

GCSE
COMBINED SCIENCE:
TRILOGY

8464/B/2F

Report on the Examination

8464

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General

This paper seemed to be well received by students as a large majority of them attempted every question and were able to achieve credit for their knowledge and skills. Generally the handwriting was difficult to read, and some responses were illegible. To help with marking, Word processor packages should be considered for students who find it difficult to write clearly.

Required Practical Activities were assessed in this paper and it appeared that some students were not aware of the significance of these. These questions did not score high marks as students did not appear to have understood:

- the methods
- the equipment being used
- the concepts of independent, dependent and control variables
- validity.

Levels of demand

Questions are set at two levels of demand for this paper:

- **Low demand** questions are designed to broadly target grades 1–3.
- **Standard demand** questions are designed to broadly target grades 4–5.

A student's final grade, however, is based on their attainment across the qualification as a whole, not just on questions that may have been targeted at the level at which they are working.

Question 1 (low demand)

- 01.1** This question was generally very well answered. 57% of students achieved both marks and it was rare to encounter a student who did not achieve at least one mark.

Some students only ticked one box, so it is worth reiterating that reading the question stem is of utmost importance. The number of boxes to tick in multiple choice questions is given in bold font.

- 01.2** Students were given a straightforward statement that, 'Birds that arrive early might survive better than birds that arrive late'. They were then asked to give one reason for this. 60% of students identified early arrivals having access to more food, better choice of mates, nesting sites and less competition for resources. There were obvious clues in the list given in question **01.1**, which students may well have picked up on.

Those students who did not gain the mark generally did not 'add value' to their response and simply stated, 'they would get food', which was insufficient. The most common incorrect answers related to temperature or being 'better adapted'.

- 01.3** Students were asked to name one greenhouse gas. 71% of students correctly named 'methane' or 'carbon dioxide', with a few also gaining credit for the use of correct chemical formulae. Some students, however, wrote the 2 as a superscript and so were not awarded the mark. Incorrect answers of carbon monoxide and water were fairly common.

- 01.4** This question was generally well understood with 41% of students achieving a mark for identifying one other effect of global warming. The common answers were sea levels rising, melting ice caps, flooding, extinction and habitat loss. Quite a few students managed to put two or three answers into the one mark eg as the ice caps were melting, this caused the sea levels to rise which resulted in flooding and often habitat loss.

There were, many vague answers such as acid rain, weather changes, temperature changes, ice melting and crop growth being affected. These were insufficient to gain credit.

- 01.5** This question asked students to identify two human activities that cause global warming. Burning fossil fuels was usually identified but turning off lights or using too much water was often selected as the second response.

- 01.6** This question asked which gas in the atmosphere causes acid rain. Many students selected carbon monoxide, a small number ozone, but 58% of students did select sulfur dioxide.

Question 2 (low & standard demand)

- 02.1** Students had to identify two descriptions of DNA. Double helix was almost always selected but the second answer selected by students was often protein rather than polymer. A large number selected both 'Double helix' and 'Single strand' which is contradictory. 29% of students achieved full marks.
- 02.2** Students had to complete sentences by selecting words from the box. Many students did not attempt this question (43%) and those that did, often reversed the answers. 57% of students achieved one or two marks.
- 02.3** Students were asked for two types of gametes in humans. Common incorrect answers seen were ovary and testes or X and Y.
- 02.4** 22% of students answered correctly. The most common incorrect responses for the process when gametes join were fusion, reproduction and meiosis.
- 02.5** Students had to identify two features that showed the cell division was meiosis. Many identified 'the cell divides twice' but often failed to gain the second mark giving a range of incorrect responses.

Question 3 (low & standard demand)

- 03.1** 98% of students were able to identify the cell nucleus from the sensory neurone
- 03.2** 50% of students were able to identify the receptor.
- 03.3** Students had to label the synapse and the motor neurone on the nerve pathway. On many scripts seen (13%) there was no attempt to label either part. Where a part was correctly identified it was occasionally the motor neurone. Synapse was very rarely seen. 9% of students achieved both marks.
- 03.4** 91% of students were able to identify that the action described was a reflex action.

