GCSE

COMBINED SCIENCE: TRILOGY

8464/P/1H Paper 1 Physics
Report on the Examination

8464/P/1H
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General

Overall, the majority of students were able to attempt every question on the paper. Towards the end of the paper, where the level of demand of the questions increased, there were more students who did not attempt some question parts.

Levels of demand

Questions were set at three levels of demand on this paper:

- **standard demand** questions were targeted at students working at grades 4-5.
- **standard/high demand** questions were targeted at students working at grades 6-7.
- **high demand** questions were targeted at students working at grades 8-9.

A student's final grade is based on their attainment across the qualification as a whole, not just on questions that may have been targeted at the level at which they are working.

Question 01 (Standard demand)

01.1 Approximately 85% of students identified geothermal as the renewable energy resource.

01.2 About a third of students knew that giga means 10^9.

01.3 Students found this question to be quite accessible, and wrote a fair amount in their answers, with only about 1% omitting any attempt at an answer. Over 40% of students gave answers which included explanations for trends shown in the graphs, which placed their response into level 3.

Many students were not clear in their use of English. A fair proportion of students stated that there was more wind than sun to explain why power output from wind turbines often exceeds power output from solar panels, which was ignored. Many students also wrote about the demand for electricity over time increasing because more electronic devices were used so more electricity was needed. Statements such as this were also ignored when marking this question.

Some students attempted to explain the increase in power output from solar panels in the middle of the year by referring to temperature or to hotter months, rather than attributing this increase to greater light intensity or more daylight hours.

Question 02 (Standard demand)

02.1 Nearly 40% of students scored this mark, with just under 10% of students not attempting the question. It was very common for those who did attempt the question to place the voltmeter on the left side of the circuit in series with the battery.

02.2 Only about 15% of students gained 1 mark or more on this question. It was very common for students to think that resistors in parallel must have the same value, or that the unknown resistor must also be 20 ohms. It was also common to think that the values of the resistors added in parallel. Many students demonstrated confusion between current, potential difference, and

resistance, and it was not uncommon to see incorrect statements that resistance in parallel is shared, for example.

Some students stated that the switch was open so resistance could not be measured, and some of the students who had missed out question 02.2 stated that there was no voltmeter so resistance could not be calculated.

02.3 Almost all students wrote down the correct equation which was given on their equations sheet this year.

02.4 While nearly two thirds of students used the equation and scored 1 or 2 marks, only about a quarter them correctly converted milli-amps to amps and gained all 3 marks on this calculation. It was reasonably common for students to recognise that they needed to do this conversion, but to use a factor of 100 rather than 1000. Some students incorrectly decided to double their answer because there were two resistors, which unfortunately led to them gaining no marks for this question.

02.5 The majority of students gained at least one mark for plotting the graph, but only about 40% gained all three marks. Many thought that the line of best fit should be straight rather than curved.

02.6 About 60% of students gained this mark, which was for reading the value consistent with their line of best fit – whether this was curved or straight – from question 06.5. Many students who did not score the mark either read from the wrong axis, or read the scales on the axes incorrectly.

02.7 Very few students could identify this as a random error. Common wrong answers included human error and mechanical errors.

02.8 About a quarter of students gained full marks on this question, but about 45% scored no marks. It was reasonably common for students to read the percentage from the ends of the lines, and base their evaluation on a reading of 80%, which gained no credit.

Question 03 (Standard/high and high demand)

03.1 Just over half of all students gained at least one mark on this question. Many students seemed to think that greater efficiency means that energy is transferred at a greater rate. It was also common for answers to suggest that the transformer either increases or decreases resistance, which was ignored.

03.2 Slightly less than 60% of students gained full marks on this calculation. Many students who did not score anything attempted to use $V=IR$ for the primary coil and then the secondary coil. Students who used the correct equation but gained or lost a zero in their answer at some point could score a maximum of 2 marks.

03.3 Only about 25% of students answered this multiple-choice question correctly. This was the third most common answer, with more students selecting that current is dissipated to the surroundings, and that the cables have electrical resistance.

