GCSE

Additional Science (Combined)

AS1HP

Report on the Examination

4409

June 2014

Version: 1.0

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Additional Science Paper 1 Tier H

General
Students who scored very low marks might have been better served being entered for the Foundation tier examination.

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'.
Poor writing is often penalised, not because it exacts a penalty per se, but because examiners are unable to read it.

Question 1
(a) A considerable number of students failed to realise that the collection of the data shown in Figure 1 would require the use of a transect, rather than random quadrating. Many of those who were familiar with transects gave the impression that they had practical experience of their use as the details provided were ordered and clear. This was also true of many of those who described random quadrating well, and for these students most of the marks were still available. Some students hedged their bets by describing both techniques and the examiners were generous in this case, awarding marks where appropriate for one or the other technique. Although the data only showed presence or absence of species, the examiners accepted techniques such as '% cover' or frequencies, as these could have been converted into presence / absence data for the bars in the figure.
(b)(i) The great majority of students correctly identified 'sea rocket' as having no competitors in any part of the habitat.
(b)(ii) 'Marram grass' was correctly identified by most students, as living in the driest part of the sand dune habitat.
(b)(iii) Few students were able to interpret the data in terms of the question asked. Firstly students had to realise that older parts of the habitat were further from the sea, then to link increasing age to the pattern of numbers of plant species. However, those who reversed the age profile of the habitat could still gain both marks. Despite this, students often made one of two errors. The first of these was to only describe the first half of the relationship, an 'increase' and could only gain one mark. The second, and greater, error was to attempt to explain the relationship in terms of soil water or light intensity, for which no marks could be awarded.
(c) Many students used the information in Figure 1 and realised that the lack of plants under the pine trees was due to 'low light intensity'. Some of these students went on to gain the second mark, explaining that this would result in 'little photosynthesis'. An alternative route to gaining marks here, referring to competition for specific resources, did not use the information provided but was accepted as it would be a reasonable suggestion.

Question 2
(a) Despite being given the reactants and products in the question a number of students were unable to complete the word equation. Chemicals that did not appear in the question were included in the response, with 'hydrogen' often appearing as a 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 the reversible sign with students finding it more difficult to produce the sign than identify it.

(b)(i) Students were aware of the conservation of mass and were able to complete the calculation. The most common error was to multiply the masses of ammonia and hydrogen chloride.
(b)(ii) Correct answers to the lower yield than expected 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. Incorrect answers here usually gave the idea of ammonia and hydrogen chloride not reacting rather than being reformed. 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. A few gave answers relating to ammonium chloride being left in the apparatus. Some students took the data given about the reacting masses and stated 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 for the reaction to take place.
(b)(iii) The equation to calculate percentage yield was well known and students who knew the equation and realised that their answer to part (b)(i) was required were able to answer this well. The most common error when substituting in the equation was to invert the theoretical and actual yields. There was a significant number of students who lost a mark through incorrect rounding of the final answer, the most usual mistake being to round 87.916 to '87.91'.

Question 3
Some excellent answers were seen with two or three explanations given which linked the structure of graphite to its different properties. There were a number of good Level 2 responses seen with good structure descriptions and 1 or 2 properties but no attempt had been made at an explanation, which was required in order to access Level 3. Most were able to give at least one structure point, although weaker students at this level often described incorrect information in their responses, such as 'graphite atoms' or 'carbon molecules'.
The most common explanation seen was 'soft' because the 'layers slide over each other'. Some students gave good descriptions of delocalised electrons being able to carry current.
There was confusion between bonds. Many thought intermolecular forces were strong. A misconception was that weak intermolecular forces led to lower melting and boiling points as they didn't need much energy to break.

Question 4
(a) This question was answered well. 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. Some students referred to 'googles' in the answer but this was 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 only '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. The students are asked about the height the ball reaches so any reference to zero error and errors related to distance travelled were ignored. Quite a few 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, such as the 'ruler not being straight' rather than 'not being vertical'.
(c)(ii) Students need reminding that at standard demand 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' which gained one mark. Only a 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 students could use to express the downward gravitational force such as 'gravity', 'weight' or 'gravitational pull'. A few offered 'gravitational energy' which is incorrect. 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 such as 'acceleration' and 'velocity' as their answers. A small number incorrectly used pull / push / upward / downward as their labels.

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

Question 5

(a)(i) Most students identified at least one reason why scientists might have believed *Volvox* to be a plant. Many of these then went on to give a second reason and gained two marks. The most common error was to refer to the 'light-sensitive eye spot', perhaps students believed that this would allow the *Volvox* to locate light for photosynthesis, and although this might be a possible deduction, this is not a feature of plants. Others decided that the 'lack of a cell membrane' would indicate that *Volvox* is a plant and although this component was not labelled, the lack of a cell membrane is not a feature of plant cells. It is a common misconception that 'plant cells have a cell wall *instead* of a cell membrane'.

(a)(ii) Here students had more opportunities to gain the one mark available. Despite this, only little more than half of the students achieved this, with most correct answers referring to the presence of 'flagellae', sometimes adding that this was similar to the tail of a sperm cell.

