Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

Summer 2024

Pearson Edexcel GCE
In Physics (8PH0)
Paper 01: Core Physics I

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Introduction

This paper is divided into two sections. Section A of the paper is worth 60 marks and consists of 8 multiple choice questions followed by 7 questions of increasing length comprising of short open, open-response, calculation, and extended writing style questions. Section A examines material from the topics Working as a Physicist, Mechanics, and Electric Circuits. Section B is worth 20 marks on this paper and examines material from the whole AS specification. It contains two questions worth 11 and 9 marks including a data analysis question based on Hooke's Law and moments. Although this is not a core practical, it is similar to core practical 5 so it should be a context familiar to students from both their GCSE and their AS courses. The second question in section B was a synoptic question based on forces and Young modulus. This paper enabled students of all abilities to apply their knowledge to a variety of styles of examination questions. Many students showed a good progression from GCSE to AS level, with prior knowledge extended and new concepts taught and understood well. The longer calculation questions were generally not answered well by many students who found the multi-step approach challenging. Some questions were not answered as well as would have been expected by many learners. Q12(c), based on the resistivity equation should have been a straightforward response, however many students were shaky on the basics of how to use percentage uncertainties. In the open response and the extended writing questions, students that had a sound understanding of the physics involved did not always demonstrate this in their responses due to a lack of precision when applying their knowledge to the context and poor use of subject specific language. However, learners from across the ability range managed to score some marks within these questions. Timing was an issue for a small number of learners, usually due to spending a disproportionate amount of time answering the multiple-choice items. Q17 was mostly affected by this issue with many learners leaving the answer space blank.

Q9

A 3-mark question based on applying moments to the unfamiliar context of a windsurfer. Good responses linked the force of the wind and the weight of the windsurfer to the direction of the moments they caused, before going on to consider the effect of the wind force increasing. Common errors included mixing up the direction of the moments (clockwise and anticlockwise) and discussing clockwise and anticlockwise moments without relating them to the context of the question.

Q10(a)

This question, based on a coin coming to rest due to a frictional force, could be answered by energy considerations, or by F=ma and then an equation of uniform motion. The majority of students chose the latter method. Errors commonly seen with this method included muddling up v and u and getting confused with minus values when rearranging. Those students who chose to use energy equations instead were generally more successful.

Q10(b)

This question was a standard projectile question for a coin projected horizontally. The most common error was using horizontal and vertical values in the same equation. Candidates who had set out their working so that horizontal and vertical data and calculations were kept separate tended to avoid this error.

Q11

This question was based on applying Newton's Laws to the unfamiliar context of a balloon powered car.
Candidates are expected to refer to the particular law they are using in their explanations and generally candidates have improved in doing this over the last few series. The presence of a balloon and a car in this particular example, confused candidates who failed to realise that it must be the balloon which puts a force on the air, and therefore the air applies a force to the balloon. There is then a force on the car as it is attached to the balloon, and Newton's 2nd Law can be applied to show that the car accelerates. Many candidates failed to mention the balloon.

Q12(a)

This was a standard question testing the practical skill of measuring the diameter of a wire. Most candidates scored the first mark point, with some missing out on the second due to not taking readings at different places/orientations.

Q12(b)

This was a standard calculation involving the use of several equations. It was a shame to see how many candidates either forgot to add the unit, or simply did not know the unit for resistivity.

Q12(c)

This question was based on comparing percentage uncertainties and involved combining percentage uncertainties in a simple fashion. Many candidates did not seem to notice that the diameter was squared in the equation and therefore the percentage uncertainty was doubled. Some candidates doubled the percentage uncertainty but for the wrong reason, stating that it doubled because the diameter was halved to find the radius. Many candidates simply stated that the ammeter had the largest percentage uncertainty and therefore was the most significant. Candidates should be encouraged to look at how many marks were available for questions. The simple statement about the ammeter was unlikely to be worth 3 marks. This should have given candidates the idea that there was more to the answer than this.

Q13(a)(i)

This question involved drawing a free body diagram for the car. Candidates generally produced an accurate diagram, but the labelling of the resistive force arrow as 'resistance' or 'friction' sometimes limited the marks available to two. Some candidates missed the normal reaction force arrow off entirely or drew this and the weight parallel to one another.

Q13(a)(ii)

This question involved resolving the forces on the car parallel to the slope. Many candidates were confused as to whether they should use sin or cos of the angle given.

Q13(b)(i)

This question involved the calculation of the gradient of the graph. Many candidates drew a tangent to calculate this, although not always on the steepest part of the graph. Some candidates simply used an equation of motion which assumed that the graph was linear. This was not acceptable.

Q13(b)(ii)

This question involved a description of an energy transfer taking place. Many candidates failed to score this mark as they either did not mention the starting energy store of kinetic energy of the lorry, or did not state where the energy store was, e.g. 'to thermal energy'. These candidates did not show progression from GCSE.

