GCSE

COMBINED SCIENCE: SYNERGY

8465/4F Physical sciences
Report on the Examination

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Question 1

1.1 – Around one third of students gave the correct answer. The vast majority gave the response ‘the time taken for the driver to react’, failing to realise that ‘time’ and ‘distance’ are different quantities.

1.2 – The majority of students gave the correct response of ‘ice’. The other two options of ‘sun’ and ‘mobile phone’ were evenly divided.

1.3 – Over three-quarters gave the correct response of ‘friction’. ‘Up thrust’ was the most common incorrect response.

1.4 - Over three-quarters gave the correct response. Of the other two responses, ‘braking distance decreases as speed increases’ was chosen slightly more often than the ‘is not affected’ response.

1.5 – The vast majority attempted the question, and most were able to calculate the value correctly. About one-quarter of students realised that the unit of weight was the newton, with most opting for kilograms. Some students gave units which were not those given in the box to choose from.

1.6 – Around 40% of students gave two correct responses. A large number got one of the two correct.

1.7 - Most students were able to calculate the value correctly. The most common error was to square the value of deceleration.

1.8 – Despite the question prompting students to use the data from the table of braking forces, few did so. Many suggested that the cars may have had different masses despite the question saying that they were the same. Likewise, many suggested that the cars were travelling at different speeds, despite the question saying that they were both travelling at 31 m/s. A lot of responses suggested a factor which would affect the thinking distance rather than the braking distance.

Question 2

2.1 – Around half of students gave the correct response of ‘halogens’. The other two responses were fairly evenly split.

2.2 – Around two-thirds of students gave the correct answer of iodine. The most common incorrect response was fluorine.

2.3 – Around two-thirds of students gave the correct electron configuration of ‘2,7’. The response ‘2,3,4’ was the most popular incorrect response.

2.4 – The answers were fairly evenly split between the three responses, with the correct response of ‘small molecules’ being slightly more popular.

2.5 – Around one-fifth of students did not answer this question. Slightly fewer than one-fifth gave the correct answer of ‘potassium iodide’. There was a wide variety of other responses, including ‘potassium iodine’, various other potassium compounds, other common chemicals and words which had no relevance to the question.

2.6 – Although most students attempted this question, they appear to find this topic difficult. Some filled in parts of the table, but not all. It appeared that the majority of students who answered the question placed ticks and crosses randomly. Only a small minority (around 7%) scored all 3 marks.

Question 3

3.1 – Around two thirds of students gave the incorrect response of 'L' for the position of the ammeter. The correct response of 'J' and the incorrect 'K' were fairly evenly divided, with slightly more opting for the correct response.

3.2 – Around 10% of students did not answer this question. The majority drew the symbol correctly. Common incorrect responses were symbols for resistors, cells and switches.

3.3 - Most students drew a neat line with a ruler through the points shown. A few drew freehand lines, which usually were wobbly and therefore did not gain the mark. A few students, possibly thinking that they needed to have the same number of points above the line as below, drew a line which was steeper than the true best fit line - this did not gain the mark.

3.4 – Around three-quarters of students gave a correct answer, either from their graph or recognizing the pattern that the resistance was increasing by 12 ohms each time, therefore 5 resistors would have a resistance of 60 ohms.

3.5 – The answers to the first part of the question were fairly evenly divided between the three options. Many left the second part of the question unanswered, possibly indicating that the first part was just a guess. Of those who attempted the second part, very few gave a correct explanation as to why the data showed that resistors were arranged in series.

3.6 – Around 7% of students did not answer this question. Of those who did, the vast majority gained both marks for performing the calculation correctly. The most common incorrect response was to divide the two given values instead of multiplying.

Question 4

4.1 – Very few students knew that gold was unreactive. Of the many different answers given, the two most common were 'it is formed underground' and 'it is a compound'.

4.2 – Around half of students gave the correct response of 'electrolysis'. The other two responses were fairly evenly divided.

4.3 - Around half of students chose the incorrect response of O^{2+}. The next popular response was the correct answer of O^{2-}.

