GCSE

COMBINED SCIENCE: TRILOGY

8464/P/1F Paper 1 Physics (Foundation)
Report on the Examination

8464/P/1F
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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.

This year almost all students did appear to have access to a calculator, with less evidence of students working out answers on paper than last year.

Levels of demand

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

- low demand questions were targeted at students working at grades 1-3
- standard demand questions were targeted at students working at grades 4-5.

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 (Low demand)

01.1 Approximately half of all students identified the type of radiation.

01.2 Slightly more than 40% of students recognised that an alpha particle has 2 protons.

01.3 About two-thirds of students chose the correct value for X.

01.4 Just under two thirds of students chose the correct activity.

01.5 Nearly 80% of students scored full marks in this simple calculation, with the majority of the remaining students gaining no credit. Common mistakes were losing a zero somewhere in the working, multiplying the two numbers together rather than dividing.

01.6 Nearly 50% of students gained some credit on this question, although only about a fifth of students scored both marks.

Many students did not state the effect of the lead on the count-rate, with a fair proportion writing that there were fewer counts and making no reference to rate or a time-frame. A small minority of students stated that the lead stopped the gamma from being emitted by the source, which is incorrect and gained no credit.

It appeared that some students misread the question and described the effect of the radiation on the lead, giving a description of the lead being irradiated rather than describing the effect on the count-rate.

01.7 Around 40% of students knew that the lead was exposed to gamma radiation, with the remaining students being split more or less equally between the other two options.

01.8 Just over 40% of students identified that gamma radiation consists of electromagnetic waves.

01.9 Roughly a third of students gave a correct answer. It was very common for students to state that using the long tongs made it less likely for the radioactive source to touch the skin. Many students stated that the radioactivity could travel through the tongs. It was reasonably common for students to think that it was being held by tongs so that it could be safely held above a bunsen burner. A small, but noticeable, proportion of students gave statements indicating that they thought the radioactive source was hot, or could electrocute you, or could explode, which was why the tongs were needed.
There was some confusion from a small proportion of students about the difference between radiation and radioactivity. These students tended to give answers describing longer tongs reducing the exposure of the scientist to radioactivity, rather than to radiation, which was not creditworthy.

Question 02 (Low demand)

02.1 Just below 50% of students knew that the gravitational potential energy decreases.

02.2 About 70% of students knew that the kinetic energy decreases.

02.3 Nearly 90% of students answered this question correctly. The most common mistake was from students who calculated 2.5 × 9.8, but did not then multiply by the height of the block above the ground.

02.4 Just over four fifths of students gained both marks in this kinetic energy calculation. The most common error was to forget to square the value for speed.

02.5 Slightly less than half the students recognised that friction transfers energy to the surroundings.

02.6 Nearly 90% of students gained at least 1 mark for this explanation, most commonly for identifying that the speed would increase. Many students were not using physics terms to describe the effects of oiling the wheel, with many just saying it would be more slippery. This was insufficient to gain marking point 2. A fair proportion of students stated that the oil would make the wheel wet, or that it would prevent rust, neither of which gained credit.
It did not matter where students thought the friction was being reduced: some stated that friction between the wheel and the zip wire would be reduced, while others had the friction between the wheel and the axle. As long as they had the idea of reduced friction, they scored marking point 2.

Question 03 (Low demand and standard demand)

03.1 Nearly 90% of students gained both marks for this calculation. A fairly common incorrect method was to subtract 50°C from 420 J/Kg°C, and give a value for the temperature change of 370°C, which gained no credit.

03.2 Slightly less than 40% of students selected the correct meaning for internal energy. It was (very) slightly more common for students to think that internal energy is the energy added to the steel particles as they are heated than to select the correct answer.

03.3 About 70% of students chose the correct statement describing the particles in a solid.

03.4 Approximately 45% of students knew the mass of steel stays the same.

03.5 The correct diagram to show the change in arrangement of the particles was chosen by over 95% of students.

03.6 Roughly two fifths of students answered this correctly. Many students wrote about the motion of particles, which was ignored, rather than the arrangement of particles. Students who stated that the particles spread out but remained in contact with each other scored this mark.

03.7 Just over three quarters of students recognised that melting is a physical change.

03.8 Over half of the students gained full marks on this question. Almost no students gained 1 or 2 marks, but about 10% did not attempt it at all. Evidence of a relevant calculation had to be shown before any credit could be awarded. So, for example, students who calculated the average of 2, 4.5 and 7 and came up with an answer of 4.5 g, and then selected medium carbon did not score any marks.

03.9 Nearly 60% of students gained full marks on this standard demand calculation. A small proportion of students attempted to convert 4.0 kg to g, which limited them to a maximum mark of 2.

Question 04 (Low demand and standard demand)

04.1 Slightly more than half the students correctly chose the thermistor, with the variable resistor being the most common incorrect answer.

04.2 Just under 40% of students recognised that current is a flow of charge. The most common answer was that current is a flow of energy, which did not gain any credit.

04.3 About 60% of students scored at least 1 mark on this question, but less than one in ten students gained full marks. Many students just put the thermistor near to the beaker of water or near to the kettle, so that recording the resistance would not give a relevant measurement. Some measured the resistance of the water rather than the resistance of the thermistor. It was not uncommon for students to pour the iced water or boiling water on the ground and then put the thermistor in the ground. Few students organised their answer into a logical sequence.

04.4 Over 40% of students correctly identified the trend as non-linear.

04.5 About half of the students gained both marks for this calculation, with the majority of the remaining students gaining no credit. Many of those who did not score calculated the change in temperature rather than referring to Figure 5 and determining the change in resistance.

04.6 Only about 85% of students correctly wrote down the equation, despite the equation being given on the Equation Sheet this year. Over 5% of students did not attempt this question.

04.7 Nearly 70% of students scored at least one mark, with about 65% gained full marks for this calculation.

Question 05 (Standard demand)

05.1 Approximately 60% of students identified geothermal as the renewable energy resource.

05.2 Only about a fifth of students knew that giga means 10^9.

05.3 Many students found this question to be quite accessible, and wrote a fair amount in their answers, although about 1 in 10 students did not attempt this question. About a third of all students' responses were in level 1, giving answers which tended to describe trends in the graphs but not give any attempt to explain the trends or begin to suggest any reasons for the trends. About a third of students gained marks in level 2, giving answers which were better than simple descriptions of the graphs, but tended not to give full explanations for any trends. Just over 10% scored marks in level 3, for giving explanations of trends shown in the graphs.

Many students were not clear in their use of English, and it was common to see statements such as "It is windier than it is sunny," which were ignored. It was also relatively common for students to think that the *y*-axes represented the number of people using wind power or solar power, rather than the power output.

Statements that solar power output increases in the hotter months were ignored. However, an answer that referred to solar output increasing in sunnier months was heading towards an explanation and could lift an answer to a higher level.

Question 06 (Standard demand)

06.1 Less than 10% of students scored this mark, with over 20% of students not attempting this 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.

06.2 Only about 5% of students gained 1 mark or more on this question. It was very common for students to think that resistors in parallel have to 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 thought that the value of the resistors should be multiplied, but that nothing can be multiplied by 20 to make 26. Very few realised that as resistors are combined in parallel, the total resistance decreases.

06.3 Nearly 90% of students wrote down the correct equation.

06.4 While nearly three quarters of students used the equation and scored 1 or 2 marks, only a very small proportion of students 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.

06.5 About four fifths of students gained at least one mark for plotting the graph, but only about 15% gained all three marks. Some students did not label the axes, and a fair proportion labelled them X and Y. Many thought that the line of best fit should be straight rather than curved.

06.6 Just over a quarter 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 values from 4.8 ohms rather than 4.4 ohms because they did not read the scale correctly.

06.7 Very few students could identify this as a random error. The question was not attempted by about 1 in 10 students. Common wrong answers included human error and mechanical errors.

06.8 About a fifth of students gained marks, with another fifth not attempting the question at all. 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.

Mark Ranges and Award of Grades

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