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Examiners' Report
October 2025

Pearson Edexcel International Advanced Level In Physics
WPH16/01

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General

The IAL paper WPH16 Practical Skills in Physics II assesses the skills associated with practical work in Physics and builds on the skills learned in the IAL paper WPH13. This paper assesses the skills of planning, data analysis and evaluation which are equivalent to those that A level Physics candidates in the UK are assessed on within written examinations. This document should be read in conjunction with the question paper and the mark scheme which are available at the Pearson Qualifications website, along with Unit 6 and Appendix 10 in the specification.

In this specification, it is expected that candidates will carry out a range of Core Practical experiments. The skills and techniques learned from carrying out these experiments will be examined in this paper, but the Core Practical experiments themselves are not assessed. Candidates who do little practical work will find this paper more difficult as many questions rely on applying the learning to novel as well as other standard experiments.

Candidates are expected to know and use terminology appropriately, and use standard techniques associated with analysing uncertainties. These can be found in Appendix 10 of the specification. In addition, command words may be used which to challenge the candidates to form conclusions. These are given in Appendix 9 of the specification, and centres should make sure that candidates understand what the command words mean.

The paper for October 2025 covered the same skills as in previous series and was therefore similar in demand. However, it was clear that many candidates were not sufficiently prepared for this examination.

Question 1

This question was set in the context of investigating the oscillation of a trolley between two springs.

Part (a) concerned the timing of the oscillations. In part (i) candidates had to describe **two** techniques the student should use to time the oscillations. This is a standard question that appears in many series. However, candidates often made the mistake of reiterating the information already given in the question. i.e. timing multiple oscillations and repeating to calculate a mean. Another common error was not stating where a timing marker should be placed, i.e. at the centre of the oscillation. Candidates often described starting the stopwatch after several oscillations, but it was rare to see any reference to the initial displacement being small.

In part (ii) candidates had to explain how using a video camera would improve the results. This is a common modification that candidates should be familiar with. However, often candidates give answers that were too general or related to previous mark schemes rather than specific to this experiment. Most candidates were able to say that slow-motion would be an advantage but often did not explain why clearly enough. Some suggested that reaction time was a factor but did not relate this to judging when an oscillation is complete. Some candidates referred to the resolution, which is not appropriate in this case.

Part (b) concerned processing the time measurements. In part (i) candidates had to **determine** a mean value of the time period from the set of data. Note that candidates are not expected to identify and remove "anomalous" data. The most common error was giving the answer for $5T$ rather than T however unit errors were rare. At A2 level, candidates are expected to give the correct value of the mean to the **same number of decimal places as the data**. Some candidates gave too many decimal places.

Part (ii) involved calculating the percentage uncertainty in the mean value. The candidates must show the calculation for the first mark, and this is awarded for calculating the **correct half range or furthest from the mean**. Occasionally, candidates used what appeared to be a resolution or the full range, which is not accepted. Other common errors included dividing by the mean and using the first and last point in the table instead of the highest and lowest values. The final mark was for the correct percentage uncertainty given to **one or two significant figures**. Often candidates gave three or more significant figures.

Finally, part (c) involved an investigation where the student varied the mass of the trolley. In this part candidates had to criticise the recording of the data. This is a familiar type of question used in many series. Some candidates gave irrelevant information, such as inconsistent intervals or the range

of masses being too small. Some suggested the significant figures for mass was incorrect but gave this as the number being inconsistent or not the same as the time period. Some identified a potential problem with one of the values of time period but used the term "anomalous" which is not accepted without further clarification.

Question 2

This question assessed planning skills within the context of investigating current-carrying coil.

Part (a) concerned using the oscilloscope trace to determine the maximum e.m.f. induced across the small coil. Although this was not a "show that" question, candidates should show their working. Most were able to use the scale factor correctly. The most common errors were not using the full height and dividing by two, and misreading the scales.

In part (b) candidates were given a relationship between the e.m.f. induced across the small coil and the current in the large coil. In part (i) candidates had to complete a circuit diagram that could be used to investigate the relationship. Some candidates clearly did not understand the experiment as they included the small coil in the circuit diagram. Another common error was not including a means to vary the current, although it was less common to see incorrect symbols being used. Some candidates included a voltmeter which was not needed but some placed this in series which meant they could not access a mark.

Part (ii) was the familiar planning question based on determining the constant in the relationship using a graphical method. Candidates should be aiming to devise a method for the investigation described in the question that could be followed by a competent physicist. Although marks were not awarded for linking ideas, candidates using vague language or not describing a method logically can lead to marks not being awarded. The best answers were structured and concise, leading to a method that could be followed easily. In addition, candidates should devise a method which **relates to the formula given in the question**. In some cases, candidates did not use the variables identified in the question. Those candidates that started by analysing the formula often scored well.

