



GCSE

COMBINED SCIENCE: SYNERGY

8465/2F Life and environmental sciences

Report on the Examination

8465/2F
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Question 1 (low demand)

- 01.1** Almost three quarters of students correctly determined that bees feed on sugar solution to obtain energy. The most common error was that students thought bees required sugar to provide proteins.
- 01.2** This question was answered well. Over three quarters of students knew that receptors detect stimuli but some incorrectly thought it was the role of the effectors.
- 01.3** Four fifths of students correctly selected the reflex action as being automatic.
- 01.4** Just less than half of students scored a mark for knowing that the gap between two neurones is called a synapse. The remaining two incorrect responses, gland and impulse, were both equally selected by the students who did not achieve a mark.
- 01.5** The students were asked to name the neurone that carried the impulse to the muscle in the tongue. This question was not answered well with only a quarter of students achieving the mark. There was clear confusion between the starting neurone in the reflex arc and the final neurone as students mainly incorrectly selected the sensory neurone as their answer.
- 01.6** Less than a third of students were awarded a mark for this question. The question asked why was it an advantage to see the parts of the flower that produce sugar solution? The most common response was to find food, but this was insufficient as the bee could find food without detecting ultraviolet radiation. A few students also described how bees made honey which was not relevant for this question.
- 01.7** Over half of students knew that ultraviolet radiation was between visible light and X-rays when placed in order of decreasing wavelength.
- 01.8** Almost three quarters of students knew that radio waves had the lowest frequency. Several students incorrectly answered by using the letters in the diagram.

Question 2 (low demand & standard demand)

- 02.1** This question was answered well with almost all students knowing that the ocean is the orca's habitat.
- 02.2** Almost three quarters of students scored 2 or more marks on this question. The most common correct linkage was the seaweed to the producer. Some students incorrectly thought the sea otter was the primary consumer which often meant they thought the orca was the secondary consumer.
- 02.3** Almost a third of students achieved two marks for this question. The most common correct factors stated that light and temperature affected the rate of photosynthesis. Some students just said sun which was insufficient.
- 02.4** This question was answered well with over four fifths of students achieving the mark. Most students gained the mark by saying humans caused the decrease in number of fish by fishing or humans eating fish. Correct descriptions of pollution such as plastic waste or rubbish in the sea were more common than just stating pollution.

02.5 This question asked students to describe how a decrease in number of fish could affect the number of organisms in the food web given previously in the question. If students didn't use the food web or spoke about an alternative food web, they could not gain credit. Several students spoke about sharks eating fish which was not relevant to the question so they could not achieve a mark.

This extended response question was answered well with almost half of students achieving level 2.

For level 2, students needed a linked statement and most stated that the decrease in fish caused a decrease in seals due to a lack of food. Students often failed to get into level 3 as they omitted details about the orca being able to eat sea otters as well as seals.

Question 3 (low demand & standard demand)

- 03.1** Over three quarters of students correctly said that carbon monoxide is produced from the incomplete combustion of hydrocarbon fuels. Carbon dioxide dissolving in water was the most common incorrect response.
- 03.2** Over half of students identified that it is acid rain that is formed when sulphur dioxide dissolves in moisture.
- 03.3** Over half of students scored a mark in this question for stating that oxides of nitrogen are produced when fuels are burnt in air at high temperatures. The most common incorrect answers were concentration or rate. Phonetic spellings were allowed.
- 03.4** This question was answered poorly with only a quarter of students scoring a mark for giving an example of how oxides of nitrogen can be harmful to human health. The most common correct answer was damage to the lungs or asthma. The most common incorrect answers were either just stating how it gets into the body eg breathe it in or giving a disease such as cancer which is not affected by oxides of nitrogen.
- 03.5** Over three quarters of students correctly read the data table so could identify the particulate group that the soot particle belonged to.
- 03.6** This question was answered poorly with less than a third of students achieving a mark. A clear indication of why an electron microscope was necessary to view soot was required. Common incorrect answers were that the microscope was stronger or more powerful. These statements were too vague to gain credit. Not many students related the microscope that was used to the size of the soot particle, instead comparing the two types of microscopes which could not gain credit.
- 03.7** This question was answered well. The students had to read the axis on the bar chart and then do a simple calculation. Almost two thirds of students achieved all 3 marks for this question. Students who did not achieve full marks for this question had not read the graph correctly with many students not using data from 1990. The most common error was to use either the two sets of data for road transport or the two for industrial processes so they could not achieve the first marking point. Most students knew they had to subtract their two values, but some did not do this correctly. Several students did not show their working so could have lost marks unnecessarily.
- 03.8** This question asked students to read a bar graph and give three conclusions from the data given. Less than a tenth of students achieved all 3 marks. A common mistake students

made was to not refer to the particulates or emissions. If this variable was not stated, they could not gain the mark for that conclusion. Incorrect answers such as there were more industries or more cars were regularly seen. When students answered correctly, they often identified that the mass of particulates decreased in 2020 for both industrial and road transport. Not many students attempted to compare the difference in mass of particulates between industrial process and road transport for each year.

