

GCSE

COMBINED SCIENCE: SYNERGY

8465/1H: Paper 1 – Life and environmental sciences (Higher)
Report on the Examination

8465
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General

This paper was marginally more difficult than in previous years. The unfamiliar context and Venn diagram in Question 4 resulted in lower marks than expected for this question. In Question 7 the level of logical thinking required for some question parts made the questions more difficult than anticipated.

Questions 1 and 2 are common with Combined Science: Synergy Paper 1 Foundation tier.

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** 78% of students were able to give one or two correct uses of UV and IR radiation. The most common correct answers were sunbeds for UV and heating/cooking for IR. The most common misconceptions were that either, or both, were used for x-rays or medical diagnosis. Their correct use in medicine such as UV for sterilisation or treating babies with jaundice and IR for heat lamps to treat muscle pain, were given credit.
- 01.2** Half of the students knew that an electron going from a higher energy level to a lower energy level would emit light.
- 01.3** The vast majority of students either were able to convert 300 000 000 to standard form or they had memorised that the speed of electromagnetic radiation is 3.0×10^8 .
- 01.4** The equation $v = f\lambda$ was well known to students who were able to locate it on the Physics Equations sheet if they did not remember it.
- 01.5** Some students gained one mark for substitution but were unable to rearrange. Many went on to gain three marks having a correct calculation, but forgetting that the unit for wavelength is metres or m.

Question 2 (standard demand)

02.1 It was not simple to spot the unmentioned control variables in this method. The most common correct answers were to use the same potato or the same type of potato or to control the volume of salt solution. The most common misunderstanding was to give the concentration of the salt solution as a control variable when in fact it is the independent variable in this investigation.

There was much vague use of the word 'amount' rather than volume of solution. A proportion of students referred to 'mass' and/or 'time' which were identified in the question and so were indicated as factors not to consider. 14% of students gave two correct variables with 40% providing one correct variable.

02.2 The majority of students successfully calculated the mean value and realised that it was a negative quantity.

02.3 There was a wide spread of answers to this extended response question, ranging from 0–6 marks. The majority of students achieved two or three marks, usually for awareness that osmosis had taken place, water had entered the potato and through a partially permeable membrane. Any correct references to concentrations inside or outside the cells or other details would likely elevate the answer to four marks. Some students limited their responses to Level 1 by saying that salt solution, rather than water, entered the cells. Responses giving full and accurate details of either water or solute concentration gradients would likely be awarded five or six marks.

02.4 The most common responses awarded a mark referred to either a greater magnification or to the level of detail seen on sub-cellular structures. A number of students also correctly referred to the image being 3D. Some students who were beginning to show understanding fell short because they referred to it as being 'more zoomed in' or 'much clearer' both of which were too vague to gain credit. A common misunderstanding seemed to be that because the image shown was in black and white, rather than colour, it must be an EM image.

02.5 Conversion errors, either failing to convert 1.2 cm to 12 mm, or 0.008 mm to 0.0008 cm, resulted in a very large number of answers ranging from 1.5, 15, 150 to 15 000. Provided the working was visible these were awarded two marks for the correct method.

02.6 Starch is indeed a carbohydrate, but this is not the reason it needs to be broken down in digestion. The correct answer, that starch is insoluble, was given by 45% of students.

02.7 Many students may well have known the answer that starch is broken down by carbohydrase/amylase to produce glucose/sugar if quizzed in class, but in the examination situation they were unable to respond. Many referred to general digestion in the gut or action by acid in the stomach. Just under a half of students gained one or both marks.

Question 3 (standard & standard/high demand)

- 03.1** The majority of students had clearly understood the principles of finding both mass and volume to calculate density. Many gained three marks as their method was valid and would work but was lacking in the precision and detail needed to gain full marks. Those students who did not specify appropriate measuring instruments or quantities to be measured, or who measured only mass or volume, were awarded one or two marks.
- 03.2** This question proved to be an excellent discriminator of mathematical ability and problem solving. Some students gained one mark for selecting the correct equation and substituting the values given but then failed to rearrange.

Those who did successfully rearrange usually went on to calculate the correct volume of the cube and so gain three marks. More mathematically astute students were able to take the cube root of this volume to find the length of one side and then use that to calculate surface area. Some students were able to gain these last two marks if they successfully carried out the last two steps but used an incorrect value they had calculated for volume.

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

- 04.1** The binomial naming system of genus name followed by species name did not appear to be well understood by students. The most common, and incorrect, answer was the complete binomial of *Eutrema salsugineum*. 38% of students gave the correct genus name.
- 04.2** A third of students were able to extract the correct time from the evolutionary tree. 4 million years ago was a common incorrect answer, possibly from misreading the question and thinking the two varieties concerned were rapeseed and turnip.
- 04.3** The answers given to this question underlines that students struggle with binomial names. The majority of students gave the common names instead.
- 04.4** Many students were able to describe the ethanol and water test, or the Sudan III test, and a few gave the grease mark on paper test for lipid. Students did not gain marks because they omitted water from the ethanol test but the correct positive result was credited. The most common misunderstanding was that the iodine test was for lipid rather than starch.
- 04.5** The process of selective breeding was not well known. Many students believed that farmers had been genetically modifying their plants for thousands of years. The most commonly awarded mark, in about a quarter of responses, was the compensation mark for naming the process as selective breeding, but supplying no details or incorrect details.
- 04.6** The correct answer of breeding to find fertile offspring was rare. Most answers referred to the fact that they shared the same binomial or that their ancestry had been traced for thousands of years.