The mark scheme for this type of the question follows a similar structure in each series therefore candidates should be able to access some marks. As a minimum, candidates should be identifying the variables to be measured with appropriate apparatus and those that should be controlled. Those that include some measurement techniques often score well. In addition, candidates should state how many sets of data are needed to draw a graph. A common error was stating the number of sets of data to calculate a mean value. Most candidates scored the mark for stating the correct graph, i.e. plotting

y against *x*, but candidates should ensure that the expression for the gradient is consistent with this convention.

Question 3

This question involved plotting and analysing the graph of the current in a capacitor discharge circuit. A question involving a graph appears in each series therefore there are plenty of opportunities to practise this skill and consult Examiner's Reports to correct common errors.

In part (a) candidates had to describe **two** safety precautions when using electrolytic capacitors. At this level, safety precautions should be specific to the experiment and not general laboratory safety. It was clear that many candidates had not practiced previous papers as there were too many general electrical safety comments, for example, not spilling water on the circuit. Some also thought that the circuit would get hot. Another common error was to state that a low p.d. should be used without relating this to the value given on the capacitor.

In part (b) candidates were given the relationship given the relationship $I = I_0 e^{-\frac{t}{RC}}$. In part (i) candidates had to **explain** how a graph of ln *I* against *t* could be used to determine the value of *R*. This type of question should be very familiar and appears in most papers. The first mark was for performing a correct log expansion of the given formula. Given that this is a standard formula, there were a significant number that did not do this correctly. For the second mark candidates must compare their log expansion with $y = mx + c$, which is standard for this type of question. Unusually, there were more that did not do this compared to other series. Another common error is not making the comparison **explicit**, i.e. the order of the log expansion **must match** the order of terms of the equation of a straight line. In some cases, candidates used arrows and missed out the + and = which was not credited. Candidates then had to identify the gradient correctly as $-\frac{1}{RC}$. Some referred to "*m*" or relied on a loop or arrow rather than state "the gradient is". As this is an "explain" question, this must be explicit. Occasionally, candidates forgot the minus sign.

Part (ii) assessed the candidates' ability to process data and plot the graph of ln *I* against *t*. The mark scheme follows the same format for each series, and the number of candidates that plotted an incorrect or unprocessed graph was higher than usual.

The first mark was for **processing the data correctly**. To gain these marks, the values must be **correct** and given to a **consistent number of decimal places** sufficient to plot a graph accurately on standard graph paper. For logarithms candidates should give **three decimal places** although two can be accepted if it is valid for the graph. The most common errors here were truncating rather than

rounding, using an inconsistent number of decimal places in processed data, or using too many or too few decimal places.

The second mark was for **placing the axes the correct way around and labelling with the correct quantity and unit**. Candidates should note that the question is always written in the form "plot *y* against *x*". This also often lead to mistakes in later parts. The most common error is not using the correct format for labelling a log axis, either by missing out the brackets or units or both. The correct form is log (quantity/unit), e.g. ln (*I* / mA). Some candidates also reversed the *y* axis to make the scale look "positive".

The third mark was for **choosing an appropriate scale**. At this level, the candidates should be able to choose the most suitable scale in **values of 1, 2, 5 and their multiples of 10** such that **all** the plotted points occupy **over half the grid in both directions**. Candidates should note that, although the graph paper given in the question paper is a standard size, the graph does not have to fill the grid and using the grid in landscape is unnecessary. Candidates at this level should also realise that **scales based on 3, 4 (including 0.25) or 7 are awkward and not accepted**. Candidates should also label every major axis line, i.e. every 10 small squares, with appropriate numbers, so that examiners can easily see the scale used. A minority of candidates tried to use the values of logarithms as their scales.

The fourth mark is for **accurate plotting**. Candidates should use **neat crosses** (× or +) rather than dots when plotting points. Candidates were not awarded this mark if they used large dots that extended over a small square, used an awkward scale or a scale that was too large. Candidates should check a plot if it lies far from the best fit line.

The final mark is for drawing a **reasonable best-fit line** and was awarded most often. When drawing a best-fit line, candidates will often join the first and last points instead of judging the scatter of the data points. Candidates should ensure there are plots on both sides of the line and that the line cannot be rotated. Other errors include the line being too thick, i.e. over half a small square, discontinuous, or containing a clear bend. Candidates should use a single piece, 30 cm ruler for this examination and draw a line that fills the page.

In part (iii) candidates were asked to **determine** the value of *R* from the graph. Candidates are strongly advised to show their working. There were several common errors seen. The first mark is for using a **large triangle which covers at least half the page** to calculate the gradient. Many candidates used the first and last points, or other data points from the table. This is only acceptable if the data points lie **exactly** on the best fit line. Candidates should find places where the best-fit line crosses an intersection of the grid lines near the top and bottom of the best-fit line and **mark these as**

a triangle on the graph. Those that drew the triangle on the graph tended to make fewer mistakes and those that used awkward scales were often only successful when sensible values were used. Some candidates included a factor of 1000 or did not convert the unit for *C* correctly which led to an incorrect value for *R*. The final mark could be awarded from an incorrect value, but often candidates used too many or too few significant figures.

