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October 2025

Pearson Edexcel International Advanced Subsidiary level In Physics
WPH13/01A

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General

The IAL paper WPH13 Practical Skills in Physics I assesses the skills associated with practical work in Physics. 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 3 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 at AS level. These can be found in Unit 3 and Appendix 10 of the specification. In addition, command words may be used which 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 but was slightly less demanding.

Question 1

This question was set in the context of determining the density of paper. This type of question should be familiar as the techniques are examined in most series.

Part (a) involved determining the thickness of one sheet of paper using digital calipers. The techniques for using calipers can be found in several Core Practicals. In part (i) candidates had to describe a method using the calipers. Some candidates misread the question and described a method using a metre rule. These candidates could gain some credit but not full marks. Most candidates indicated that they would measure the full height, but some did not state that the value should be divided by the number of sheets. Most also stated that they would take multiple measurements to calculate a mean but did not gain the mark as they did not state in different places. A few candidates mentioned at different orientations, which is not a correct term in this context.

In part (ii) candidates had to determine the percentage uncertainty in a single measurement of the height of the stack of paper. It is expected that the uncertainty in a **single** measurement is **half** the resolution. Some candidates used the full resolution, which was not accepted for full marks. Some candidates used resolutions of 1 mm or 0.1 mm despite the diameter being given to **two** decimal places, i.e. the resolution of digital calipers. Candidates should note that percentage uncertainties should be given to one or two significant figures. A few candidates used the thickness of a single sheet instead of the whole stack.

Part (b) involved calculating the density of the paper using the data provided. Most candidates scored marks. In part (i) the candidates had to calculate the mean width and length. It is **not** expected that candidates identify and remove an “anomalous” data point from these calculations. The most common error was not giving the **mean** values to the **same number of decimal places as the data** or omitting a unit.

In part (ii) the candidates had to calculate the density. This was done well by most candidates. The most common error was using too few significant figures as these candidates often gave the answer to 2 decimal places. When **combining variables**, it is good practice to use the **lowest** number of significant figures as the data.

Finally, in part (iii) the candidates had to identify a potential source of systematic error in **the mass measurement.** This was not answered well. Many candidates just stated zero error without reference to the balance or referred to another instrument. In this context, scales are not an appropriate instrument to measure mass, so this was not given credit.

Question 2

This question was set in the context of investigating the interference of sound waves.

Part (a) involved two aspects of the set up of the apparatus. In part (i) candidates had to **state** a reason for connecting the two loudspeakers to the same signal generator. This was answered well as most candidates had the idea that this was to ensure the waves were coherent. The most common error was not referring to waves.

Part (ii) was a familiar safety question which was answered well. Candidates should be identifying a **specific risk**, and this was most often missing, for example, candidates would refer to a loud sound but not that it could damage hearing. The second mark if for stating **how the risk is minimised**. There were plenty of options here but most commonly candidates referred to some kind of ear protection. Terms such as “earpods” or “ear masks” were not given credit. Some candidates referred to standing at a distance from the signal generator instead of the loudspeakers.

Part (b) involved using the data to determine the wavelength of the sound waves. In part (i) candidates had to determine an **accurate** value of the separation of the minima. This indicated that a **mean value** was necessary and most candidates did use the mean of all 5 gaps. The most common errors were incorrectly calculating a mean or using a single gap. In part (ii) candidates had to determine the wavelength from the formula. Most candidates correctly calculated the wavelength, but did not give the value to the nearest cm.

Part (c) was an extension to the investigation to determine the speed of the sound waves. In part (i) candidates had to **explain** the additional apparatus required. Candidates often find this more challenging as they do not know the names of pieces of equipment. While many knew that the frequency would need to be measured, they either did not know how to measure frequency or could not state a suitable instrument. Some candidates did mention a mobile phone, but this also needs an appropriate application. Similarly, a data logger would need an appropriate sensor. Some candidates tried to describe an oscilloscope or CRO but did not remember the actual name. Some candidates thought that this was a time-of-flight measurement and stated that a stopwatch was needed.

In part (ii) candidates had to **explain** how increasing the speed of sound would affect the value of the separation of the maxima. Most attempted this however, the most common error was not stating that all other variables would remain constant.

Question 3

This question was based on an experiment to determine the efficiency of a motor. The techniques for measuring distances are found in many Core Practicals.

Part (a) candidates had to complete the circuit diagram for this investigation. Most candidates scored marks and used correct circuit symbols. Some candidates added a resistor to the circuit diagram, which was not necessary but did not interfere with how the circuit would operate. The most common error was either not including an ammeter, a voltmeter, or both. Where these were included, they were often placed correctly.

Part (b) concerned the measurement of the height the mass reached after 10s. Part (i) should be familiar as it is a standard **accurate** method for measuring a **single value** of the height with a metre rule. In general, this was answered well. The most common omission was not stating that the metre rule should be clamped or fixed in place. Some candidates did not use terminology correctly. For example, “straight” is not a suitable alternative for “vertical”. Both perpendicular and parallel need to be relative **to** something, e.g. perpendicular to the floor. Occasionally, candidates understood that the metre rule had to be vertical but did not include a means of checking it. Candidates often realised that the metre rule should be close to the mass and described a suitable technique. However, occasionally it was unclear whether a set square was being used to ensure the metre rule was vertical or for reading off measurements. It is also recommended that candidates avoid the use of “horizontal” and “parallel” when describing taking measurements from a scale.

