Qualification Accredited

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Oxford Cambridge and RSA

A LEVEL

Examiners' report

PHYSICS B (ADVANCING PHYSICS)

H557

For first teaching in 2015

H557/03 Autumn 2020 series

Version 1

Introduction

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

i	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.

Paper 3 series overview

This paper is worth 60 marks out of the total 270 marks for the qualification. It includes content from all teaching modules but places emphasis on practical skills. Most parts of the paper include structured questions, problem solving and calculations, as well as Level of Response (LoR) questions. This paper appeared to be accessible to most candidates and there was little evidence that candidates had run out of time.

Candidates who did well on this paper generally did the following:	*Candidates who did less well on this paper generally did the following:*
• Described and explained concepts using correct scientific terminology. • Used detailed and logical arguments. • Were able to interpret graphs correctly. • Laid out 'show-that' questions clearly and logically and included all the steps.	• Used poor or incorrect terminology to explain physical concepts. • Mis-read scales on graphs. • Didn't show all the steps in their working or calculations.

The practical work addressed by this paper is covered in the specification.

3.1.2 (d)(iv) calibration of a light sensor.

4.1(d)(v) determining the speed of sound in air by formation of stationery waves in a resonance tube.

5.2.1(d)(i) using an electrical method to find the specific heat capacity of a liquid.

6.1.1 (d)(iii) investigation of transformers.

Section overview

Section A comprised three questions based on three different practical investigations and made up 40 of the marks. In this paper the three practicals were finding the specific heat capacity of a liquid, the calibration of a light sensor, and an investigation of standing waves in a column of air. All three questions included quite a lot of graphical work as well as short answer and calculation questions, and there was also an extended writing question about the calibration of the light sensor.

Section B consisted of one question about transformers and made up 20 marks. It included a second extended response question about the structure of the core of a transformer, as well as some short answer and problem-solving questions.

Comments on responses by question type

Level of response (LoR) questions

The two LoR questions tested very different skills in this paper.

The first LoR Question 2c, required candidates to interpret two graphs and use data to make calculations and then explain the effect that background light would have on the expected results from the experiment. Most candidates were able to correctly interpret and manipulate the numerical data from the graph, even if they were unable to complete all the required calculations. The more challenging part of the question was to explain the effect that background light would have on the calibration curve. Many candidates found it difficult to explain the correct direction of the shift in the graph.

The second LoR Question 4civ, asked candidates to qualitatively explain the effect of having an air gap in the core of a transformer and to explain why the core should be laminated vertically. Candidates who were able to use the correct scientific terminology usually did well in this question. A common misconception here was for candidates to confuse electrical properties with magnetic properties of the core.

Graphical questions

There was a lot of graph work in this paper; all three of the questions in Section A included graphs.

In Question 1 candidates were asked to explain the shape of a graph. In a Physics paper, explaining the shape of a graph should include some scientific explanation, not just a description of how the gradient changes. They were then asked to draw a line of best fit through only the first linear section of some pre-plotted points, and some attempted to draw a straight line through the whole curved trend. The gradient calculation in this question didn't seem to offer any major problems as most candidates picked data points from either end of their drawn line and the scales were relatively easy to read correctly.

In Question 3 most candidates were able to draw an acceptable 'worst-fit' line on a pre-plotted graph with error bars. In this case some candidates had trouble reading the scale correctly and there was more tendency to pick two data points which were too close together for the gradient calculation.

	AfL	When candidates calculate absolute uncertainties, they should only be quoted to one significant figure. Then the calculated quantity should ideally be given to the appropriate number of decimal places. For example, in Question 1(b)(ii) the calculated value for power per unit mass is 210.75 $W\,kg^{-1}$. The uncertainty works out to approximately ±16 $W\,kg^{-1}$. This uncertainty value should be given to 1 sf; i.e. 20 $W\,kg^{-1}$, and then the calculated value rounded to the nearest 10 $W\,kg^{-1}$; i.e. 210 $W\,kg^{-1}$.

Common misconceptions

In the first part of Question 1 many candidates incorrectly suggested that recording the temperature at more frequent intervals was an improved experimental design. In such questions, candidates should focus on the largest sources of uncertainty in experiments, which in this case is the way in which the liquid was being heated, not the temperature readings.

Many candidates confused permittivity with permeability in Question 4(d), and there were some candidates who thought that the two coils in a transformer were connected electrically through the core.

Key teaching and learning points – comments on improving performance

Include all the steps in calculations and show-that questions.

Plotted points and read offs on graphs should always be correct to the nearest half small square.

When taking two points on a line to calculate gradient, they should be at least half the length of the drawn line apart.

In order to calculate the intercept of a straight line in the form $y = mx + c$; the equation should be rearranged correctly for $c = y - mx$, not $y \div mx$, which is often seen.

Guidance on using this paper as a mock

Much of this paper assesses practical skills, which are common to all experimental work. Typically, candidates should be familiar with the content of Module 1.1 and Module 2, as well as some of the theoretical modules.

Supporting you

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Supporting you through 2020-2021

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