A LEVEL
PHYSICS

7408/1 Paper 1
Report on the Examination

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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 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

Usually over 20 000 students take this exam. The entry for this exceptional series was significantly lower in number (740 students) and not as strong in terms of performance.

It was very clear that the student outcomes were much lower than typically expected. The mean mark was only 30%, whereas the mean mark for the 2019 entry was 59%. There is no reason to believe that the standards of the two papers were significantly different, however. Despite the fact that students were able to obtain marks on every question, the highest mark was only 73/85. In a typical series we would expect to see students obtaining marks across the full mark range.

The performance of these students in Section A was relatively poorer than their performance in Section B when compared to the 2019 cohort. It may be that this was due to written answers requiring a particular emphasis or details that can be missed by students who have not been prepared thoroughly or have not developed good examination technique. This information and an analysis of the answers suggest that these students found this examination much more challenging than students found similar examinations in the past.

Comments on Individual Questions

SECTION A

Question 1

Although some very good work was evident, there was much evidence of carelessness in the answers seen. Common errors included the incorrect value for the lepton number of a positive muon in 01.1, a failure to identify the uncharged nature of the particles in 01.2 and 01.3, and giving incomplete answers. In 01.4 in particular, many students only compared the rest masses of the particles and went no further.

Question 2

This question about the photoelectric effect proved to be very challenging to a significant number of students. In 02.1, many merely mentioned the threshold frequency without further explanation. Power of ten errors when reading the graph were common in 02.2. Parts 02.3, 02.4 and 02.5 were very poorly answered by the majority of students. A significant number attempted to answer the questions based on simple electricity and $V = IR$, for example. Answers indicated that many

students were unfamiliar with the idea of stopping potential and there was a lot of confusion with work function.

Question 3

This question dealt with the ideas behind double-slit interference using the context of sound waves. It was pleasing to note that many students understood what was meant by *coherence*, but some failed to gain the mark for stating that the phase rather than the frequency was the same. In part 03.2, many students demonstrated an awareness of constructive and destructive interference without explaining how they come about. There was also a lot of confusion between phase difference and path difference. In 03.3, the best answers were by students who realised that the Young slit equation should not be used, and who worked out the path difference from first principles. In 03.4, a surprisingly large number of students failed to identify their answer to 03.3 as the wavelength of the sound. In 03.5, although the question specifically asked for a discussion of the amplitude, many students simply referred to a change in pitch. A large number of students also incorrectly suggested that the speed of the sound waves would change.

Question 4

Much of the work on motion in this question was relatively straightforward and, in a typical series, students would be expected to score well on it. Although the average scores on most of the question parts were higher than the paper average, a large number of errors in basic understanding were seen. In 04.1, for example, many students struggled to work out the area, or suggested that the average speed was the average of the speeds of the three sections. In 04.2, a surprisingly large number of students did not identify the slower response time as the appropriate one for the calculation. Many careless errors in the use of *suvat* equations were also seen in 04.3. It was pleasing to note in 04.4 that several students understood the premise of the question and indicated that the chevrons would be too far apart and therefore people would ignore them or that the car in front would also take some distance to come to rest. Very few fully correct answers were seen in 04.5. Although most students attempted to apply ideas of circular motion, the angle of the slope was largely ignored. Many answers suggesting $N = mg$, or applying the equation of circular motion down the slope rather than horizontally, were seen.

Question 5

Students generally struggle with questions on electricity, but the early parts of this question were answered well. Many students had difficulties with 05.4 which tested assessment objective AO3. The main problem was probably that students were not told what to calculate and therefore struggled to produce a coherent argument leading to a conclusion. The answers seen suggest that students would benefit from much more guidance and practice with questions of this kind. In particular, students should be encouraged to set out their answers logically. To gain marks, the answers to 05.5 had to be at A-level standard. Very many students made vague statements that suggested they had little knowledge of the work on superconductors that is on the specification.

SECTION B

The performance of these students on the multiple-choice questions was poorer than in previous years but not quite so poor as their performance in Section A.

Question 29 proved to be the most difficult, with the majority of students choosing option B. Perhaps these students used $\frac{V}{3}$ as the "lost" volts rather than the terminal pd.

There were several other questions where a distractor was more popular than the correct answer. In question 16 the most popular answer was D. Students choosing this possibly failed to understand the difference between a π and a 2π phase difference.

In question 19 the most popular answer was C. The majority of students failed to spot that the angle given was between the two second-order maxima, rather than the central maximum and the second order.

In question 27 the most popular answer was C. Students choosing this distractor probably believed that the resistance of the thermistor increases with temperature.

Concluding Remarks

In terms of difficulty, this paper was similar to papers set in previous series. The large number of multiple-choice questions means that almost the whole specification is covered every series. The balance of assessment objectives and mathematics content is also very similar year on year.

There were particular areas of the specification, such as stopping potential and the photoelectric effect, that were less well understood than expected. The students' performance was more typical in those topics that have a closer link with GCSE, such as the question about the speed trap and the early parts of the electricity question.

In common with previous series, question parts that assessed AO3 and required students to make a judgement were generally answered less well. It is important that students are prepared for questions that require them to come to a judgement, and where the method used to reach that judgement will not always be explicit.

Mark Ranges and Award of Grades

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