- 03.9** This question tested student's knowledge of how our lungs protect us from particulates. Almost two thirds of students scored one or more marks for this question. Often students that only achieved one mark did not know that the cilia moved the particulates away from the lung. Some students thought that enzymes were produced by the cells in the trachea and bronchi.

Question 4 (low demand & standard demand)

- 04.1** This question was answered poorly with less than a tenth of students gaining 2 marks. The students needed to say how the small intestine was adapted for its function. Most students correctly stated that it had a large surface area and a thin wall. Some students were still incorrectly referring to the cell wall of the small intestine. Very few students commented on the blood supply to the small intestine. Unfortunately, some students just described the diagram of the wall of the small intestine rather than saying how it was adapted for the absorption of glucose.
- 04.2** Students were required to interpret the diagram which showed how starch entered the bloodstream. Most students achieved only 1 mark for this question. The majority of correct answers were for saying diffusion was process C. Not many students correctly stated that process B used active transport to move the glucose molecules into the cells of the small intestine instead saying it was by diffusion.
- 04.3** This question was answered poorly with only a third of students achieving a mark for saying starch was too big or insoluble to be absorbed into the blood. Several students said it needs to be digested which did not answer the question so could not gain credit.
- 04.4** After an experimental method was described students needed to say the colour change for iodine when starch was present. Only a third of students answered correctly. The negative iodine test result of orange was the most common incorrect answer.
- 04.5** Less than half of students correctly identified the time taken for starch to break down as the correct dependent variable for the method described. The temperature of the water was the most common incorrect answer. Students possibly had not read the method but instead used the diagram of the apparatus which showed the use of a thermometer.
- 04.6** This question was answered well with over four fifths of students correctly identifying the anomalous result in the table of results provided.
- 04.7** Almost three quarters of students knew what they should do if they got an anomalous result in their data. Correct answers were mainly to repeat the test or redo it.
- 04.8** Over half of students knew that to improve the experiment they needed to shorten the time interval to test for starch to every 30 seconds.

- 04.9** Students were asked to use a simple table of results to give a conclusion. Almost two thirds of students answered this correctly mostly by saying starch needs an enzyme to break it down.

Question 5 (low demand & standard demand)

- 05.1 Students were given a diagram of part of the carbon cycle and growth of trees. Almost half of students gained 3 marks. Most students correctly stated that X was growth but there was confusion between what Y and Z were with a full range of different answers for both.
- 05.2 Almost a third of students knew which organisms were involved in breakdown of plant material and decay. Bacteria, fungi, insects, or type of insects were common correct answers. Some students gave answers such as bugs or germs which were too vague to gain a mark.
- 05.3 This question tested students' knowledge on the transport of materials into the tree. Almost a fifth of students achieved one mark for this question. They mainly did so for saying minerals enter the tree seedling through the root hairs.
- 05.4 This question was asking students about how competition was limited for trees by removing young trees from the area. Almost two thirds of students gained one or more marks for this question. This was usually for correctly stating that they would have more light, nutrients or water. Many students failed to explain why that helped to grow the trees faster by either relating it to competition or photosynthesis.
- 05.5 Students were expected to say an advantage of trees growing faster for the farmer. This question was answered poorly with less than a quarter of students achieving a mark. The most common answer was for saying the farmer would get more wood. A lot of students said reasons why growing a tree faster may be beneficial rather than relating it to the farmer. Incorrect answers such as more oxygen was common.
- 05.6 This question was poorly answered with less than a tenth of students achieving two or more marks. Students could state that trees reduced carbon dioxide but did not relate this to photosynthesis or global warming. Greenhouse effect was often referred to rather than global warming which was not sufficient.
- 05.7 Students had to use a table of results to give two conclusions regarding the number of tree species in the forest. This was not answered well with almost a quarter of students scoring two marks for this question. Many students gave conclusions about number of trees rather than tree species so could not receive any credit for their answers. Common correct answers were that the number of species decreased and stating the number of tree species that were lost in forest A and B.

Question 6 (low demand & standard demand)

- 06.1** This question was answered poorly as only approximately a fifth of students scored a mark. Descriptions such as "spirals" were common incorrect answers as the question had asked for the scientific term to describe DNA.
- 06.2** This question was answered poorly with almost three quarters of students not achieving a mark. The most common incorrect answer was that copies of organelles were made during mitosis.

