

GCSE
COMBINED SCIENCE:
TRILOGY

8464/B/1H: Paper 1 - Biology (Higher)
Report on the Examination

8464
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General

There were five questions on the Higher tier paper. Questions one and two targeted grades 4–5 and were common with the Foundation tier paper. Questions three to six mainly targeted grades 6 and above.

Practical skills have to be assessed in the question papers. Paper 1 specification content covers five of the seven required practicals. These should be used to teach skills related to:

- planning investigations
- the different types of variable
- use of apparatus
- identifying errors in methods and suggesting improvements
- presenting and analysing results.

These skills can then be applied to different investigations. It was noticeable in the quality of response when a student had carried out practical work effectively, particularly in relation to the use of a microscope.

Students generally demonstrated good maths skills. Some errors included incorrect reading of the scale on the graph, and a poorly drawn line of best fit. Some problems were seen in relation to rounding numbers and the use of significant figures.

Many responses demonstrated a poor understanding of transport processes. Students referred to diffusion, osmosis or active transport in response to several questions.

Many students did not appreciate the difference between the command words ‘Explain’ and ‘Describe’.

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.

Question 1 (standard demand)

01.1 Around 64% of students correctly identified the blood vessel that carries deoxygenated blood away from the heart to the lungs. The most common incorrect response was vessel C, which carries oxygenated blood away from the heart to the body.

01.2 Around 37% of students knew that pacemaker cells are found in the right atrium. Almost as many students thought that these cells are found in the left ventricle.

01.3 Half of the students knew that digitalis originates from foxgloves. The most common incorrect response was willow.

- 01.4** Around 72% of students gained full marks for calculating stroke volume and correctly rounding their answer to two significant figures. More students are showing their working for calculations which helps them achieve compensation marks should their final answer be incorrect.

The first marking point was for reorganisation of the equation. This could be written in words, but writing out the equation as a triangle was not creditworthy. 96% of students gained two or more marks. This was usually for the first two marking points. There were some errors seen in the rounding of the answer, either to 53 or to more than two significant figures.

- 01.5** Around 13% of students gave a detailed account and achieved Level 3 in this extended response question. They logically linked the effect of beta blockers to the supply of oxygen to respiring muscles, and the need to breathe faster or deeper. Some went on to explain that anaerobic respiration might occur, leading to a build-up of lactic acid and an oxygen debt.

Half of the students were limited to a Level 2 response because they did not explain why the breathing rate would need to increase.

Question 2 (standard demand)

- 02.1** About 69% of students correctly named amylase or carbohydrase as the enzyme that digests starch. Phonetic spellings were allowed.
- 02.2** The question informed students that Figure 2 was a model to represent the digestion and absorption of food molecules in the digestive system. Students should know that digestion and absorption occur in the small intestine. Named parts of the small intestine, including villi and microvilli, were all allowed. The stomach was also allowed. Just saying the gut or intestines was insufficient. Reference to the large intestine was incorrect. Other incorrect responses included organs such as the pancreas or lungs.

Some students gave partially permeable membrane as their answer, but this was labelled on the diagram. Quite a lot gave the stomach, but thought the water in the test tube was stomach acid, so only gained the first marking point. Over half of the students correctly stated that the water represented the blood or bloodstream. Hydrochloric acid was a common incorrect response.

- 02.3** About 61% of students gained both marks. The most common error was to give the names of other food test reagents, for example Sudan III and Biuret reagent.
- 02.4** About 41% of students gained the mark from this question. Some students gave both ideas – that the enzyme hadn't had time to start working and that the starch hadn't been broken down yet.

Quite a few students said that no sugar had been put in at the start, which was ignored. Misconceptions included that the sugar had diffused out of the tubing.

- 02.5** Around 23% of students gained both marks for realising that there had not been enough time for all the starch to be broken down into sugar. The response needed to refer to the digestion, or breakdown, of starch into sugar. Many students just described the test results, saying starch and sugar were both present, which did not gain credit as an explanation was asked for.

Many students talked about the substances dissolving, or moving out of the tubing by diffusion, osmosis or active transport, demonstrating a poor understanding of these three processes. Some said the starch had been digested into sugar by the water, which negated the first marking point. Quite a lot of responses were answers to question 02.6, which was about the size of the molecules.

