AQA

GCSE
COMBINED SCIENCE: SYNERGY

8465/1H

Report on the Examination

8465

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General

Questions 1–3 are common with the Foundation Tier.

Students appeared to find it difficult to apply their knowledge to novel contexts. Questions designed to test AO1, AO2 and AO3 will be found in all GCSE Science papers. Please see the specification for assessment objective weightings across the papers.

Students need to recognise the command words used, and to answer accordingly. Frequently, students are giving descriptions when answering an 'explain' question, and vice versa.

Multi-step calculations were problematic for students, with many stopping part way through a calculation. Students must bring a calculator and ruler for this examination. The mathematical requirements that may be examined can be found in the specification.

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 86% of students gave the incorrect answers of fat, protein or fibre, demonstrating a lack of understanding of digestion. Glucose, sugars and carbohydrates were also frequently seen, which did not score a mark, given the way the question was phrased.

01.2 65% of students could calculate the mass of sugars in 180 g of sweet potato, when given the mass of sugars in 100 g of sweet potato.

01.3 'Level descriptors' are used to mark 'extended response' questions such as this. Level 2 and level 3 answers require students to make unprompted links between aspects of an explanation. For example, responses that only referred to processes in the leaf rarely contained relevant links to answer the question. 18% of students were able to answer sufficiently to enter level 2 or level 3.

Many misconceptions regarding photosynthesis were seen, such as roots absorbing carbon dioxide for photosynthesis and carbon dioxide being used in respiration.

Question 2 (standard demand)

02.1 Most students could choose a sensible linear scale and label the *x*-axis. Some errors in plotting were seen. The line of best fit was a smooth curve in this instance. Straight lines of best fit and dot-to-dot did not gain the fourth marking point. 75% of students achieved three or four marks.

02.2 79% of students could not calculate the gradient. Some students attempted to count the squares of the graph paper to calculate the gradient, rather than use the appropriate scale.

Students were expected to calculate the gradient in '°C/second' because seconds were the unit of time provided, however, some students calculated the gradient in '°C/minute'. This could achieve full marks if the method was clear. Just calculating the change in temperature was insufficient.

02.3 53% of students could calculate the change in thermal energy using the equation on the Physics Equations Sheet, although some did attempt to use an incorrect equation. Errors in calculating the temperature change were frequent. Unit conversion from joules to kilojoules was generally correct when attempted.

02.4 32% of students could state two control variables. however students should be aware that general statements regarding keeping equipment the same are insufficient. The answer should apply to the investigation given in the question.

Question 3 (standard demand)

03.1 44% of students could correctly link three methods of contraception to how the method works.

03.2 44% of students could describe that a low dose of a new drug would be given because there may be harmful side effects.

03.3 This was an 'extended response question', asking students to evaluate the use of three contraceptive methods. Students should know that marks will not be awarded for repeating information given in the question. Evaluate means students should use the information supplied, as well as their knowledge and understanding, to consider evidence for and against. Guidance regarding command words can be obtained from the AQA website.

Some students misinterpreted the percentages in the table as referring to the percentage use of each method of contraception. The strongest answers evaluated aspects from the table, and students own knowledge, such as prevention of sexually transmitted infections.

91% of students were able to give level 2 or level 3 answers. 5% of students achieved full marks.

Question 4 (standard & standard / high demand)

04.1 79% of students could recall the correct age of the Earth in standard form.

04.2 79% of students were not able to calculate a percentage change. Many did not give their answer to two significant figures. Incorrect rounding was frequently seen.

04.3 80% of students recalled that carbon monoxide is released by incomplete combustion.

04.4 Few students described volcanoes releasing water vapour. Misconceptions were frequent, such as volcanoes releasing carbon dioxide that changed to water vapour. More students could describe water vapour condensing, although recall of the water cycle was frequent, not always relevant, and often confused between evaporation and condensation. 295 of students achieved one or two marks for this question.

04.5 35% of students could describe melting ice caps as a result of increasing greenhouse gases. Misconceptions included that carbon dioxide dissolving in oceans increases the volume of water, and that increased rainfall is responsible for sea level rise.

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

05.1 26% of students could identify that gamma emission is an electromagnetic wave. 2% of students could explain that gamma emission does not change the number of protons.

05.2 The most common mark awarded was for the idea that irradiating food kills microorganisms. Answers were often too vague regarding preventing food poisoning, with more students referring to best before dates, which was insufficient.

Misconceptions referring to the half-life of the food being extended were seen. There were also misconceptions regarding food that has been irradiated becoming radioactive.

05.3 Some students could relate their knowledge of properties of gamma radiation to being able to pass through packaging. Recall of penetration properties needed to be applied to the situation given in the question.

05.4 Some students could state that irradiated food has been exposed to a source of radiation, or that radioactive food emits radiation, however, 6% of students did both to give a full answer. The most common misconception was that the term irradiated means removing a source of radiation from food.

Question 6 (standard & standard / high demand)

06.1 The majority of students could describe xylem as hollow cells, or tubes. The second marking point, for the presence of lignin (to strengthen the cell) was rarely seen. Some students referred only to cells having a semi-permeable membrane, or other cell parts, that did not answer the question. 27% of students achieved one or two marks for this question.

06.2 38% of students could correctly calculate the real length of the cell by recalling and using the correct equation. Many did not convert units from millimetres to micrometres, or did so incorrectly, by dividing by 1000, or multiplying by 100. Marks were awarded if an incorrect calculation of length was then correctly converted; illustrating that students should always show their working.

06.3 77% of students could not explain how guard cells increase in volume. Many referred to water vapour or carbon dioxide entering or leaving via the stomata, which did not answer the question. Marking point one, for the idea of water entering the cell was often confused. References to osmosis or a description of osmosis for the second marking point were rare, with 55 of students achieving full marks.