4.4 – Fewer than half of students gave the correct answer of 'carbon'. Incorrect responses were fairly evenly spread amongst the other chemicals in the equation, and also a few additional ones such as water and carbon monoxide.

4.5 – Common answers which gained marks were 'less mining' and 'less waste produced'. There were many responses of the type 'more environmentally friendly' and 'less pollution' – these were insufficient to gain a mark.

4.6 – Around 40% of students were able to perform this calculation correctly. One common error was to divide 420 by 100. Another was to divide 420 by the sum of the two values of 420 and 560.

4.7- It appeared that many students did not understand the term 'property' as the majority of answers did not state a property – 'iron' and 'steel' were common responses. Of those who gave a property, the melting point was the most common incorrect answer. Fewer than 10% of students gave the correct answer that steel is magnetic.

Question 5

5.1 - Around three quarters of students gave the correct response of 'measuring cylinder'. Of the incorrect responses, most chose 'beaker' and some chose 'test tube'.

5.2 – Around one-third of students gave the correct answer of 'balance' or 'scales'. Many gave 'scale' which did not gain the mark. Other frequently seen responses were 'measuring cylinder' and 'test tube'.

5.3 – Around one-third of students gave a credit-worthy answer by saying that inserting the stopper quickly would reduce or prevent the escape of gas produced in the reaction. Quite a few answers were too vague, eg 'to make it more accurate'.

5.4 – Around 70% of students gained a mark for saying that the volume increased as time went on. Some gained a second mark for saying that the volume eventually stayed constant. A number of students had the correct idea of this but described the shape of the graph ('plateaus' or 'straight line') rather than referring to the volume of gas.

5.5 – More than half of students performed the calculation correctly, although often confused the unit as s/cm^3. Many took the value of volume at 150 seconds (the end of the graph line), instead of the 30 seconds asked for.

5.6 – Around half of students answered both parts correctly, with a further one-fifth gaining one of the two marks.

5.7 – The responses were fairly evenly split, with slightly more choosing the correct response of 'activation energy'.

Question 6

6.1 – Fewer than half of the students gave the correct option of 'outer core'. 'The mantle' was the most common incorrect response.

6.2 - The responses were fairly evenly split, with slightly more choosing the incorrect second diagram.

6.3 – Around half of students recognised 'current' as a control variable. The next most common response was 'dependent variable'.

6.4 – Around 14% failed to answer this question – perhaps they did not realise it was a question as there was no answer line. Around two-thirds circled the correct anomalous result. Various incorrect values were circled, including whole lines or columns.

6.5 – Around half of students realised that the anomalous result should not be included when calculating the mean. A few thought that the student should make up a number similar to the other two values, and a few thought that you would include the anomaly in the calculation of the mean.

6.6 – Whilst the majority of students read the correct value from the graph, there was also a significant number who did not give the correct answer. It appeared that a lot of students had taken the value at 80 turns of wire (the end of the graph line).

6.7 – A small number drew a line above the original line, some drawing it curved and others straight. The vast majority just extended the given line to the edge of the graph grid. Nearly one-third of students did not attempt this question, possibly because they did not realise it was a question as there was no answer line.

Question 7

7.1 – Nearly one-quarter of students left this unanswered. It appeared that students did not know how to calculate the area of a triangle as only around 4% scored the two marks for this question. The most common (incorrect) response was to multiply 0.6 x 6 = 3.6.

7.2 – As in the previous part, nearly one-quarter of students did not attempt this question. Of those who made an attempt, around half scored both marks. A common error was to take two correct values for Δx and Δy but divide them incorrectly.

7.3 – The three responses were fairly evenly divided, with the incorrect ‘distance’ being a slightly more popular choice.

7.4 - Despite the instruction to select two responses, around one quarter of students selected only one. There were several combinations for two responses, which were fairly evenly spread in the number of times they were chosen. The correct combination of ‘greater deceleration’ and ‘maximum height less’ was slightly more popular than any other combination.

7.5 – The correct answer of 10.0 m was given by around half of the students. The incorrect response of 5.0 m was chosen by the majority of the remaining students.