(a)(iii) Examiners had expected that this would prove to be more difficult than the final performance data suggested, as only a little less than half the students gained this mark. Many students were able to explain either that all the cells in the colony are 'the same' or that there is 'no specialisation'.

(b) Whilst most students were able to work out that the flagellae are involved in movement, relatively few could explain that mitochondria either provide the energy for this movement or are the site of respiration. Unfortunately many of the students who did refer to respiration showed poor understanding of energy transfers, suggesting that energy could be 'made' in mitochondria.

Question 6

At first sight this evaluation question may have appeared daunting to students. However what students should recognise is that the provision of information will help them to answer the questions. It is important, then, that they should read the information carefully, review the question(s) and then re-read the information. Astute students highlighted or underlined what they considered to be important parts of the information. The question then guided students as to how they should tackle the evaluation. Three marks were available for students who explained how the black dye worked. Some students failed to realise that the black dye would reduce the light available to the pygmy-weed. Those who did recognise this could pick up three marks fairly easily. Firstly stating this point and then linking it to the reduction (or prevention) of photosynthesis, resulting in the death of the pygmy-weed. Students might then have recognised that the native plants would be unaffected by the dye as they were not growing at the time the dye was present. Most of the students who gained credit for the possible problems of the use of the dye realised that

wild animals would have less food. There were relatively few who realised there might be a lack of dissolved oxygen in the pond, although it was not uncommon for students to suggest the wider dire global consequences of changes in atmospheric gases; this was not accepted by examiners, as this is a small-scale investigation in countryside ponds. However many students did believe that there was a possibility of toxicity to animals and even humans, despite the statement in the information that the dye is 'non-poisonous'; whilst others considered the harm to the aesthetics of having 'black water in the ponds'. Although an appreciable number of students did gain three or four marks for the explanation of how the dye works and its possible problems, very few went on to gain the fifth mark for a justification of a decision. Some ignored this requirement altogether or simply stated that they 'agreed' or 'disagreed' with its use. Those who did gain this mark were able to make a balanced judgement, weighing an advantage with a disadvantage of removing the weed. Statements such as 'I think the weed should not be removed because providing food for wild animals in the winter is more important than preserving native plants' were sufficient for this mark. Justified decisions both for or against the removal of the pygmy-weed were acceptable here.

Question 7

(a)(i) A good majority of students was able to identify at least one function of muscular tissue within the digestive system; indeed many gave all three of the marking points. Some students had somehow missed the three references to the 'digestive system' in the three lines they should have read before answering, suggesting that the muscular tissue would 'move the body'.

(a)(ii) A significant minority of students was unable to offer any creditworthy suggestions for the role of glandular tissue in the digestive system. However approximately half of the students gained two marks, here, most commonly for a reference to 'enzymes' and for describing their function of 'breaking down' or 'digesting' food.

(b)(i) Those students who realised that the various digestive juices added to the food during its passage through early parts of the digestive tract contained water, often picked up at least two marks here, usually referring to 'saliva' and stomach 'acid'. Students did not have to identify to which part of the digestive system these juices were added, although incorrect statements about the origin or site of action of a juice would disqualify the mark. Very few students gained all three marks, commonly omitting the juices added in the early part of the small intestine. It was evident that many students believed that the digestion of food would itself 'produce water' (the opposite being true).

(b)(ii) The absorption of soluble food substances (following its digestion) should be well-known by students. This question used this information, as if the solutes are removed; the percentage of water in the remains will increase. This was expected to be a demanding question aimed at discriminating the highest grade students and so it proved. The most common error was to believe that water somehow was added to the food as it moved along the small intestine.

(b)(iii) A good percentage of students demonstrated knowledge that water is absorbed in the large intestine. Unfortunately some confused the large and small intestines, here, stating that the absorption of water in the small intestine would result in a decrease of the water in food in the large intestine.

Question 8

(a) The students who knew the definition of an isotope were able to give a concise answer and obtain 2 marks. Some used the examples given of chlorine isotopes and were able to correctly calculate the numbers of protons and neutrons from the information given. However other students were not able to use the information and gave incorrect data, usually that the number of neutrons in the isotopes were 35 and 37. However students can lose marks through failing to make clear what the numerical data refers to. Chlorine contains '17 protons and electrons' needs further clarification. Does the student mean it has '17 protons and 17 electrons' or the 'total of protons plus electrons is 17'? Students who were unaware of what an isotope is gave a variety of answers.
(b)(i) Most were able to use the Chemistry Data sheet and correctly read the value. A few assigned units usually 'g' to the value whilst others gave the atomic number rather than the relative atomic mass, neither of these was acceptable.
(b)(ii) Few students could describe why the relative atomic mass is a different value to the mass of the isotopes. Those who obtained the mark stated that it was an average value for the isotopes, though few described it in terms of average mass of all the atoms present. A good student explained how the weighted average led to a value of 35.5. The large proportion of incorrect answers was usually as a result of trying to explain in terms of the number of neutrons present.

