

GCSE

COMBINED SCIENCE: SYNERGY

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

8465
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General

The paper was similar in difficulty to previous series with mixture of contexts throughout the questions. Questions ranged from simple ‘tick the box’ answers to a six-mark extended response requiring understanding of the required practical activity on osmosis. This enabled students of all abilities to demonstrate knowledge, understanding and the skills of logical reasoning, calculation and interpretation.

Questions 9 and 10 are common with Combined Science: Synergy Paper 1 Higher tier.

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 & standard demand)

- 01.1** 43% of responses gave the correct function of all three types of cell. The most known were that a muscle cell contracts and a gland cell produces hormones.
- 01.2** While half of all students knew that the receptor cells were in the foot, a significant proportion confused receptor cells with the brain.
- 01.3** 42% of students knew that the coordinator was the central nervous system, while others thought it was the sensory neurone.
- 01.4** A very high proportion of students realised that the toes curling was the response.
- 01.5** Students found this question challenging. Some students were able to link respiration to the need for energy, which was credited at this level as an alternative to releasing energy, but many students still referred to producing, making or creating energy which is incorrect. Very few students went on to explain why this energy was needed to gain the second marking point.

Question 2 (low & standard demand)

- 02.1** Two-thirds of students knew that the coronary arteries are in the heart.
- 02.2** The stent was the best-known treatment. How statins and replacement valves work was also fairly widely known, but not usually by the same students, so an overall mark of two was common.
- 02.3** For this question on genetic modification all three options appeared attractive to students. Half the students did select the correct answer that genes are transferred into the bacteria.
- 02.4** Two-thirds of students used their logical thinking to select that large quantities of the drug being produced was a benefit.
- 02.5** Similarly to **02.4**, three-quarters of students were able to identify that genetically modified animal organs being less likely to be rejected was an advantage.
- 02.6** Cruelty to animals, or animals being killed was the most common correct response seen. Vague answers about it being immoral, unethical or the inability of animals to give consent were not awarded the mark.

Question 3 (low demand)

- 03.1** A ruler, spelled in many ways, was by far the most common, and correct answer.
- 03.2** While half of students did correctly find $3^3 = 27$ and so ticked the correct box, many also calculated $3^2 = 9$ and so ticked the wrong box.
- 03.3** This was a simple density calculation with the equation given and most students gained the first two marking points. Far fewer understood 2 significant figures, with many interpreting this as 2 decimal places to give an answer of 1.63 instead of 1.6.
- 03.4** It was well known that the instrument used to measure mass is a balance.
- 03.5** 41% of students gained the two marks for this question by saying that you would add the key to the measuring cylinder and measure how much the water level rises. Few detailed taking original and final volumes and subtracting, or adding the key and subtracting 70 cm^3 from the new volume. A number of students talked about a eureka can rather than describing the experiment with the equipment shown.

Question 4 (low demand)

- 04.1** 46% of students selected appearance for traditional classification criteria, but fewer students knew that modern classification results from DNA analysis.
- 04.2** The binomial system is not widely understood at foundation tier level with all three options being chosen equally as the genus name.

- 04.3** The correct time span of 4 million years ago was extracted by almost 90% of students, however 9 was also popular.
- 04.4** A common misconception by students was thinking that rapeseed oil was a carbohydrate. A possibility is that students were influenced by the reference to cooking.
- 04.5** The process of selective breeding was the most common answer chosen. Active transport was also common.
- 04.6** The definition of genome was not well known, with all three options chosen about equally.
- 04.7** Most students gained the first marking point for being able to read the correct value from the graph. Few were able to add the 5000 found only in cabbage and carry out the correct percentage calculation despite having been given the equation. The stumbling block seems to have been the problem-solving step of how to find the total number of genes in cabbage rather than knowing how to calculate percentage.
- 04.8** Half of students selected the correct option that most genes are the same in cauliflower and cabbage.

Question 5 (low & standard demand)

- 05.1** 87% of students knew that gonorrhoea was the disease in the list which is sexually transmitted.
- 05.2** The bar was well plotted by those students who attempted this question. It is possible that the question was overlooked by the one sixth of students who did not attempt to plot the bar. This may be as it appeared at the top of the adjoining page.
- 05.3** Almost all students gained this mark.
- 05.4** 69% of students were able to make both appropriate readings and subtract. Others did gain a single mark for two correct readings from the graph.
- 05.5** Described in many ways, two-thirds of students were able to convey the idea that the estimated risk was higher than the actual risk.
- 05.6** Three-quarters of all students knew that a barrier method, or a named barrier method, would reduce the spread of STDs.
- 05.7** Although the word 'mutations' was seen rarely, about one fifth of responses did refer to damaged, changed or corrupted DNA to gain the mark. Responses referring to killing or attacking DNA were not accepted, while references to destroyed, degraded or broken-down DNA were ignored. Genes, alleles or chromosomes were acceptable instead of DNA, but references to cells being mutated were not given credit.

