GCSE
PHYSICS

8463/2H
Report on the Examination

8463
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General Introduction to the November Series

This has been an unusual exam series in many ways. Entry patterns have been very different from those normally seen in the summer, and students had a very different experience in preparation for these exams. It is therefore more difficult to make meaningful comparisons between the range of student responses seen in this series and those seen in a normal summer series. The smaller entry also means that there is less evidence available for examiners to comment on.

In this report, senior examiners will summarise the performance of students in this series in a way that is as helpful as possible to teachers preparing future cohorts while taking into account the unusual circumstances and limited evidence available.

Overview of Entry

The entry for this examination was much smaller than that of the usual Summer series at only 435 students.

Levels of demand

Questions are set at three levels of demand for this paper:

- **standard demand** questions are designed to broadly target grades 4–5
- **standard/high demand** questions are designed to broadly target grades 6–7
- **high demand** questions are designed to broadly target grades 8–9.

A student's final grade, however, 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.

Comment on Individual Questions

Question 1 (Standard demand)

01.1 Approximately 85% of students identified the correct change to the apparatus.

01.2 To gain credit, the suggestions should be feasible. The most popular correct answers were 'to add a pulley' and 'lubricate the string'.

01.3 Suitable scales should cover at least half of the graph paper and start at the origin. Lines of best fit are either straight as in this case or smooth curves, never 'wiggly' lines. Approximately 70% of students scored all four marks.

01.4 Students should understand that 'direct proportion' and 'positive correlation' do not have the same meaning.

01.5 The question was about improving this investigation and not changing to a different investigation. Those students scoring one mark generally did so for the idea of 'repeating the investigation'. A significant number of students added 'to take a mean' but did not score the mark as the idea of 'ignoring anomalies' was omitted.

01.6 Approximately 88% of students were able to recall this equation.

01.7 This calculation was generally well answered, although a significant number of the students failed to give the answer to 2 significant figures.

Question 2 (Standard demand)

02.1 The most common error was to give 'fission' as the answer in the second space.

02.2 Just under 70% of students were able to recall this equation.

02.3 This calculation was generally well done. There were errors made with the standard form and in the rearranging of the equation.

02.4 The lifecycle of stars was well known. However many students limited the mark they scored by not giving any relevant detail beyond the stages the star goes through.

02.5 About 50% of students correctly identified the property of the star.

Question 3 (Standard demand)

03.1 Slightly over 78% of students missed the point of the question, that with a wider ray it would be more difficult to determine the centre of the ray. Many of the students simply repeated, albeit in slightly different words the stem of the question.

03.2 Those students scoring zero generally either failed to draw a line of best fit or failed to extrapolate it. This then gave an answer outside of the permitted range. 30% of students scored both marks.

03.3 There were few complete answers given. Some of the students gave a good practical description but failed to finish the description by including obtaining the range of results given in the table. A small minority of the students described an investigation into reflection rather than refraction

03.4 Just over 55% of students were able to estimate the uncertainty.

03.5 61% of students identified the property of the light wave.

Question 4 (Standard and standard/high demand)

04.1 This part was poorly answered. Many students drew the ray diagram for a convex lens.

04.2 75% of students correctly identified how the image changed.

04.3 80% of students knew that the bolt should be made from iron.

04.4 There were some good, clear and logical explanations given. However some of the students failed to link the switch closing to a current in the circuit. The final marking point was missed by a significant number of the students who failed to give an 'action' acting on the bolt i.e. attraction or pulling etc.

04.5 There were many correct answers given with the working out clearly shown. A significant number of the students failed to score all 4 marks as the attempt to convert to metres was incorrect. A smaller proportion of the students tried calculating energy stored. Some of those scored 1 mark for showing a correct conversion from 1.50cm to 0.015m.

04.6 It was not always clear if the students were writing about the spring or the solenoid. The most common way of scoring one mark was for 'increasing the current' or a correct description of how this could be achieved. Answers simply in terms of 'increasing the magnetic field' were insufficient for credit to be awarded.

Question 5 (Standard/high demand)

05.1 Approximately 60% of students understood the meaning of 'conservation of momentum'.

05.2 This calculation was often set out well with working clearly shown. This enabled a significant number of the students to score compensation marks. A large number of the students were able to calculate the initial momentum of both player A and player B but did not know how to then calculate the common velocity after the collision. The minus sign for player B was often missing.

05.3 There were few complete answers seen. Students scoring two marks often stated the time of collision would increase and so decrease the force. The point about time increasing leading to a reduction in the rate of change of momentum or reducing deceleration was rarely seen. As an 'explain' question, simply stating 'force is reduced' was insufficient for any credit to be given.

Question 6 (Standard and standard/high and high demand)

06.1 The majority of the students were able to convert MHz to Hz correctly. A large number of the students did not know the unit of wavelength with the symbol 'λ' being a common incorrect answer.

06.2 Only 3% of students were able to write a complete answer to this question. Many of the students described the final movement of the car rather than what happens in the electrical circuit. A significant number of the students thought that absorbing radio waves would result in sound being produced. Some of the students realised that there would be a current in the aerial but used terms such as 'produce a current' and 'produce an electrical signal' which were insufficient for credit to be awarded.

06.3 The most frequent correct answer was to state that radio waves are transverse and sound waves are longitudinal. Another popular correct answer was the idea of radio waves being able to travel through a vacuum / space. Comparisons of wavelength / frequency did not gain any marks due to the overlapping range of wavelength and frequency of radio waves and sound waves.

06.4 83% of students correctly described the motion of the car during the first 30 seconds.

06.5 The majority of the students knew how to calculate velocity from a straight line graph but failed to realise the significance of the curved line. Those few students that drew an appropriate tangent to the line at 20s generally went on to score all four marks.

06.6 Whilst 25% of the students gained all six marks for this calculation, a significant number of the remaining students gained partial credit for clearly showing the working out, part of which was correct.

06.7 There were very few complete and correct answers to this question. A significant number of the students correctly referred to air resistance increasing with speed but then went on to state that air resistance becomes equal to speed. It was common for answers to be in terms of real cars, the effect of speed on braking distances or the likely increase in accidents.

Question 7 (Standard/high and high demand)

07.1 Many of the students scored one mark for the idea of being able to provide a variable potential difference. A significant number of the students thought incorrectly that it would be the power output that is varied.

07.2 55% of students scored zero, often due to incorrect substitution into the chosen equation.

07.3 This was very poorly answered with very few of the students showing any knowledge of how an alternator works. The vast majority of the students started the explanation by stating that a current flows through the coil, going on to explain with varying degrees of clarity how an electric motor works. A number of the students simply described an alternating current.

07.4 There were many vague answers with only 9% of the students realising the function of the slip rings.

07.5 Very few of the students appeared to understand the question asked. A minority gained one mark for stating that there would be no current. A significant number of the students wrote that the current would be reduced. A statement referring to 'magnetic field' was made by a number of students but usually it was not clear which magnetic field was being referred to - that of the permanent magnets or that produced around the coil.

Concluding Remarks

Students appeared to have enough time to answer this paper and the majority had taken the time to learn the required equations.

Mark Ranges and Award of Grades

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