests could result in discrimination was appreciated but detailed answers describing job loss and difficulty in getting insurance were rare.

3a Was well answered with students either knowing about cloning or being able to work out the answer from the information provided.

b This question discriminated well.

4a This question revealed many misconceptions. Many candidates thought that the nitrogen came from the fuel, perhaps because they had learned about sulfur impurities in coal. Few candidates knew that nitrogen and oxygen need the high temperatures, in a car engine, to react and fewer still that nitrogen monoxide is the primary pollutant. A number of answers referred to the production of carbon dioxide.

b Even at Higher level candidates seem to find these diagrams challenging to complete. A pleasing number of candidates could draw carbon dioxide but few could draw a molecule of nitrogen, so limited themselves to one of the three available marks. Only the best candidates gained all three marks.

ci This was well answered and candidates were clearly familiar with reading graphical information and it was particularly pleasing to see that the majority of candidates correctly identified the correlation.

iii This part was also very well answered.

5a That incomplete burning of hydrocarbons produces was well known by stronger candidates, but many others answered "carbon dioxide" or even "sulfur dioxide" showing some confusion despite this question being asked many times in the past.

bi Many candidates considered the results to be reliable simply because five samples had been taken, rather than referring to the actual data collected. Even when candidates did recognise that the data was reliable because of the small range of values on each day, many failed to gain the mark. This was due to vague answers which did not make it clear that candidates were talking about the results on each day being similar to the other results on that day.

bii This was well answered with most candidates being able to calculate a mean or best estimate correctly.

biii This question was also well answered showing most candidates understood ranges.

6a This question discriminated well. Most candidates gained one mark most commonly failing to gain the second by not appreciating that "fossils are found in certain layers of rock over the whole world" neither supported nor opposed Wegener's theory.

6b This was the best answered of the free response questions. Most candidates knew Wegener was not a trained geologist and better candidates that the lack of mechanism to move a continent was a major reason for his theory not being accepted. Marks were lost through poor expression such as candidates writing that people at the time couldn't see the movement rather than they didn't have the technology to measure the movement.

ci this question discriminated well with only the stronger candidates correctly identifying both statements which described seafloor spreading although most candidates correctly identified C - that magma oozed onto the seabed from the mid-oceanic ridge.

cii This question proved very difficult with very few correct responses.

ciii About half the candidates correctly answered this question.

7 Most candidates gained one mark for the idea of or use of the term Big Bang. However, others used the term but then went on to describe the formation of the solar system suggesting a major confusion in their minds between the formation of the Universe and that of the Earth. Fewer candidates gained the second mark about the end of the Universe with many again showing confusion between the Universe and the Earth and answering in terms of asteroid collisions or the Sun exploding. That we can not currently accurately estimate the mass of the Universe was not well known.

8a Many candidates opted for Italy having mountains rather than volcanoes as the best indicator that Italy is close to two tectonic plates.

b Stronger candidates managed this question well but many others were distracted by C and wrongly included it in their answers.

c The data was recognised more often than the explanation. However, given the emphasis placed on these ideas by the specification and in previous exams it was disappointing that more candidates could not correctly identify the data and explanation from the statements.

d Most candidates knew that a single piece of data does not prove a claim.

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

General Comments

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

Most candidates attempted all the objective style questions but still showed lack of confidence when faced with the longer response questions that are now a feature of these papers, and a significant proportion left these sections completely blank. Candidates lost marks needlessly by this strategy. This trend was not limited to the weakest candidates, there were many examples of candidates scoring well on the objective questions but attempting none of the longer answers. It was also noticeable that even the weakest candidates who did attempt these longer response questions were able to gain some credit from their attempts.

Question 1

1a This question was designed to allow the weakest candidates to show their understanding. In fact, candidates of all abilities found it difficult to decide which substance were mixtures and which single chemicals. Iron and crude oil were the best identified, wood was commonly classified as a pure substance.

1b This question was also designed to allow the weakest candidates to show their understanding, and worked very well. The relative advantages of glass and plastic were well understood. The most common errors tended to arise with transparency and weight, with candidates suggesting that plastic bottles are less transparent than, and also the same weight as, glass.