In part (ii) candidates had to **explain** why repeat measurements are appropriate for this measurement. Most candidates realised that repeat measurements reduce the effect of random error, but this on its own is not enough as an explanation. Very few candidates mentioned that there would be variation in the readings, although some did make a vague attempt by suggesting there would be parallax error without stating its effect. Some candidates referred to systematic error which is a contradiction.

Finally, in part (c) candidates had to explain how the measurements would be used to determine the efficiency of the motor. Generally, this was answered well and those that scored the first two marks often went on to score the final mark. Some candidates copied down the formulae from the formula sheet in the hope that this would be given marks. In this type of question, the formulae must be related to the context, so the power or energy needed to be defined in words that related to the investigation. Another common error was to use power and energy in the efficiency formula.

Question 4

This question included plotting and analysing the graph for determining a value for the Planck constant. A question involving a graph appears in each series and the mark scheme follows a common format. Therefore, there is plenty of opportunity to practise this skill and consult Examiner's Reports to correct common errors.

The candidates were given the relationship between the activation potential difference V_a and the wavelength λ of the photons emitted by the LED.

In part (a) they were asked to **explain** why a graph of V_a against $\frac{1}{\lambda}$ should give a straight line. This was similar to questions in previous series, however there was an additional mark available. In general, candidates rearranged the formula correctly, although some candidates did not attempt to do this. In this case, candidates could only score the second mark. The second mark was for relating the formula to $y = mx + c$ and was scored most often. The final mark was for stating what the gradient is **and** that it is constant, which is the condition for a straight line. Some candidates did not relate m to the gradient, so could not score the mark. This needs to be explicit. Others did not state that the gradient is constant.

Part (b) assessed the candidates' ability to plot the graph of V_a against $\frac{1}{\lambda}$ and use the graph to determine the Planck constant. Part (i) was for processing the data. Although most candidates could calculate this, many stated the wrong power, often −6 or −7. Most candidates used an appropriate number of decimal places, but some truncated rather than rounded a value.

Part (ii) was plotting the graph. This scored better than in previous series. The first mark was for **placing the axes the correct way around and labelling with the correct quantity and a unit**. Using an incorrect format, i.e. quantity (unit) rather than quantity / unit, was rare although there were many that did not include the −1 power for m.

The second mark was for **choosing an appropriate scale**. At this level, candidates should be able to choose the most suitable scale so that the small squares are 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**. In most cases a landscape graph unnecessary. Candidates should realise that although the graph paper given in the question paper is a standard size the graph does not have to fill the grid. In addition, axes can start at zero provided the plots cover over half the page. **Scales based on 3, 4 (including 0.25) or 7 are awkward and not accepted** as these often lead to errors in plotting and data extraction. Candidates should label every major axis line, i.e. every 10 small squares, with appropriate numbers so that examiners can easily see the scale used. Occasionally, candidates shifted their axes so that the labels were inappropriate numbers which can also lead to errors.

There are two marks 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, an awkward scale or a scale that was so large that the plots extended over less than 2 squares. Mis-plots were uncommon, but candidates should check a plot if it lies far from the best fit line.

The final mark is for a **reasonable best-fit line**. A reasonable best-fit line should have plots either side of the line and cannot be rotated. Candidates should also circle a data point that is not being used to judge where the best-fit line should be. Where candidates were not awarded this mark, it was either because the line was too thick, i.e. over half a small square, discontinuous, or had a clear bend. Candidates should be encouraged to use a one piece, 30 cm ruler for this examination. Some candidates still insist on joining the first and last data points even when all the plots are clearly on one side of the line.

In part (iii) candidates were asked to determine the Planck constant **from the graph**. There were several common errors seen. The first mark is for using a **large triangle that covers at least half of the graph paper** to calculate the gradient of the graph. 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 **to mark these as a triangle on the graph**. Those that drew the triangle were less likely to make mistakes, and those that used awkward scales were often only successful when sensible values were used. Some candidates also stated dx/dy which was not credited. Many candidates completed the calculation, but some candidates stated an answer outside the range often with a power of ten error, used too many significant figures or omitted a unit.

Finally, in part (iv) candidates were asked to **evaluate** the accuracy of the value of Planck constant obtained from the graph. As this was not the usual style of question, candidates could simply state whether their value was close to 6.63×10^{-34} Js or not, however some candidates did not refer to accuracy. Most candidates calculated a percentage difference but did not comment on the value obtained.

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 the performance on this paper.

- Learn what is expected from different command words, in particular the difference between describe and explain.
- Be able to describe how to measure lengths, angles, force, time, potential difference and current using appropriate apparatus and techniques.
- Refer to random or systematic errors when explaining techniques.
- Practise writing experimental methods including identifying safety issues specific to that experiment.
- Show working in all calculations and give answers using appropriate significant figures and a unit.
- Choose graph scales that are sensible, i.e. the value of the smallest 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 ($\times$ or +) and check any points that lie far from the best-fit line.
- Use a one piece, 30 cm ruler to draw straight best-fit lines. Ensure there are data points on both sides of the line, the line cannot be rotated, and the line extends over 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 at AS level. These are given in Unit 3 and Appendix 10 of the IAL specification.