AQA

GCSE

COMBINED SCIENCE: TRILOGY

8464/P/1F: Paper 1 – Physics (Foundation)

Report on the Examination

8464
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General

Overall, the majority of students were able to make an attempt at every question on the paper, although as the level of demand increased towards the end of the paper, particularly in questions 5 and 6, there were more students who did not attempt some question parts.

In calculations there seemed to be far fewer students this year who were doing calculations without a calculator.

The handwriting of numbers was far more ambiguous than in previous years, with fours that look like sevens, sevens that look like fours or like nines, ones that look like sevens, threes that look like fives, zeros that look like sixes and many other variations. In most cases it was possible to work out what number was intended by looking at handwriting elsewhere in the exam paper.

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 This multiple-choice question was answered correctly by around 80% of students.

01.2 Slightly more than 40% of students answered this question correctly.

Many students gave the answer of voltmeter, perhaps suggesting that they did not read the word "adjust" in the question.

01.3 Just under 40% of students answered this question correctly.

01.4 Nearly three quarters of all students gained both marks in this calculation.

Some students incorrectly tried to use the number 2.5 in their calculations, for example adding the three currents and dividing by 2.5, or by adding 2.5 V to the sum of the currents before dividing. These responses gained no marks.

01.5 Nearly 90% of students correctly substituted into the equation and calculated the correct answer.

01.6 Almost 90% of students gained both marks for this calculation.

01.7 While almost all students gained at least one mark on this question, only about 15% gave both correct answers.

01.8 Around 60% of students identified the correct graph.

Question 02 (Low demand)

02.1 Approximately half of all students used the diagram to work out that the counterweight and the lift would move through the same distance.

02.2 Only about 40% of students realised that the gravitational potential energy of the counterweight would decrease as it moved down.

02.3 Just under 90% of students gained both marks in this calculation.

02.4 About half of all students gained at least 1 mark, with about 15% gaining both marks.

It was more common for students to identify that the kinetic energy of the lift would decrease, than to identify that the internal energy of the brakes would increase.

02.5 Nearly 90% gained at least 1 mark, with just under 40% ticking both of the correct boxes.

02.6 Just under 70% of students scored both marks.

The fact that extension should have been squared was missed or misunderstood by a fair proportion of students, who either calculated 0.5 × spring constant × extension, or calculated (0.5 × spring constant × extension)^2.

02.7 About half of all students gained this mark.

Question 03 (Low demand and standard demand)

03.1 Just under half of all students were able to identify the correct nuclear equation.

03.2 Slightly less than 45% of students recalled that alpha radiation can travel a few centimetres in air.

03.3 Nearly three quarters of the students knew that paper stops alpha radiation.

03.4 Only about 40% of students identified the symbol for a beta particle.

03.5 Approximately a quarter of students gained the mark for this calculation.

Many students added 7 to 119, while a large number of students appeared not to understand the symbol ±, and divided or multiplied the two numbers.

03.6 Only about 5% of students correctly identified all three variables, with about 10% giving two correct answers. Approximately 55% of students gained at least one mark.

03.7 Nearly 60% of students gained at least one mark on this question, with the vast majority of these describing the decreasing count rate with increased distance from the source.

Some students incorrectly identified this as an inversely proportional relationship. The range in air of nuclear radiation helps to distinguish between alpha, beta, and gamma radiation, but very few students commented on the maximum distance travelled.

Question 04 (Low demand and standard demand)

04.1 Just under half of all students gained both marks on this question, with very few students gaining just one mark.

Common incorrect answers included attempts to subtract 7.5°C from 30 seconds, or attempts to convert time into minutes, as well as answers dividing 30 seconds by 7.5 °C.

04.2 The vast majority of students correctly drew the bars, but labelling the y-axis was far more problematic for students. A fair number of students labelled the axis, but forgot to include units, or included an incorrect unit. However, a very large proportion of students labelled the vertical axis "Y".

04.3 Nearly 90% correctly identified Y as the best thermal insulator, but only about 15% were able to give the correct reason.

Most students referred in their answer to the final temperature, but did not mention the change in temperature. It was also not uncommon for students to talk about "heat", which did not gain any credit.

04.4 Only about 15% of students selected the correct temperature.

04.5 Slightly more than 85% of students gained both marks for this calculation.

A common mistake was to attempt a spurious conversion of kg to g. Students who did this were awarded a maximum of 1 mark for this question.

04.6 Only about a fifth of students gained this mark.

04.7 About 85% of students wrote the correct equation, although the students had an equation sheet listing all equations this year.

For the students who did not gain the mark, many looked at the symbols for resistivity (ρ), mass (m) and volume (V), and then looked at the equation sheet to find the equation linking momentum (p), mass (m) and velocity (v).