03.4 About a quarter of students scored at least one mark, but very few gained more than this. Some thought that the LDR was an LED, suggesting that as it gets darker the LDR needs to emit more light so the current must increase, for example. Some thought that the total resistance of the circuit must remain constant, so as the resistance of the LDR decreased, the resistance of the fixed resistor must increase. Many students struggled to express themselves, finding it difficult to

express which potential difference they were writing about – the potential difference across the battery, the fixed resistor or the LDR.

03.5 Approximately a fifth of students gained all 4 marks, with about half of all students scoring 3 marks on this calculation. Many students did not attempt to convert mA to A, and of those who did many conversions were incorrect. Of the students scoring 0 marks, it was reasonably common for them to neglect to square the current when using $P = I^2 R$.

Question 04 (Standard, standard/high and high demand)

04.1 Only about a fifth of students correctly identified peer review as the process. It was common for students to suggest peer assessment, and some students wrote about double-blind trials.

04.2 About 35% of students answered this question correctly. Many students answered by giving a type of radiation (alpha, beta, or gamma) rather than stating a property.

04.3 Just under a quarter of students gave the correct unit. Phonetic spelling was acceptable, but if students abbreviated their answer to Bq, they had to use a capital B and a lower case q.

04.4 About 20% of students scored at least 1 mark on this question. Some suggested the idea of background radiation, which was not relevant to answering the question and is not mentioned on this specification. A number of students confused count-rate with half-life, and some students suggested that the radiation would be too fast for the detector to detect.

04.5 Approximately 55% of students identified that alpha radiation was emitted by the source, but only about a fifth of students could explain how the data showed this. Stating that alpha has a low range in air was too vague to gain the mark. Other answers which were insufficient for the second marking point included that it was alpha because as distance increases the count rate decreases.

04.6 Around a third of students gained all three marks on this calculation, with most other students scoring no marks. It was reasonably common for students to calculate 1568/98, and decide that 16 half-lives had passed, which scored no marks. Another common incorrect answer was to find the value halfway between 1568 and 98.

04.7 Just over 70% of students selected the correct answer, that radioactive decay is a random process.

Question 05 (Standard/high and high demand)

05.1 Around half of students gained at least 1 mark on this question. There were many acceptable ways to describe the toy being at eye level in position B. A fair number of students suggested that in position B the student could push down harder on the toy so that it would reach a greater height, which missed the point of the question and tended to score no marks.

05.2 About 85% of students gained at least 1 mark for this calculation, with about 20% scoring full marks, about 25% on 4 marks and about 15% on 3 marks. Most students did not attempt to convert the height into metres. Many students struggled to give the answer to 2 significant figures, perhaps caused by students not understanding how their calculators were giving the answer in standard form. So, for example, 7.8125×10^{-3} as an answer might have been rounded to 7.8 without any power of 10 shown.

05.3 Approximately a quarter of students scored at least 1 mark, with many not knowing how the specification defines a closed system.

Question 06 (Standard, standard/high and high demand)

06.1 Approximately 35% of students scored 2 or 3 marks for their explanation. Explanations of gas pressure need to mention the idea of particles, and those who did not mention particles (or atoms, molecules etc.) scored no marks. Those who did mention the idea of particles often mentioned collisions but did not state that the collisions were between particles and the wall of the container. It was also common for students to say that the number of collisions increased, but not include any reference to rate of collisions or to a time period.

06.2 Slightly more than half the students scored at least 1 mark, although only the best students gained both marks on this question. It was quite common for students to refer to plastic having a lower melting point than metal, which was ignored. A fair number of students contradicted themselves by stating that metal is a good thermal conductor and a good insulator so that it keeps the coffee hot, which gained no credit.

06.3 Only a very small proportion of students identified that the property is (a low) specific heat capacity.

06.4 A little less than 50% of students suggested a valid way to increase the speed.

06.5 Roughly 30% of students scored 2 marks, and just under 25% scored all 6 marks on this extended calculation. About 20% of students gained no marks at all. Most students got as far as calculating the mass of 0.209 kg. The majority of students did not convert 15kJ to J, and many then incorrectly re-arranged the specific heat capacity equation.

Mark Ranges and Award of Grades

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