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Examiners' Report/ Principal Examiner Feedback

January 2015

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

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This paper is intended to examine the same skills, knowledge and understanding as the practical work undertaken by home candidates, including planning and analysis. Candidates are expected to be familiar with standard laboratory equipment and to be able to estimate the magnitude of measurements likely to be met within common experiments. Special care has been taken to ensure that marking and grading are done to the same level as for home candidates.

In general candidates attempted all questions. There were some common errors, particularly where candidates put themselves at a disadvantage by imprecise use of scientific language and English. For example, it is important that candidates use scientific language and concepts carefully and precisely and must therefore distinguish 'mass' from 'weight', resistance' from 'resistivity', and 'parallax' from 'parallel'. In calculations, numerical answers were sometimes given to too many significant figures in a practical context. An additional common issue this year was the difficulty that some candidates had with powers of ten in calculations and also in converting between multiples and sub multiples of units.

Some responses indicated that candidates had not really understood what was being asked, and they need to read the stem of the question fully to get a clear idea of the context to which their response needs to be addressed. This was particularly noticeable in question 7 where some candidates described the determination of the e.m.f. of a cell rather than the required experiment.

Candidates are expected to have access to a pencil, ruler and eraser. These would have been particularly helpful in drawing the graph in question 8.

Questions 1 to 5

These multiple choice questions were usually well answered. However, in question 5 some candidates found the conversion of units difficult.

Question	1	2	3	4	5
Mean mark (max 1)	0.84	0.82	0.80	0.82	0.61

Question 6

This was a generally a well-answered question, the mean mark was 2.79. However, some candidates showed confusion between Hazard and Risk. The examiners marked the two ideas together and most responses were clear enough to score well. Weaker responses tended to offer an insufficiently specific risk.

Suggested precautions were credited only if they were specific to the identified risk. For instance, wearing safety goggles is an appropriate precaution against eye or facial injury, but would not protect against a general injury. Similarly, the risk of weights falling in the experimenter's feet requires specific protection, for example - stout shoes.

Some candidates advised experimenting with thicker wire or smaller weights. Whilst this might well reduce the risk, it would also compromise the main aim of the experiment.

Question 7

Most of the candidates helpfully divided their response into the seven sub-sections. This clarified their intentions and enabled the examiners more easily to give full reward where it was due.

Circuit diagrams for part (a) were mostly clear and accurate, although not always drawn with a ruler and pencil. Some candidates omitted a means to vary the current but most of the circuits seen would enable the collection of useful data.

The majority of candidates correctly identified the quantities to be measured for part (b). Consequently, most candidates chose appropriate measuring instruments for voltage and current in part (c). Far fewer were able to specify the appropriate ranges for these instruments. Whilst some candidates could usually suggest a suitable range for the voltmeter, a smaller proportion went on to work out an appropriate range for the ammeter.

Few candidates realised that taking repeat readings, in part (d), would be inappropriate unless sufficient time was allowed for the bulb to cool down.

This weakness seemed to continue into responses for part (e), where many candidates described a situation where resistance remains constant – for instance sketching a V/I graph showing a straight line. The best responses included a sketched V/R graph that showed appropriate variation in R. Most candidates mentioned the use of $R = V/I$, but not all of them were clear that a range of values for R should be obtained and that there would be a positive value of R when the p.d. was zero.

Responses to part (f) were mostly quite good. Candidates usually identified a zero error in the meters as a source of systematic error. Parallax error was often mentioned, but this was not always linked to the use of an analogue meter.
Safety comments in part (g) were not always fully explained. For instance, comments about low risk were left vague by not linking them to the use of low voltage, or concerns about avoiding heated components were incorrectly linked to the connecting wires rather than to the hot bulb.

Question 8

Most candidates were able to complete the table correctly for part (a), although some offered either an incorrect unit or no unit for r^2. The responses to part (b) were generally very good. Many candidates were able to offer three valid criticisms even though two were enough to gain full credit.

Part (c) yielded some thorough responses. Most candidates gave a correct comparison to $y = m + c$, properly identifying the variables and the slope from the given relationship. Fewer went on to identify explicitly the constant factors or the proportionality.

The graphs drawn in for part (d) usually showed some skilful work. Axes were generally given correct labels for both quantity and units. The scale chosen was usually a sensible one, although a few candidates ignored the simple scales offered by the printed grid and used an inappropriate scale, with intervals of 4 or 7, for instance. The weakest responses tended to include some non-linearity, either displaying the given data values at equal intervals or incorporating a change of scale on the v axis for values above 0.1 ms^{-1}.
Plotting of the points was generally very good but less care was commonly taken when drawing the straight line. Many responses showed little attempt to balance the number of plots on either side of the line. Many lines simply joined the last point to the origin or included the first three points, missing the last one completely.

Most candidates used a large triangle to determine the gradient for part (e) and were able to read suitable points correctly from their graph. Gradient calculations were largely successful though some candidates gave an inverse value, in error. Most gave their value to an appropriate number of significant figures.

Most candidates successfully substituted their value for the gradient when calculating the viscosity in part (f). Fewer went to calculate a value sufficiently close to the expected result. This usually resulted from unsuccessful manipulation of the units. Even so, a large proportion of candidates gave a correct unit for the viscosity, but many spoiled this final answer by offering an inappropriate number of significant figures.

Many candidates identified temperature change as a factor that would affect the value obtained for the viscosity. Some realised that the ball might not have reached terminal velocity. Other responses began well, by mentioning factors affecting timing or distance measurement, but did not go on to contextualise these by relating them to the measurement of the velocity of the falling ball.

Finally it was pleasing to see that most candidates had some knowledge of practical skills and a good awareness of how to make an experiment reliable and valid. We would encourage future candidates to develop these theoretical links with practical applications.

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