1c This part was common with the higher tier paper.
This was the first of the questions requiring a longer written answer and a significant minority of candidates left it blank. This question discriminated very well, with almost all those that did attempt it demonstrating some level of appreciation of the properties of plastics, and the most able candidates getting all three marks.

Answers commonly discussed wooden furniture or window frames, paper shopping bags, clay pots and metal containers. However, examiners were impressed by the range and creativity of the thinking that was shown. Memorable responses included plastic as a replacement for grass in Astroturf and as a replacement for feathers in quill pens!

Some candidates appeared to be uncertain of the nature of a 'material', so while answers such as 'paper bags' were quite sufficient for the first mark, 'shopping bags' was not enough as the material of the bag was not stated. Others did not notice the instruction to name a material other than glass. It cannot be emphasised enough how important it is that candidates read the question carefully. It can be a useful practice to mark any such instructions with a highlighter pen so that they do not get forgotten in the general stress of the examination. It was not uncommon for a candidate to forget the instruction part way through the answer and to shift to a discussion of glass

Question 2

2a In part ai the vast majority of candidates realised that less than half the paper is recycled, with the most common error being 'more than half'. This question allowed middle ability candidates to show their strength, as did the choice of methods to reduce the environmental impact in part aiii.

Parts aii and aiv were more difficult, with common mistakes being "We are using more paper every year" for part aii and "Processing waste in China is cheaper ... " for aiv.

2b This part was common with the higher tier paper.
Again, it required a longer written response and was left blank by a minority of candidates. Many candidates found it very difficult to articulate their ideas about the environmental advantage of using waste to supply energy, with answers which were either too unspecific to be given credit "it produces less pollution" and "energy sources being reduced" or which copied out passages from the question without taking them any further.

Question 3

This question was common with the higher tier paper, and discriminated well

3a Able candidates recognised that the property of microwaves discussed in the article was that they are absorbed by food. Weaker candidates were much less certain and often ticked more than one box.

3b This part was well answered, most candidates realising that the more powerful oven generates more photons per second. However, again there were some multiple ticks. The most common incorrect answers were "the oven has a bigger space" and "the intensity of the microwaves is greater".

3c Able candidates realised that the statements of Donna and Anne mentioned the reduction of risk and risk and benefit. Common mistakes were to put Clive or Bimal for the first part. Some candidates had considered Donna, crossed her out and replaced it with another and then used Donna for the second part. It was very pleasing to see that in almost all cases candidates who changed their mind did so clearly, and the examiner was able to credit the candidate's final intention.

Question 4

This was another longer response question and was often left blank by a significant minority. For those candidates who did attempt it the question discriminated well, with the most able candidates appreciating that plants take in carbon dioxide overall and animals produce it. As the question was not specifically assessing the nature of photosynthesis and of respiration, in this case examiners took a very lenient approach to suggestions such as "plants breathe". This may not always be the case! Examiners also accepted answers which ignored the carbon dioxide production from living animals and instead focussed on the process of decay of either the animal or of its faeces.

Examiners were impressed at the number of candidates who picked up the reference to methane from question 2b and discussed methane production from cows. While this did not gain credit, it did show a level of alertness which was very encouraging.

Question 5

5a The task of taking readings from the graph was designed to allow weaker candidates to demonstrate their understanding, and they did well. The most common incorrect responses for ai were 12, 13 and 7.

5b Again there was a significant minority who were presumably put off by the requirement for a longer response and so did not attempt this part. For the others the question discriminated well. Most candidates appeared to be familiar with the term correlation, though they then had considerable difficulty in linking their understanding to the two graphs. The best answers identified the two variables that were being compared ie atmospheric carbon dioxide concentration and temperature, and gave a similarity in the behaviour of the two variables. Weaker answers often described one of the graphs only. Answers such as 'the points all go in a line' or 'there is a line of best fit' did not gain credit, though examiners did feel that these responses gave far more insight into the thinking of the candidate than if the candidate had not attempted the question at all. Some candidates discussed carbon rather than carbon dioxide. This may have been a short hand on the part of the candidate, but examiners were not certain enough of the intention of the candidate to be able to give credit.