- 06.3** This question was also answered poorly with almost three quarters of students not achieving a mark. There may have been confusion between meiosis and mitosis as the most common incorrect answer was 3 picograms suggesting students thought the amount of DNA halved.
- 06.4** Students were asked to use data given to calculate the number of cells produced from mitosis after 48 hours. Less than a tenth of students gained three marks. Almost two thirds of students gained two marks for being able to calculate the number of divisions in 48 hours. Unfortunately, several then continued to incorrectly calculate the total number of cells after 48 hours by multiplying the number of divisions in 48 hours by the number of original cells to get an answer of six.
- 06.5** Students were asked to give a factor that caused mutations in DNA but not to refer to ionising radiation. Just over a twentieth of students achieved a mark for this question. Many students gave the incorrect answer of cancer or gave an example of a type of ionising radiation such as UV. Several students also incorrectly stated genes or genetics but this was not creditworthy as that is the outcome of a DNA mutation and not a factor that causes it.
- 06.6** Students were asked to interpret a graph showing number of cancerous cells and non-cancerous cells over a certain number of days. Less than a twentieth of students gained 3 marks for this question. Many students gave patterns for cancerous cells only with no reference to non-cancerous cells. Patterns concerning changes of rate of cell division were rarely seen. The most frequent correct response was for saying the number of cancerous cells increased and a few students correctly stated that cancerous cells increased up to 1000 whilst non-cancerous increased up to 340.
- 06.7** Students were told to extrapolate the line for non-cancerous cells and then use this to calculate the number of cells on day 7. Many students did not attempt the line of extrapolation and if they did they failed to use a ruler. Credit was still given for a reasonable attempt to draw a line free-hand but this often led to inaccuracies when they used their line to determine the number of cells. When students correctly extrapolated using a ruler they tended to be able to read the scale on the graph correctly to predict the number of non-cancerous cells on day 7.

Question 7 (standard demand)

- 07.1** Students were asked to use data from a diagram to determine the number of times a liver cell was longer than a bacterial cell. Almost half of students achieved both marks. The most common error was when students subtracted: $28.6 - 4.4$.
- 07.2** This question was answered poorly with less than a tenth of students scoring 4. When asked for comparisons between the two cells some students confused the cell wall with the cell membrane. Whilst students could correctly state that cell B had a nucleus they found it difficult to describe that cell A had DNA in the cytoplasm. Some students thought the plasmids in the diagram of cell A were mitochondria or chloroplasts. Answers concerning ribosomes were rarely seen. Answers which only referred to one cell could not gain any credit.
- 07.3** This question was answered poorly with less than a twentieth of students achieving a mark. Students gave examples of tissues rather than writing a definition.

07.4 Less than a fifth of students could correctly use the diagram to see that the cell had swollen and therefore had gained water due to being placed in a less concentrated sugar solution than inside the cell. The most incorrect answer chosen was that the sugar solution was more concentrated than inside the cell.

07.5 This extended response question was a recall of a required osmosis practical. It was attempted by over two thirds of students with approximately a tenth of students writing a level 3 answer. Students often did not achieve 6 marks due to not saying how to calculate the change in mass of the potato or describing the method using imprecise scientific terminology such as repeat with different sugar solutions rather than sugar concentrations.

Level 2 answers often wrote unclear accounts of a method. Students tended to state control variables but omitted the need to measure the mass of the potato at the start and end of the experiment. Their method would therefore not be able to yield any valid results so could not access level 3.

Level 1 answers concentrated on control variables rather than a description of a method that would give valid results.

Students that could not access level 1 had designed experiments which used benedict's and iodine solution. They had clearly misunderstood the practical method that was required.

07.6 Students had to use data from a table to construct a line graph on axes provided. Over a quarter of students achieved 1 mark for this question. This was often due to a non-attempted line of best fit. Common mistakes involved using a ruler to join the points or by attempting to draw a straight line through the points.

07.7 This question was answered poorly with only just over a fifth of students achieving a mark. Students did not use their graph to determine where the line of best fit crossed the x axis to determine the concentration of sugar solution that would cause no mass increase in the potato. Most students could not accurately read the scale on the graph and a common incorrect answer was 0.0 as they had read the y axis.

Question 8 (standard demand)

08.1 A method for determining liquid density was given along with a diagram. Around a fifth of students identified the independent variable. An error students made was the use of vague terms such as the type of liquid or just answering the liquid.

08.2 When asked to give a control variable more than a third of students correctly answered. Amount of liquid was the most common incorrect answer given. Same block was the most frequently correct answer seen.

08.3 Over a fifth of students gained this mark. The most common correct answer for a source of error in the practical was the block moving. Not many students referred to refraction in their answer.

08.4 Students were asked to use a table of results to give a conclusion. Over half of students achieved this mark. Most incorrect answers were when students referred to the block floating or sinking rather than using the dependent variable of distance between the liquid surface and bottom of the block. Some students mixed up the variables saying that as the

distance between the liquid surface and bottom of the block increased the density of the liquid decreased which could not gain credit.

- 08.5** The correct equation linking density with mass and volume was correctly selected by over three quarters of students.
- 08.6** Students needed to calculate the volume of the block after they had been given the density and mass. Over a third of students achieved all three marks for this question. The most common mistake was incorrect rearrangement of the formula. Unfortunately, some students had not shown their working and incorrectly rearranged the equation so scored 0 marks.
- 08.7** When asked how the density of the liquid water changed as it boils over half of students correctly identified that the density would decrease. However less than a twentieth achieved both marks. Many students either did not attempt to give a reason for their answer or gave statements such as “because it is a gas” which is insufficient for the mark.

Mark Ranges and Award of Grades

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