



GCSE

Combined Science: Synergy

8465/2F Paper 2 Life and Environmental Sciences Foundation Tier

Report on the Examination

8465
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General comments

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

Problems encountered included:

- chemistry and physics questions on this paper not being answered as well as the biology questions
- poor handwriting making some answers illegible
- multiple choice questions sometimes having the incorrect number of boxes selected
- multiple lines of best fit when drawing graphs with no indication of which one to mark. This could be avoided by using a pencil and rubber rather than pen
- the understanding of Required Practical Activities, including why method steps were used.

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 and 9 are common with questions 1 and 2 on the Higher Tier. These questions are identical with each other and are targeted at standard demand.

Question 1 (low demand)

This physics question assessed knowledge of radioactivity and data interpretation.

- 01.1** Over half of the students correctly identified that losing an electron changes an atom into an ion. The most common incorrect response was a neutron.
- 01.2** This question was not answered well with over two thirds of the students incorrectly thinking that uranium combines with helium to form thorium. Just under a third of students correctly selected the middle box where uranium decays into thorium and helium.
- 01.3** There was some confusion over comparing the penetrating power of alpha and beta particles. Most students incorrectly thought that the penetrating power was the same for both particles. Just over a third of students correctly stated that alpha particles were less penetrating than beta particles.

- 01.4** This question was answered well with over half of all students scoring one or two marks. The students had to suggest why radon gas was more harmful than uranium using information given in a table. The most common correct answer seen was that you could not see the gas as it was colourless. Not many students realised that the gas would emit radiation inside the body.

Some students commented on radon being a gas so it could spread meaning it would be more harmful. This was not creditworthy as the gas could also spread away from you so would not cause you harm if it did this.

- 01.5** Although most students could correctly compare the actual number of people with the estimated number of people who contradicted lung cancer or lung diseases, a few students related this to the risk of getting the conditions which did not answer the question.
- 01.6** This question was not answered well with almost two thirds of students not achieving a mark. The correct answer to this question is based on the worker needing to make an informed choice or the worker needing to take precautions. A lot of students answered this question by repeating the information in Table 2, for example ‘as uranium causes cancer’. This was insufficient for the mark.

Question 2 (low demand)

The question mainly required chemistry knowledge and included a mathematical calculation and graph interpretation.

- 02.1** This question was answered well with over three quarters of all students correctly stating that carbon monoxide is formed by the incomplete combustion of hydrocarbons.
- 02.2** This biology question was answered well with almost two thirds of students achieving a mark for knowing the part of the blood that transports oxygen. Common incorrect answers were white blood cells or a named blood vessel rather than cell.
- 02.3** The majority of students correctly drew a bar with almost three quarters of students achieving this mark.
- 02.4** Most students correctly read the values off the graph and could then use them to calculate the answer. The most common incorrect answer was reading the bar at 0% carbon monoxide as 94 or 99.
- 02.5** Over half of the students correctly interpreted the trend to gain the mark.
- 02.6** Over half of the students correctly realised that a faster heart rate is a symptom of carbon monoxide poisoning. The most common incorrect response was a high temperature.
- 02.7** Most students answered correctly by stating either that the carbon monoxide would leave the room or that oxygen would enter the room. Over three quarters of students achieved this mark.

Question 3 (low demand)

Knowledge of the electromagnetic spectrum and physics practical methods were assessed in this question.

- 03.1** The majority of students knew the use of ultraviolet waves. The use of microwaves was often misunderstood with 'radio programme transmission' being the most common incorrect answer seen for this type of wave.
- 03.2** This was answered very well with over four fifths of students stating the equipment needed to measure time. The most common correct answer was stopwatch.
- 03.3** Almost two thirds of students correctly identified distance as a control variable. Dependent variable was the most common incorrect response.
- 03.4** This question was answered well with over three quarters of the students' identifying burns from the infrared heater as being a risk to the students for this practical.
- 03.5** Over four fifths of students correctly identified the starting temperature of the room by reading and interpreting the graph.
- 03.6** This question was answered well with almost three quarters of students gaining two marks for this question. Several students did not select two boxes, either selecting one or three boxes, therefore could not achieve all of the available marks. Confusion between whether the black surface was the better absorber or reflector was the most common error seen.
- 03.7** This question required students to predict results for a thermometer with a grey surface. Most students realised they needed to start the line at 20 °C so achieved the first marking point, but less than a tenth achieved the second mark for drawing the line between the two existing lines.

Question 4 (low & standard demand)

Many different biological concepts were assessed in this question including cell structure, the osmosis Required Practical Activity and plant diseases.

