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GCSE

# COMBINED SCIENCE: SYNERGY

8465/2H Life and environmental sciences

Report on the Examination

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**Question 1 (standard demand)**

- 01.1 Students were asked to use data from a diagram to determine the number of times a liver cell was longer than a bacterial cell. This question was answered well with over four fifths of students achieving both marks. Common errors were when students subtracted:  $28.6 - 4.4$ .
- 01.2 Over a third of students scored 4 marks for this question and many wrote more than 4 correct similarities and differences between the liver and bacteria cell. A few students confused the cell wall with the cell membrane. Answers which only referred to one cell could not gain any credit.
- 01.3 This question was answered poorly with approximately a quarter of students achieving a mark. Students gave examples of tissues rather than writing a definition.
- 01.4 Less than a quarter 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 frequent incorrect answer chosen was that the sugar solution was more concentrated than inside the cell.
- 01.5 This extended response question was a recall of a required osmosis practical. It was answered well with almost half 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 clear accounts of a method including the use of control variables but failed to say the starting mass of the potato needed to be calculated and the final mass. 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.
- 01.6 Students had to use data from a table to plot a line graph on axes provided. Almost two thirds of students achieved both marks for this question. This was often due to a poorly drawn 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.
- 01.7 This question was answered well with almost three quarters of students achieving a mark. Students used their graph to determine where their line of best fit crossed the x axis. Some students did not use the graph instead giving an answer of 0.25 as that was between the positive and negative percentage change in mass values on the results table.

**Question 2 (standard demand)**

- 02.1 A method for determining liquid density was given along with a diagram. Around half of students achieved this mark. An error students made was the use of vague terms such as the type of liquid or just the liquid.

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- 02.2 When asked to give a control variable almost two thirds of students correctly answered. Temperature and block were the most used correct answers.
- 02.3 Almost half of all students gained this mark. The most common correct answer for a source of error on the experiment was the block moving but many students correctly stated that the glass refracted the light.
- 02.4 Students were asked to use a table of results to give a conclusion. Over three quarters 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.
- 02.5 The correct equation linking density with mass and volume was correctly selected by almost all students.
- 02.6 Students needed to calculate the volume of the block after they had been given the density and mass. Over four fifths 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.
- 02.7 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 quarter of students achieved both marks. Many students did attempt to give a reason for their answer but gave statements such as 'because it is a gas so has lost particles through evaporation' which is incorrect.

### **Question 3 (standard demand & standard / high demand)**

- 03.1 This question was answered poorly with many students not able to describe how the adaptations aided absorption. Less than a tenth of students achieved both marks. Students rarely gained a mark for answering how a constant blood flow aided diffusion. A common mistake was misinterpreting the question to not say how the adaptation helped but why it helped. Incorrect answers such as to speed up diffusion were therefore commonly seen.
- 03.2 Over half of the students answered this correctly. Most students correctly answered that amylase breaks down starch.
- 03.3 Over three quarters of students got 1 or more marks for this question, which was mainly achieved by stating that 37°C is body temperature which is why that temperature was chosen. Many students did not make the connection between temperature and enzyme function.
- 03.4 The students were given a table of results they needed to interpret. To answer this question the student's needed to know what iodine and benedict's reagent tested for and then go on to explain the results. Over two fifths of students achieved 1 or more marks for this question which was often for stating that starch and sugar were both present in the tubing. Some students were confused between benedict's reagent and biuret solution so were saying protein was detected in the tubing.
- 03.5 Students were asked to use the same table of results to then explain why there was no starch in the water around the test tube. This question was answered poorly with over three

quarters of students not achieving any marks for this question. Many students did not realise that it was the size of the molecules that either allowed it to pass through the tubing or stopped it being able to pass through the tubing. Many students thought that all of the starch had been digested which is why it was not present in the water from the test tube.

