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General Certificate of Secondary Education

Science A 4406

SCA2FP Unit 6

Report on the Examination

2012 examination – June series

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Science A
Foundation Tier SCA2FP

General

There were 15 questions on the Foundation Tier paper. Questions 1–10 targeted grades E–G. Questions 11–15 targeted grades C–D and were common with the Higher Tier paper.

The Quality of Written Communication (QWC) question (question 12) was generally well attempted.

Many students did not confine their answers to the spaces provided, instead writing in the margins or blank parts of other pages. These portions of the script are not scanned and the examiner may not be able to read what is written there.

Question 1 *(Low Demand)*

This question was well answered, with over half the students scoring all three marks. When questions are asked about adaptations the response should relate the adaptation to the habitat. Many students did not link the features to how they would help the hare to survive the conditions in the Arctic. Most students gained a mark for saying the hare's thick fur helped it to keep warm. Having large feet had to be linked to the snowy or icy conditions. 'To run fast' did not gain the mark. A surprising number of students thought that hares are predators and had to be camouflaged from their prey. References to prey were ignored as long as the response made it clear that they were camouflaged or less easy to see.

Question 2 *(Low Demand)*

(a) The majority of students realised that large-scale composting schemes would reduce landfill, but fewer knew that they produce substances that help plants to grow. Quite a lot of students thought it would reduce the amount of household rubbish. Only a few students ticked the wrong number of boxes.

(b) The majority of students gained one mark with over a third attaining both marks. The most common correct answer was that warm conditions are needed to decompose organic waste.

Question 3 *(Low Demand)*

(a) Most students knew that the puppies were produced by sexual reproduction. Some said embryos or genes were fused together instead of gametes. Also, some students thought the puppies all looked different because their cells contained different mixtures of gametes. Gametes and genes were most commonly confused. Half the students attempting the question scored all three marks.

(b) (i) Most students knew that genetically identical organisms are called clones. Some said twins, which was ignored, whilst others stated gametes. Most students knew that clones are produced by asexual reproduction.

(b) (ii) Almost a third of students answered this question correctly. Most of these students said taking cuttings was a quick and easy method to produce identical plants. Clippings or cutting a leaf was not enough for the mark. The most common incorrect answer was cloning.

Question 4 *(Low Demand)*

(a) (i) Almost two-thirds of students were able to identify photosynthesis as the process used to remove carbon dioxide from the air.

(a) (ii) Fewer students were able to identify respiration as the process by which all organisms release carbon dioxide.

(b) There were many suggestions students could have made to reduce the amount of carbon dioxide in the atmosphere, but the majority used the picture in the question for ideas. Plant more trees and burn less fuels were common answers. Some listed several suggestions for burning less fuels, such as walk, use cars less and reduce industrial processes, but there was only one mark for these. Many said use renewable energy sources, but this on its own was not enough for the mark as burning biomass would release carbon dioxide. A specific example was needed, such as solar or wind power. The majority of students were able to score at least one mark for this question.

Question 5 *(Low Demand)*

(a) Almost half of students gained two marks, with very few students not scoring anything.

(b) Climate change was a common correct answer, but a change in the weather was ignored. Some students referred to changes in temperature, but these had to be qualified, for example, 'it's warmer earlier in the UK'. Food availability or competition for food was often stated for a mark.

Question 6 *(Low Demand)*

(a) The vast majority of students answered this question correctly, saying sunflower oil is extracted from seeds.

(b) Many students did not state that oil is obtained from the crushed seeds by pressing, but just repeated information written on the diagram. More students knew that oil does not mix with water and many went on to say oil is less dense, or lighter, than water. Some just rephrased the beginning of the sentence without adding anything new that would explain why the oil layer is above the water layer. Some said that oil is thicker than water, which was ignored, or that oil is an emulsifier, which is incorrect.

(c) Just under half of students gave the correct colour change for bromine water as orange to colourless.

(d) (i) Less than a tenth of students were given full marks for this question. Most students calculated the mean as 17, gaining one mark only. They had included the anomalous result of 23 in their calculation. Some students had difficulty calculating the mean and ended up with an answer that was clearly incorrect.

(d) (ii) About a third of students gained full marks. However, many said olive oil was the most unsaturated because the lowest mean volume of bromine water was added to this oil. This was the wrong way round and showed that olive oil was the least unsaturated.