- 04.1** This question on leaf structure was answered well with over three quarters of students scoring one or more marks. In most cases a mark was awarded for correctly stating that the stomata were the names of the holes in the leaves. Few students knew that the size of the hole was controlled by guard cells, but the incorrect answers varied equally between all options available.
- 04.2** If students scored two marks for this cell structure question it was usually for correctly identifying the chloroplast and the cytoplasm. Confusion between the chloroplast and the cytoplasm was often the reason for a student scoring one mark or less.
- 04.3** This magnification calculation was answered well with over four fifths of students scoring full marks. The most common error was dividing 0.08 by 32 which would result in 0 marks.

- 04.4** Almost two thirds of students achieved both marks for this question where students had to use their biological knowledge to determine the reasons for a step in a method. A few students did not select two boxes instead selecting one or three so could not access both marks for this question. If students scored one mark it was usually for correctly identifying that by wrapping the pepper in plastic at 5 °C water loss was reduced. To decrease the size of the pepper was the most seen incorrect answer.
- 04.5** The most common incorrect answer as to how water moves into cells was photosynthesis. Students misread the question giving an answer for why pepper plants need water rather than how it moves into the cells.
- 04.6** The most common error students made was to read the mean percentage change in mass at a concentration of 0 arbitrary units of sugar solution to give an incorrect answer of 19.
- 04.7** Almost half of the students realised that an advantage of wrinkled cell walls was to allow the pepper cells to expand.
- 04.8** This question was not answered well with over three fifths of students not achieving any marks. Students confused poor plant growth due to TMV with decreased nutrient uptake. The students gave this as an incorrect explanation for the plant's yellow leaves. Few students connected the yellow leaves to less photosynthesis. The third marking point was rarely attempted.

Question 5 (low & standard demand)

- 05.1** The majority of students correctly identified the meaning of the term 'mutation'. Students sometimes confused the meaning of the term genome with the meaning of the term chromosome.
- 05.2** Over half of students achieved both marks for this question where they had to complete a Punnett square for sex inheritance. Most students could correctly derive the offspring genotypes from the chromosomes they had chosen for the male gamete. Some students incorrectly thought the male gamete comprised of YY chromosomes.
- 05.3** Over four fifths of students correctly realised that genetic modification of human embryos was illegal in most countries due to the unknown side effects.
- 05.4** This question was answered well with almost two thirds of students correctly selecting that the modified gene in an embryo could pass to future offspring.
- 05.5** Almost two thirds of students correctly realised that HIV could be treated with antiretroviral drugs and therefore genetic modification was not necessary for resistance to HIV infection.

Question 6 (low & standard demand)

Key biological terminology and practical methodology was assessed in this question.

- 06.1** This question was answered well with over three quarters of students achieving a mark for stating respiration is exothermic. The most common incorrect answer was photosynthetic.
- 06.2** This question was not answered well with less than a third of students achieving a mark. The most common incorrect answer was endothermic, possibly due to previously stating respiration is an exothermic reaction.
- 06.3** Almost two thirds of students achieved at least one mark for this question where they had to state two control variables. Several students incorrectly identified temperature or volume of gas as control variables. Some students used vague terms such as yeast or sugar which were insufficient. Many students copied the method points directly from the stem. These were awarded the marks only if it was clear they knew what the control variable in the method step was.
- 06.4** This question was answered well with over nine tenths of students achieving a mark for correctly completing the trend.
- 06.5** This question was answered well with over three fifths of students knowing that a line graph should be drawn due to temperature being a continuous variable.
- 06.6** Students had to complete a graph. Students who achieved three marks normally had not attempted to label the y-axis. Most students correctly plotted all the points. Students who drew bar charts instead of line graphs could still receive credit.
- 06.7** Many students misread the graph when predicting the volume of gas produced by reading the value at 6 °C rather than at 7 °C. This meant just over a third of students achieved this mark.
- 06.8** This question was not answered well with over nine tenths of students not achieving a mark. Many students gave answers such as 'it is too hot' which is insufficient.

Question 7 (low & standard demand)

This biology question assessed student knowledge of proteins, drug development and human diseases.

- 07.1** Over half of students correctly identified that protein was a long chain of amino acids. The most common incorrect response was that protein was a chain of glucose molecules.
- 07.2** This question was not answered particularly well with less than a quarter of students gaining a mark for the test used for protein. Most common incorrect answers were starch, iodine and Benedict's solution.

