



GCSE

Combined Science: Synergy

8465/2H

Report on the examination

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General

Nearly all questions were attempted by all students and there were some informed answers that demonstrated a breadth of knowledge and understanding.

Some overall observations about the paper include:

- Chemistry and physics questions on this paper were not answered as well as the biology questions.
- Extended response questions did not often fully address the question, so students could not access the highest level.

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.

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

Question 1 (standard demand)

- 01.1** Almost three quarters of students achieved all 4 marks for this question. Common errors were the rearrangement of the microscopy equation and forgetting to convert the values into micrometres.
- 01.2** Students that drew organelles such as mitochondria and ribosomes could not gain marking point 2 as they had not drawn the cell in Figure 1. If students had drawn the zona pellucida and labelled either the inner line or outer line as the membrane they could gain credit for this as they were not expected to know what the zona pellucida is. Some students labelled the outer layer as the cell wall, showing a misconception of the parts of the animal cell. Most students, over four fifths, gained marking point 1, but where they did not it was usually due to the membrane of the drawn cell having gaps or not connecting into a circular shape.
- 01.3** This question was answered well with almost three quarters of students scoring a mark. A common incorrect answer was chloroplasts, as the students had not realised the question was only referring to animal cells.

- 01.4** Over half of students gained the mark for this question. Common incorrect answers were mitosis and fertilisation.
- 01.5** Three fifths of students achieved a mark for this question. The most common incorrect responses were 23 pairs or 46 chromosomes, demonstrating a common misconception that an egg cell is a body cell rather than a gamete.
- 01.6** Only a fifth of students scored 1 or more marks for this question. Many students incorrectly wrote about allele dominance, or just gave the chromosomes present in a male (XY) and female (XX) with no reference to the sperm cell. This was not creditworthy as it did not answer the question.
- 01.7** A third of students knew that LH releases an egg. The most common incorrect answer was FSH.
- 01.8** This extended response question was separated into statements regarding effectiveness of contraceptives in perfect use, real use, differences in effectiveness between perfect use and use in real life, and possibilities for these differences along with other considerations. To access level 3, analysis of data which compared contraceptives to each other or compared their perfect use to their real use was necessary.

Over three quarters of students accessed level 2 with clear comparisons demonstrated between the 3 methods of contraception and real and perfect use. Usually, these responses contained multiple correct comparative statements, and over a tenth analysed data from Figure 3 so accessed level 3.

Students who incorrectly read values off the graph and went on to compare those values correctly to each other could still gain credit for their comparative statements. However, these students would not be able to access level 3 as any analysis of data based on their incorrect graph readings would be incorrect.

Over a tenth of students achieved level 3 responses. These students demonstrated clear comparisons and often had multiple correct data analysis points throughout their answer.

Question 2 (standard demand)

- 2.1** Almost three quarters of students scored a mark for this question. Students are still referring to beakers and jugs which cannot be used to accurately measure out a volume of water so could not gain credit.
- 2.2** The majority of students who scored 1 mark did so by realising that thermometer A was easier to read. Answers that referred to human error or taking less time to read the thermometer were insufficient for this marking point. 'More accurate' was the second most common correct response. Some students said thermometer A was more precise, demonstrating a misunderstanding between the terms accurate and precise.

- 2.3** Over two fifths of students scored at least one mark, and did so by stating the cans had different starting temperatures. Different temperatures unqualified was insufficient, as they all had different final temperatures which is not why a valid conclusion could be reached. Less than a tenth of students scored 2 marks, but when they did it was usually for stating that initial temperature should have been controlled. A common incorrect answer was to repeat and calculate a mean, but this was not creditworthy as it did not answer the question.
- 2.4** Almost all students knew the advantage of using a datalogger for a cooling curve.
- 2.5** Over half of students scored 2 marks for this question. Students who scored 2 marks usually stated the temperature of the can was greatest at the start which was why it emitted the most infrared radiation. A few students correctly realised the gradient of the line was steepest at the start, but few gave the reason that the temperature changes most quickly.
- 2.6** Most students realised that the shape of the curve had to be like the line already drawn on the graph. However, less than a quarter scored a mark as many students drew the line below the curve that was already drawn on Figure 13.

