GCSE

Additional Science (Combined)

AS1FP

Report on the Examination

4409

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Additional Science Paper 1 Tier F

General
Students should be reminded that simply copying out the information in the question is unlikely to gain marks and that they must 'add value' to what is given. In some questions this may be as little as making comparisons, using terms such as 'greater' or 'less than'.
Examiners also noted the number of students whose writing was so poor as to make it difficult to interpret.

It was evident that some, particularly weaker, students had started well but as the questions became more demanding, had lost impetus.

Question 1
(a)(i) A large majority of students secured two marks, here. In most cases two of the labelled structures were offered, although some students suggested alternative acceptable structures such as 'cytoplasm', 'mitochondria' and occasionally 'ribosomes'. Those who did not gain both marks often suggested 'chloroplast(s)' or 'vacuole' which are labelled in the plant cell but are not present in the yeast cell.
(a)(ii) This part was also well answered. Both of the distractors proved to be more or less equally attractive.
(b) Well over half the students gained all three marks here. For many, one error often led to a second error. However, almost every student identified at least one correct link, most commonly the 'stomach' as an 'organ'.
(c) Although a good proportion of students secured the two marks available, a high number gained neither mark.

Question 2
(a) This sentence completion task about photosynthesis was well done by most students.
(a)(i) The vast majority of students knew that 'light' energy is absorbed during photosynthesis. Those who did not offer the correct answer often suggested 'heat'. Whilst plants may absorb 'heat' this is not the specific role of the green substance in leaves.
(a)(ii) Again, most students gave the correct response, 'water'; however there were a number of different suggestions, including 'oxygen' and 'sugar'. It should be noted that although 'H2O' is acceptable in this question as it must match the type of response accepted in separate Biology units, this format would not be accepted in the Chemistry section of the paper.
(a)(iii) Although fewer students gave the correct answer 'oxygen' than had gained the marks in parts (a)(i) and (a)(ii), this was still well done. Common incorrect responses included 'carbon dioxide' and 'water', as students appeared to be selecting answers from previous parts of the question and not thinking through what those previous parts had indicated about these substances and the reactions of photosynthesis.
(b)(i) The examiners were pleased that a considerable number of students provided answers in standard form, '2×10^{-3}', as well as the alternative format '0.002'. It was clear that some students were unable to interpret the format of the display on their calculators, simply quoting '$2^{-.03}$'. Some students had clearly not brought a calculator with them. These students often offered '1/500' which was worth one mark. The most common error was to invert the calculation, resulting in an answer of '500 (cm)'; clearly these students had not considered the consequences of their answer showing a starch grain 5 metres across in a single plant cell.

(b)(ii) The idea that starch could be used 'for growth' proved to be almost as attractive to students as the correct answer 'for storage'. Although 'for photosynthesis' was much less commonly given, fewer than half of the students arrived at the correct answer.
(c)(i) Students had to realise that photosynthesis could occur in the green area of the leaf and that the glucose produced would be converted to starch. Thus starch would be found in the green area. For students who were not familiar with this experimentally, this would prove to be more difficult. Approximately two-thirds of students did give the correct, first, answer, with the second alternative being by far the most commonly given of the distractors.
(c)(ii) This required students to recognise that the white areas of the leaf would not be able to photosynthesise or that the organic products of photosynthesis could not be made there.

Question 3

(a) The most common correct answers referred to 'amount' of water or 'amount' of glucose. Students should be encouraged to use correct physical parameters, in these cases 'volume', in all such situations. Many students offered 'temperature' which is the independent variable in this investigation. Responses of 'water' or 'glucose' were also seen by examiners, these were considered to be unclear as they might imply the same water or the same glucose were used in each part of the investigation, which would be unfeasible.

(b) The vast majority of students gained at least one mark here, usually identifying that an increase in temperature resulted in an increased glucose concentration in the water. Students very often went on to gain a second mark for quoting sets of data (of both temperature and concentration) for two temperatures. A few students realised that the concentration of glucose 'doubles for a 10^{o}C rise in temperature'. It should be noted that at this level, units were not required, although this may not be true for questions set at higher levels of demand.

Question 4

(a)(i) Most students were able to correctly label the copper and nickel atoms in the diagram of the arrangement of atoms in cupronickel. The most common error was to reverse copper and nickel, with some describing the copper atoms as 'cupro'.
(a)(ii) This was very well answered with most students knowing that cupronickel is 'harder' than copper.
(b) This was well answered with most students recognising nitinol as a 'shape memory alloy'. The most common distractor was 'smart polymer'.

Question 5

(a)(i) Most students were able to compare the differences in strength and density of the two polymers. However they found it difficult without numerical figures to compare the flexibility so didn't add any value to the information given and just repeated the information from the table that LD poly (ethene) is 'very flexible' and HD poly (ethene) is 'rigid'.
(a)(ii) Students were not directed to use the table to provide information for their responses and the most popular responses for those that did use the information were
linked to strength and rigidity. From the students that did not use the table, the most popular response was 'doesn't rust'. Students were not always aware of the meaning of 'property' and linked their answers to the design of the chair / plastic bag rather than a property of poly(ethene) giving responses such as 'easier to carry around'. Students still consider the terms strength and hardness to be interchangeable and are not aware of their different meanings. The HD poly(ethene) chair being harder was a fairly common response. Other students gave generalised comments such as 'better' but without explaining why. Comments such as these are unlikely to obtain marks without further qualification.