- 02.6** About 12% of students gained any marks for this question. Most students just described the results, saying that sugar was present in the test tube, but not starch. Those who attempted to explain the results often gave an extended response to question 02.4 and said that all the starch had been digested to form sugar.

Few realised that the sugar had passed through the tubing, but the starch had not. Some assumed that both molecules had passed through the membrane, but then the starch had dissolved in the water. References to diffusion, osmosis and active transport were often made.

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

- 03.1** Around 44% of students scored this mark by referring to use of the tap or a description of releasing water from the reservoir. Some said add more water, but did not go on to say how this could be done.

Quite a lot of students said remove the shoot from the apparatus, whilst others said remove the water. There were quite a lot who suggested changing the temperature or humidity.

- 03.2** This was a challenging question and about 19% of students achieved a mark, although both marking points were seen in responses. For the second marking point, quite a lot of students said that the readings or results would be more accurate, which was allowed. Saying that the test was more accurate was ignored as the marking point related to the measurement on the scale. Vague descriptions, such as the bubble would be easier to see or to measure, were ignored.

- 03.3** Around 22% of students scored all three marks and around 30% scored one mark. This was usually for the first marking point. This mark could be gained from a variety of readings. The most common way was to divide 66 by 5. Other students chose other pairs of readings, for example 13 divided by 1 or 26 divided by 2. Any correct pairs of readings were creditworthy for marking point 1. The most common error on this first marking point was to divide 63 by 5, due to an incorrect graph reading. This did not gain a mark, but the student could go on to gain marking points 2 and 3.

The second mark was for multiplying their answer for marking point 1 by 0.8. A common error was to divide by 0.8. The final mark was for the correct calculation, which did not need to be rounded as the question did not request this. If it was rounded, the rounding had to be correct.

- 03.4** Almost a quarter of students gained all three marks with 64% of students scoring two marks. For those achieving two marks, these were usually for plotting the points. Errors in plotting were mainly made for the zero point, or the 3 minute point.

A line of best fit should average out the points. In this case the line should have been straight and drawn with a ruler. Incorrect lines tended to be drawn either too far below, or too close to the final point.

- 03.5** A fifth of the students scored this mark. Investigation C was carried out in dry air and at a high temperature, so water loss from the shoot would have been faster than in the other two investigations. Therefore the line would be steeper than the others, but still pass through the origin.
- 03.6** Around 70% of students scored one mark for saying the shoot would not photosynthesise in the dark. Very few students could give a full explanation relating water uptake to stomata and to transpiration from the leaves.

Many students thought the potometer measured the rate of photosynthesis, or that the air bubble was a gas produced by the plant.

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

- 04.1** About 66% of students knew that malaria is caused by a protist. The most common incorrect response was virus.
- 04.2** Students were asked to give two methods used to prevent people catching malaria, with a reason or explanation for how each method would work. Around 65% of students gained two or more marks.

All marking points in the mark scheme were seen. Most students referred to the use of mosquito nets, but did not always gain the reason mark. A reference to avoiding being bitten, not just to there being a physical barrier, was required. Vaccination was also given as a method, but some struggled to explain how this would work.

There was confusion between antigens, antibodies and phagocytes. Many referred to the body being able to fight off the pathogen, which we always ignore. Some students confused insecticides and insect repellents. The insecticide kills the mosquito, but the repellent just reduces the chance of being bitten. Vague references to bug spray were not credited.

Some students had learnt various methods to reduce the breeding grounds for mosquitos, or talked about GM mosquitos. These were all given credit.

Some students did not appreciate that malaria is not passed from person to person. Some talked about isolating people, hygiene or protected sex, which were incorrect.

- 04.3** All the marking points on the mark scheme were seen. Most students gained a mark for saying a bacterial cell does not have a nucleus. 34% of students gained both marks.

04.4 Around 16% of students scored the mark for this challenging question. Students had to relate air, oxygen or carbon dioxide to respiration. Simply saying air had to get in to the bottle was insufficient at this level of demand.

Many said the bacteria needed air to grow, reproduce or survive. These were all insufficient. There were some confused responses, saying bacteria had to be able to enter the bottle through the holes.