Finally, in part (c) candidates had to explain how a data logger would improve the investigation. As is usual, many candidates produce a list of everything they can think of or have seen in other mark schemes rather than relate it directly to the experiment. Whilst many could identify the most relevant property of a data logger, the second mark was often missed as the explanation was related to a different property. Candidates should avoid using a list of reasons and instead link each explanation to a specific answer.

Question 4

This question was based on an investigation of a metal wire. The analysis of uncertainties is common to all past papers therefore candidates should analyse uncertainties on a regular basis, either whilst making measurements or using past papers. Candidates should read Appendix 10 of the specification and **include all working** as marks are awarded for the method.

In part (a) candidates had to describe an accurate method to determine *L*. Candidates found this very challenging and often described as many ways of using a metre rule as they could. Some candidates described measuring to the centre of the blocks or to the electrical connectors. In addition, some candidates either tried to use the metre rule to measure the amplitude of the vibration and some even thought the mass would be oscillating. At this level, "repeat and calculate a mean" on its own is rarely given credit. Candidates should state exactly what is being repeated.

In part (b) candidates had to **explain** a technique to determine the diameter of the wire using a micrometer screw gauge. The first mark was for **stating** the technique and the second was for **explaining** the technique **in terms of errors**. As this is A2 level, more detail is required for this question compared to AS level, such as checking **and** correcting for zero error. Although phonetic spellings are accepted, candidates must be careful not to use a different word, such as "systemic" or "system" for "systematic". More candidates than usual forgot to add "calculate a mean" or state where the repeats should be taken. Some candidates still insist on using "avoid" or "eliminate" for random error.

Part (c) involved determining whether the metal wire could be made from stainless steel. Candidates were given the formula for the density. In part (i) candidates were asked to **show that** the density of

the metal was about 8100 kg m^{-3}. For a **show that** question, all working must be shown, and candidates should give their final answer to at least one more significant figure than the value. It should be noted that a sensible number of significant figures is expected in a practical paper, so the mark may not be awarded if there are too many. Candidates often substituted the values correctly, but the most common error was incorrect powers of 10. Either these were completely missing or candidates did not convert the length to m. Candidates should check the units for the final value and convert measurements before performing the calculation. A few candidates rounded measurements before the calculation, which was not credited.

In part (ii) candidates were asked to **show that** the percentage uncertainty in the value of the density was about 6%. Candidates used two methods of solving this, either by combining percentage uncertainties or by using the maximum and minimum method. Those that used the maximum and minimum method were often less successful as they used maximum/maximum and minimum/minimum. Other errors included not using the half resolution for the uncertainty in the frequency, not calculating the half range or rounding values too early. Although this often lead to values that were similar to that given in the paper, full marks can only be obtained for a fully correct method. Occasionally, candidates added the absolute uncertainties which was not credited as the method is invalid.

Finally, in part (iii) candidates were given the density of stainless steel and had to **deduce whether** the wire could be made from stainless steel. This is a standard type of question used in every series but there were a few that did not attempt this or just made a vague statement with no calculation. It is expected that candidates **use the percentage uncertainty to calculate limits**, but the most common error here was calculating the limits of the stated density rather than the calculated density. Those that used the percentage difference method often did not score full marks as they used the calculated value as the denominator rather than the stated value. Those that had used the maximum/minimum method in the previous part should have stated the limits. The final mark was for a correct conclusion with a comparison. As in previous series, the main error with the conclusion was not explicitly making a comparison between relevant values.

Summary

Candidates will be more successful if they routinely carry out and plan practical activities for themselves using a wide variety of techniques. These can be simple experiments that do not require expensive, specialist equipment. They should make measurements on simple objects, using vernier calipers and micrometer screw gauges, and complete all the Core Practical experiments given in the specification.

In addition, the following advice should help to improve candidate performance on this paper.

- Be able to describe how to measure lengths, angles, force, mass, time, potential difference, current, pressure and temperature using the most appropriate apparatus and techniques.
- Refer to random or systematic errors when explaining techniques.
- Practice the process of planning an experiment to obtain sufficient and valid data using the formula given.
- Show working in all calculations and include a unit. Check the number of decimal places or significant figures needed for different calculations.
- Choose graph scales that are sensible, i.e. the value of a small square is 1, 2 or 5 and their powers of ten only, so that at least half the page is used. It is not necessary to use the entire grid if this results in an awkward scale, e.g. 0.25, 3, 4 or 7.
- Plot data using neat crosses (× or +) and check any points that lie far from the best-fit line. Circle any points that are not being used to judge the best-fit line.
- Use a one piece, 30 cm ruler to draw a straight best fit line. Ensure there are data points on both sides of the line, the line cannot be rotated, and the line covers the entire page.
- Draw a large triangle that covers at least half of the page using sensible points. Labelling the triangle often avoids mistakes in data extraction.
- Learn the definitions of the terms used in practical work and standard techniques for analysing uncertainties. These are given in Appendix 10 of the IAL specification.
- Revise the content of WPH13 as this paper builds on the knowledge from AS.