OCR
RECOGNISING ACHIEVEMENT

GCSE

Science A

Twenty First Century Science Suite

General Certificate of Secondary Education **J630**

OCR Report to Centres

January 2012

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Oxford Cambridge and RSA Examinations

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CONTENTS

General Certificate of Secondary Education

Science A (Twenty First Century) (J630)

OCR REPORT TO CENTRES

Overview

This was one of the last sets of examinations of the 'legacy' specification, but there are issues to report which will apply equally well to the new specification (J241).

Although these 'old' papers have far fewer free response questions than the new ones, candidates have continued to underachieve in them, and frequently leave these free response questions unattempted..

Candidates are generally successful in tackling the objective questions, but two particular points need to be highlighted. Firstly, candidates frequently change their minds about an answer, and alter their responses; this is fine, provided that the candidates make their final decisions clear. Ambiguous answers get no credit. Secondly, candidates are frequently instructed to tick one ('the best answer') or two boxes, but they are sometimes asked to tick **each** correct answer. Here it is not appropriate to assume that the number of marks is the same as the number of ticks. The best way to approach this type of question is to treat each option offered as a true/false choice, and to make a decision on each option separately.

Centres also need to emphasise to the candidates that their papers are marked electronically, after first being scanned. Therefore it is very important that candidates use legible writing and restrict their responses to the boxes, spaces and lines that are provided. On the occasions when candidates have to write outside of these spaces, they need to make it clear to the examiner that they have done so. In addition, if candidates change their minds, any alterations must be made clearly and unambiguously. Examiners sometime struggle to decipher a 'B' that has been written over in an attempt to make it into a 'D'. Candidates would be better to cross out and rewrite their new answer to ensure that they are awarded the appropriate number of marks.

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

General Comments

The paper was well attempted. Candidates are now experienced at this style of paper and few make basic errors such as ticking the wrong number of boxes. Although many still struggle with the free response questions, only a few were unable to attempt them although many just wrote anything they knew about the topic without addressing the question. Very poor handwriting and spelling made some responses difficult to interpret.

Comments on Individual Questions

Q.1 (a) Very few candidates understood that a gene is an instruction for making a protein with many more thinking that it is a code for making DNA.

Q.1 (b) Most candidates could identify at least one reason why people may choose to have their DNA tested or not to have it tested. Better answers included reference to the idea of being able to change lifestyle to reduce potential problems being a good reason to have the test done and the idea of avoiding unnecessary worries as a reason to not have it. Some considered reasons for DNA testing other than for identification of risks of developing disease such as determining parentage or solving crimes. Weaker answers showed confusion with more invasive tests and discussed possible side effects of the test such as miscarriage.

Q.2 (a) The connection between the individual with the allele for Huntingdon's disorder and a suitable decision that might be made was generally well understood. The link which was best understood was that if the embryo produced by IVF was found to have the allele then the decision might be made not to implant the embryo.

Q.2 (b)(i) The majority of candidates were able to complete the genetic diagram successfully. The errors made by the remaining candidates, varied with a significant number giving HH as a possible combination and others only quoting a single letter.

Q.2 (b)(ii) Candidates were much less successful in identifying the allele combinations that cause Huntington's disorder with many circling only one combination in spite of the information about the 50% probability given in the question. A few circled those combinations without an H allele while others appeared to circle a random combination.

Q.2 (c) Only the better candidates were able to work out the total number of UK cases of Huntingdon's disorder suggested by the given estimate per 100 000 people. The most common error was to divide the total UK population figure by the number of cases estimated per 100 000 people but many also just multiplied 12.7 by 100 000.

Q.3 (a) Most candidates realised that Adam and Lionel are identical twins because they developed from a single fertilised egg but many thought they would have come from 2 identical eggs.

Q.3 (b) Most candidates successfully identified both scars and weight as being possible differences between identical twins as they get older. The choice of eye colour instead of scars was the most common error with a small number ticking either the first or third boxes.