(d) (iii) Only a third of students stated that you would not be able to see the colour change. Many students stated that there would be no colour change or were too imprecise in the way they expressed their answers about which liquid was too dark. They said the bromine water would not change colour or that it would not work or react. Some thought it was the oil that should change colour, rather than the bromine water. Others thought it was not tested because the oil was saturated.

Question 7 *(Low Demand)*

(a) (i) Many students gained a mark for saying water vapour was released from the volcanoes, with many going on to say that this condensed to form water. Many students did not realise that anything had to happen to the vapour for it to form water, or thought that water could be formed from carbon dioxide.

(a) (ii) Three-quarters of students correctly identified the main gas in the Earth's early atmosphere as nitrogen.

(a) (iii) Identifying methane as a gas present in Earth's early atmosphere was the most common correct answer. Almost half the students gained two marks for also knowing that ammonia was present as well.

(b) Almost all students identified oxygen as one of the main gases in the atmosphere today. Over half gained full marks for also selecting nitrogen. Just under half of all students thought that hydrogen was present in today's atmosphere.

(c) (i) Approximately three-quarters of students correctly selected combustion as being the main process causing an increase in the amount of carbon dioxide in the atmosphere.

(c) (ii) Just under a third of students gained full marks for identifying two ways that carbon is locked up in sedimentary rocks. Given that only two types of sedimentary rock were listed in the choices this highlights a lack of knowledge of the rock cycle from Key Stage 3. The most common correct choice by students was fossil fuels.

Question 8 *(Low Demand)*

(a) (i) Two-thirds of students identified radio waves as having a wavelength longer than microwaves.

(a) (ii) Almost two-thirds of students identified gamma rays as having more energy than X-rays.

(a) (iii) Despite the high number of correct responses for questions (a)(i) and (a)(ii), less than half the students could identify a part of the electromagnetic spectrum with a higher frequency than ultraviolet.

(b) (i) Just under two-thirds of students identified that two complete waves were shown on the diagram.

(b) (ii) Only a quarter of students were able to work out the correct wavelength from the diagram.

(b) (iii) Just over half the students gave the correct amplitude of the waves.

(b) (iv) Only a quarter of students were able to identify the type of wave as transverse.

Question 9 *(Low Demand)*

(a) (i) Over half of students answered correctly, but a common error when naming the generator was to name it a transformer. Some students had confused the diagram with simplified versions showing the National Grid and named part A as a power station or factory.

(a) (ii) Many students incorrectly named part B as some sort of wire. Only a quarter of students gave the required answer of (power) cables or power lines.

(b) Few students gained both marks here; some scored one for either voltage or current in the correct space. Almost half of students scored no marks at all.

(c) (i) Over three-quarters of students correctly stated that a hydroelectric power station would be best to meet peak demands.

(c) (ii) Wind turbine was the most common correct answer given. A surprising number of students did not know that nuclear, geothermal and biomass power stations heat water to make steam to turn a turbine. Two-thirds of students answered this question correctly.

(c) (iii) Most students could identify nuclear as a non-renewable energy resource, although a common answer was geothermal, which is renewable.

(c) (iv) Many students gave 'renewable energy source' as an advantage of wind turbines. Statements such as 'environmentally friendly' was too vague, something relating to no air pollution was needed. If cost was mentioned it had to be linked to no fuel. Many said it was free, which was not enough for a mark. Most students gave 'not always windy' or 'noisy' as disadvantages. Cost had to relate to high set-up cost.

Question 10 *(Low Demand)*

(a) (i) The vast majority of students selected the correct answer that the Universe is expanding.

(a) (ii) Although the majority of students said the Universe started from a very small point almost a quarter thought it started from collisions between galaxies.

(b) (i) Over half of students thought star A is moving away from Earth, rather than towards Earth. This suggests that they could not interpret the diagram as showing a shift to the blue end of the spectrum, or they did not know what this indicated.

(b) (ii) Over half of students thought that star B is moving towards the Earth, rather than away from Earth.

(b) (iii) Over two-thirds selected the correct answer that star C is moving faster than star B.

Question 11 *(Standard Demand)*

(a) Most students made a good attempt at drawing the pyramid to gain full marks. A few drew illustrated food chains instead, or attempted to draw a scale drawing of the pyramid. If a scale drawing is required a grid would be provided. Some drew the correct pyramid, but only labelled the figures and not the names of the organisms, for one mark. Most students drew the pyramid the correct way up with the sizes of the bars correctly representing the masses. Many students drew pictures of the organisms involved, which is not necessary.