Question 6

6a The question discriminated well, though many weaker candidates copied out words such as cheek/tooth/film from the sectional view into the diagram of the electromagnetic spectrum.

6b Few candidates understood that X-rays are transmitted by a patient's cheek, the most commonly wrong response was that X-rays are absorbed by the cheek.

6c Many candidates realised that we use X-rays because the benefits outweigh the risk, though many ignored the statement about X-rays being dangerous and thought that dentists use harmless X-rays.

6d While the question differentiated well, many weaker candidates had trouble choosing which of the correct statements about X-rays explained why dentists stand as far away as possible form the X-ray machine. "X-rays are an electromagnetic radiation" was a commonly chosen response.

Question 7

7ai Most candidates could interpret the graph, and this part was well answered.

7aii Many candidates who left the previous longer answer questions blank were prepared to attempt this part and it was generally well answered, though some candidates appeared to be badly hampered by their communication skills. Candidates were not expected to have an understanding of history, but to make intelligent suggestions, and this they did very well. Examiners applied the mark scheme generously as the question was intended to differentiate between the least able candidates. Some answers did suggest ways in which men's lifestyles had changed, but left the direction of that change open to doubt. At this level examiners tried not to penalise unless the candidate had unambiguously got the change the wrong way round. Answers which discussed improved medical provision did not gain credit as this is not an example of a change in the lifestyle of the men themselves.

7b Many candidates identified one of the incorrect statements, usually statement 3. However, far fewer appreciated that statement 1 was incorrect, often choosing statement 5 instead. In a number of cases only one statement was identified.

Question 8

8a The role of vaccines was well understood by the more able candidates, though a disturbing number of candidates still think that viruses are affected by antibiotics. The longer response section was also well answered, with many candidates clearly describing a reason for and a reason against stopping the vaccination programme. In this case candidates who did no more than copy statements from the text were able to gain credit so long as the statement was unambiguous. Consequently answers such as "most recovered but some died" gained no credit. However, the vast majority of candidates either chose their statements carefully enough, or amplified them in some way, and were able to score well on this question.

8b&c These parts were common with the higher tier paper. While the safety aspects of drug testing did not seem to be well understood, most candidates had a good grasp of the concept of peer review. More able candidates could often link the statements about slowing the spread of resistance to antibiotics in 8c, with weaker candidates often correctly realising that it is important to finish a course of antibiotics so that all the infecting bacteria are killed, but not realising that the more often antibiotics are used the more likely is the spread of resistance.

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

General Comments:

This paper allowed most candidates to perform well. It differentiated effectively allowing strong candidates to show their knowledge and understanding of the subject.

More candidates than usual appeared to have been entered for the wrong tier in the examination. The inclusion of extended writing questions has provided extra challenge in the paper. Weaker candidates, who struggle with basic understanding, find it difficult to gain marks on these questions in the higher tier. In examinations on the new specification there will be a higher proportion of these questions. It will then become even more important that candidates are entered for the correct tier.

Weaker candidates were confused about recycling. They thought only plastics could be recycled and were unclear about the difference between recycling and incineration. A few questions also showed muddled thinking on key stage 3 concepts such as respiration and photosynthesis.

Comments on Individual Questions

Question No.

1a This question at the start of the paper was more difficult for candidates than expected. Half were unable to identify the best explanation of why plastic has replaced glass for fizzy drink bottles. The most common wrong answer was that plastic bottles can be recycled and are flexible.

b This was generally well answered with most candidates gaining 2 or 3 marks. A few lost all marks by not reading the question and using glass as the material. Some lost a mark by naming an object rather than a material on the first line but then put sensible reasons in the second part. A common misconception was that plastic was more easily recycled than metal or paper.