- 03.5** Students were asked to read two values, in milliseconds, from a table and subtract them to give the difference in muscle contraction time between an old and a young person. An answer in seconds was required. 72% of students achieved one mark from an answer of '12'. 3% of students managed to successfully convert milliseconds into seconds, to arrive at a value of 0.012s.
- 03.6** The position of the pituitary gland was correctly located by 35% of students.
- 03.7** The most common misconception for the function of LH was to control blood glucose concentration. 32% of students knew that it controlled the release of an egg.
- 03.8** This question was generally well answered with 57% of students identifying the bloodstream. However, many students thought that LH travelled via the nervous system, digestive system or in blood cells which was not creditworthy.
- 03.9** Overall 80% of students were able to identify person C as the 18-year-old boy from three graphs showing the relative levels of sex hormones. Students usually gave the correct reason of there being a high level of testosterone, although some stated the low amounts of oestrogen / progesterone.

Often students failed to gain the mark because they made statements such as 'only males produce testosterone', or 'only females produce oestrogen'. Those who did not achieve the second mark often made vague statements referring to hormones rather than naming the specific hormones.

Question 4 (low & standard demand)

- 04.1** Students had to give two variables that needed to be controlled to make the method given valid. Most marks were achieved for reference to the same number of sweeps or use of the same size net. 47% of students achieved the mark.
- Many students were incorrectly focused on ensuring that the water tray contained the same amount of water, or that the tray needed to be cleaned after each sweep. Others wanted the sweeps to be done at different sites and / or by different people at a different pond.
- 04.2** 78% of students correctly calculated the mean value of water fleas at the pond edge.
- 04.3** The range of the results was correctly answered by 73% of students. It was more common to see 103 as the answer rather than 19 to 122.

- 04.4** 13% of students offered a creditworthy explanation as to why such a wide range of results was found. There were many references to the relative lack of experience of different students doing the test, being rushed and fleas flying away before being counted. There were also a number of criticisms given of the method used which was also not creditworthy.
- 04.5** 42% of students were able to give the conclusion about the distribution of water fleas in the pond using the pupils and teachers mean value. However, many answers identified the relative accuracy of the people carrying out the sweeps at the different sites, or the effect of disturbance, or time of day and where the Sun was shining.
- 04.6** The change in the number of bloodworms between two dates was answered correctly by 89% of students.
- 04.7** Most students made an attempt to calculate the number of shrimps in the pond in 2016 as a percentage of those in the pond in 2014. However, there was a wide range of incorrect answers. 27% of students gave a correct answer.
- 04.8** Students found this question challenging. They were required to make a conclusion about the change in the level of pollution in the pond between two dates using the data provided in two tables. In order to substantiate this, there needed to be a reference to the decrease in either mayfly nymphs or shrimps.
- Many students did not make it clear that the level of pollution had risen. Often they cited a rise in bloodworms or water snails which was insufficient. Others simply relayed the change in numbers at low, medium and high levels of pollution which did not demonstrate the use of all the data and hence was not creditworthy.
- 04.9** Students were asked to suggest two problems caused by the rapid increase of the human population. 44% of students achieved at least one mark, with clear references to 'food insecurity' and 'water shortage'. The ideas 'species extinction' and 'deforestation' were also prevalent, although a number of students failed to achieve full marks due to stating both 'deforestation' and 'habitat destruction' as separate points.

Marks were missed by vague references to pollution, resources running out and burning fossil fuels. Other very vague responses included more people, overcrowding, more waste (litter, plastic), lack of birth control, more animals being killed to feed people and lack of houses or employment.

Question 5 (low & standard demand)

- 05.1** Students were asked for the cause of three types of variation. 58% of students gave all three correctly. Many identified eye colour but less were able to correctly identify skin colour and short hair.
- 05.2** Students were generally good at identifying the alleles for blue eyes with 82% answering correctly.
- 05.3** 78% of students got the eye colour of the man when given the alleles. 'Green eyes' was also seen a fair number of times even though only brown and blue had been mentioned in the question stem.
- 05.4** 78% of students were able to complete the Punnett square correctly. A very small number appeared to be confused about inserting the alleles for the woman and hence could not gain credit.
- A large number of students used Bb or BB as their female's gametes and gained credit for the correct derivation.
- 05.5** When the Punnett square was completed correctly using bb, the student generally also gained this mark. However, where the student had used BB or Bb then the percentage quoted was usually incorrect.
- Many students gave their response in the form of a ratio; often 2/4 was encountered, rather than 1/2. Students need to understand the difference between probability and ratios.
- 05.6** The most common misconception for this question was that genotype, rather than phenotype, was the scientific term used for the child's eye colour. 23% of students answered correctly.
- 05.7** The effect of a mutation as usually having no effect was not a common response from students (14%). Most responses were 'definitely change appearance' or 'probably cause a disease'.