- 07.3** The majority of correct answers for why heart attacks are non-communicable were for a heart attack not being able to be passed on or spread. Students that achieved a mark for the alternative marking point rarely used the term pathogen. Virus or bacteria was the most common correct alternatives for this marking point.
- 07.4** The majority of students achieved two marks for this question which asked about the risks and benefits of the new drug.
- 07.5** This question was not answered well with over two thirds of students not achieving a mark for explaining why placebos are used in drug trials. Students who gained a mark usually did so by stating that the patient would not know if it was the placebo or drug. Students were often vague about what a placebo was using terms such as dummy drug, sugar pill or fake drug which were insufficient.
- 07.6** This question was not answered well with just over a third of students achieving both marks for correctly identifying two advantages of peer reviews. The most common incorrect response was saying that people who are not experts simplify the results during peer review. Few students realised scientists not involved in the drug trial assess whether the results are valid so did not gain this mark.

Question 8 (standard demand)

This question assessed student's knowledge of Required Practical Activities, methods and apparatus used in chemistry experiments.

- 08.1** The students were asked to use a results table to suggest how the pH in two different methods was measured. This question was not answered well with almost two thirds of students not achieving a mark. Students who achieved one mark normally did so by giving the correct method for method A. pH indicator or pH scale was often referred to and was insufficient.
- 08.2** Almost half of students knew that each method gave values to different resolutions so it would not be valid to calculate a mean. Over a third of students incorrectly thought you could calculate a mean for each method using all four samples.
- 08.3** This question tested the students understanding of practical terminology and was not answered well with a tenth of students achieving a mark. Accurate was the most common incorrect answer.
- 08.4** Students had to interpret a table of results to say which river was most likely to be in an area with a high concentration of sulfur dioxide in the air. The most common incorrect answer was river Y with less than a quarter correctly identifying river X.

- 08.5** This question required students to explain why they had chosen a particular river as being in an area with a high concentration of sulfur dioxide in the air. Students who correctly identified river X in their previous answer often also realised it was because river X was acidic. Students who incorrectly said river Y sometimes incorrectly thought it was because the higher the pH the more acidic it was. Very few students achieved marking point 2. Students who thought sulfur dioxide dissolved into the river could not achieve this mark as it needed to be clear a chemical reaction was taking place in the air. Not many students realised the connection between sulfur dioxide and acid rain to gain marking point 3.
- 08.6** Students had to describe a method for one of the chemistry Required Practical Activities. This question was not answered very well with approximately a tenth of students scoring one or more marks. Several students misread the question and gave a method for how to dissolve solids into river water. This was not creditworthy. Incorrect methods that described distillation or how to calculate the density of an object were commonly seen. Students that described the correct method sometimes forgot to measure the initial mass of the evaporating dish and so the mass of dissolved solids could not be calculated. A valid outcome could not be reached so students could not access Level 2 if they missed out this key method step.

Question 9 (standard demand)

This question was assessing students' knowledge of biodiversity, practical ecology methods and practical techniques.

- 09.1** Almost three quarters of students did not achieve a mark for this question. Some students described a transect instead of the random sampling method meaning they could not achieve any marks. Ideas such as randomly throwing the quadrat or blindfolding pupils were insufficient for marking point 2. Most students who scored one mark did so by describing how to generate random numbers.
- 09.2** Several students gave reasons as to why increased plant species may affect animal biodiversity. This was not creditworthy as it did not answer the question. An answer of more animals was insufficient. It needed to be clear that the number of different animal species was increasing.
- 09.3** This question was not answered well with less than a twentieth of students scoring a mark. Common incorrect answers were that the relationship was not equal or accurate.
- 09.4** Almost half of all students achieved a mark for this question. Most students answered by saying living grass had more plant species. If a student did not score a mark, it was usually because they had not attempted to answer the question.
- 09.5** This question was not answered well with less than a quarter of students achieving both marks. Several students incorrectly thought repeating the experiment three times at different times of the day would improve the experiment. The most common correct answer was recording the number of plants of each species as well as the number of species.

- 09.6** This extended response question was separated into statements regarding how plastic grass decreased biodiversity and increased biodiversity. Students did not have to refer to both increasing and decreasing biodiversity to achieve full marks. Students rarely realised that plastic grass could increase biodiversity. Almost half of students achieved Level 1, less than a twentieth achieved Level 2 and very few achieved Level 3.

Links between statements were necessary to enter Level 2. Most students who entered Level 2 gave linked statements concerned with plastics entering the food chain in rivers and oceans. Whilst many students realised the nutrient content of the soil was decreased, they did not link this to fewer decomposers because there was no/less soil so they could not access Level 2 with this statement.

Common correct answers such as less plants or fewer habitats were limited to Level 1.

- 09.7** Almost half of students achieved a mark for knowing that smaller populations are more likely to become extinct as less genetic variation is a greater risk if the ecosystem changes.
- 09.8** Most students achieved one mark for this question for stating how to increase biodiversity in and around fields. The most common correct answer was planting more trees or plants. Very few students said do not mow the grass.

Mark Ranges and Award of Grades

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