Q.4 (a) Very few candidates understood that an unspecialised cell was one that could develop into any kind of cell although some came close with answers relating to them having no specific job. A common misconception was that it was to do with fertilisation and many gave information about their potential uses such as curing diseases and mending broken bones. A few simply said that they were cells which were not specialised and gained no marks.

Q.4 (b)(i) The majority of candidates understood that Jon thought that the use of embryos was wrong as they would develop into human beings if the cells were not used. A significant number chose Saleema's concerns about the source of the embryos or Jayne who didn't understand the science.

Q.4 (b)(ii) All but a few understood that Philip's comments about the need to help lots of people with incurable diseases showed that he thought it was right to act in the way which will benefit the greatest number of people. The most common incorrect choice was Cain for thinking that using embryos for research is legal so it must be OK.

Q.5 (a) The composition of gases in the air is not well known and a wide range of incorrect suggestions were seen. Many thought that oxygen was the most abundant gas with nearly as many thinking it was carbon dioxide. A few did not choose oxygen for any of the gases and elements that are not gases, such as carbon and sulfur, appeared frequently.

Q.5 (b)(i) Most candidates were able to successfully link formulas with both names and diagrams of the molecules. The most common confusion was between nitrogen monoxide and nitrogen dioxide.

Q.5 (b)(ii) There were few good descriptions of why the sulphur dioxide does not remain in the air although some knew that it formed acid rain without being able to explain how this happens. More candidates gained marks by describing harmful effects on the environment such as effect on buildings. There were some confused accounts of sulphur reacting with carbon to cause global warming.

Q.6 (a)(i) Most candidates realised that the outlier would be at the top or bottom of the range of values for a particular time of day. A significant number chose 71 from the afternoon values instead of sample 4 from the evening values.

Q.6 (a)(ii) Most candidates who attempted to calculate the mean of the values of particulates in the air in the morning did so successfully although a few decided to treat the value for sample 4 as an outlier to get a solution of 11.75 instead of 11. A larger number chose 12 as 'being in the middle' of the values given.

Q.6 (a)(iii) Most candidates were also able to identify the range of values in the afternoon although some chose the wrong time of day and others chose 58 (the top number) with either 62 or 64 which were at the bottom.

Q.6 (b) Most candidates realised that the reason for the airport being open in the morning but closed in the afternoon was due to the large increase in particulates although some only accounted for the afternoon closure without making a comparison with the morning. Weaker candidates explained the reason that the aircraft cannot fly when the particulate levels are high, often just repeating the stem of the question.

Q.7 (a) Very few candidates did not see that Daniel's comments, about the number of earthquakes taking place on the edges of tectonic plates, were giving data to support the connection between earthquakes and the movements of tectonic plates against each other. Anna's use of value of the strength of the earthquakes was the most common distracter.

Q.7 (b) Candidates were also confident that Chandra's comment about the need to train people to know what to do in the case of an earthquake was a reference to an action that could be taken to reduce the effect of earthquakes on people. The most common error was to choose Brian who was the only other person to suggest an action even though it was to study earthquakes more rather an action designed to reduce the effect of earthquakes on people.

Q.7(c) Anna's description of the destruction and death caused by earthquakes was correctly identified by most as the statement mentioning a serious consequence of an earthquake with Brian's comments about the possible links between the earthquakes and the need to study earthquakes more being the most commonly chosen incorrect response.

Q.7 (d) Candidates found it more difficult to choose both correct statements which included data with all possible combinations being seen.

Q.8 (a) About half the candidates were able to arrange the objects in the Universe in the correct order of size. The most common error was to think that the Earth is smaller than the Moon although all incorrect orders were seen.

Q.8 (b) More candidates could place the Earth, the Sun and the Universe in the correct order of age. Most realised that the Earth was younger than the Universe but there was some uncertainty about the position of the Sun.

Q.9 Most candidates were able to identify a relevant piece of evidence found in rocks with fossils being the most common response. Good descriptions of the change which it shows were less common, for example many candidates just described the use of fossils to age rocks without relating this to a change such as evolution or matching fossils showing movement of continents.

