Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

January 2019

Pearson Edexcel International Advanced Subsidiary Level
In Physics (WPH03)
Paper 01 Exploring Physics

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January 2019
Publications Code WPH03_01_1901_ER

Introduction

This paper is designed to test candidates' knowledge and understanding pf practical skills. Although the majority of candidates showed good knowledge and understanding, there were some weaknesses in understanding some experimental procedures. It is important in the context of practical work that appropriate numbers of significant figures are used in answers. Some answers lost marks because scientific terms were not used correctly or because examiners had difficulty in understanding imprecise and confused explanations. As ever, it is important that candidates read the beginning of the questions carefully in order to identify the context.

The mean mark on the paper was 22.5. This was 2.5 marks lower than the mean on the corresponding WPH03 paper last year and the standard deviation was higher.

		Mean	Standard Deviation	A	E
WPH03	1801	24.5	7.6	31	17
	1901	21.3	7.1	27	15

This report should be read together with the published paper and mark scheme available on the Edexcel website.

Section A – Multiple Choice

Questions 1-5

All questions all had high percentages of correct responses.
An explanation of the distractors is included in the mark scheme.

	Subject	Percentage of candidates who answered correctly
1	SI system	78
2	Reading measuring instrument	76
3	Mean, anomalous values and significant figures	81
4	Understanding of method to measure free fall	81
5	Experimental method	74

Section B

Question 06 Investigation of the *V-I* characteristics of a filament lamp

Question 6(a)
Good candidates drew accurate circuit diagrams that scored well. Incorrect circuits usually omitted a means to vary the current. Nearly all candidates placed both meters properly.

Question 6(b)
Many candidates gave an appropriate advantage of digital meters, usually citing the impossibility of parallax error. A few responses mentioned the ease of switching range (and/or purpose). Some ignored the instruction in the question and discussed accuracy. A few candidates mistook the aim of the question and described advantages of data loggers instead.

Question 6(c)
The mark scheme outlines three possible means of scoring the two marks: all include an assertion and a reason.
This question elicited partial responses from many candidates. They mentioned, for instance, repeating the readings and finding an average. A full explanation should also have included the effect of the technique, for instance reducing the effect of random errors. Few candidates chose to mention alternative techniques, such as ensuring simultaneous readings or allowing the temperature of the filament to stabilize. A sizeable minority of candidates did not take the nature of the investigation into account. Whilst it might be appropriate to allow a resistor to cool between readings, this is not the case with a white-hot filament lamp.

Question 7 Determination of density

Question 7(a)
The majority of candidates stated quantities appropriate for measurement in the experiment. A few suggested measuring volume directly: this was only credited when the plan clearly described a displacement method for measuring volume.

Question 7(b)
Responses here were generally very good. Whilst nearly all included mention of the balance, some omitted an appropriate instrument for measuring the thickness of the microscope slide.

Question 7(c)
Responses to this part of the question usually included two quantities correctly linked to an appropriately chosen instrument - but few went on to provide convincing justifications for the choices. Candidates should include indication of the precision of each instrument and relate this to the expected measurement. Expected values for the dimensions of the microscope slides were included in the

question stem and candidates should have been able to estimate a sensible value for the mass of a microscope slide. A good way to link the precision of the instrument to the measurement is to include a basic percentage uncertainty calculation.

Question 7(d)
Many candidates gave good comments about the appropriateness of repeating the readings. However, comments were expected to include a deeper reason than repetition simply to yield a mean value. Good responses mentioned the need to deal with the effects of random error or anomalous values.

Question 7(e)
There were many good responses that included the suggestion of stacking the ten slides together and measuring the combined thickness. Some candidates realised that it was appropriate to obtain a mean value of thickness measurements made in different parts of the slide. Very few candidates went on to link their chosen method to the reduction of percentage uncertainty in the measurement.

Question 7(f)
Most candidates could give the appropriate equations to use in order to determine the density from their stated measurements. However, some offered suitable equations but gave them using a symbol for the term (e.g. $V = l \times b \times w$ and $\rho = m/V$). This approach is only acceptable if all the symbols used are properly defined.

Question 7(g)
Most candidates were able to state zero error in an instrument that they named, for instance the balance or the micrometer as a main source of uncertainty or systematic error. Far fewer mentioned a second source, although some stated the thickness of the slide could cause concern, either that it might vary or that it has a small value.

Question 7(h)
Most of the worthwhile comments on safety were about the dangers of sharp glass and the necessity for its careful handling.

Question 8 Determination of speed of sound in air

Question 8(a)
Most candidates responded well and were able to give two valid criticisms of the results.

Question 8(b)
80% of candidates gave poor responses to this question: common response being simply to rearrange the information given in the question and state that $l = \lambda/4$. However, 7% of candidates did respond very well, correctly identifying the positions and separation of the node and antinode.

Question 8(c)i
This question was generally well answered, with 60% of candidates scoring at least one of the marks available. The comparison between the two equations was generally clearly shown – for instance by rearranging the speed equation to give $\lambda = v \times 1/f$, writing $y = mx + c$ below it and then indicating the links between the comparable terms. Fewer candidates went on to state both that the gradient v is constant and that $c = 0$.

Question 8(c)ii
Most candidates displayed the derived data properly, although a few struggled to use an appropriate number of significant figures or a correct unit for $1/f$. Graphs were generally drawn well with properly labelled axes and appropriate choice of scale. Plotting of points was usually done accurately, but many candidates drew unbalanced "best fit" lines – sometimes because they forced their line through a false origin.

Question 8(d)
The majority of candidates used a large triangle in their gradient calculation and usually showed this clearly on the graph. Calculation was mostly good, most values were shown with a correct unit, but many were expressed to an inappropriate number of significant figures for a value derived from the gradient.

Question 8(e)
The suggestions from the candidates included a range of acceptable reasons for the difference, the most popular being a parallax error affecting the measurement of length with a metre rule. A few candidates showed familiarity with the technique and described the difficulty of locating the exact position for the loudest sound.

Summary

This paper provided candidates with a wide range of contexts from which their knowledge and understanding of the physics contained within this specification could be tested.

The following are useful ideas for candidates:

- All diagrams should be drawn with a ruler and labelled clearly.
- Familiarity with the SI system and the plotting and use of graphs using scales which are multiple or sub multiples of 1, 2 and 5 should be reinforced.
- Candidates should make sure they understand the term 'experimental techniques'.
- Answers may be written using bullet points.
- Assertions should always be supported with reasons.
- In the planning questions, it is useful to consider whether a reader could carry out the experiment completely from the instructions given in the answer.

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