#### **Question 4 (standard demand & standard / high demand)**

- 04.1 Approximately a quarter of students correctly described how carbon monoxide was formed. Answers which said there was no oxygen could not achieve the mark as it needed to include combustion or burning. Some student's answers were too vague and just stated that burning caused carbon monoxide to be produced.
- 04.2 Approximately a quarter of students achieved this mark for knowing a harmful effect of oxides of nitrogen. The majority of correct answers concentrated on the effect on human health so respiratory problems was the most frequently seen correct answer. Very few students explained the effect on plants or water systems.
- 04.3 Students had to read a value off a graph that was given and then use this value to calculate percentage change to 2 significant figures. Around a third of students achieving four marks. Incorrect readings from the graph followed by unclear methods of working meant that students did not achieve many marks for this question. Students were generally very good at giving their answer to 2 significant figures.
- 04.4 Most students correctly interpreted the graph with a third of students scoring 2 marks and just less than a fifth of students scoring 3 marks. Most students who scored 2 marks achieved this by stating that the emission of all three pollutants decreased and the emissions of oxides of nitrogen increased initially and then decreased.
- 04.5 When asked to give a reason for the change in emissions the most common correct answer seen was that less fossil fuels were used. Several students also correctly stated that more renewable energy was used. Many incorrect answers referred to global warming which is a consequence and not a reason for the change in emission of atmospheric pollutants. Only a quarter of students achieved a mark for this question.
- 04.6 Although this appeared to be a chemistry question, students were asked to use a biology microscopy equation to determine the size of a soot particle and then use a data table to interpret their answer. This question was answered well with about two thirds of students being awarded all five marks for this question. Some students could not convert millimetres to micrometres but realised their mistake when they were determining the particulate group using their calculated answer. A few students had incorrectly rearranged the equation.
- 04.7 This question asked students to describe how the body protects the lungs from particulates. Many students did not mention cilia in their answers and that they are necessary to move the mucus away from the lungs meaning about a fifth of students achieved 2 marks. Most students that achieved one mark did so by knowing that mucus traps the particulates. Several students thought coughing or sneezing removed the particulates but with particulates of this size this alone would be ineffective so this was not creditworthy.

#### **Question 5 (standard demand / high demand & high demand)**

- 05.1 Approximately two fifths of students gained one mark for this question. The majority of students answered by saying that the remaining trees had more space or light and less

than a twentieth of students went on to link this to photosynthesis and it allowing the trees to grow quicker.

05.2 This question required students to describe how carbon from carbon dioxide becomes tree biomass, but the question also stated that photosynthesis and respiration needed to be commented on. Only a hundredth of students scored four or more marks for this question. Many students spoke about glucose being made in photosynthesis but did not comment on its use in respiration. Very few students could say what glucose from photosynthesis was used for. Even fewer students could explain what energy released by respiration was needed for within the plant.

05.3 This extended response question was attempted by almost all students with a twentieth of students accessing level 3. Students were asked to give both the environmental and biological benefits of forests. Environmental benefits were often omitted from answers but where it was included the removal of carbon dioxide by photosynthesis and linking this to global warming was the most common response.

Level 2 answers often explained the biological benefits of maintaining forests but omitted the environmental benefits. Many gave detailed descriptions of how increasing biodiversity would increase habitats and so stop organisms from going extinct. Very few students referred to wildlife corridors.

Students that failed to score concentrated on photosynthesis producing oxygen and so improving air quality for organisms which was not relevant to the question.

#### **Question 6 (standard demand / high demand & high demand)**

06.1 Only a fiftieth of student's scored five marks for this question. Whilst a number of students knew the correct order of the neurone sequence for the reflex action they failed to mention that electrical impulses or signals were passing along them. Very few students referred to the synapse or that chemicals moved across this gap between neurones. There was confusion regarding the term 'stimulus' with several students saying that the sugar solution was detected by a stimulus. Whilst most students realised they needed to describe the reflex pathway, they did this for humans with no reference to the bee and therefore it was difficult for them to describe the correct effector response. A minimal number of students incorrectly thought it was the brain that coordinated this automatic response.

06.2 Students were given an experiment that they were unfamiliar with and a set of data to interpret. A quarter of students gaining a mark. The most common correct answers for possible control variables were the same volume of solution used and same species of bee. Some students referred to amount of solution rather than volume so could not gain the mark.

06.3 Students were asked to evaluate a scientist's conclusion based on a set of data given. Only a quarter of students scored 1 or more marks for this question. Very few students referred to the limitations of the scientist's conclusion but if achieved it was usually by commenting on the number of repeats. Many students were referring to number of visits rather than frequency of visits which was not creditworthy. Students had to do a calculation using data from the table rather than just quoting values to gain a mark for data to support MP1 and/or MP2. This marking point was often not attempted.

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

- 07.1 Three quarters of students correctly knew that the frequency of ultraviolet waves is higher than the frequency of visible light waves.
- 07.2 This calculation required students to select the correct equation from the physics equation sheet and then rearrange it to determine the frequency of an ultraviolet wave. Three quarters of students scored 3 or more marks for this question. The most common mistake was not converting 340nm correctly. Some students gave an incorrect answer and failed to show any working which limited the number of marks they could achieve.
- 07.3 Students were asked to explain a diagram of a refracting wave. This answer was not answered well with only a quarter of students gaining 1 or more marks. This was mainly credited for knowing that the wave slowed as it passed through air to liquid or from a less dense to a more dense medium.

A lot of students had some idea of the mechanism of refraction but did not express this in terms of wave fronts so could not achieve more than one mark.

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

- 08.1 Half of students correctly identified the definition of a community.
- 08.2 This extended response question was not answered well but was primarily a high demand question. This question required students to not only interpret the graph shown in figure 11 and the food web in figure 12 but also retain the information given to them throughout the question regarding the mussels food source.

To access level 3 students needed to realise that mussels and barnacles were not going to run out of their food source as they fed off algae which was replenished every day when the rock pools flooded.

A third of students wrote a level 1 response which normally meant they had correctly identified that all species of the rock pool increased in numbers due to the lack of starfish. Correct use of the term ‘apex predator’ was often used in responses.

Many students failed to access level 2 as they did not give a reason as to why limpets and chitons decreased in numbers. They failed to see that their food source of seaweed would run out. Poor descriptions of competition were often seen in responses and the use of the term competition or outcompete was rarely seen.

Upon realising that the limpets and barnacles would decrease in number due to lack of food students should have realised that there would then be more space for the mussels and barnacles to multiply. Very few students realised that the mussels and barnacles were competing for space and not food as they had not retained the information at the start of question 8 about the rock pools replenishing with fresh water twice a day and so bringing fresh algae in with them.

Some students were confused by the food web. Incorrect references to mussels eating seaweed or eating the limpets was often seen.

- 08.3 About two fifths of students achieved 1 or more marks for this question. Most students realised that in rock pool A the number of species stayed the same but did not go on to state that it was a stable community with all the species in balance.
- 08.4 This question was not answered well with three quarters of students not achieving a mark. Students were expected to know from the diagram shown that offspring X was formed by mitosis and then describe the stages of this form of cell division. Students were not specific enough when answering this question. Vague answers concerning chromosomes being pulled to opposite ends of the cell rather than one set being pulled was often seen. Whilst students realised that the two cells that were formed were identical to one another they often failed to refer to them being genetically identical so could not achieve the mark. A few students were confused between mitosis and meiosis and thought 4 cells were being created in the process.
- 08.5 A quarter of students gained one mark for saying that the starfish did not need to find a mate or partner but very few went on to say why this was an advantage. Minimal numbers of students used the alternative answer of a low chance of egg and sperm meeting in water to gain a mark.



### **Mark Ranges and Award of Grades**

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