Q.10 Very few candidates showed an understanding that the vastness of the universe with so many planets means that there are many possibilities of there being life elsewhere. Most answers referred to possible evidence for life such as other planets having suitable conditions or movement having been seen on other planets. Many could not go beyond the solar system and discussed the possibility of life on Mars.

Q.11 (a) Most candidates were able to correctly select light pollution as the best reason for the difficulty in making clear observations of stars at night. Sunlight was the most common incorrect choice.

Q.11 (b) Methods used to measure the distance to a star were less well known with many candidates incorrectly choosing 'bouncing laser beams off the star' and others selecting only one choice.

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

General Comments

Most candidates are now very familiar with the demands of this paper, but a number still omit free-response questions, even on this Higher tier paper, which may mean that they were not entered for the paper to which they were best suited. In a number of cases the writing was difficult to interpret, although there was no evidence that candidates found the paper too long.

Comments on Individual Questions

1 Although almost all candidates were successful in identifying the description of a gene, only the more able knew what pre-implantation genetic diagnosis is, with many confusing it with gene therapy or even genetic testing on the fetus itself. Analysis of the Punnett square was usually done well.

2 Better candidates gained marks by organising their answers well, while many knew what the question was about – chromosomes, genes and alleles – but repeated themselves and omitted key aspects.

3 This objective question was well answered.

4 Weaker candidates still expect carbon dioxide to be a major component of the air, but most candidates were well able to label the pie chart. Parts (b)(i) and (ii) provide an interesting comparison between responses to objective and free response questions; both had similar levels of difficulty. The problems in (b)(i) lay in recognising that any left-hand box must join to only one right-hand box, and that one of the right-hand boxes was redundant. The problem in the free-response (b)(ii) was the chemical difficulty of the reaction $NO + O_2 \rightarrow NO_2$; only the best candidates were aware of the role of NO_2 in acid rain. Candidates were not penalised for thinking that it was NO, instead of NO_2, which was a respiratory irritant, although that detail is not in the specification.

5 Most candidates were able to find a best estimate by finding the mean with the outlier excluded but found it harder to justify that there was a real difference between the two data sets. The objective part (b) was toughened by the fact that 4 of the 6 choices were correct, (so the proportion of candidates getting full credit was relatively small).

6 This objective question was generally well answered, although the part where two ticks were needed (out of the four choices) proved the most demanding, even though the candidates were told that there were two correct choices.

7 This objective question, based on recall of information that candidates are expected to know, proved hard for most candidates.

8 Many good answers were seen to this question. Those candidates who were unsuccessful generally did not read the instruction to ‘give two examples of evidence and explain’ where each of the two marks required a quoted example and its explanation. Some candidates gained two marks for quoting the same example with two different explanations, such as fossils showing not only the changes in populations, but also that separate continents were once joined.

9 Better candidates tackled both aspects of this question - *explain why many scientists think it is likely that life does exist somewhere out in the Universe, and suggest why no evidence of life has been found so far* – but less successful answers were unstructured and contained repetitions.

10 In this question some plausible distractors, particularly that space telescopes were better because they were nearer the stars, meant that few candidates gained both of the marks, although most gained one.

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

General Comments:

This paper was appropriate for the ability range of the entry and questions were accessible to candidates across that range. There was no evidence to suggest that candidates were short of time.

As in previous sessions, candidates were well prepared for the objective style of questioning and there were few "no responses" for these questions. Candidates also seemed to understand and be able to follow the instructions for the objective questions. Occasionally candidates put the incorrect number of ticks in the boxes. If they are asked for two, they should give only two, otherwise they are likely to lose marks.

There were more issues relating to questions requiring extended answers. Some candidates do not seem to appreciate that a question worth two or three marks requires more than a very basic response. Many answers to the free response questions lacked appropriate scientific detail and clarity in their answers. For example, the use of words such as 'it' and 'they' often makes answers unclear. Candidates need to be reminding to state exactly what they are referring to. There is a much greater number of free response questions in the examinations for the new specification, so Centres would do well to concentrate on preparing their candidates for this type of question.