Question 3 (standard and standard/high demand)

- 03.1** The students were asked to explain how pure water is obtained via distillation. Most students realised the sample needed to be heated, but the steps that followed were often not written logically, so only a tenth of students scored 4 marks. Marking point 2, water vapour is produced, was often missing from responses. Descriptions of Liebig condensers were frequently seen, which could gain credit for marking point 3.
- 03.2** Almost half of students scored 1 or more marks. This was usually by saying that pure water boils at 100°C. Heating the water and measuring the temperature with a thermometer was insufficient for marking point 1. A range of incorrect answers was seen, including testing the pH using universal indicator and evaporating the liquid to see if any crystals form.
- 03.3** This question tested the students understanding of models of states of matter, with almost half of students gaining one or more marks. The most common correct answer was that the model does not show particle movement. Several students incorrectly made comments that implied the model should have been of water in a liquid state. The misconception shown was that water is only a liquid and not a solid, although this was clearly stated in the question.

Question 4 (standard and standard/high demand)

- 04.1** Care must be taken to ensure numbers on chemical formulae are subscript and that elements have capital letters. Most students could correctly write the symbol equation but could not balance it, so only scored 1 mark.

- 04.2** Many students gave improvements, such as increasing or decreasing the time to count the bubbles or repeating the experiment and calculating the mean. These were both incorrect. Whilst some students could name an improvement, not many could go on to explain how it made their results more valid. The most common correct answers were to control the temperature or length of the plant. Less than half of students scored one or more marks.
- 04.3** The majority of students correctly calculated the light intensity at a distance of 60cm. The most common error was dividing 0.000278 by 0.0025.
- 04.4** Almost three quarters of students scored one or more marks for this question. Some students extrapolated the wrong line, and others misread where their line crossed at 10cm, which meant they scored a maximum of one mark.
- 04.5** Almost three quarters of students scored at least one mark. Most students did not score 2 marks as they gave the reason for their answer in terms of bubble numbers rather than rate of photosynthesis. As all the plants photosynthesised more at higher light intensities, this was insufficient. Answers had to state that plants photosynthesised the **most** at higher light intensities, which very few students gave as their reason for choosing species C.
- 04.6** This question was not answered as well, with over three quarters of students not achieving a mark. The most common correct response was soot, whilst the most common incorrect response was carbon dioxide.
- 04.7** Almost half of students scored 1 mark for this question for correctly realising that global dimming will lead to lower light levels and so that would reduce the rate of photosynthesis. Few students went on to connect this to less glucose being produced and less than a twentieth of students connected a lack of glucose to a lack of protein or cellulose or fewer amino acids.

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

- 05.1** Less than a tenth of students achieved 3 or more marks for this question. Whilst most students realised there would be a lack of respiration due to CHD, many answers implied it was due to less blood and therefore oxygen flowing through the heart, rather than to the heart muscle cells. Vague statements such as less blood and oxygen to the body meant marking point 6 could not be awarded. Confusion was sometimes seen whereby respiration was producing glucose or that energy was needed for respiration, rather than that respiration released energy.
- 05.2** Over a third of students achieved a mark for this question. The most common correct answer was that stem cells take time to differentiate. Answers such as 'it takes time for the cells to adapt' were not creditworthy as they did not use key biological terms.
- 05.3** Most students correctly identified why stem cells from a patient are more successful than from a donor, with over two thirds of students achieving one mark or more for this question. Most students who scored one mark did so by correctly stating the stem

cells from the patient won't be rejected. Few students went on to say this was by the immune system or white blood cells. The body attacking the cells was a common response seen but was insufficient for this second marking point.

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

- 06.1** Over a third of students scored 2 marks for this question. The most common incorrect answer was that all electromagnetic waves are longitudinal.
- 06.2** Over half of students could interpret the diagram to correctly identify the position of the radio receiver when the radio waves were detected.
- 06.3** Three quarters of students scored 3 marks. The most common error was the conversion of frequency into hertz. This was either not attempted, so they just used 2400Hz, or was calculated incorrectly. Most students could rearrange the equation correctly.
- 06.4** This question was not answered as well, with just over a tenth of students scoring one mark or more. The marking points were directly from the specification, but this is a high demand question. 'The alternating current is proportional to the frequency of the radio waves' or 'as the alternating current increases so does the frequency of the radio waves' were common incorrect attempts at marking point 2. Marking point 1 was rarely attempted.