(b) The question asked about biomass, but most students attempted to answer in terms of energy losses along the chain. As references to energy were ignored this allowed some students to score one mark for loss in wastes, although most talked about heat and movement which would not result in a loss of biomass. There is a lack of understanding of biomass. Losses from the chain can only be due to something that has mass not being passed on. Other incorrect answers referred to the sizes and numbers of organisms at each level. Three-quarters of students scored no marks.

Question 12 *(Standard Demand)*

In this question students were assessed on their ability to both describe differences between the tree on its own and the trees growing in a forest and to give reasons for the differences. They were also assessed on 'QWC' - their ability to use good English, organise information and use appropriate specialist terms. Most students' QWC was appropriate to the level of their scientific response.

To attain Level 3 (5–6 marks) students needed to include descriptions of at least two differences with correct explanations in terms of competition. Most students attained Level 2 (3–4 marks) by giving at least one difference which they made a reasonable attempt to explain. A basic description of a difference or explanation was all that was needed for Level 1 (1–2 marks). Some students explained the differences, but could not attain Level 2 because they had not described the differences as well.

The question was well attempted with most students organising their answers logically. Over half the students were credited with three or more marks. Some students gave confused descriptions of what the trees in the forest competed for, giving names of gases and water, which were ignored. Many mentioned leaves being eaten by animals, which was also ignored.

Question 13 *(Standard Demand)*

(a) Most students could complete the word equation, given that the information was provided in the stem of the question. However, many students gave the reactants and product in the wrong order. Some gave steam instead of water, but this was allowed. Misspelling of compound names often negated marks, for example, ethane instead of ethane, and ethanal instead of ethanol. It is always advisable to write a word equation rather than a symbol equation if this is what the question asks for, as many students made errors in the writing of formulae, for example, using lower case letters, superscripts or incorrect formulae. C_2H_6O was often given, which was allowed. Many responses included unexpected chemicals, such as petrol, crude oil, hydrogen and other gases. Just over a quarter of students gained the mark for this question.

(b) The most common responses were that fermentation is cheaper, quicker or more environmentally friendly, none of which gained a mark. Some students did say that

sugar (cane) grows in Brazil or that sugar (cane) is renewable to gain the mark. Few made reference to crude oil.

(c) Most students copied information straight from the table gaining no marks. Value needs to be added to the information to be creditworthy. For example, a comparison between the length of time taken for the two processes, 'fermentation takes longer' would score one mark, but 'fermentation takes a few days' would not. Likewise, 'fermentation produces ethanol that is not pure' is creditworthy, while 'fermentation produces a dilute solution' is not. Many answers referred to the cost or pollution, both of which were ignored.

Question 14 *(Standard Demand)*

(a) The majority of students said adding compost and hydrogel increases the water holding capacity of the soil. This only gained one mark. They needed to clearly state that when used individually; each one increased the water holding capacity to gain two marks. Many students did not read the units given for the masses added and incorrectly stated that compost was better than hydrogel. Quite a few gained the last marking point for saying 'adding both compost and hydrogel gave the highest water holding capacity'. There were some answers that just restated values from the table without explaining what they showed, so gained no marks.

(b) Many students did not attempt this question or confused polymerisation with cracking or thermal decomposition or another chemical process. The idea of **many** monomers joining together or a **large** molecule being formed was needed in order to gain full marks. Many students gained a mark for stating that monomers bonded or joined together. Many students incorrectly stated that a single bond changes to a double bond. Very few students gained both marks available.

Question 15 *(Standard Demand)*

(a) Very few students gained three or four marks. Most students struggled to give two similarities of light and sound waves. The most common difference given was that light travels faster than sound. A few said sound waves cannot travel through a vacuum. Many got transverse and longitudinal waves mixed up. Many students said light can be seen, but sound cannot, rather than focussing on the properties of the waves themselves.

(b) (i) Many students identified the wavelength and frequency from the question, but had trouble substituting into the equation. Although almost half the students scored full marks, a number of students attempted to guess what the liquid was; a common answer was 'water', rather than choosing a letter from the bar chart.

(b) (ii) Over half the students did not score any marks on this question. Many students gained one mark for either identifying the pattern (up to mercury) or by identifying the fact that mercury did not fit the pattern. The irregular intervals between values in the table confused many students and they were unfamiliar with the way that the hypothesis was stated: 'There is a link between...'. Some students attempted to find a mathematical relationship between the two quantities rather than simply identifying the trend.

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