Question 9

(a) Many students did not follow the instruction given by the command word in the question to *explain* why the polymers were used but just gave a list of properties. Others gave a comparative list of properties but again did not go onto explain why they were used. A mark was most commonly obtained for an explanation of the strength or rigidity of HD poly(ethene), though many students confused strength and rigidity, with many answers incorrectly linking rigidity to be able to hold more weight. Students found it difficult to link the flexibility of LD poly(ethene) to being able to change shape to hold shopping. A number do not have a realisation of temperatures as there were quite a few answers relating to being able to use HD poly(ethene) rather than LD poly(ethene) on a sunny day as it had a higher melting point so would not melt.
(b)(i) A significant proportion of students did not follow the instructions to use the information in the table to answer the question, giving answers in terms of properties such as boiling points. Others gave a list of properties rather than just referring to the melting point. Most correct answers related to thermosoftening polymers melting, rather than thermosetting not melting. In responses such as 'thermosoftening melted at lower temperatures' some students gave the impression that thermosetting polymers would melt at higher temperatures. Others thought that LD poly(ethene) is a thermosoftening polymer, with HD poly(ethene) being thermosetting
(b)(ii) Few students used the cue given in the question to answer in terms of intermolecular forces. Those who did usually realised that they were weak but were generally unable to explain that these forces are between polymer chains.
(c) Most students did not appreciate that the question required more than just a list of different properties. Marks were usually obtained by reference to the different temperatures required, but few mentioned the need for different catalysts. Others though didn't have an understanding of the properties, with answers such as because they are LD and HD being common – or gave other properties from the table. Many thought it was due to the higher density of HD or gave examples of thermosetting and thermosoftening

Question 10

(a) Many good answers were seen with the idea of transferring two electrons from magnesium to oxygen and then going onto obtain a third mark by mention of ions/ionic bonding or a full outer shell.
However students found it difficult to obtain both mark points 3 and 4, with students tending just to refer to ions being produced without detail of the charge. Weaker students at this level referred to sharing of electrons or covalent bonding or even atoms rather than electrons moving.
(b) There was little understanding of the structure of magnesium oxide with many references to molecules. The most common mark point obtained was a reference to a large amount of energy being required to break bonds. Although many students mentioned strong bonds, they then often negated the mark due to incorrect chemistry, such as stating that there were strong intermolecular forces, often linked to ionic, whilst others made references to ionic / covalent bonds between molecules. Some referred to it being harder to break down but gave no further explanation.

Question 11

(a)(i) The majority of students correctly answered with air resistance. Drag and friction were also used well. However a few did suggest friction between the wheels and the road surface which is not the 'main' part of the backward force.
(a)(ii) Just under half of students answered this correctly. 'Balance' or 'equal' were popular incorrect answers
(b) A high number of students were awarded the first two marking points. However, a few incorrectly described the acceleration as increasing. The second marking point was usually answered with either 'less air resistance' or the idea that the cyclist is more 'streamlined'. The third marking point was more elusive with only a few answering in terms of 'resultant force'. Those that did explain by comparing backwards and forward forces were usually good, but some expressed this incorrectly by saying 'the backward force is lower meaning the forward force is greater'.
(c) This calculation proved to be a problem for many students. There was a high number of re-arrangement errors and a teaching point here is to get students to substitute into the equation as it is written on the equation sheet, to avoid re-arranging incorrectly before substituting and losing all marks for an incorrect answer. There were also a few who incorrectly used their calculator by doing 18-3/2 instead of (18-3)/2.
(d) Many answers involved comments regarding wind or mass. Generic answers of 'friction between tyre and road' were not worthy of credit and more was required in terms of specific bike factors.

Question 12

(a)(i) Many students identified that it would be necessary to measure the current and the voltage, however the vast majority failed to realise that where the voltage was measured was important and thus only gained a total of 1 mark.
(a)(ii) Just fewer than half the students were awarded a mark for this question, with many incorrectly thinking the current increases when the resistance in the circuit increases.
(b)(i) The common answer was a simple 'as the light level increases the resistance decreases' only a few went on to say by what factors. Expression of their answers was important and some did not gain credit for incorrectly linking change in light level due a change in LDR resistance.
(b)(ii) There were many speculative answers to this question with many values exceeding the 9V supply and some in their thousands. It is worth reminding students to think about their final answer before moving on.

Question 13

(a) This proved quite difficult for the students and they struggled to articulate their answer in terms of the context of the question. Many put simply 'does not change' which was not enough for the first marking point. The few that did gain the first marking point did not go on to say under what conditions it was true.

(b) This was not answered as well as expected. The common mistakes were incorrect re-arrangement and reading 5.0 as 50. The examiners thought this latter mistake was still worthy of one mark if they attained an answer of 0.63 as they have only made a reading mistake.

(c) This was poorly answered by the students. The most common correct answers were based around the motion being backwards. The most common incorrect answers mentioned no gravity or weight in space.