04.8 Just over half of all students gained all 3 marks in this calculation, with about 10% gaining 2 marks.

Many of those who made mistakes saw that the unit for volume is cm^3 and therefore decided to calculate 0.186^3 as part of their answer; some calculations also included 0.300^3.
Despite the question asking for the answer in grams, and needing no conversion to achieve this, some students attempted to convert to kg, which led to a maximum possible mark of 2 for this question.

Question 05 (Standard demand)

05.1 About 15% of students gained all three marks on this question, with around 80% failing to score any marks. Nearly a fifth of students did not attempt this question.

Errors were made reading the graph, with a fair number of students misreading the scale to obtain an incorrect peak value for gas, leading to a maximum mark of 2 on this question. It was common for students to think that the peak value of demand was the maximum value on the y-axis, which prevented any marks from being scored. Some students tried to determine the total supply and demand at 6 pm, which resulted in no marks being awarded.

05.2 Over half the students chose the correct energy resources.

05.3 Just over one in ten students recalled the name of the national grid. Nearly a quarter of students did not attempt this question.

Many students thought that the question was referring to a wifi signal, a mobile phone signal, or the internet. In many cases this led them to try to answer question **05.4** by also writing about mobile phone networks or wifi signals, which they were unable to do successfully. Some students gave answers such as national power grid, or national electricity grid, which did gain the mark.

05.4 Only slightly over 5% of students gained any marks at all on this question. Over a quarter of students did not attempt the question.

There was a clear misconception among many students that greater efficiency referred to increased rate of delivery of electricity. It was not uncommon for students to suggest that a step-up transformer increases the speed of the current so that electricity can get to consumers more quickly. Some students thought that a step up transformer physically lifted the cables up above the ground. It was reasonably common for students to suggest that step up transformers were positioned high above the ground to ensure better network coverage, or that they give a better signal with fewer connection issues, which seemed to correspond with responses to question **05.3** about mobile phone networks or Wi-Fi networks.

Question 06 (Standard demand)

06.1 Nearly 70% of students gained some marks on this question, with about a third of students accessing level 2 of the mark scheme and gaining 3 or 4 marks. Only about 5% of students gave answers which scored in level 3.

It was clear that a lot of students were not aware of what a top pan balance is, with many thinking that it is a device to help prevent things from falling over, or that the pan of the top pan balance was to be used for heating the oil. As a consequence of this misunderstanding, a very large number of students placed the top pan balance on the heater. Many students, who did know what a top pan balance is, thought that it would be used to find the weight of oil, rather than the mass of oil.

While most students realised that the thermometer should be used to measure temperature, some students measured the heat with the thermometer, which was not worth any credit.

The joulemeter was often confused with a voltmeter, or students did not appreciate the function of a joulemeter. Common suggestions included setting the joulemeter to 10 and leaving it for a fixed time, for example.

A lot of students did not mention the measuring equipment at all, and simply stated that they would weigh the oil and measure its temperature. Students who did this could gain some credit but were unable to access level 3 on the mark scheme.

Many students described the wrong experiment, instead of finding the boiling point of the oil, carrying out a cooling-curve experiment, or describing how to use an immersion heater to find the specific heat capacity of a block of metal. These responses could still gain some credit, for example by correctly stating how to use the thermometer.

06.2 Approximately half the students could identify the risk when using the given equipment.

It was clear that many students were unable to distinguish between risks, hazards, and precautions. Some students did not talk about safety at all, instead suggesting that a risk might be inaccurate results, for example.

06.3 Nearly 90% of students chose a correct equation from the equation sheet.

Some students omitted important parts of the equation, such as the equals sign, and therefore did not gain the mark.

06.4 Over 60% of students gained full marks on this question, with just over a quarter of all students who attempted the question gaining 0 marks.

Students who started the question by using the equation $E = P\,t$ tended to make fewer mistakes when rearranging than those who used the equation $P = E / t$.

06.5 Fewer than 5% of students recognised that the electrical component whose resistance decreases as temperature increases is a thermistor.

06.6 Just over 10% of students gained both marks, with a further 20% gaining one mark on this question. About 1 in 5 students did not attempt this question.

Some students misread the temperature scale, deciding that the maximum temperature reached was 152 °C or 170 °C, for example. Some students thought that the relevant temperature was the change in temperature of 140 °C. Of those students who correctly read 160 °C from figure 12, but did not then use figure 11, many decided to divide the temperature by a time read from the graph. Some students used their temperature with the maximum resistance of 1000 Ω shown on figure 11.

Students who read 160 °C on figure 12, but decided that this was the resistance of the resistor by writing 160 on the answer line, gained no marks.

06.7 About 20% of students chose the correct answer to why this was a physical change.

Mark Ranges and Award of Grades

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