Question 6 (standard demand)

06.1 70% of students achieved at least one mark. The most confusion appeared to be whether diseases / herbivores were biotic or abiotic.

06.2 Most students achieved one mark for identifying the importance of more light as one moves further away from the tree, with a significant number gaining the second mark for the link to photosynthesis. There were, however, a good number of responses only referring to Sun which was not creditworthy.

Very few (less than 1%) got maximum marks for stating production of proteins/glucose. Many students referred to food being made which was insufficient. It was common for students to make two creditworthy points about 'light' and 'less water / minerals', but only achieving the single mark on offer

06.3 This question asked for the name of two pieces of equipment that would have been used.

- Quadrat was the most popular correct answer, although some missed out on the mark for incorrect spelling.
- Light meter was rarely encountered. Answers often referred to ammeters, voltmeters and light sensors, solar panels and arbitrary measurers.

27% of students achieved at least one mark.

06.4 This calculation was very difficult for students, with 3% answering correctly. They were asked for the total area sampled. Many attempted to calculate the area of the circle in the diagram. It was also quite common to see answers for area of a quadrat multiplied by 5 rather than by 6.

06.5 Students were asked to suggest a reason why the investigation was done as quickly as possible on the same day. 28% of students referred to the idea of light intensity being controlled. However, many gave insufficient answers about the Sun, weather or temperature being the same.

This question was often approached from two perspectives, both of which were creditworthy with a reference to light. Either, why it was done as quickly as possible or why it was done on the same day.

- 06.6** There was a huge variety of suggestions about how the investigation could be improved. 17% of students identified sampling at a smaller distance or repeating under another tree.

Popular misconceptions seen referred to extending the transect, using a bigger quadrat or repeating the investigation at a different time. One particularly popular response seen was to do it more slowly. This had clearly been derived from the stem of the previous question. There were also a number of responses which simply suggested repeating it which were insufficient.

- 06.7** This question asked students to identify which plant species would only grow at high light intensity. 42% of students were able to give 'daisy'. The most popular incorrect answer was clover, possibly because it was the species with the highest percentage coverage at high light intensity.

- 06.8** Students were asked to make a conclusion about the relationship between light intensity and the total percentage cover of plants. 24% students achieved the first mark point but the second one was rarely seen.

The two most popular incorrect responses were those that only referred to number of plants rather than cover or percentage and those who stated the relationship the wrong way around eg 'as percentage cover increases so does the light intensity'.

- 06.9** Students were asked to suggest another factor which may have caused the results obtained. Generally many students gave water, minerals and a few gave temperature as a correct factor. However, very few responses then linked the factor to how the tree would cause the results and subsequently, the second mark was awarded much less often. Common misconceptions for the factor mark were carbon dioxide and moisture. Trampling was also seen but was not creditworthy. 5% of students achieved full marks.

Question 7 (standard demand)

- 07** This 'level response' question asked for advice that doctors should be given in order to prevent the spread of a new strain of bacteria. Many students answered it in terms of advice that patients should be given by doctors and this was acceptable if relevant points were given. The majority of lower-attaining students responded in terms of general hygiene and separation. In the case of the former, washing hands was commonly seen with the additional reference to antibacterial hand washes or similar less frequent. The reason for the precaution which is to kill bacteria was rarely seen. Isolation was described in a great variety of ways and a lot of the time there was a correct reason given for it. There were also frequent additional comments about face masks, gloves and various other types of protective clothing. Some students also gave descriptions of how to stop the spread of STDs.

Of the more scientific / biological reasons completing the course of antibiotics was the most common and this frequently had a weak link with references to immune rather than resistance. There were a few very good scientific explanations for this precaution.

Lots of students described in various ways that doctors should not overuse the antibiotic and in some cases, there were appropriate weak links. Some students also referred to not using them for viral infections or mild infections but on these occasions there were rarely any relevant attempted links.

A lot of students decided the whole population needed to take the antibiotic so large stocks had to be available at pharmacies, so they could get them. Again many were under the assumption that if they were given the antibiotic in advance, it would prevent them from getting the infection rather than treating the infection once they got it.

Also a significant number thought mass vaccinations were the answer. In some cases these were accompanied by very good scientific explanations about how vaccines work, but more often they suggested the fluoroquinolone should be used as the vaccine. Another common incorrect response was to describe drug trials and although some used appropriate science this was irrelevant and did not gain marks.

Overall students found this question difficult with 18% achieving level 2 or 3.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.