

GCSE
COMBINED SCIENCE:
SYNERGY

8465/2H: Life and environmental sciences (Higher)
Report on the Examination

8465
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General

This was the second year of the new GCSE specification and it appeared that students had sufficient time to complete the paper. Questions 1 and 2 were common with the Foundation tier.

Students scored less well with application of knowledge particularly with the movement of substances across a cell membrane.

The Required Practical Activity (RPA) question on how to set up a microscope slide was also poorly answered and in part, suggested that students may not have first-hand experience of doing this.

Question seven had the greatest percentage of parts not attempted. This also required a practical application of knowledge.

Recall of genetic terminology was another area of weakness with many students unable to convey the meaning of key terms.

As always, students are reminded to write in black ink. Where handwriting is poor, examiners make every effort to read what is written, but some answers can be difficult to read.

Levels of demand

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

- **standard demand** questions are designed to broadly target grades 4–5
- **standard/high demand** questions are designed to broadly target grades 6–7
- **high demand** questions are designed to broadly target grades 8–9.

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 (standard demand)

01.1 Around 44% of students achieved this mark. Common errors included 0.42 – 1.20 (most frequently seen), but also 0.14 – 0.59.

01.2 This extended response question differentiated well with about 37% of students able to give a detailed method and description of how they would change the independent variable, therefore accessing Level 3.

More than half of students were able to access Level 2 by stating the reaction test that would be completed with detail about how they would change the independent variable. Some students gave detailed accounts of the method they would use but did not make their experiment valid by testing two individuals; one with caffeine and one without.

A noticeable number of students described the ruler drop test being timed with a stopwatch rather than reading the measurement from the ruler.

- 01.3** Over 90% of students scored the mark for correctly selecting receptors.
- 01.4** A quarter of students gained two marks for identifying a control factor, and half of all students scored one mark. Common correct responses included tiredness, age and distance from the light box. The most common responses that did not gain credit related to mass or diet of the athlete.
- 01.5** Test 4 was correctly identified by most students. The most common incorrect response was test 3.
- 01.6** This calculation was well attempted, with around 72% of students achieving two marks. About 23% of all students failed to give their answer to four significant figures so were limited to one mark.
- 01.7** A quarter of students were able to convert 138.2 ms (milliseconds) to s (seconds). Common errors included multiplying by 1000 or dividing by 100.
- 01.8** Half of all students scored the mark for correctly selecting that anomalies could be identified. The idea of results having more precision was the most common error.
- 01.9** More than half of the students were able to correctly identify why the conclusion may not be valid. Many incorrect responses related to male or female athletes being better than the other.

Question 2 (standard demand)

- 02.1** Around 13% of students scored two marks and approximately 43% gained one mark. Common incorrect responses included students reiterating the stem of the question. Many also gave simple statements about recycling rather than suggesting an increase in recycling.
- 02.2** Around 17% of students scored two marks and approximately 50% gained one mark. Many also gave simple statements about using renewable resources rather than suggesting an increase in renewable resources.
- 02.3** This calculation was well attempted, with around 63% achieving two marks. About 2% of students scored one mark by showing the correct working without calculating the final, correct answer.
- 02.4** Around 29% of students were able to access Level 3 of this extended response question. These students gave a clear outline of the mechanism and giving detailed, linked consequences.

Approximately 45% scored marks within Level 2. Most were able to identify the mechanism of a rise in greenhouse gases or global warming. Many students were able to identify the consequences linked to the ice caps melting.

Those that failed to score often tried to relate their answer back to paper production or electricity generation.

As with the Foundation tier, this question differentiated across the ability range very well.

Question 3 (standard, standard/high & high demand)

- 03.1** About 28% of students achieved two marks with approximately 16% gaining one mark. Common errors included glucose and lipase.
- 03.2** Around 12% of students scored two marks with approximately 56% achieving one mark. Many identified 37 °C as being the optimum temperature but many missing the fact this was human body temperature.
- 03.3** Only a very small percentage of students were able to identify the fatty acid product as being the cause of the decrease in pH. Many suggested that bile was acidic and so this would be the reason for the change.
- 03.4** Around 72% of students achieved credit for correctly describing the pattern in the table. Those that did not gain the mark often suggested as the concentration of bile increased, so did the pH.
- 03.5** About 4% of students achieved two marks with approximately 57% gaining one mark. The second marking point was the most common correct response with many stating the lipid would be digested more quickly. Very few students were able to link the larger surface area with the enzymes ability to act on it for the first marking point.

Question 4 (standard, standard/high & high demand)

- 04.1** About 15% of students achieved all four marks with approximately 18% scoring three marks. Those that did not score three or four marks were unable to identify tobacco mosaic virus. Many made simple statements suggesting a fungus. About 9% of students did not attempt this question.
- 04.2** Around 6% of students accessed this mark. Students needed to describe isolating and burning the leaves to gain credit. Many responses only covered one of these two aspects.
- 04.3** About 15% of students gained the mark for using a fungicide. There were many varied incorrect responses including the use of pesticides, disinfectant and antibiotics.
- 04.4** About 6% of students achieved five marks with approximately 7% gaining four marks. Many students attempted to answer this question in terms of how the school microscope is useful in looking at the damaged plants rather than how to use a light microscope.

About 42% of students achieved one to three marks with many answers not prepared well to respond in a formal, precise way. Many simply stated that the slide should be put under the microscope. The use of correct terminology eg objective lens, stage, slide, focussing knob/control was often missing.

There was significant confusion between magnification and focussing in many students' answers.

- 04.5** Around 14% of students achieved three marks with approximately 34% gaining two marks. Here the greatest difficulty was in converting one of the units so their final answer was out by a factor of ten. Students need to understand that both values must be in the same unit in order to correctly calculate magnification.

- 04.6** Many partial answers, typically 'a virus is too small' resulted in around 18% of students scoring this mark. The idea that a student could not observe a virus because it could make them ill was quite common.
- 04.7** About 53% of students were able to describe the pattern in Table 5 however very few were then able to relate this information to the increase in the number of infections after 1956. Very few, about 1%, were able to link the infection to the survival of the fungus.

Question 5 (standard/high & high demand)

- 05.1** Around 4% of students achieved three marks with approximately a further 10% gaining two marks and about 22% with one mark.

There was considerable confusion in identifying B and many chose water which then led onto a description of water entering by osmosis. Other incorrect responses included glucose and carbon dioxide. Many students missed out 'ions' although did go on to correctly identify active transport.

- 05.2** Students struggled with this question with around 8% achieving any marks. Many gave an answer involving sugar (solution) movement into the dandelion by osmosis. Most did not seem to recognise the change in shape of the dandelion strip.
- 05.3** A quarter of students were able to suggest a concentration for the sugar solution in the dandelion cells. Many incorrect responses were higher than the expected value. Some gave a single value of 0.2 mol/dm^3 or 0.4 mol/dm^3 , which was insufficient for the mark given the information provided in the table.
- 05.4** This question was very challenging. Around 9% of students achieved one mark with about 10% not attempting this question. A very small percentage of students were able to identify that at 0.2 mol/dm^3 the plant cells were absorbing water and at 0.4 mol/dm^3 they were losing water.

A small number of students were able to identify that when the concentration was the same, the dandelion strip would have the same shape as it had at the start.

- 05.5** Less than 1% of students achieved two marks with around 12% gaining one mark. Incorrect responses included:
- repeating and calculating a mean
 - leaving for a longer period of time
 - using more concentrations.

A common incorrect response involved the idea of taking photographs of the samples.

Some students correctly stated that the mass should be taken before and after, but failed to include the idea of working out the net gain/loss in mass.

Question 6 (standard, standard/high & high demand)

- 06.1** Around 37% of students achieved this mark with about 13% not attempting to answer. Incorrect responses were wide and varied with some drawing half the number of chromosomes and others drawing multiple chromosomes inside and outside the nucleus.
- 06.2** Approximately 4% of students achieved two, three or four marks with about 28% gaining one mark. Most students were unable to identify the similarities with just a few stating that the chromosomes would replicate.

The differences required detailed responses and the quality of answer lacked the required depth of understanding. Many identified two cells produced by mitosis and four cells by meiosis but were unable to include whether they were genetically identical or not.

Very few mentioned that the cells produced by mitosis had the full set of chromosomes whereas the cell produced by meiosis would only have half the number of chromosomes.

- 06.3** About 10% of students achieved this mark with few having learnt a definition of gene and allele. Most knew the terms had something to do with inheritance.

There were many different wrong answers including:

- genes are passed on, alleles are not
- genes are DNA, alleles are characteristics
- alleles are inside genes.

- 06.4** Almost a fifth of students gained one mark by identifying a dominant allele as the one that is always expressed.

Many tried to explain using examples such as BB. Others suggested weaker and stronger genes. Some suggested it allows traits/characteristics to be seen.

- 06.5** Students were required to not only identify person 3 as being heterozygous but also to explain why using evidence. Some identified that person 3 had a child without achondroplasia but then failed to link back to the fact they must then have a recessive allele.

- 06.6** Nearly all students attempted this question and there was good discrimination with more than a fifth gaining four marks, almost a third achieving three marks and approximately 37% scoring one or two marks.

Many students missed out on a mark for failing to identify which children would or would not have achondroplasia. Others failed to identify the correct alleles required but were able to score marks for the correct derivation.

Question 7 (standard, standard/high & high demand)

- 07.1** More than half of the students correctly identified gamma waves with many incorrect responses being radio waves.

- 07.2** Very few students were able to gain marks on this question with around 1% gaining two marks and approximately further 6% scoring one mark. Nearly 13% of students did not attempt this question.

Those that did score usually recognised that the radio waves would be absorbed. Many responses were confused and showed no understanding of the physics.

- 07.3** More than a quarter of students failed to attempt this question. Of those that attempted, less than a third achieved both marks and around 23% gained one mark. Most students were able to recognise the direction of the wave although some indicated total internal reflection within the glass block.

Those that did not show the direction often gained the mark for drawing the correct distance between the wave fronts when their wave exited the glass block.

- 07.4** No students achieved full marks on this question and less than 1% scored two marks. About 23% were able to score one mark for the wave slowing down in glass or the compensation mark.

A lot of students obviously had some idea of the mechanism of refraction but could not express themselves in terms of wave-fronts hitting the glass at an angle.

- 07.5** Approximately 4% of all students gained five marks on this calculation. By far the most common error was not converting 420 ms to 0.42 s. These students recognised that:

frequency = $\frac{1}{\text{period}}$ and so used $\frac{1}{420}$ in subsequent equations with around 14% achieving 4 marks.

The alternative of wave speed \times time was frequently attempted, although students did not clearly show how this was derived and so were restricted by the number of marks that could be awarded. Those who invented an equation to justify their calculation gained no marks.

Question 8 (standard, standard/high & high demand)

- 08.1** Around 67% of students scored the mark for correctly selecting C with the most common distractor being B.

- 08.2** About 9% of students achieved three marks with a further 9% scoring two marks. The most common correct response was that the pancreas producing insulin and this was evident in a quarter of students gaining one mark.

There was confusion with terminology that restricted some students from accessing more marks. Many students suggested that glucose was stored as glucagon.

- 08.3** Very few students were able to recognise that the blood glucose concentration was likely to rise as high with around 2% gaining both marks. A few more students, about 13%, scored a mark for identifying that the person with diabetes would not need to inject as much insulin.

A large number of students only made vague statements regarding treatment and there were many confused answers. Approximately 12% of students did not attempt this question.

08.4 This question was well attempted by students with a fifth of students achieving all three marks. Approximately 35% scored two marks and more than a quarter scored one mark.

There were some very effective responses – mainly mentioning that mothers with GDM tended to have a higher BMI; mothers with GDM tended to have heavier babies; and the teenagers of mothers with GDM were more likely to be overweight.

Some students over confused their wording which led to them losing clarity in their response. Some students incorrectly stated that GDM causes a higher BMI in pregnant mothers.

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.