A-LEVEL
PHYSICS

7408/1 Paper 1
Report on the Examination

7408
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General Introduction to the Autumn Series

This has been another 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

Just over 300 students were entered for this examination. This is much lower than the number who are entered for a typical series, where the entry has been over 20 000. As expected, a much higher proportion of the students than usual were external entries.

There was evidence to suggest that the entry was much weaker than a typical series. For example, the mean mark for this examination was 30/85 whereas, for the similar examination in 2019, the mean mark was 50/85. In a typical series we would expect to see several students achieving full, or nearly full, marks. This exceptional performance was not seen in the work of students in this series. The highest mark was 66/85.

Many gaps in knowledge and understanding were seen. In 12 of the 23 items in section A, more than half of the students received zero marks. On average, 11% of students made no attempt whatsoever at these items. In Section B, 14 of the 25 questions were answered incorrectly by more than half of the students with 4% of students on average making no attempt. This is despite the fact that Section B only contains multiple-choice questions.

In several of the answers, little more knowledge and understanding than that expected of a good GCSE student was seen. There were many examples of students being unfamiliar with the specification content.

Comments on Individual Questions

Question 1

Question 01.1 was answered correctly by a majority of students. However, although a mark was available for answers that included the calculation of the number of nucleons, this mark was withheld when the student made any suggestion that what they had calculated was the number of neutrons. This resulted in very few students receiving more than one out of three marks for partial answers.

In question 01.2 many students were familiar with the kinetic energy equation, but had difficulties with the conversion between MeV and J.

Answers to the remaining parts indicated that many students were unfamiliar with the conservation laws or the decay of the kaon into pions, which are both explicitly on the specification.

Question 2
Answers to questions 02.1 and 02.2 were often vague and incomplete, lacking the detail necessary at A-level. This meant that very few students scored full marks on either question.
Question 02.3 proved to be one of the least accessible on the paper. Only the occasional student demonstrated any awareness of the assumptions associated with Young's slits. There are several situations involving two-source interference where the Young double-slit equation is invalid and students should be able to identify them. Despite being told that the equation could not be used, most students ignored this when attempting to answer question 02.4. This meant they could only obtain a maximum of 2 marks for this question.

Question 3
The speed calculation in question 03.1 was completed correctly by the majority of students. It was evident from the answers to question 03.2 that many students failed to grasp the geometry of the situation, or the significance of angle *A*. Although many students were able to use Snell's Law to determine the critical angle, the mark was withheld when they indicated that they believed that the angle being calculated was *A*.
Similar issues with the behaviour of light in an optical fibre were seen in question 03.4. Even those students who realised that light escaped the core at the boundary failed to get credit by omitting the partially reflected ray or drawing the transmitted ray closer to the normal.

Question 4
Circular motion is a demanding topic for many students. Answers to these questions indicated the difficulties students commonly have with the ideas of reaction force, centripetal force and angular speed. The multi-step calculation in question 04.4 proved too difficult for many students, some of whom did little more than work out the Young Modulus, which was not needed. Some of these students made a little progress when they used their calculated Young Modulus to determine a quantity that they could have simply read from the graph. The idea of a safety factor was usually either missed or not understood.

Question 5
Some of the more straightforward calculations in this question were completed successfully by most students and it was pleasing to note how many could successfully solve a quadratic equation. Students generally had more difficulty understanding what the answers represented. Little attempt was made in question 05.5 to discuss the graph in any detail beyond simple statements about what is represented by the gradient and area. A surprisingly large number of students suggested the graph showed the path of the ball, and made contradictory statements because of this.

Question 6
Students often have difficulty with electricity questions at this level. The added complication of a log-log graph proved to be beyond the experience or understanding of many students.

Section B
Several of the multiple-choice questions proved to be extremely difficult. In particular, questions 20, 27 and 29 were answered correctly by fewer than 30% of the students. In question 20 more students opted for B and for C than for the correct answer (D), indicating a lack of familiarity with scale diagrams. In question 27 the most popular answer was B, indicating the difficulties students have with combining resistors, and the second most popular was C, suggesting that students did not understand the difference between open and short circuits. The most popular answer to question 18 was D, probably because the students did not spot that this was a stationary, rather

than progressive, wave. The most accessible questions were 10 and 16, both of which were answered correctly by over 70% of the students.

Concluding Remarks

The standard, range and style of questions used in this paper were similar to those used in previous series. The mathematical difficulty and Assessment Objective (AO) coverage was also very similar. It was clear that many students were unable to make much progress with the questions requiring them to choose their own method, or reach a judgement or conclusion. These are the questions that are designed to assess AO3. Whilst this has been true in previous series, the evidence for it was even stronger here.

Generally the questions on particles were answered well. Other topics which had a strong link to GCSE content were also answered confidently, but often at too low a level to obtain many marks. The poor performance on the question on circular motion and the electricity question indicated a lack of knowledge or understanding in these areas.

Mark Ranges and Award of Grades

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