(b) Very few students obtained two marks, as many thought that LD and HD poly(ethene) were different types of thermosetting polymers. A higher proportion realised that the difference in properties was due to being made at different pressures rather than by using different catalysts.

Question 6

(a) This was well answered with most students being able to identify magnesium oxide as 'a compound'.

(b)(i) This question was well answered by many students who were able to interpret the diagram given of the process and obtain full marks. The understanding of the type of bonding was shown in the explanations given although there were occasional references to sharing of electrons or covalent bonding which limited the response to a maximum of 3 marks. The students were directed in the question to give their answer in terms of electrons and the vast majority did, though there were occasional references to atoms moving.

(b)(ii) Most students knew that magnesium oxide has a high melting point as it has 'strong bonds'. The other distractors, 'low boiling point' and 'insolubility in water' were given in roughly equal proportions.

Question 7

(a) Most students were able to successfully use the information to work out the information required for the two isotopes of lithium. The number of neutrons was most likely to be incorrect.

(b) Most students were able to identify that the two different types of lithium atom were isotopes.

Question 8

(a) About half the students were awarded the two marks for this question. The popular distractor for the first part of the question was 'different' for the comparison of the forward and backward force. The popular distractor for the second part of the question was 'increase' for air resistance as the cyclist stops pedalling, perhaps due to mis-reading the question.

(b) A very high percentage correctly identified that the velocity of the cyclist would 'increase'. Each of the distractors proved equally attractive.

(c)(i) The numerical part of the question was generally well answered, but the unit for acceleration once again did cause a few problems, with the most common incorrect answer of 'm/s'. A mistake that was often made was to reverse the initial and final velocities and give an answer of '-3', however this was not penalised.

(c)(ii) Approximately half of the students knew the velocity time graph for constant acceleration was a straight line. The most common incorrect selection was the first graph thinking the velocity somehow increases at an increasing rate.

(d) The majority of students gained at least one mark for answers about 'fairness' and the 'harmful side effects'. There were a number that misinterpreted the question and discussed how the drugs enhanced performance but didn't go on to say why this was not allowed under competition rules. A few gave answers about a cyclist 'travelling faster' and 'having more accidents' which were not worthy of credit.

Question 9
(a) Approximately half the students knew that the momentum of the astronaut is ‘zero’ if they are stationary. The common distractor was ‘mass’, perhaps thinking that astronauts have no mass, rather than no weight, in space.
(b)(i) This was generally well answered with most students giving some sort of straight arrow pointing to the left.
(b)(ii) A high proportion answered this correctly by knowing the momentums are equal and opposite. Each of the distractors proved equally attractive.
(b)(iii) Just over half of the students realised the astronaut would ‘continue moving at a steady speed’. The common incorrect conclusion was that she would ‘slow down and stop’.

Question 10
(a)(i) A high number of students correctly identified ‘F’ as the switch, but there were number of electrical component alternatives given for ‘G’ the resistor.
(a)(ii) Circuits still continue to cause students problems, even if they have answers to choose from. Very few scored the full 3 marks for this question. Many thought the current was shared between the components. The potential difference across the LDR caused the most issues with students either selecting the ‘9V’ straight from the diagram or somehow thinking it was greater than the supply potential difference.
(b) A high number of students incorrectly thought the resistance increased. The allowable alternatives for ‘decreased’ were ‘goes down / lowers / reduces’, but ‘weaker’ was not worth credit.
(c) Students are told in the question that the light level would be too low to see the ball, so responses that repeated this such as ‘can’t see the ball’ were not sufficient for the mark. Students need to add value to the information given and a number did go on to say why they needed to be able to see the ball in cricketing terms. Others commented on the fairness of the game or why the umpire needed to be able to see the ball to make decisions. A few students misread the question and gave answers about how the resistance of the LDR changed or about the light being ‘too bright to see the ball’.

Question 11
(a) On the whole this part was not answered well. Many students appeared to be familiar with techniques involving random quadrating, which are appropriate in habitats showing no specific environmental change. However, the data shown in Figure 15 could not have been acquired this way. Students should also be familiar with transects of one kind or another.