Question 1

(a)(i)
This was a good start to the paper with the majority of candidates scoring two marks.

(a)(ii)
Only a small number of candidates were able to correctly identify that the plastic chairs are not as heavy as the wooden ones. Many incorrectly ticked that plastic is a renewable resource.

(b)
This question was well answered by the majority of the candidates. It was pleasing to see that the candidates had a good understanding of the Life Cycle Assessment and that it is the manufacture, use and disposal of the item that is relevant to these types of questions.

(c)(i)
Candidates' answers to this question suggested that this area of the specification was not very well known or understood. The question was poorly answered by many candidates or they made no attempt at the question. Candidates did not seem to grasp that the question was asking about the molecules within crude oil. Many candidates compared wood and plastic (following on from part (b)) or talked about polymers. A small number of candidates gained one mark by correctly describing the difference in the size of the molecules but it was more common to see references to different strengths or properties. For the similarity, a few correctly identified that the molecules are hydrocarbons. However, many responses incorrectly stated that a similarity was that all the molecules were made from crude oil.

(c)(ii)
This part question was also poorly answered. There were more attempts made than in part (c)(i) but there were still a large number of "no responses" seen. Most candidates did not write about the formation of polymers. Instead answers described molecules melting or being pushed together. The few candidates who did write about polymerisation did not then go on to explain it further. There was evidence to suggest that candidates were confusing the formation of a polymer with changing the properties of plastics by adding crosslinks.

Question 2

(a)
The majority of candidates scored full marks here.

(b)
Candidates also performed well on this part question. Occasionally candidates had ticked or underlined their choice of response rather than circling it as asked.

Question 3

(a)
The majority of candidates correctly identified Amy and Clive as those who talked about the greater risk of mobile phones to children.

(b)
Most candidates were correctly able to identify Betty.

(c)
Fewer candidates identified David as the person who accepts the possible risk of using mobile phones. His comment suggests that a child needs a mobile phone in case of an emergency, and that need outweighs the possible risk to the child.

Question 4

Candidates seemed familiar with the idea of global warming and many identified the use of cars as a human activity that contributes to global warming. The more able candidates correctly qualified this with a reference to the production of carbon dioxide. Answers which failed to achieve the second mark included vague references to exhaust emissions, polluting gases or, incorrectly, carbon monoxide. A significant number of candidates correctly wrote about burning fossil fuels, but again this was not always linked to the production of carbon dioxide. A few candidates described deforestation. Only a very small number of candidates could correctly explain how removal of the trees would lead to an increased amount of carbon dioxide in the air. Some common incorrect answers included smoking, dropping litter, not recycling our waste or polluting rivers. A few candidates referred to activities which actually produce heat like bonfires.

Question 5

The majority of candidates scored at least two marks out of the possible three. The most common error was in the first sentence where ions or electrons were incorrectly chosen instead of photons.

Question 6

A significant number of candidates gave clear, simple answers in terms of plants taking in carbon dioxide and animals producing carbon dioxide, although quite a few of these incorrectly used the term 'breathing' for both. However, many candidates remain very confused about the exchange of gases between plants and animals. A large number of answers placed animals and plants together and described them as taking in carbon dioxide to produce oxygen which we (humans) then use, rather than recognising that it is the animals and humans that should be placed together. Some of the weaker candidates described the need for light by plants, which was not relevant to the question. The most able candidates gave good descriptions of photosynthesis and were able to explain why it is important to animals. The very best candidates talked about respiration as well and gave an answer worthy of 3 marks.

Question 7

The majority of candidates scored two marks here by correctly selecting 'microwaves' and 'light'.

Question 8

(a)
Most candidates scored two marks here.