2a This was well answered. Most candidates correctly worked out the percentage of waste paper recycled.

b In part i about half the candidates were able to find the correct explanation for Britain only recycling some of its waste paper. All the other sentences were seen as wrong answers. Part ii was well answered with most able to explain the environmental impact of sending waste paper to China.

c Many candidates understood the context of this question and answered it well. Again, some candidates were muddled on the idea of recycling. Answers that stated that waste is recycled when burned were not uncommon. Some answered in terms of carbon dioxide. They believed, wrongly, that burning waste would reduce carbon dioxide emissions into the air and linked this with global warming and saving the planet.

3a Both parts of this question were well answered. Candidates understood the relationships between melting point and inter-molecular forces and how properties of polymers are changed by cross linking.

b Part i was difficult for many candidates. Some identified the correct responses, but then ticked an additional box. Some had not read the question carefully enough and gave responses for PVC with plasticizer. In part ii most candidates knew that the length of time used would make a difference to the Life Cycle Assessment for two products made from

PVC. However, they did not realise that the other correct answer must also be related to the product made.

4a This was a discriminating question with good candidates picking, from four correct facts about microwaves, the one that had been described in the article.

b&c All these questions were well answered showing candidates had a good understanding of the power ratings of microwave ovens and ideas of risk and benefit in this context.

5 This question had the highest number of 'no responses' on the paper. Many candidates did not understand the question, although the first sentence should have given a lead into what was required. A number wrote about global warming and some included the hole in the ozone layer. Of those who answered in terms of natural processes some lost marks from their lack of understanding of photosynthesis and respiration in terms of reactants and products and references to plants 'breathing'. Only a few were able to recognise the balance between respiration and photosynthesis.

6a Part i was well answered and most candidates scored a mark. Part ii proved much more difficult. Most candidates were unable to estimate the time when the carbon dioxide concentration was above 260ppb from the graph. There was no pattern in the wrong answers.

b Very few candidates had sufficient understanding of correlation and cause to be able to answer this question correctly. There was no pattern for which of the three questions was found easiest and no pattern for which wrong answers were chosen.

7a Questions on labelling the electromagnetic spectrum are always discriminating. However it was pleasing to see that more answered this correctly than in previous sessions of the examination, although there were a surprising number of 'no responses'.

b This question was more difficult. Only a few, good candidates understood why X-ray photos will show cracks and holes in teeth. The most common wrong answer was that the cracks and holes in teeth absorb X-rays.

c This was well answered. Candidates had to identify two correct statements for the mark. Almost all knew that dentists needed X-rays to see what was wrong with the teeth, but some could not correctly choose the other statement.

d Another discriminating question. Good candidates knew the dentist was applying the ALARA principle. All the wrong answers were seen. There is still confusion between ALARA and the precautionary principle.

8a There was very little understanding of the word 'peer' in this question. Few knew that the scientist had to be working in the same field as those writing about the studies. Many more knew that the review gave reliability to and prevented bias in the report. Some weaker candidates thought this question was about people with heart disease explaining it to others.

b This was a discriminating question that was generally well answered. Weaker candidates again confused carbon dioxide and oxygen in respiration. They also made mistakes about the direction of blood flow in arteries and veins.

9a Some candidates realised that this question was about a vaccine for a new flu virus and gave the correct answer. Most gave answers that were more general reasons for why vaccines work which did not score marks.

b Very few scored three marks for this question. There were many one mark answers, often for the virus mutating. Candidates found it difficult to explain why mutation meant vaccines were not effective. Weaker candidates showed a misunderstanding of basic words such as bacteria, virus, antibodies and resistance.

c Most candidates scored a mark on this question by knowing what was checked when animals and healthy volunteers were tested with a new drug. The common wrong answer for both trials on human cells grown in the laboratory and people with the illness were that they only tested effectiveness.

d In part i few candidates realised that a control group is used in a trial for ethical reasons. Most thought it would allow the effectiveness of the new drug to be seen. Part ii was well answered by most candidates. Those who did not score on this question had not followed instructions and had ticked a box in each of the three columns.

e This question was well answered. Candidates knew how antibiotics could be used effectively. There were still a few who did not read the instructions and tried to join all the right hand boxes to the two left hand boxes.

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

General Comments:

This paper allowed candidates to perform well and there was a wide spread of marks showing good differentiation.

