



A-LEVEL PHYSICS

7408/3BD Turning Points in Physics
Report on the Examination

7408
Autumn 2021

Version: 1.0

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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 100 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 6000. As expected, a much higher proportion of the students than usual were external entries.

There was evidence to suggest that the cohort was much weaker than in a typical series. For example, the mean mark for this examination was 11/35 whereas, for the similar examination in 2019, the mean mark was 17/35. In a typical series we would expect to see several students achieving full, or nearly full, marks. Such exceptional performances were not seen in the work of students in this series. The highest mark was 28/35.

Many gaps in knowledge and understanding were seen. Only one of the 11 question parts had a mean mark greater than 50%, and that was the multiple-choice question (01.4). On average 13% of the students answering each question part made no attempt.

There were many examples where students demonstrated little more knowledge or understanding of the content than that expected of a student who had only studied the core topics. It was clear that many students were unfamiliar with the option content.

Comments on Individual Questions

Question 1

This question discriminated extremely well, with students picking up a range of marks on each question part. Answers which were written clearly and contained the appropriate level of detail were able to score well. In question 01.2 it was clear that students continue to be confused by equations that include both a V for p.d. and a v for velocity. It was pleasing to note how many students were able to identify a value for the wavelength, however. There was evidence of a significant lack of experience with the use of electron diffraction to investigate the de Broglie hypothesis in question 01.3.

Question 2

In order to score both marks in question 02.1 a comment was needed comparing the calculated value for the speed of light with that in the data booklet. This was commonly missed. In question 02.2, many students demonstrated some knowledge of Maxwell's model but few could relate it to

the experiment. Question 02.4 assessed Assessment Objective 3 (AO3) and was not answered well by many students.

Question 3

As usual the levels of response question produced a range of marks and discriminated very well. Few students were able to pick up all six marks, however. There was much confusion between this experiment and the one used to determine the speed of light.

Question 4

This question on relativity proved to be quite difficult for many students. As has been seen in many series in the past, there was much confusion about which reference frame was being considered in the calculation. There were also some poor descriptions of proper time and inertial frames.

Concluding Remarks

The level of difficulty, range and style of questions used in this paper were similar to those of the questions used in previous series. The mathematical difficulty and AO coverage was also very similar. Almost all of the questions proved to be challenging, but it was clear that many students were unable to cope with the questions designed to assess AO3 in particular. There were also many answers that indicated poor knowledge of the specification content.

In general, the question on the electron gun and charge on the electron was the most accessible. The questions on proper time and the discussion of the determination of the speed of electromagnetic waves by interference caused the most difficulties. Whilst these have caused problems in the past, the evidence of difficulty is stronger in this series.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.