

A LEVEL

Examiners' report

PHYSICS B
(ADVANCING PHYSICS)

H557

For first teaching in 2015

H557/01 Autumn 2020 series

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.



Reports for the Autumn 2020 series will provide a broad commentary about candidate performance, with the aim for them to be useful future teaching tools. As an exception for this series they will not contain any questions from the exam paper nor examples of candidate responses.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

A full copy of the exam paper and the mark scheme can be downloaded from OCR.

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Paper 1 series overview

H557/01 'Fundamentals of Physics' component is worth 110 marks and assesses specification content from across all the teaching modules.

Section A consisted of 30 multiple choice questions, each worth one mark.

Section B included five structured short answer questions worth a total of 23 marks. Each question typically examined a single context. To do well on this section candidates needed to be comfortable answering questions that involved problem-solving and practical-based questions as well as performing calculations.

Section C, consisted of seven questions worth 57 marks in total. In addition to some short answer questions there were two opportunities for extended writing (Questions 37c and 39) worth 6 marks each.

<i>Candidates who did well on this paper generally did the following:</i>	<i>Candidates who did less well on this paper generally did the following:</i>
<ul style="list-style-type: none"> • Attempted all the multiple choice questions in Section A. • Performed the calculations required in Section B well. • Were able to give written explanations of key ideas – for example by using the ideas from kinetic theory required by Question 32b and wave superposition in Question 35a. • Used sound physics, covering fully the required strands identified in the question, in a logical structure for the extended response Questions (37c and 39). Were able to tackle the calculations required in the more demanding questions – for example 40 which required a competency in the use of exponential functions and Question 39 where candidates who did well could use logarithms effectively to support their explanations. 	<ul style="list-style-type: none"> • Left some Section A multiple choice questions unanswered. • Found it difficult to present sound reasoning for questions that required explanation - for example in 41bi which required explanation of exponential and inverse square terms in an equation. • Covered just one of the required strands for the extended response Questions 37c and 39, lacking structure in their reasoning; Question 39 proved particularly challenging as candidates sought to perform calculations without being clear as to the purpose or relevance of them. • Didn't attempt some of the questions towards the end of the paper – Questions 41 and 42 – where there are some marks that were accessible through, for example completing graphs or performing less-complex calculations.


Themes in candidate responses


In this series calculations were generally performed well, whereas questions that required explanations were less well answered than in previous series with many responses lacking clarity and coherent reasoning. This was particularly true of the extended response questions and the more extended questions in Section C, but was also evident in shorter questions of Section B - for example 32b and 35a.

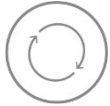
Comments on responses by question type

Multiple choice questions

Most candidates were able to complete the 30 multiple choice questions in Section A. Candidates found Question 30 to be the most difficult on this section.

	Misconception	Candidates who did less well on the multiple choice section tended to give an incorrect response to Question 25, incorrectly believing that the magnitude of the output voltage of a simple transformer is determined by the magnitude of the input current (selecting response C), rather than understanding that it is proportional to the rate of change of input current (response A).
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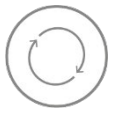
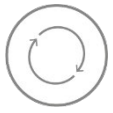

	Misconception	In Question 30, several candidates did not realise that a change of direction does not change the plane in which the aircraft is flying, meaning that the induced emf is the same for all directions of flight.
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	AfL	A number of candidates left some responses unanswered, perhaps in the mistaken belief that they would be penalised if they selected an incorrect response.
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Level of response questions

There were two Level of Response (LoR) questions. Question 37c was answered well, with many candidates able to achieve a Level 2 response by covering all three strands at least superficially. The points made by candidates tended to cover the strands relating to change in trajectory and the origin of air resistance competently. Coverage of the changes to the x and y components of the projectile's velocity was often less convincing; algebraic reasoning was not required to gain credit for this strand, but those candidates who attempted this often did not explain the relevance of the calculations performed. Few candidates achieved a Level 3 response, but those that did tended to use algebraic reasoning well to explain the changes to the components of velocity and the projectile's trajectory.

Candidates found Question 39 more demanding; many attempted calculations involving half-life, but these were often incomplete and unclear as to whether they were attempts to explain the ratio of uranium isotopes changing over time, or an estimation of the age of atoms. Some responses neglected to address the assumptions made, and these were given Level 1 at best.

	AfL	Centres should make sure that candidates know credit can be given for diagrams in extended response questions – for example in Question 37c simple sketch graphs showing changes to trajectory provided useful evidence to show candidates' understanding.
	AfL	Where calculations are used as part of extended response questions, candidates should explain or indicate the relevance or purpose of their calculation to make sure that the line of reasoning is clear as required for the higher mark to be given within the level of response.
	AfL	Highlighting or underlining in the question the key points required in the answer helped candidates to make sure they covered all three strands required in their response to achieve Level 2 or 3, thereby avoiding limiting their responses to Level 1.

'Show that' questions

In common with previous series, there were several 'show that' questions on the paper. While there was evidence that some candidates had successfully re-worked their responses having originally arrived at a value inconsistent with that given in the question, others did not score the marks as they did not perform a full evaluation, simply giving the 'show that' value – for example in Question 34b, candidates who calculated values of approximately 3.3 gained full credit, but those who gave the 'show that' value of 'about 3' did not gain the final evaluation mark.

Common misconceptions

Many candidates in Question 36bi confused the terms amplitude and frequency. In Question 38 some candidates also stated or implied that 'red wavelengths are shifted towards the red end of the spectrum', whereas red wavelengths and longer are shifted away from the red end during red shift.

Key teaching and learning points – comments on improving performance

Candidates' performance would improve further if they focused on the context of the questions and the precise requirement, rather than simply repeating knowledge they have learned when they are asked to 'suggest why...'. A good example on this paper was Question 41ai where some candidates repeated knowledge about the alpha particles being 'stopped easily by paper', or beta particles being 'stopped by aluminium' rather than linking the absorption to the situation described in the question, for example by saying that 'alpha is absorbed in the surface layer of the food'.

Guidance on using this paper as a mock

This paper is typical of that set in recent series.

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