- 04.7** Most students showed the awareness that a genome was to do with genes, but fewer were able to be precise and specify that it referred to all the genes, or DNA, in an organism. A tenth of students gave a creditworthy answer.
- 04.8** Half of the students were able to gain this mark for understanding that cauliflower and kale had more genes in common than cauliflower and cabbage. If data was included it needed to be correct and this meant that some students failed to gain the mark for quoting incorrect figures.
- 04.9** The Venn diagram proved too difficult to interpret for almost all students who could not extract the required data from it. Of those who did, almost all went on to calculate the correct percentage.

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

- 05.1** A quarter of students were able to describe an alpha particle as comprising two protons and two neutrons or as a helium nucleus. A few students did not gain this mark as they described it as a helium atom or a helium ion.
- 05.2** Half of all students selected the correct tick box to indicate they had successfully divided 0.182 by 1 000 000 000. The most common alternative was to multiply instead.
- 05.3** A large majority of students were able to find the ratios by dividing the appropriate numbers.
- 05.4** Most students attempted this explanation with 29% achieving at least one mark. The first three marking points were seen quite frequently, but not necessarily in the same response. The final marking point regarding the nucleus was only seen rarely.
- 05.5** A third of students were able to list the numbers of protons, electrons and neutrons in the two atoms. A further fifth of students gained one mark for noting that the number of neutrons was the same. Some students missed the instruction to give numbers and so supplied a description using atomic number and mass which was insufficient for any marks.
- 05.6** Students understood that a different number of neutrons is involved in atoms which are isotopes, but unless they also described these as being the same element, or having the same number of protons the answer did not go far enough to gain credit. A quarter of students gained this mark.

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

- 06.1** 67% of students chose bacteria as the correct answer.
- 06.2** Most students were able to give an advantage of using organs from GM pigs. The readily availability of organs or being able to avoid the long waiting times for a human organ were the reasons most often given. Some answers were too vague, such as ‘there are a lot of pigs’, and references to not having to kill humans to obtain organs were of course not given credit.
- 06.3** The process involved in genetic modification was not well known, so few marks were achieved. Where an enzyme or a vector were mentioned one mark was awarded.
- 06.4** Students could see the clear advantage to the farmer of being able to produce more cotton and so earn more money. Some students did realise that less pesticides would be needed and this was an advantage either economically or environmentally. Three-quarters of the students gave correct answers.
- 06.5** Most students completed an accurate Punnett square diagram. The marking point most often missed, as in previous years and for other biology papers, was the step for identifying the phenotype of each genotype.
- 06.6** Responses showed that students struggled with this concept. The first marking point for more offspring being able to eat GM cotton and survive was the most often seen, followed by the third marking point for passing on the dominant allele to the next generation. Half of the students gained some credit.

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

- 07.1** Acid in the stomach was well recognised, but far fewer students went on to say that the acid killed the pathogens. Instead many students gave lurid descriptions of how the acid prompted vomiting to rid the stomach of pathogens.
- 07.2** 14% of students were able to make the link between HPV and cancer.
- 07.3** Two-thirds of students were able to identify the treatment needed as antibiotics.
- 07.4** Oestrogen was the more well-known hormone to help maintain the uterus lining. LH was the most common incorrect answer seen.
- 07.5** Students either knew about categoric and continuous data, as outlined in the specification, or they did not. The 15% that did, gained the mark for stating that this was categoric or non-continuous data. The remainder of students either said it was to be able to compare more clearly or that it was because there were two bars for each group.

- 07.6** This question was set at a very high demand and involved concepts that very, very few students were able to express. Some came close by referring to the different perception or knowledge of some diseases but did not go on to say how this would affect the different estimated risks.
- 07.7** It was well known that barrier methods will help reduce the spread of STDs for the first marking point. But a low percentage were able to go on to explain how this helped by preventing the passage of pathogens from one person to the next. Referring to fluids or diseases was insufficient for this mark.
- 07.8** 51% of students appreciated that the immune system in late stage AIDS patients is damaged or weakened. Very few students went on to explain how this actually affected white blood cells, antibody or antitoxin production, or phagocytosis, and so how normally mild infections would now have very severe symptoms.

Question 8 (standard/high & high demand)

- 08.1** A detailed and precise reflex action pathway needed to be described to achieve the marks in this question. A minority of students were able to do this. The two marking points most often seen were for a receptor sensing a stimulus or touch or pressure for the first marking point, and the muscles of the toes contracting or the effector causing a response for the sixth marking point.

There was a great deal of confusion over which neurones were where, and the involvement of the brain sending messages all over the body. 52% of students did not gain any marks and 16% gained one mark.

- 08.2** Although some students recognised that the tight shoe laces would restrict blood flow, very few were able to link this to lack of oxygen and anaerobic respiration for the third marking point. Some students gained a mark in the fourth marking point for understanding that the pain was being caused by a build-up of lactic acid in the muscle. Theories proposed often referred to trapped nerves and to muscles needing more room, swelling up and causing pain. 18% of students gained marks in this question which was set at a high level of demand.

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.