04.5 The question required students to apply their knowledge from different parts of the specification to cell division and survival. Over half of the students gained one or more marks. Many students just described the sections of the graph, but did not give reasons for changes in the number of living bacterial cells.

Marking points 1 and 4 were seen most often:

- In stage A, a reference to the bacterial cells dividing slowly, or the cells adjusting to the culture conditions was needed.
- In stage B, many students either referred to the rapid rate of cell division or the plentiful supply of nutrients, but both aspects were needed to gain the mark.
- Only a few students explained why the population remained constant in stage C.
- The reason why the population decreased in stage D was often well expressed. This was usually in terms of nutrients running out rather than the build-up of wastes in the solution.

04.6 In this tough question, about 11% of students scored two or more marks, whilst about 32% scored one mark. This question differentiated across the ability range of students well.

The question stated that calculations must be included, but many students did not attempt any. Three of the five marks were for calculations. Two of these were for calculating the surface area:volume ratio for each cube. Some students calculated the surface area and volume, but did not write them as a ratio. Others forgot to multiply the surface area of one face by 6. The third calculation mark, for converting the two ratios to the same scale, was rarely seen.

If no calculation marks were gained, there was a compensation mark for calculating the total surface area of both cubes, calculating the volume of both cubes or calculating the surface area and volume of one cube when they had not written it as a ratio. Most students who had attempted to do calculations gained a compensation mark.

There were many confused explanations. Quite a lot said active transport would have to be used by the multicellular organism. Many realised that the surface area of cube Y is larger than the surface area of cube X, but did not relate this to the volume. Others thought that cell Y was 55 000 times larger than cell X, which was incorrect.

Question 5 (standard, standard/high & high demand)

- 05.1** Around 38% of students gained full marks for calculating the length of the root hair in micrometres. Around 33% of students scored three marks because they made an error with the unit conversion. As mentioned earlier, more students are showing their working for the calculation.

The first marking point was for substitution into the equation given in the specification. The second marking point was for reorganisation of the equation to calculate the real length of the root hair. The third marking point was for correctly calculating the length in mm. The final mark was for converting this value to μm . This was an independent marking point, so a conversion of their incorrectly calculated length could gain this mark. This was often awarded. The most common errors related to incorrectly reorganising the equation, or an incorrect unit conversion.

- 05.2** This extended response question highlighted that many students either did not understand how to use a light microscope, or could not explain the procedure in a clear step by step way.

Some students had not read the question carefully. Instead of starting with a prepared slide, they explained how they would prepare a slide, which was not creditworthy. Knowledge of the names of the parts of a microscope was poor.

If students only said that the $\times 10$ objective lens should be used to give a total magnification of $\times 50$, they gained one mark. In order to access Level 2, a detailed method in a logical sequence was needed, as well as a description of how to achieve a magnification of $\times 50$. 9% of students achieved Level 2. Many responses lacked detail, or gave confused accounts of how to focus a microscope.

- 05.3** This question asked students to describe the changes in the rate of absorption of ions for the seedling with no oxygen added. Many students compared the seedlings with and without oxygen, saying the rate of absorption with oxygen was faster. This is a correct statement, but does not answer the question. Others described the change in mass of the ions absorbed, rather than the rate.

A fifth of students scored one or more marks. Where one mark was awarded, it was usually for saying that the rate gradually decreased as time went by. Students always find it more difficult to interpret data when it is given in a table, rather than displayed as a graph. It might help if students sketched the data as a graph, so the changes in rate would be more obvious. Alternatively they could calculate the rate at each time point.

- 05.4** Around 79% of students scored one mark for saying that more nitrate ions are absorbed in the presence of oxygen. Stating that the ions were absorbed better was insufficient as at this level the idea of more or faster was required. Only a few went on to explain that this was because the ions were absorbed by active transport, which requires energy from respiration. The last marking point was rarely seen.

05.5 Students found this question difficult and approximately 11% scored one or more marks. A direct description, of how nitrate ions are used to help plants grow, was required. Although nitrate ions are used to form other substances in a plant, the direct link between the formation of proteins for growth was needed.

Many students gave a description of nitrate ion uptake and transport in the plant, but this did not answer the question. Reference to active transport was often seen. Many thought that nitrate ions are transported in phloem. The use of nitrates as a food or as a source of energy was often stated. Some thought that nitrates contain glucose.

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.