06.4 Some students were able to analyse the graph and deduce that rainfall is low from March to November, and link this to less water loss as an advantage to the tree. Few students correctly referred to the idea of temperature being high and therefore the rate of transpiration being rapid. 7% of students achieved two or three marks.

Many misconceptions were seen regarding water uptake in plants. Many answers referred to water entering the leaves through stomata. Some students believe leaves prevent the tree from taking up water.

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

07.1 83% of students could identify that the best description of a gene from the options given was a short section of DNA.

07.2 71% of students incorrectly selected that a gene codes for a DNA helix, rather than a sequence of amino acids.

07.3 12% of students could give the scientific term ‘genome’.

07.4 44% of students knew that the term phenotype describes the observable characteristics of an individual.

07.5 Most students attempted to draw a Punnett square diagram, as stated in the specification. Credit could still be awarded for other genetic diagrams, but mistakes were seen more frequently if other methods were used.

Students were asked to use a genetic diagram to show the probability of the offspring inheriting Marfan syndrome. Few students identified which offspring genotypes would inherit Marfan syndrome, therefore marking point three was awarded infrequently.

This question discriminated well with a good spread across the mark range. The most frequent mark achieved was three (40% of students).

07.6 Students found this high demand question challenging with 3% of students achieving two or more marks. Many misconceptions regarding mutations, meiosis and mitosis were seen.

The most frequently awarded mark was for recall that meiosis produces gametes. Few students could go on to explain how a mutation in a gamete could be present in every cell of an individual.

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

08.1 65% of students could not describe how to safely boil ethanol. Some referred to safety glasses, despite being directed not to in the question. Others thought that using a beaker above a Bunsen burner is sufficient, or suggested mixing the ethanol with water.

08.2 This question tested knowledge of a Required Practical Activity and generally, this was answered well with 51% of students achieving some credit.

Students should be reminded not to describe the positive result of a test for starch as purple, as this could be confused with the Biuret test for protein.

08.3 Students were asked to explain how chromatography causes different pigments to separate. It was clear that most students had good understanding of chromatography and detailed descriptions of methods were seen. Students must ensure they take notice of the command word in the question. 'Explain' questions require students to make something clear, or state the reasons for something happening. Descriptions of detailed methods often failed to answer the question.

The best answers referred to solvent moving through the paper, rather than assuming the solvent was water. Most students could explain that different pigments have different solubilities in the solvent and therefore are carried different distances.

Responses using the terms from the specification: stationary and mobile phase, often achieved all three marks, but there were some misconceptions regarding these terms. Some students incorrectly describe the pigment as the stationary phase.

12% of students achieved either two or three marks.

08.4 This high demand question required application of knowledge of R_f values to a novel context. 14% of students answered correctly. Many of these students could identify that the pigment could be xanthophyll or chlorophyll b, or describe that the R_f value ranges overlap.

A significant number thought the pigment could be chlorophyll a or chlorophyll b, which was incorrect. It's possible these students used the distance moved (24 mm) and interpreted this as an R_f value of 0.24.

08.5 26% of students demonstrated an excellent understanding of R_f values in a difficult context. Those who did not achieve full marks often recalled the equation incorrectly. If the equation was recalled correctly and then rearranged incorrectly, the first marking point could be awarded. Again, this demonstrates that students should show every stage of their calculations.

Usually, when a mark is awarded for recall of an equation, the full equation should be given. In this instance, because the question was phrased in terms of R_f value, the whole equation was not required.

08.6 This 'extended response' high demand question was not answered well. Students often simply repeated the stem of the question, which will never gain marks.

- Level 1 responses included aspects of the indicative content, but with no attempts at linking, or developing simple statements to give a complete answer to the question.
- Level 2 responses included ideas from the indicative content, with some attempt at logical linking, but were not fully clear.
- Level 3 responses require relevant points to be given in detail and linked to give a clear account. Few students were awarded level three marks.

8% of students gave level 2 or 3 answers. To award level 2 or 3, the answer had to apply to the situation given, rather than straight recall of the process of evolution, without application to the context given.

Weaker answers frequently gave confused accounts of photosynthesis, often confused with respiration. Some responses stated all the student could remember regarding photosynthesis, without engaging with the command word of the question.

Misconceptions regarding mutations, adaptation and evolution were common. Incorrect references to plant camouflage, plant breeding and genetic modification were seen.

Question 9 (standard / high & high demand)

09.1 This high demand question required students to use a combination of recall from the specification and relative size, and negative standard form. As anticipated, any students found this challenging with 7% of students achieving three or four marks.

09.2 This high demand question discriminated well with only the highest-attaining students achieving any marks (15%). Students were expected to calculate the surface area to volume ratio for both cubes, make them comparable, and then describe the change in ratio as the size / length of the cube changed. Some students calculated the surface area and volume, but could not express this as a ratio, or appreciate that they need to be comparable.

Some students chose to calculate ratios of model cells of different size to those in the question. This approach could lead to marking point three, but not correct calculations for marking points one and two in this instance.

09.3 This proved to be the most difficult question on the paper with 5% of students achieving any marks. Students occasionally took their lead from the prior question about surface area to volume ratio, but this was rare. Many answers described diffusion in detail, without answering the question. Comparisons of cell structure between bacteria and animal cells were frequent, but did not answer the question.

09.4 As expected, students found this question very difficult with 3% of students achieving full marks. They were unable to make the link between active transport and respiration. Many students confused the concentrations of glucose and oxygen when trying to describe the active transport of glucose. Incorrect answers referring to respiration making / creating / producing energy were seen.

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.