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

- 07.1** Students found this question challenging, with over half of students not scoring any marks. This extended response question required students to explain how scientists could predict future climate change and why these predictions may not be correct. Both parts of the question needed to have been answered to access level 2. Students could give good examples of why future climate change was hard to predict, such as the increased use of electric cars lowering emissions, or greater use of solar power. Vague statements such as 'look at the concentrations of gases in the atmosphere' were insufficient, as they were too similar to the stem of the question. Students had to make it obvious they were not just looking at data, but analysing it. Phrases such as looking at patterns, trends, calculating rates were common ways in which students expressed they were analysing data, and so could receive credit for their response. Very few students realised that you would need to extrapolate from a graph to determine the future climate predictions. Most students did not say how predictions could be made and therefore could not access level 2.
- 07.2** Over a tenth of students scored 1 or more marks. These students realised more evaporation would cause more water vapour to be in the atmosphere, which is a greenhouse gas. Most students did not refer to the interaction of radiation with matter in their answers, so could only score a maximum of 2 marks.

- 07.3** Most students knew the calculation needed to determine the number of times greater methane was compared to CFCs in the atmosphere. Almost a quarter of students scored 2 marks and did not gain the final marking point as they either did not attempt to give their answer to 2 significant figures, or did so incorrectly.
- 07.4** Whilst almost half of students received a mark for this question, it was often for saying that carbon dioxide has the highest concentration in the atmosphere, or that it was higher than both methane and CFCs. Some students misinterpreted the question and instead gave examples of how carbon dioxide was emitted into the atmosphere. This was not creditworthy.

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

- 08.1** This question was answered poorly, with less than a twentieth of students scoring two or more marks. It was important the student was clear that they were breeding the best of the fruit flies. A student who bred flies with longer and rounder wings could not score the mark, as longer and rounder is not the best. For marking point 2, again they had to select the best from the offspring and breed them to get this mark. The final mark was rarely seen as it was important that it was clear that the process continued **until** all the flies had long and round wings. An answer that said continue for many generations was insufficient for this marking point
- 08.2** Almost a tenth of students gained 2 or more marks for this question. Several students answered in terms of dominant and recessive alleles, which was not relevant for this question. Students are not expected to know about fruit flies, so realistic reasons for why short wings were an advantage gained marking point 3. Very few students used the alternative route to explain why the population changed to have short wings. When students did use the alternative route on the mark scheme to answer the question they had to use the term allele, not just gene, to achieve the marking points.
- 08.3** A third of students scored a mark for this question. Common incorrect answers were fly, insect, and the first or second word of the name.
- 08.4** A third of students scored a mark for this question. Incorrect answers commonly seen were knife, scalpel and microscope.
- 08.5** Almost a fifth of students scored 1 or more marks for this question. The most common correct answer seen was marking point 1. A lot of students said there would be less females to breed with, but this was insufficient for marking point 2. The number of females would not have decreased but the proportion of females to males would have decreased, meaning the flies would be less likely to find a mate. Students who said flies couldn't reproduce could not get marking point 3 as the flies could reproduce but less often, so a decrease in **rate** of reproduction was essential for this marking point.
- 08.6** This extended response question asked students to explain the benefits and risks of releasing GM fruit flies. For level 3 students had to explain both a benefit and a risk.

This question was not answered well, with less than a tenth of students gaining 3 or more marks. The question required students to use information given throughout question 8. Many students thought releasing more GM flies would mean an increased damage to crops, which was not correct. The students had not realised that the number of GM flies would cause a reduction in the wild fruit flies, which you can only understand from the stem of question 08.5.

Students often gave multiple reasons for the risks of GM, but had not linked this to the effect on the wild fruit fly population which limited their level. Answers with valid risks were seen more commonly than answers that contained benefits or both benefits and risks. Very few students went on to fully explain the risks and the benefits. A list of benefits and risks with no attempt at explaining them limited a student to level 1.

Mark Ranges and Award of Grades

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