



GCSE

Combined Science : Synergy

8465/1F

Report on the examination

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General

This paper was well received and gave students at all grades from 1 to 5 the opportunity to demonstrate their science knowledge. The paper was at the same level of difficulty overall as previous papers.

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.

Questions 8, 9 and 10 are common with questions 1, 2 and 3 on the Higher tier. These questions are identical with each other and are targeted at standard demand.

Question 1 (low demand)

1.1 Over four fifths of all students knew that particles are arranged randomly in a gas.

1.2 A slightly lower percentage knew that particles move randomly.

1.3 Nearly three quarters of students were able to recognise that particles exert a force when they hit the container walls.

1.4 Using the equation and straightforward data given in the question, about three quarters of students were able to calculate the temperature increase. A few students could substitute but calculated incorrectly and so scored 1 mark.

1.5 In both 1.5 and 1.6, many students did not realise that a straightforward relationship answer was required. Instead, they thought that they need to explain the mechanism and invariably went wrong. Many referred to reactions, collisions, other types of energy, and pressure. For 1.5 'moving around more' or 'vibrating more' were not creditworthy. Approximately a half of students gained the mark.

1.6 The most common error was referring to speed rather than kinetic energy. References to creating or producing more kinetic energy were incorrect.

Question 2 (low demand)

2.1 Most students knew that the inks must be insoluble in water, although a minority thought the water was moving too slowly.

2.2 Many students gave vague precautions linked to general working in a laboratory, rather than the specific task of pouring alcohol into a beaker. Using gloves, glasses, tying hair back, putting bags under tables, wearing a lab coat or a mask were insufficient for the mark. Using a funnel was also common but insufficient. Safety glasses or goggles did score the mark, as well as references to not using alcohol near flames.

2.3 Over three quarters of all students realised that a pencil line would not move up the paper.

2.4 Almost all students could see that ink C contained 3 dyes.

2.5 This simple conversion proved difficult to just more than half of students, who multiplied or divided by various multiples of 10. 240 mm and 2400 mm were common incorrect answers.

2.6 Many students were able to correctly calculate the R_f value using their conversion from question 2.5. Those students who reverted to the value of 2.4 cm given in the data gained 1 mark. Although R_f values do not have a unit, if mm was added to the answer line this was not penalised.

Question 3 (low demand)

3.1 About a third of students knew that it is the number of neutrons in the atoms of isotopes of an element that is different.

3.2 Many students were confused about the descriptions of different types of radiation. Less than half knew both beta and gamma, a quarter knew just one of the two and a quarter did not know either.

3.3 Just under half of students knew that gamma radiation could pass through 5 mm of aluminium.

3.4 Similarly, approximately the same number knew that alpha radiation would be stopped by a sheet of paper.

3.5 About a half all students knew that several metres of concrete would absorb all three types of radiation.

3.6 The decay equation for caesium-137 was not well known. Although about a half of students were able to identify the correct option, a large number choose option 1 which gave just beta radiation on the right-hand side.

3.7 Very few students scored both marks. While many recognised that the half-life of xenon was shorter, they were unable to explain that by using data from the graph. Most referred to the line for xenon being lower or decreasing quicker. A common misconception was that the half-life was half the time on the x-axis at 20 days and used data from that point.

3.8 Approximately half the students recognised that the reason the caesium-137 would still be releasing large amounts of radiation was because less than one half-life had occurred.

Question 4 (low demand)

4.1 Photosynthesis was identified by about one third of students as the process which allowed algae to be producers in a food chain.

4.2 More than half of students realised that the penguins were the secondary consumers. However, a large number thought it was the krill.

4.3 This question was well done overall. The most often missed mark was MP2 for the idea that fewer penguins were eaten by seals. Although this was often implied in answers, it needed to be clearly stated to score the mark. Common misconceptions were that the food chain was going in the opposite direction, or that the seal waste helped the algae to grow, so fewer seals meant less algae and the food chain would collapse. About a third of students gained all 3 marks in this question.

4.4 Despite the example given in the question, some students still confused abiotic and biotic factors. A third of students gained 2 marks and further half gained 1 mark.

4.5 A small majority of students identified stealing stones as an example of competition between penguins.

4.6 This was a simple conversion, with the conversion factor given in the question. Despite this, many students struggled, with the most common errors being to multiply by 10 000 instead of dividing, to divide 10 000 by 18 000, or to add numbers together. Over half of students gave the correct answer of 1.8 m².

04.7 Although students could gain full marks using their calculated value in question 4.6, not many correct answers were seen. Less than half of students gained 2 marks. If students used the unconverted value of 18 000 m² in a correct calculation they scored 1 mark.

04.8 Quadrats are familiar to students and so three quarters gained this mark.

04.9 Transects are less well known so a lower percentage gained this mark.

Question 5 (low and standard demand)

5.1 Just over a third of students were able to locate the pituitary gland in the head. As a multiple-choice question with three options, it suggests that many students were just guessing.

5.2 Almost all students knew that oestrogen was produced in the ovary.

5.3 Over half of students were able to calculate the number of control rats by dividing the total of 4500 micrometres by the mean thickness. There were various incorrect methods seen, including adding the mean thicknesses to get 515, taking a mean of the thicknesses to get 257.5, multiplying instead of dividing, and adding all the numbers together. Students who chose the incorrect thickness of 265 but carried out the correct method scored 1 mark.

5.4 This simple comparison was correctly interpreted by about four fifths of students.

5.5 Many students struggled to link the problem of chemical Y in food packaging to contaminated drinking water and food. Two fifths of students scored both marks and a further two fifths gained 1 mark. The most common misconception was to link chemical Y to being a fossil fuel.