Question 6 (low & standard demand)

- 06.1** 62% of responses correctly labelled A as the nucleus. Incorrect responses may have been due to students only being familiar with a nucleus seen in a typical animal or plant cell and not transferring this knowledge to a sperm cell.
- 06.2** Those students who knew the term 'double helix' achieved both marks immediately. The most common single mark was for a 'twisted' or 'spiral' structure. References to a 'ladder' structure were not credited unless further detail was given.
- 06.3** A majority of students gained the mark with the response 'eggs'. No credit was given for 'gamete' as that is in the question stem.
- 06.4** Many students were not able to interpret what was required by this question despite the very strong clue given in the figure. Some unusual suggestions were made about the size or shape of chromosomes but very few answers were in terms of numbers. 6% of students gained the mark.
- 06.5** Most answers gaining credit were restricted to Level 1 because they related solely to this sperm containing a Y chromosome so the offspring would be a male with XY genotype. Some answers were seen giving the full reasoning and gaining the full four marks. 63% of students provided no relevant content and a 17% did not attempt an answer.

Question 7 (low & standard demand)

- 07.1** A small majority of students knew that a neutron had no charge. Fewer were able to give +1 for the proton. As charge was asked for in the question '1' was insufficient.
- 07.2** The plum pudding model was identified by over half of students. However, a significant number also selected the nuclear model option.
- 07.3** Although two neutrons and two protons was the most frequent response, a significant number of students selected two protons and two electrons as the composition of an alpha particle.
- 07.4** 43% of all students gained full marks for this question.
- 07.5** Some students find ratios a difficult concept. 73% of students worked out the ratio as 40:1.
- 07.6** Generally students seemed vague about the gold foil experiment and while few opted for the third choice, answers were split between alpha particles bouncing back and the fact that most alpha particles followed path A.
- 07.7 & 07.8** Two-thirds of all students could identify the diagram of a helium atom in Figure 12, and a majority were also able to work out which two represented isotopes of the same element.
- 07.9** This calculation was beyond the majority of students. Many multiplied instead of dividing and so ended up with an atom with a radius of 1.82×10^8 or 182 000 000 metres.

Question 8 (low & standard demand)

- 08.1** White blood cells were well known as the cells which create an immune response.
- 08.2 & 08.3** The role of antitoxins and phagocytosis were less well known and fewer students were able to supply these answers. Engulfing was not an acceptable answer for phagocytosis having been given in the question stem, but digestion was awarded credit.
- 08.4** Cilia were fairly well known as hair-like structures but ‘a type of acid that destroys pollen’ proved a strong distractor for mucus.
- 08.5** Students appeared to engage well with this question. There were some excellent descriptions of symptoms and almost all students gave at least one correct idea. ‘Hay fever’ as an everyday description of a pollen allergy was not given credit as a symptom.
- 08.6** 19% of students were able to explain that antibiotics kill bacteria and therefore an allergy, which is not caused by bacteria, cannot be treated by antibiotics.
- 08.7** Very few students were able to explain antibiotic resistance and the problem it causes. Descriptions of that problem were accepted, such as ‘so the antibiotics will no longer work’ for the second mark point. Many referred to bacteria becoming immune or the body being resistant to antibiotics, which are incorrect.

Question 9 (standard demand)

- 09.1** 45% of students were able to give at least one correct use of either UV or 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.
- 09.2** Most students believed that an electron going from a higher energy level to a lower energy level would absorb light, rather than emit it.
- 09.3** Three-quarters of students were either able to convert 300 000 000 to standard form, or they had memorised that the speed of electromagnetic radiation is 3.0×10^8 .
- 09.4** 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.
- 09.5** This question discriminated well with some students gaining one mark for substitution but not going on to rearrange. Many went on to achieve three marks having a correct calculation, but forgetting that the unit for wavelength is metres or m.

Question 10 (standard demand)

10.1 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.

10.2 43% of students successfully calculated the mean value and realised that it was a negative quantity.

10.3 There was a wide spread of answers to this extended response question, ranging from 0–6 marks. The majority of creditworthy responses gained one or two 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.

Many 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. 69% of students did not give any relevant information and a further 15% did not attempt to answer.

10.4 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. A fifth of students provided a correct response.

10.5 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. 42% of students gained two or three marks.

10.6 Starch is indeed a carbohydrate, but this is not the reason it needs to be broken down in digestion. Few correct answers, that starch is insoluble, were seen. This may reflect partly the reading ability, and pressure to complete the paper, as students appeared not to fully read and understand what was being asked.

10.7 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 well. Many students referred to general digestion in the gut or action by acid in the stomach.

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.