(b)
The idea of peer review was well understood and many candidates were able to score both marks. A number of the best candidates gave all three marking points. Common errors were to say it was just reviewing or looking over the study. Others referred incorrectly to the idea of making it a fair test. The less able candidates gave answers in terms of checking the tea or coffee, drinking to make sure it was safe, or described the idea of checking the study for spelling errors rather than testing the scientific theory.

(c)
Although the majority of candidates were correctly able to identify that a heart attack occurs when fatty deposits block an artery carrying blood to the heart muscle, there was a surprising number of candidates who thought that the blockage occurred in a vein.

(d)
Candidates found this question hard with few able to identify B as the correct graph. The majority selected A or D instead as these show the more typical correlation.

(e)
Candidates had to give three separate lifestyle factors to be awarded this mark. Many wrote down two correct factors but far fewer were able to name three correctly. The most common errors were to include smoking (which was given in the question) or to give vague descriptions of diet or exercise. Phrases such as unhealthy or unbalanced diet were not credited, and neither was exercise unless it was qualified. A large number of candidates also stated that taking drugs increased the risk of heart disease and this was also not credited.

Question 9

(a)
Few candidates scored a mark here. It was common to see a tick placed incorrectly in the box next to '…can reproduce asexually'. This is true, but is not one of the **best** statements that describe how microorganisms make us ill.

(b)
Few candidates scored a mark here. Both ticks were required to score the mark yet a large number of candidates incorrectly suggested that using antibiotics might make the virus resistant.

(c)
Most candidates gained some marks here by describing that the daughter would not get measles herself, and that therefore she would not be able to pass the disease on to other people. Far fewer candidates achieved the third mark, although some gave a good description of the idea of benefit and risk, recognising that the benefit of having the vaccination outweighed the small risk of side effects. A few of the less able candidates simply copied information from the question without using it to describe why it was important for Annie to have her daughter vaccinated. Some candidates described how the vaccination would work to protect the body from infection.

(d)
The majority of candidates scored at least one mark, recognising that a vaccine causes white blood cells to make antibodies. The most common mistake here was to suggest that the vaccine acts as a barrier stopping the measles virus entering the body.

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

General Comments

Students remain well prepared for the objective questions. Most candidates understood and responded accurately to the rubric. However, candidates show far less confidence in answering questions when extended writing is required; they are more likely either not to attempt a question or else to fail to answer the question as asked. Clearly the free response questions present a greater challenge to students and centres are encouraged to give more opportunities for students to practise this style of question.

Generally the questions were well answered although ideas about peer review and the need for a mechanism to explain a correlation are not yet well established.

Comments on Individual Questions

1a This proved to be a difficult question with many candidates adding extra property descriptions of their own rather than using the ones provided in the table of data. Candidates often erroneously gave density as part of their explanation.

1bi and ii Surprisingly few candidates knew that crude oil is composed of hydrocarbons and even **f**ewer candidates could explain that molecules differed in chain length. Part ii also proved difficult with most candidates not knowing that monomers join together to make polymers. Candidates often gained a mark for the term polymerisation, even if this was poorly explained.

1c This question was well answered by the majority of candidates who knew at least one environmental advantage of incineration or recycling of plastics.

2a Most candidates understood and could interpret the graph well enough to score at least one mark for this question.

2b Whilst many candidates appreciated more energy is needed to separate longer chain polymers, few understood this was because there are larger forces between longer chain molecules.

3a, b and c Nearly all candidates scored well on this question, showing a good understanding of risk and a familiarity with this 'talking heads' style of question.

4a This question was well attempted with few candidates not feeling able to provide an answer. However, most answers were very disappointing. There are clearly some major misconceptions regarding the role of the ozone layer and how energy is trapped by greenhouse gases. Candidates were also handicapped by poor use of technical vocabulary or making no attempt to explain the greenhouse effect using scientific terms.

4b Most candidates knew some of the possible effects of global warming but identifying all three proved difficult, with recognising that some areas would become colder being the effect most often missed.

5a Most candidates scored one mark for knowing that photons of red light have less energy than those of blue light or appreciating that the red lamp must be emitting more photons per second. However, candidates rarely gave both correct statements.

5b A pleasing number of candidates could name the three types of ionising electromagnetic radiation, although some included beta and alpha radiation. Better candidates went on to correctly describe ionisation but many other candidates described how ionising radiation could kill cells/damage DNA or cause cancer/mutations.

5c This question was well answered with many candidates able to give two effects of ionising radiation on cells with cancer.

6ai and ii Most candidates appreciated that a large sample size and long term study would make findings more reliable. However, many candidates lost marks by not explicitly stating that the study was long/had a large number of participants. Again candidates lost marks by simply stating that the study was reported in a scientific journal without adding that this would therefore have required peer review. In part ii most candidates suggested further studies or graphs to show the correlation with very few candidates appreciating that a mechanism showing how tea and coffee may protect the heart was needed.

6b Here graph C proved to be a strong distracter for weaker candidates.

6c Although candidates often gave two correct lifestyle factors, 'smoking', given in the stem of the question and 'poor diet', which was too imprecise were not creditworthy

6d This was very well answered.

6e A surprising number of candidates drew more than one line, despite the instruction to draw one line being emboldened. Other candidates lost marks by thinking that a vein leading to heart muscle is blocked causing a heart attack.

7a How microorganisms cause illness was well known with the selection of "can reproduce asexually" being a common error.

7b Most candidates knew that viruses are not affected by antibiotics and that unnecessary use of antibiotics increases the chances of resistance.

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

General Comments

Most candidates completed the paper and there was no evidence that shortage of time was an issue. The majority of candidates seemed to understand the way the questions were designed to be answered. The free response questions were worth up to four marks, and some candidates found it difficult to address the specific requirements of these. Often, lower scoring candidates did not read and understand the whole question; instead they seemed to respond to key words and this limited scoring to no more than one or two marks. It is at least encouraging that most candidates attempted these questions, which suggests that they felt able to tackle them, even if they failed to score. It was felt that, compared with previous years, there were fewer instances of candidates routinely leaving these questions blank.

Only on one question did significant numbers of candidates fail to attempt an answer (5(a)(iii), see below), and this was probably due to the specific demands of the question.

Comments on Individual Questions

Q1(a) This question required candidates to sequence steps in generating electricity from waves. This was challenging and most candidates scored either 2 or 0.

Q1(b) Most candidates were able to score at least one out of the 3 marks available for this question, but very few scored all 3. Common correct responses were that the waves are variable and that the power output of wave power is lower than in fossil fuel stations, but many candidates mentioned lower power output as an advantage. Some candidates misunderstood the role of the oil and thought that if it leaked there would be a major oil spill. Other candidates stated that it can be used over and over again.

Q1(c) Candidates were required to find a value from the graph and the majority of candidates gave the correct value. By far the most common incorrect answer was 2 metres.

Q1(d) Most candidates scored the mark for describing the pattern as an increase, but commonly referred to 7 metres for the height at which the power output levels off, rather than the maximum of 6 metres.

Q6(a) Only the more able candidates recognised that manure contributes nutrients to soil. Commonly, vague reference was made to manure helping wheat to grow, or even keeping it healthy. Candidates often stated that wheat needs nutrients, but did not say that it would deplete the soil of these.

Q6(b) Despite a large number of possible marking points, few candidates scored more than 1 mark for comparing organic and intensive farming, usually for reference to pesticides. Some responses mentioned animal cruelty issues not covered by this question.

Q7(a) (i) Candidates were required to draw lines to join up E numbers with the type of additive and how it works. This proved difficult, but more able candidates were able to score all three marks. In part (ii), the majority of candidates were able to identify the significance of the E number.

Q7(b) A very well answered question, but some candidates ticked more than one box although the question asked for “a tick in the box next to the correct answer”.

Q8(a) Candidates showed a good understanding of differences between type 1 and type 2 diabetes. In Q8(b), fewer candidates were able to select a reason for diet and lifestyle changes.