5.6 Three quarters of all students were able to link fewer antibodies with not being able to recover from infections

5.7 Only a minority of students are familiar with the term phagocytosis. Phonetic versions were acceptable, as was 'phagocyte(s)'. Many students improvised with 'digestion', 'eating', 'mitosis', 'antibodies' and other vague terms which did not gain the mark. Nearly a third of students did not attempt to answer the question.

5.8 Enzymes were well recognised as the substances which digest large molecules into smaller ones.

Question 6 (low and standard demand)

6.1 The functions of the guard cell and the root hair were fairly well known, but meristem less so. On average students gained 2 marks out of 3.

6.2 Many students knew that blocking phloem tissue would reduce the transport of substances in the tree. However, the option of weakening the cell walls was a strong distractor.

6.3 The correct option of destroying infected orange trees was by far the most popular. About one in three students also selected the option of washing hands which gave them both marks.

6.4 Colours of Benedict's solution were not well known, with perhaps the most common correct answer seen as 'brick red' when sugar is present. Many students confused it with the Biuret test and gave 'purple', or the starch test and gave 'blue / black'. Only about a sixth of students gained both marks.

6.5 Despite the help given by the diagram with equipment names, only a quarter of students provided a valid method to gain 3 or 4 marks. The most common reasons for not reaching level 2 were to heat the beaker of water with nothing in it, to not mix the drink with the

Benedict's solution, and if they did mix the drink and the Benedict's solution, to not heat the mixture before observing the colour / result.

Question 7 (low and standard demand)

7.1 Although this was a multiple-choice question, it was set at standard demand, and many foundation tier students were unable to make the link from protein break down to amino acids and then to less urea being excreted. Both other options seemed plausible to many students.

7.2 Just over half of all students were able to pick the colour of biuret solution from the choices given.

7.3 Confused English expression regarding nutrients, carbohydrates and lipids meant that examiners were often unable to discern what students were trying to say, and so marks were not awarded. Less than half of students gained marks. Errors included stating that both were high in carbohydrate and low in lipids, and just quoting numbers from the table instead of doing a comparison. Many students did not attempt this question.

7.4 About a fifth of students were able to calculate the mass of carbohydrate. Common errors were to multiply or add the numbers instead. Nearly a quarter of students did not attempt this question.

7.5 Approximately a third of students did not attempt this 6-mark extended response question, and a further one third gained no credit. A range of marks was seen but the majority remained in level 1, as insufficient detail of the breakdown of carbohydrates or lipids was present. Correct content was mainly about the uses of the molecules formed. Common misconceptions were:

- bread contains the enzymes
- stomach acid breaks down all the food
- carbohydrate breaks down into starch
- carbohydrates and lipids are broken down into carbohydrase and lipase rather than by the enzymes
- all nutrients are broken down into amino acids.

Those students who ignored the question asked and instead gave a detailed answer about the parts of the digestive system did not gain credit.

Question 8 (standard demand)

8.1 The most common correct answers were temperature and water levels, although some students gained credit for oxygen, ions or blood pressure. There was a common misconception that various hormones, especially insulin, were controlled by homeostasis rather than that they are the mechanism by which homeostasis can work. A quarter of responses were blank.

8.2 This question was well done overall. Some students misread the peak value but could still gain 1 mark if their value was in the range of 4-9 and they subtracted successfully. Almost half of students gained 1 or 2 marks.

8.3 There were very few plotting errors. The most common mark missed was for drawing a straight line of best fit instead of a curve. A third of all students gained the full 3 marks, and a further quarter gained 1 or 2 marks.

8.4 A fifth of students identified the release of insulin for 1 mark. Only a small percentage carried on to explain how this worked to decrease the blood glucose concentration by moving it into muscle, liver or cells, or by converting it to glycogen. Common errors were that it was stored in the pancreas, or it was sent to various places in the body to provide energy.

8.5 Almost half of students correctly identified glycogen.

8.6 Students clearly understood that both exercise and diet were important aspects of lifestyle to be addressed in treating Type 2 diabetes. However, a very large number of them only gained 1 mark because they were too vague about what should be done about the diet. A balanced diet, a healthy diet, not eating junk food or watching your diet were all insufficient to describe a diet low in carbohydrate, low in sugar or low in fat.

Question 9 (standard demand)

9.1 Students showed a lot of confusion about the meanings of the numbers on the atom. Less than a fifth were able to understand and do the simple mathematics to work out that there were 79 electrons and 118 neutrons. The most common error was to just use the numbers from the atom, giving 197 for the number of electrons and 79 for the number of neutrons.

9.2 There were few correct answers for the structure of an alpha particle. The most common replies were 'small', 'round' and 'a circle'. A third of students did not attempt this question.

9.3 Almost a quarter of all students realised that the total number of particles would be needed and gained 1 mark for 172696. Only a small minority knew how to convert the 196 into a percentage to gain a further 2 marks.

9.4 One mark was the most common award, usually for recognizing that alpha particles passed through because atoms are mainly empty space.

Question 10 (standard demand)

10.1 Approximately a quarter of students knew that mutations could stop cells producing a protein. Many decided instead that it would cause cells to divide.

10.2 MP1 was usually awarded for realising that white lions would not camouflage in the brown grass and so be more visible. Many were able to relate this to lack of food and starvation. This mark was also awarded if students thought that predators or hunters would kill the lions, as GCSE students are not expected to know that lions are top predators in a food chain. Some students did realise this and specifically said it would be the white cubs which

would be killed. Less than one student in fifty gained MP3 which was about the impact of this on natural selection.

10.3 The genetic diagram for 6 marks was generally well done. By far the most frequently missed mark was for being unable to identify the brown and white lion phenotypes. Some students did not successfully transfer the parental gametes from the stem of the question, but could still gain 4 marks if derivation, identification and correct probability for their gametes were given. A good range of marks was seen.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.