7.6 - The responses 0.0 m and 5.0 m were fairly evenly divided, with the correct 0.0 m being a slightly more popular choice

Question 8

8.1 – Fewer than 10% of students gave the correct answer of ‘water’. A common incorrect response was ‘hydrogen’.

8.2 – Around 40% of students did not attempt this question. Of those who made an attempt, many did not describe a test but wrote some correct or incorrect fact about carbon dioxide. Of those who described a test, the ‘squeaky pop’ was the most common response. Only around 5% gave the correct test.

8.3 – Many students did not seem to appreciate the term ‘mass’, so gave answers such as measuring the temperature or the time. A few students had the correct idea but did not refer to mass, eg, ‘measure how much fuel before and after’, ‘find the amount of fuel…’ etc. Around 10% of students scored both marks.

8.4 – Around one-quarter of students were able to give a correct control variable, the most common being the volume of water. ‘Amount of water’ was insufficient to gain the mark.

8.5 – Many students picked out that fuel C either had the highest temperature increase or had the least amount of fuel burned, but few gave both reasons. Some students did not score marks because their answers were imprecise, eg, ‘the temperature went up’, ‘it burnt 1.23 g of fuel’, etc.

8.6 – This question was not answered very well, many indicating that it would stop other gases from getting in or protect the students. Many had the correct idea, but were imprecise in their wording, eg, it stops energy from escaping to the surroundings, it keeps all the heat in the water, etc.

8.7 – Around one-fifth of students gained a mark. Some students seemed to have forgotten that the question related to heating water, giving answers referring to mixing the chemicals or making sure all the chemicals reacted together.

Question 9

9.1 –Students found this question very difficult and around one-third did not attempt it. Students did not seem to realise that they needed to give detail in their answer, eg, how to measure the height, what range of heights, what increments, etc. Many went into detail about how the various pieces of apparatus were connected, just repeating what the diagram showed – there was no credit for doing this. Some students described variations of the experiment, eg doing it with different torches, using different solar cells, etc. Around one-third of those who wrote something, scored no marks. Only around 5% scored more than 2 marks out of 6.

9.2 – Around one-fifth of students gave the correct range of values, realising that the LED emits light when there is a current through it. Incorrect responses commonly seen were ‘0 to 3.7 V’ and 0.21 to 3.7 V (0.21 being the value of the current when the potential difference was 3.7 V). A few answers did not give values but had statements such as ‘from electricity to light’, etc.

9.3 – Over three quarters of students gave the correct response of V = I R.

9.4 – Around one-fifth of students gained all four marks for this question. A large number of students mis-read the value of current from the graph as 0.9 A instead of 0.09 A. They were able to gain some marks if they used this value in the correct equation to work out a value of resistance consistent with the incorrect current value. Many students were unable to re-arrange the equation in terms of resistance.

9.5 – Around one-third of students did not attempt this question. Of those who answered, the majority stated that the resistance increases – it appeared from some of the answers which had further detail that the students thought the graph was showing resistance against potential difference. A few described the relationship between current and potential difference but did not address the resistance.

Question 10

10.1 – Around 15% of students left this blank – despite it being near the end of the paper, it did not appear that students were running out of time. Around one-third of students correctly chose 'power output' as the advantageous feature, giving a suitable reason such as generating more electricity. A number of students have the erroneous idea that wind turbines are creating wind. A large number did not seem to understand the question and gave an advantage of the bladeless turbine, usually that it did not present a risk to flying birds. Some did not seem to realise that the 'feature' asked about had to be one of the features given in the table.

10.2 – Around 20% of students did not answer this question. Many did not realise that the question was asking them to describe the relationship shown by the graph (figure 9). Of those who did, most referred to the power output increasing as the frequency increased, scoring one mark, but did not describe the relationship further. Many students seemed to be answering the question 'why does the frequency change?' by referring to wind and weather conditions.

10.3 – Around four-fifths of students gave the correct response of Q= I t.

10.4 – Around half of students were able to re-arrange the equation and correctly calculate the time. The most common error was multiplying the two values given. Whilst most realised that time was measured in seconds (or minutes or hours if converted), there were some unusual units given for time, eg, amps, newtons, cm^3 etc.

Mark Ranges and Award of Grades

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