Q14(a)

This question involved using data from the graph and an understanding of the circuit shown. It was generally well answered, but some candidates simply used numbers given in part (a) in $R = V/I$, ignoring the information in the stem of the question.

Q14(b)

This was a 6-mark linkage question. Candidates were expected to link the positive potential difference with the LED flashing on, and the negative potential difference with the LED turning off. Many candidates, despite being given +6V in the question, simply stated that the potential difference was 6V from A to B and did not emphasis that it was positive. Some candidates were imprecise with their references to the oscilloscope trace, stating 'at B' instead of 'from B to C.' A few candidates seemed to think that a 'flash' happened instantaneously and got bogged down in discussion of what happened at specific points on the trace.

Q15(a)

This question involved recognising that the area under the graph represented charge. Most candidates correctly calculated the area using equations for geometric shapes, although a few used the 'counting squares' method to get an estimate which was rarely accurate. A comparison and a conclusion were both needed for the last mark point.

Q15(b)(i)

This question was based on work done by friction to transfer energy from the car as it travelled at constant speed. Most candidates correctly used the efficiency equation, but then did not attempt to convert to joules and therefore did not access the first mark point. Those that did attempt a unit conversion were often unsure whether to multiply or divide by 3600 as evidenced by several crossed out attempts at the working.

Q15(b)(ii)

This question also involved energy transfers. Most candidates were able to calculate the gravitational potential energy gain of the car but were unsure how to progress from there. There were two possible routes. The first recognised that the gravitational energy gain needed to be subtracted from the useful energy available, and then the remainder could be used to calculate the new range and the reduction could be calculated. The second route involved realising that the gravitational potential energy gain reduced the work done by the frictional force, and therefore could be used to calculate the reduction in the range directly. This was conceptually more difficult but made the calculation less prone to errors.

Q16(a)

This question tested practical skills. A diagram was given so that the task could easily be visualised. Some candidates utilised the diagram by drawing on a set square to show how the length could be measured. This is a good way of making this point as a diagram can be clearer than trying to explain this.

Q16(b)(i)

Most students attempted this question and scored some marks. The vast majority plotted the correct graph, although some missed the original length given in the question and instead calculated 'length – 3.1cm', or worked out the intervals between the values. Most students chose sensible scales, but occasionally awkward scales were chosen for the y axis (remember that 2.5's and 4's are included in these) and therefore could not be awarded either MP3 or MP4. Many candidates are still using brackets around units on graph axes labels instead of quantity/unit. Best fit lines were generally of a high quality with fewer candidates than normal producing bent lines due to using a short rule, or forcing their line thorugh the origin.

Q16(b)(ii)

Most candidates chose a large gradient triangle which was good. A significant number of students used a data point either from the best fit line or from the results table and substituted the numbers into the given formula. However, most failed to do this successfully as they either ignored 'c' or substituted the 3.5cm value given as the original length of the spring. If they read c off correctly, then they could access all the marks provided that the data point was for d>30cm (more than half of the range of d). Very few candidates were able to give the correct unit for k. Mark point 4 is stand alone (given that there is working of some kind shown) so candidates should be encouraged to give their answer to a suitable number of significant figures and add the unit.

Q17(a)

This question used the concept of washing hanging on a washing line. Most calculated the weight of the blanket correctly, but many did not attempt to calculate the angle and thus resolve forces to find the tension. The mention of tension led some to try to use the equations for stress, strain and Young modulus, however, the lack of the cross-sectional area for the wire meant that they did not get very far. Candidates found it hard to work out the dimensions needed for sinθ from the dimensions given. Small errors in doing this were excused for mark point 2, as the final answer would be wrong and therefore mark point 4 would not be awarded. Those that got as far as resolving often got muddled with the factor of 2, either missing it out or using it incorrectly.

Q17(b)

This question involved force and Young modulus in an explanation. The question specifically asked for Young modulus to be referenced. Many candidates chose to ignore that and jumped straight from less weight to less extension with no mention of Young modulus. This restricted the marks available to MP1 and 2. Several candidates thought that Young modulus would change showing a lack of understanding of this quantity. Surprisingly, mark point 2 was rarely awarded, with good candidates often moving straight from weight to stress decreasing.

Summary

This paper provided students with a wide range of contexts from which their knowledge and understanding of the physics could be tested. A sound knowledge of the subject was evident for many, but the responses seen did not always reflect this as the language lacked precision and its ambiguity prevented some marks from being awarded. Based on their performance on this paper, candidates are offered the following advice:

- Note units that will need converting as you read through a question.

- Practice questions under timed conditions to ensure that you do not run out of time on the last question.

- For projectile questions, split your answer section in two, with one side for horizontal data and calculations, and the other for vertical. This way you are less likely to muddle up which piece of data to use.

- Complete questions set in unfamiliar contexts to practice applying knowledge rather than simply learning set methods.

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