Despite this major error, the mark scheme allowed students who only described random quadrating to score three of the four marks, if the response was sufficiently detailed. Relatively few students though, described the need to record the presence of particular species. ‘Repetition’ without further qualification as to why this should be done did not gain credit. Those who did realise that a transect was required were also prone to omit vital details, such as where the transect should be placed, ‘from sea to trees’ or at least ‘across the habitat’. Many students also attempted to describe how to record both the light intensity and water content of the soil; as the question had specifically excluded these, any attempts were ignored.
(b)(i) Most students correctly deciphered the information in Figure 15, identifying ‘sea rocket’ as having no competitors in any part of the habitat.
(b)(ii) Fewer, but still considerably more than half, students matched ‘marram grass’ as living in the driest part of the habitat.
(b)(iii) The format of the data in this question was probably unfamiliar to many students, thus it would have been useful to them to have counted the number of plant species in different parts of the dune. This would have shown them that the number ‘increased and then decreased’. Very few students gained both marks here; furthermore examiners were only able to award one mark for the

first part of the relationship to relatively few students. The majority of students who gained no mark here more commonly attempted to explain why the numbers of species varied, often relating age to a decline in resources or an increase in competition. Unfortunately neither of these answered the question and marks could not be awarded.

(c) Observation of the data in Figure 15 would have confirmed to students that few species live where the pine trees are. Closer inspection would have revealed that there was relatively little light at ground level in this area of the habitat. Although some students realised this, many did not go on to explain that the low light intensity would result in little photosynthesis. Those students who said that there was 'no light' under the trees were not credited, as the data clearly showed this to be incorrect.

Question 12

(a) Although students were given the reactants and products in the question few students were able to complete the word equation. Many chemicals that did not appear in the question were included in the response. Students who were able to make an attempt at the word equation then often lost the mark through carelessness or lack of understanding of the procedure with 'ammonium' and 'ammonia' being interchanged for the reactant and product. Despite being asked for a word equation there were some attempts at using the formulae but apart from hydrogen chloride these were rarely correctly written. There were a variety of symbols used for reversible sign with students finding it much harder to produce the sign than identify it.

(b)(i) Just over half the students were able to correctly calculate the maximum mass that could be obtained. The most common errors were to multiply or subtract the masses of ammonia and hydrogen chloride.

(b)(ii) There were few correct responses as to why the yield was lower than expected. Correct answers were usually in terms of the reaction being reversible, with either a simple statement that the reaction was reversible or a description of the process. There were very general responses stating that reactants were lost but without any further qualification, or that impurities were responsible. Those who answered in terms of a loss of substance often referred to the reactants being lost but without qualification usually not appreciating that they were gases. Incorrect answers here usually gave the idea of ammonia and hydrogen chloride not reacting rather than being reformed. A few gave answers relating to ammonium chloride being left in the apparatus. A very common incorrect response was to take the data given about the reacting masses and state that there was double the amount of hydrogen chloride to ammonia, so not enough ammonia to react, without an appreciation of the different masses required.

Question 13

There were a few good answers seen with a good description of the structure and properties of graphite. To obtain level 3 though, students were also required to make an attempt at an explanation of how a property of graphite is linked to the structure. The most usual explanation of a property was softness being linked to the layers sliding. Most answers demonstrated little knowledge of the structure or properties of graphite, with many just repeating the question. The students weren't able to use the diagrams to help them with the structure of graphite, with many not realising that the layers were present. Many students gave a property of graphite as being strong or having a low melting and boiling point.

Question 14

(a) The examiners were looking for safety procedures that would be followed if they were to do the experiment, so 'wearing hard hats' was not worthy of a mark and neither was an answer in terms of trapping skin in the spring. To 'make sure it doesn't hit anyone' was not enough for the safety instruction, but quite a lot of students did refer to 'aiming away from people', ensuring a 'clear area' and 'not standing in front' of the catapult, which were all worthy of a mark. Many students referred to 'googles' in the answer and they were not penalised here. A few students were concerned with the safety of the 'fixed points' despite being told they were 'fixed'.

(b) This was poorly answered and it is worth reminding students that they need to make sure they know the specific technical terms for energy types as given in the specification. The majority of students wrote just 'elastic' as their answer which was not enough for the mark.

(c)(i) By far the most common mistake with this question was students thinking the ball was travelling too quickly to measure, instead of realising the ball was stationary at its maximum height and therefore it was the short amount of time it has stopped for that was important. Students are asked about the height the ball reaches so any reference to zero error and errors related to distance travelled were ignored. A considerable number looked at the diagram and incorrectly thought the 'ruler was broken' or was 'not long enough'. Some students lost marks by not expressing their ideas fully like 'ruler not being straight' rather than 'not being vertical'.

(c)(ii) Students need reminding that at this level they are expected to do more that put numbers direct into an equation and multiply them together on a calculator. In this case they needed to convert the mass to the correct SI unit, which only a few did. The most common answer was '360'. Few students knew the correct answer for the unit of energy, with many alternatives being given.

(d)(i) There were a number of creditworthy ways the students expressed the downward gravitational force such as 'gravity', 'weight' or 'gravitational pull'. A few offered 'gravitational energy' which was not worth a mark. For the upward force the common correct answers were 'air resistance' (resistance by itself was not enough to gain the mark), 'drag', and 'friction'. Upthrust was an allowed answer because although not the main force it is a (very small) part of the upward force. A few students used motion terms like 'acceleration' and 'velocity' as their answers. A small number incorrectly used pull / push / upward / downward as their labels.

(d)(ii) Just over three quarters of students knew the kinetic energy increases as the ball accelerates towards the ground. Each of the distractors proved equally attractive.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator