GCSE
COMBINED SCIENCE: TRILOGY

8464/B/2F: Paper 2 Biology Foundation
Report on the Examination

8464
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General

Students found this to be an accessible paper and responses were given to all questions towards the end of the paper. Questions six and seven were common to the Higher tier paper.

As designed, some questions were more difficult, but all of the mark points on the mark scheme were gained by some students. Two points proved most difficult. One was in question 05.6 where, even if students understood that species were being added and removed from the garden, they did not relate this to the definition of a stable community given in the specification. The other was in question 06.9 where students found it difficult to express the difference between an automatic reflex action, which did not involve the brain, and the ruler drop test reaction, which did involve the brain or was a conscious action.

Examiners often noticed a very broad or vague answer that hinted at the right idea, but credit could not be awarded because of lack of scientific detail. Teachers could help students if they encouraged them to read their answers and ask themselves if what they have written really answers the question in a scientific way. Examples of this could be seen where students referred to 'wildlife' in question 02.6, 'wood' or 'resources' in question 03.4, 'to compare' in question 06.3 and 'damages the environment' in question 07.2.

Some students were clearly disadvantaged by spelling or handwriting that examiners just could not decipher, despite often referring it to a more senior examiner. Schools can ask for special arrangements such as scribes for students if necessary.

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 asked for the name of the process which controls conditions inside the human body. It was generally well answered with 77% of students knowing the correct answer 'homeostasis'.

01.2 Half of students identified the two ways in which information is sent to control body conditions. Both 'antigens' and 'muscles' were common misconceptions.

01.3 62% of students correctly gave temperature or glucose concentration as conditions controlled in the human body. Ions and pH were more rarely seen. Quite a few students gave oxygen or carbon dioxide levels, which was credited at this level.

The most common incorrect answers were 'heat' and (details about) 'controlling food intake'. Hormones and examples of hormones were also seen. Frequently students simply stated blood, blood levels or blood pressure.

01.4 From the graph, students were asked to calculate the amount of extra water lost on a hot day. There was more than one route that could be used to obtain the correct answer but where an incorrect calculation was shown, marks could not be awarded.

A third of students gained one mark for adding up the correct bars on the graph and a quarter gave a fully correct figure with or without working shown. There were a variety of incorrect calculations involving division and multiplication.

01.5 Although most students referred to sweating in their answers, only half extended this to 'more' or 'a lot', which was needed to gain credit. A common misconception was that there is no sweating on a cold day and although this did not lose credit if the correct answer was given, the graph did not support this idea.

Another common answer was about the idea that a person drinks more on a hot day and therefore urinates more. 8% of students stated that this was to cool the body to gain the second mark. Vague ideas of regulating the body temperature were not credited.

01.6 This simple percentage calculation was completed successfully by over half of all students. Many used a 'trial and error' method or a 'back calculation' and it did seem as if many may not have had a calculator in the examination.

Question 2 (low & standard demand)

02.1 As the question was assessing the student's knowledge of how to achieve randomness, rather than just how to use a quadrat, answers about throwing quadrats did not gain credit. Because of this very few marks were awarded, as just 9% of students gave a method which would achieve randomness. Correct responses seen included:

- using a random number generator
- selecting random coordinates before going outside
- rolling dice to determine number of steps
- using the last three digits of each group member's phone number to create the random numbers.

02.2 A description of a quadrat was required for this question. It was well answered with most students referring to 'square' in their response. Two thirds of students gained the mark.

The most common insufficient answers referred to 'grids' or 'internal squares' only, which failed to describe the outside structure.

02.3 80% of students were able to correctly calculate the mean value.

02.4 84% of students were able to calculate this simple area question.

02.5 As this question was marked with questions 02.3 and 02.4, any incorrect answers for mean or area were allowed to be carried forward. 37% of students gained full credit, with the most common error being to divide the area by the mean rather than multiply them.

02.6 A large proportion of students either confused biotic factors with abiotic factors or totally disregarded this part of the question. Many answers gave two abiotic factors, most often 'sunlight' and 'rain'. Just 5% of students gave two biotic factors, and a further 20% gave one. Most commonly credit was given for 'trampling' and 'eaten by animals/insects'.

02.7 Half of students identified less sunlight or less water as the reason daisy plants were smaller. A further quarter of these students went on to link this to lack of photosynthesis causing less growth. Answers referring to no light or no water did not gain credit. If a student gave less nutrients or less minerals this was accepted for the first mark but they needed to link this to more proteins to gain the second mark and so this was very rarely seen.

Question 3 (low & standard demand)

03.1 71% of students were able to link descriptions of animal adaptations to the types of adaptation. Nearly all of the other students gained one mark, due to confusion between structural and functional adaptations.

03.2 Most students knew at least one feature that would help orchids survive. Quite a few incorrectly gave 'oval shaped leaves' or 'no scent'. It must be stressed that a high number of students only ticked one box despite 'two' being emphasised twice in the question stem.

03.3 70% of students correctly identified the definition of biodiversity. Habitat was the most common incorrect choice.

03.4 Half of the students gave a sensible reason why rainforests are being destroyed. Many of the students who did not achieve the mark gave vague answers such as 'for wood' or 'for resources'. Some students knew that rainforests may be sources of medicines or rare species but this is not a reason why they are being cut down.

03.5 This question asked for one factor that might cause a species of orchid to become extinct. Many students did not fully consider the question and gave generic answers such as, 'new predators' which was not creditworthy as it did not refer to orchids.

However a third of responses were correct, the most common being 'a lack of insects for pollination'. Some students recognised that over-collection of orchids was becoming an increasing problem and this was credited.

03.6 A great variety of possible suggestions was made with 13% of students knowing that genetic material is made of DNA. Genes, chromosomes and DNA cells are not names of chemicals.

03.7 Even fewer (6%) knew that the name for the entire genetic material of an organism is the genome, despite this being clearly given in the specification. Many students gave the answer to question 03.6, DNA, as the answer here.

Question 4 (low & standard demand)

04.1 Just over two thirds of students recognised that the new colour was due to a mutation.

04.2 Selective breeding appears to be better understood this series. 31% of students were able to gain two marks for selecting two cats with blue tail tips and breeding them together. A fifth of students answered in terms of breeding cats but did not choose the correct parents.

Only 5% of students were able to answer to the next generation, or until all cats had the characteristic. There were many incorrect responses describing aspects of genetic engineering, cloning and IVF.

04.3 Many reasonable suggestions were given for why the cat breeder may want to have kittens with blue tails. The most frequent correct responses were ‘rare’ and ‘able to make more money’. There were a number of answers given that did not gain credit which included:

- ‘so they are all the same’
- ‘the breeder would know they were hers’
- ‘to create a new species’.

04.4 53% of students recognized that heart defects could be caused by inbreeding. ‘By sexual reproduction’ or ‘by mitosis’ were both common alternatives.

04.5 The sex chromosomes of XY for males and XX for females were known by almost a third of students. This piece of very basic biology information is one that teachers should ensure all students know for answering examination questions.

04.6 Half of students could successfully complete the Punnett square diagram. Credit was awarded for the derivations, provided some combination of X and Y was given for gametes. Those who did not gain marks usually did so for using other symbols such as M and F or B and b.

04.7 Students were asked why there were not two kittens of each sex in the litter. An answer referring to chance, randomness or probability was required. Random was the most frequently seen correct answer. References to 50% or 50:50 were only credited if it was clear the student was referring to each kitten rather than the litter.

The biggest misconception was the idea of female genes being stronger or dominant. Some suggested there were more X chromosomes. Students found this difficult with 18% of students providing correct answers.

Question 5 (low & standard demand)

05.1 79% of students correctly identified the spider as the secondary consumer in the food chain.

05.2 82% of students also knew that the blackfly would increase if the spiders died.

05.3 Most students who identified an increase in question 05.2 knew that this was because blackfly are no longer being eaten. Those that did not gain credit gave answers relating to the blackbirds rather than the blackflies and others clearly had the misconception that the blackflies were eating the spiders.

05.4 21% of students were able to correctly give the relationship for biomass as you go up the food chain, although many more may have had the right idea if they had been able to express it clearly. Answers relating to larger or named animals having the largest biomass were insufficient to gain credit. Other students made comparisons between the size of an animal and its biomass.