Most candidates managed to complete all the paper, although there was evidence that a limited number of candidates were short of time, in that those questions which were not attempted were towards to end.

Some candidates still lack confidence in answering the extended writing questions. They often try to answer by re-writing the stem of the question which does not score marks or give short, one sentence answers, limiting themselves to one mark, when there are three marks for the question. A very few candidates miss out these questions altogether. In the new specification there will be a higher proportion of these questions than at present. It is, therefore, really important that candidates practice this type of question. They should understand how they are marked and ensure that they are attempted.

Question No.

Comments on Individual Questions:

1a A straightforward and well answered start to the paper with most candidates scoring 2 marks for this question. Those that scored 1 mark usually did so because they mis-read the bar chart.

b Again, most candidates knew that radiotherapy, to treat cancer, used ionising radiation.

c This question asked candidates to use the bar chart to explain why children would not get cancer from the radiation from nuclear power stations. Some answers were very brief, just saying that the radiation from nuclear power stations was very small. Candidates should know that if there are three marks available for an extended writing question they need to write down three points for those marks. Those that did write more about the bar chart scored two or three marks.

2a Another well answered question with most knowing why gamma radiation is used in preference to alpha for finding cracks in pipes.

b This part was much more difficult. Candidates did not understand where the portability of a gamma ray source would be an advantage over using an X-ray source using mains electricity. All the wrong answers to this question were seen.

c Most were able to suggest one way that workers using gamma rays can be as safe as possible. Many incorrectly suggested that protective clothing, goggles and face masks would protect workers from gamma radiation.

3a Strong candidates knew how to complete the flow diagram showing how electricity was generated from biomass. Weaker candidates were unclear on the difference between generating electricity from burning and from a nuclear reaction. Many thought a nuclear reaction would provide the heat in this waste burning power station.

b Most candidates gained one mark for knowing that carbon dioxide given off by the power station came from burning plants. Many could not link this to the other part of the cycle: that all carbon in plants comes from the air. They opted for the sentences that suggested that sugar plants contained carbon.

4a This question was a common question with the higher tier and was well answered in the foundation paper. Strong candidates were able to describe the graph in detail, gaining both marks. Weaker candidates usually described the general trend of the graph, giving them one mark.

bi Part i asked for an example of extinction caused by human activity. Less than half the candidates were able to do this. Common wrong answers were dinosaurs, or examples of currently endangered species, such as tigers and polar bears. In part ii candidates were able to link biodiversity with extinction and score a mark. Although many realised that extinction would have an effect on food webs they found this difficult to explain clearly. General statements such as food webs are destroyed are incorrect and do not earn marks. Very few understood that resources must be maintained if we are to use the environment in a sustainable way.

5a & b Almost all candidates were able to interpret information from a table and answered these questions correctly.

c Most knew that all hominids shared a common ancestor, but few knew that all species of hominids except homo sapiens were extinct. Descendant and different were the most common wrong answers.

d In part i only a few knew when life on Earth was thought to have started. Most wrongly chose 350000 or 35000 years ago. In part ii many candidates could complete the sentences about evolution. Some were confused about the idea of a 'process'. They thought that variation was the process and this depended on genes.

6a Almost all candidates recognised that increasing obesity increases the number of people diagnosed with type 2 diabetes, but fewer realised that better methods of diagnosis would also do this.

b Many candidates were able to give a benefit for why people did not choose a healthy lifestyle. They found it more difficult to explain that one of the reasons people did not choose a healthy lifestyle was because they did not know or understand about the risks of developing type 2 diabetes.

c There were many misconceptions about the differences in the two types of diabetes. Some thought it depended on the amount of sugar in the blood; some thought that one type was genetic and the other wasn't. Others thought that an obese person would always suffer from diabetes. They did not understand that obesity is a risk factor for type 2 diabetes not a cause.

7 There was a good understanding of the nitrogen cycle with most candidates gaining one or two marks on this question

8a This was a discriminating question with good candidates showing knowledge of intensive and organic farming methods.

b Many knew why organic farmers rotated crops to control pests. Fewer were able to link smaller fields with more habitats for natural predators. The popular wrong answer was that smaller fields mean fewer predators.