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

General Comments

This paper was well answered by the majority of candidates. It discriminated effectively allowing strong candidates to show their knowledge and understanding of the subject. A few candidates had difficulty accessing and answering questions on this paper; they would have been better suited to the foundation tier paper.

Most candidates score marks on the objective style questions, but many find those requiring written answers more difficult. Many of these answers lack scientific detail and candidates often lose marks by being imprecise and unclear. If candidates are asked for advantages and disadvantages they should make it quite clear which part of their answer is about advantages and which part about disadvantages. Again, if they are asked about similarities and differences they should be clear about which is which.

Comments on Individual Questions

1 In part (a), many incorrectly included 'turbines turning generators' even though they weren't mentioned in the newspaper article and are only used when high pressure steam is available, for example in fossil fuel power stations. Part (b) required a written response giving advantages and disadvantages of wave farms. Most scored 2 marks, but very few used the chart to link peak production to the energy needs for the third marking point. Part (c), which overlapped with the foundation tier, was completed very well by higher tier candidates. In part(d) many candidates scored 1 mark by writing that the power increased as wave height increased but missed the levelling out of power for wave heights larger than 5.8m. Some candidates stated the relationship the wrong way round ie 'the greater the power the bigger the wave'.

2 Very few candidates gained a mark in part (a). Most knew that gamma rays were very penetrating, but wrongly believed that their activity was less under water. Most candidates scored in part (b) usually for the expense and leakage marks. Some candidates incorrectly thought launching rockets at the Sun would bring life on earth to an end by blowing the Sun up and showering the earth with nuclear debris. A sizeable number of candidates expressed concern for the rocket's pilots.

3 This question on calculating the half- life of tritium discriminated well. Some good candidates scored only 1 on this. They knew that the activity was halved every 12 years, but, unfortunately, started the calculation with an activity of 800 counts at 12 years rather than at 0 years.

4 In part (a), few candidates could correctly name three background sources of radiation. There continues to be confusion between the electromagnetic spectrum and radioactive substances. The most common wrong answer was mobile phones. Some candidates just listed alpha, beta and gamma. Part (b) was more successfully answered though some wrote about the penetrating power of, and protection against, background radiation.

5 In part (a), few candidates knew when life on Earth began and even fewer knew that scientists think the first living cells developed from molecules with many suggesting bacteria were the source. In part (b), most candidates gained some credit, typically scoring 1 or 2 marks, but many candidates did not have a clear grasp of the issues, constantly

confusing similarities with differences. Some candidates gave vague answers whilst others just described selective breeding and/or natural selection and did not address the question. Quite a few candidates said that in natural selection animals chose who they bred with. Very few candidates compared the time scales between the two.

6 Many were unsure how to interpret the diagram about the likely evolution of hominids. Answers of one, three or four were seen in equal amounts for both sentences. Part(b) was even more difficult. Where candidates gained credit it was for stating that there was 'not enough evidence'. Occasionally candidates scored the 'interpretation of evidence' mark.

7 Most candidates scored 1 mark, equally divided between the two answers, but few correctly answered both. When information is given in the stem candidates should carefully read it to look for clues in answering the question.

8 Part (a) was a discriminating question where candidates had to interpret E numbers and know how these worked. Almost all candidates knew in (b) why risk assessments were carried out on food. Most could identify the person suggesting benefits outweighed the risks in part (c), but fewer candidates were clear on the precautionary principle.

9 Very little knowledge of this part of the nitrogen cycle was shown. Decomposition was a frequent answer for the formation of nitrates from nitrogen in part (a). Some took the distracters from part (b) as the answer. They were then likely to use this wrong distracter as an answer to part (b) as well.

Many candidates answered part (c) correctly. Those that didn't usually believed that organic farming replaced nitrogen in the soil whilst intensive farming did not.

Part (c) was very poorly done. Candidates did not realise that this was testing a different part of the C3 specification. References to insecticides, pesticides and manure used in organic farming were common. Some candidates mentioned growth of fungi in storage but only a very few knew that plants sometimes contain naturally occurring toxins.

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