05.5 The bar chart was generally well constructed with a third of students gaining full credit and 41% gaining two of the three marks. The mark most often missed was for labelling the y-axis as many students did not do this, or simply labelled it 'y'.

05.6 Students found this question difficult. 14% of students were able to refer to the constant adding and removing of organisms or give a change that would lead to this such as mowing the grass. A small minority of students gained a second mark for reference to constant population sizes needed in a stable community.

Question 6 (standard demand)

06.1 Three-quarters of students gained some credit for describing the ruler drop test. Most described the dropping and catching of the ruler but this mark point was not awarded if there was a countdown or warning given, or if the student was dropping and catching the ruler themselves.

Many were able to describe exactly where the ruler should be positioned above the hand, but if a large height was indicated this mark was not awarded. The measurement on the ruler where it was caught was the third mark and any references to timing were ignored.

06.2 65% of students correctly calculated the dose of caffeine for group D.

06.3 45% of students realised that a drink with no caffeine was needed to be able to see the effect of caffeine on reaction time. This could be expressed in various ways including 'as a control group', however 'a control variable' was not given credit as caffeine is in fact the independent variable. References to a 'placebo' were ignored.

06.4 Half of the students were able to estimate the reaction time for a drop of 23 cm.

06.5 Many students appeared to not read this question carefully and answered a different question giving that reaction time either increased or decreased. 17% of students correctly expressed the relationship as 'as the mass of caffeine increases so does the decrease in reaction time' which is directly from the graph. Some students just quoted data from the graph which did not gain credit.

06.6 A 'mathematical' reason was required as to why these points were negative, so ideas related to errors, or the method were not relevant. A large number of students surmised that the ruler was not caught at all. 12% of students realised it was because the reaction time increased rather than decreased after the drink and gained the mark.

06.7 44% of students were able to give the correct range of results for group C.

06.8 A quarter of students were able to give one variable that should have been controlled and a few gave two correct answers. The most common correct variables were related to the position of the hand and ruler before the test or using the same hand each test.

Most incorrect responses referred to some aspect of the caffeine drink which was in fact the independent variable and already very well controlled.

06.9 17% of students were able to gain one mark for realising that either a reflex action is automatic or that the ruler drop test requires a conscious action or involves the brain. Many students only referred to the absence or presence of danger as distinguishing the two actions, or said that the ruler drop test only needed 'hand-to-eye coordination' or 'did not involve the brain'.

Question 7 (standard demand)

07.1 45% of students were able to name another greenhouse gas. Methane was the most common correct answer, but water vapour was also seen. The most common incorrect answers were carbon monoxide and nitrogen.

07.2 Two effects of climate change were required and many students gained both marks for stating 'polar ice caps melt and sea levels rise'. Ice caps melting was often described in vague ways that did not gain credit including 'ice melting' and 'icebergs melting.' The most common insufficient responses were 'hotter summers' or 'changes in weather.' As global warming was given in the stem of the question, rising temperatures did not gain a mark.

Loss of habitat was insufficient without qualification as much habitat loss is due to human activity. Many students referred to 'animals/plants' becoming extinct which gained credit although 'species becoming extinct' was preferable. Misconceptions included that acid rain, earthquakes and volcanoes were effects of climate change.

22% of students gave two effects and 37% of students gave one effect.

07.3 Students found it difficult to describe how carbon from the atmosphere is cycled through living organisms. Many students did not gain credit as they restated what was shown in the diagram about transfer from one organism to another.

Those students who did recognise the need to name a process or processes gained credit, mainly for photosynthesis or plants being eaten. However, to progress to Level 2 detail needed to be given and this was often very vague or incorrect. Very few students gave detail of how carbon dioxide is used in photosynthesis, a few referred to the production of glucose but then stopped. Many students began with photosynthesis and then continued with how oxygen is needed by animals rather than the cycling of carbon.

Those students who recognised and named the processes of respiration or decay often gave better linked detail. Many referred to the decay process releasing carbon dioxide rather than the respiration of the microorganisms releasing the carbon dioxide. The passing on of carbon between levels of consumers was rarely mentioned.

42% of students did not attempt this question or gained no marks. 8% of students were able to provide an answer matching the Level 2 descriptor in this question that differentiated between students well.

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.