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

General Comments

Although this examination was relatively short with a significant number of free response questions, there was little evidence that candidates were short of time. Most candidates were able to make some response to all questions.

Comments on Individual Questions

Question No.

1a The flow diagram showing how electricity is generated in a waste burning power station was not well understood with more than half the candidates including a reference to heat from a nuclear reaction.

1b Most candidates could successfully select at least one correct statement to explain why the power station is carbon neutral although a significant number thought that it was due to sugar containing carbon rather than the carbon in plants coming from the atmosphere and some continued with the idea that nuclear power was involved.

2a The idea that there would be less darkening of the film where the gamma rays had passed through the pipe first was well understood by the majority of candidates.

2b The majority of candidates knew that beta radiation is less penetrating than gamma.

2c Candidates struggled to interpret the question and comparisons of X rays with gamma rays were too often imprecise. Few candidates thought about the difficulties of using an X ray machine in situations where there were poor electrical supplies or confined spaces with many just repeating the stem of the question. Few candidates gained all 3 marks.

3a A disappointing number of candidates were unable to add up the total radiation dose received annually from the data given in the bar chart.

3b Even fewer were able to select the dose received from food and drink and convert this to a percentage.

3c Candidates showed a good understanding of the risk from the radiation produced by the power station with few failing to select at least one correct statement.

4a The changes to the cod population shown in the graph were well described with many candidates including the required details such as appropriate years.

4b Most candidates showed some understanding of the consequences of using the environment in a non sustainable way but some just tried to include the words in the stem rather than to explain those ideas. Answers such as 'would damage the food web' are not sufficient to demonstrate an understanding of the problem. Few candidates were able to show the consequences to future resources.

4ci/ii Few candidates were unable to choose the best comment about natural selection with most choosing Charles' statement. However, their understanding of variation was poor.

4d The majority of candidates were able to draw at least one valid conclusion from this challenging graph with an encouraging number gaining both marks.

5a The likely origin of hominids was well understood as Africa although a significant number chose worldwide.

5b Only the more able candidates were able to deduce that the sample size was too small to indicate a break in the pattern of increasing brain size. The answer seen most frequently was that the brain size was smaller.

5c Candidates found it difficult to choose a suitable word to complete the sentences about hominids. Many said that the hominids shared a gene and that all species other than H. Sapiens are dead rather than extinct.

6a/b/c Candidates showed a very good understanding of the different types of farming with almost all able to choose at least one correct statement, usually the correct linking of the use of renewable resources with farmers using animal waste to fertilise the soil. Most were also able to link the idea of benefits outweighing risks with the consideration of the balance between crop yield and damage to the environment and that a choice to purchase only organic food as the effects of pesticides on the body are unknown as being an example of use of the precautionary principle.

7a Most candidates were able to select the correct links from the nitrogen cycle but they found the selection of bacteria as the type of organism which took nitrogen from the soil and put it into the atmosphere. Fungi and nitrates were common errors. The conversion of nitrogen in the air back to nitrates in the soil by lightning strikes was better understood although all incorrect conversions were seen frequently.

7b The effect of excess fertilisers on aquatic life was very poorly understood. The majority answered in terms of more toxic chemicals and discussed poisoning of various life forms in the water including, surprisingly, the idea that the fertilisers would directly kill the plants. A small number realised that plant life would grow excessively but very few considered any consequences of this.

8a Only the most able candidates were able to select both correct descriptions of information overweight people would need to know to assess the risks involved with type 2 diabetes.

8b Most candidates were able to recall the methods used to control type 1 and type 2 diabetes. A few got the methods the wrong way round and others lost marks by imprecise answers such as 'medication' or 'injections' without mention of insulin.

8c Again, only the most able were able to complete the sentence to explain why untreated diabetes causes problems. Weaker candidates drew multiple links in spite of the question clearly indicating that they should draw only one link between both pairs of lists.

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

OCR Customer Contact Centre

14 – 19 Qualifications (General)
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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

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

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