Pearson

Examiners' Report
Principal Examiner Feedback

October 2017

Pearson Edexcel International Advanced Level Physics (WPH03)

Unit 3: Exploring Physics

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General introduction

This paper is designed to test students' knowledge and understanding pf practical skills. Although the majority of students 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 students read the beginning of the questions carefully in order to identify the contexts.

The mean mark on the paper was 25.0; this was 2.1 marks lower than the mean on the corresponding WPH03 paper last year and the standard deviation was also lower.

		Mean	Standard Deviation	A	E
WPH03	1610	27.1	7.3	34	23
	1710	25.0	6.1	32	23

This report should be read together with the published question paper and mark scheme which are available on the Pearson qualifications website.

Section A – Multiple Choice

Questions 1-5

An explanation of the distractors is included in the mark scheme.

Although questions 1, 3 and 5 had high percentages of correct responses, it was clear from responses to questions 2 that some students were not so confident with measurement uncertainty nor appropriate measuring instruments.

	Subject	Percentage of students who answered correctly
1	SI system	0.76
2	Mean, anomalous values and significant figures	0.59
3	Viscosity measurement	0.79
4	measuring instruments	0.60
5	Measuring instruments	0.80

Section B

Question 6:

6(a) The question yielded a range of responses. Many gave perfect answers, but a common fault was the omission any means to vary the current. Some students included a lamp instead of the resistor. A few circuits showed the voltmeter incorrectly placed so as measure the p.d. across the power supply or across the variable resistor.

6(b) Most students answered this question well and pointed out that using the digital ammeter would not lead to parallax errors.

6(c) The majority of the students found this part difficult. Most responses referred to techniques that were already covered in the question, such as repeating the readings, calculating means or drawing a graph, and received no credit. Some students realised that temperature change in the resistor would affect the result, but fewer suggested a means to avoid it. Others realised that zero errors in the meters could reduce accuracy, but very few had a suggestion as to how a correction might be applied.

Question 7:

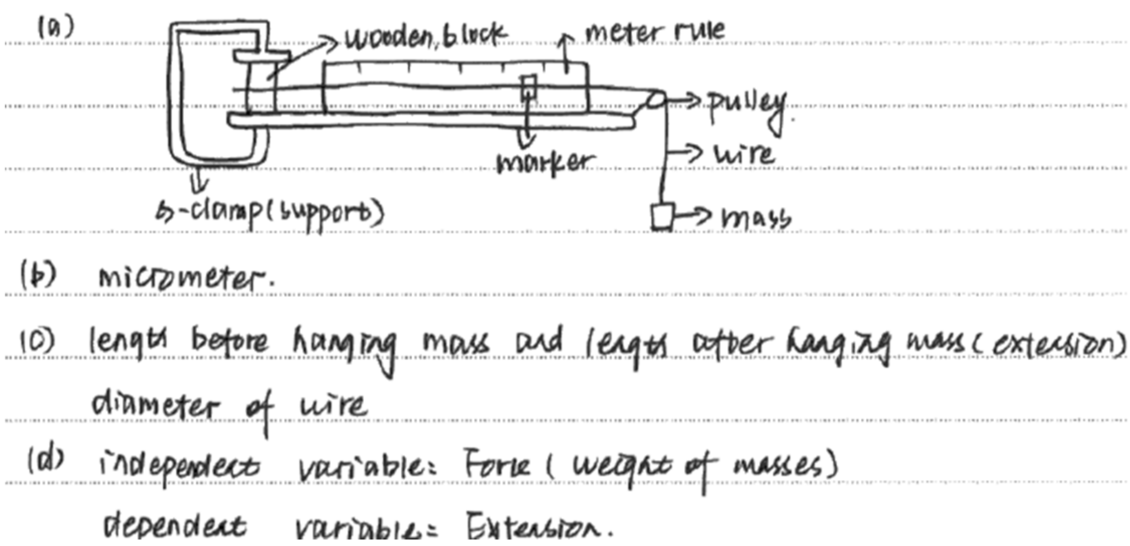
7(a) The diagrams were generally well drawn and clearly labelled. Weaker responses showed set ups that were either unlabelled or lacked a fixing point for the wire.

7(b) Most students included a micrometer and a tape measure or metre rule. Some omitted to specify the length of the rule and received no credit.

7(c) Most students realised that the extension of the wire was a quantity that should be measured. Fewer also included both the diameter and the original length of the wire as necessary measurements. Some allowance was given when another part of the response clarified that an original length of 2 m had been assumed.

7(d) Students tended to identify appropriate independent and dependent variables and this part was generally well answered. A common error was to give stress and strain as these variables.

An example of a good answer to the parts 7(a) to 7(d) is shown below. It would have been improved by using a ruler for the diagram.



(b) micrometer.

(c) length before hanging mass and length after hanging mass (extension)
diameter of wire

(d) independent variable: Force (weight of masses)
dependent variable: Extension.

7(e) Most responses included appropriate instruments for each measurement. A suitable precision for each of these instruments was also usually indicated. However, very few students went on to relate the precision to the size of the expected measurement. Some students suggested using an ordinary Vernier calliper to measure the diameter of the wire. An instrument that is precise only to ±0.1 mm would not be appropriate, since the wire is likely to be less than 1 mm in diameter. However, some digital callipers offer a precision ±0.01 mm, which would be appropriate.

7(f) Many students floundered here but some made excellent, detailed comments about the need to repeat the diameter measurement to take account of variations in the cross-section of the wire. Other students correctly pointed out that the wire might stretch beyond its elastic limit, ruling out the opportunity to repeat extension measurements usefully.

7(g) There were many detailed and thorough responses to this part of the question. Students who missed points usually omitted to relate the force and the hanging mass (a simple statement such as $F = mg$ was sufficient). Some students gave the cross-sectional area in terms of radius and did not relate this to the measured diameter. Most of the sketch graphs seen were good.

7(h) A few students were able to relate the expected size of small measurements (for instance the diameter) to the percentage uncertainty caused. Most gave sensible suggestions about parallax error and zero error appropriately related to a particular instrument or measurement.

7(i) Most students could comment sensibly on the expected risks and necessary safety precautions.

Question 8:

8(a) Most students were able to make two valid points when criticising the results in the table. Some expressed concern about inconsistency in the way the results were recorded, despite all the angles showing the same precision.

8(b) The columns for sin *i* and sin *r* were completed successfully in most cases. Some students gave correct values but showed them to an inappropriate precision. Results corrected to two significant figures were required in this case.

8(c) Graphs were generally drawn very well. Some students lost marks for small slips such as including a unit for the sine values, using an inappropriate scale or plotting a point incorrectly. Plotting errors often resulted from a poor choice of scale. Scales of multiples or sub-multiples of 1, 2 and 5 should be used.

8(d) Many students were able to draw a large triangle to find a suitable value for the refractive index.

8(e) Most students found this part difficult to answer. Responses were usually limited to general ideas, such as repetition and averaging (despite the advice in the question) and looking out for anomalous results (despite having already drawn a graph). There were some appropriate responses, although few of these included sufficient detail for both marks.

Summary

This paper provided students 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 students:

- All diagrams should be drawn with a ruler and it is important to use the correct symbols for electrical components.
- Familiarity with the SI system and the plotting and use graphs involving sines are useful knowledge and skills.
- Students 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.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

http://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html

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