Examiners' Report/
Principal Examiner Feedback

January 2015

Pearson Edexcel International GCSE
in Physics (4PH0) Paper 1P

or

Pearson Edexcel Certificate
in Physics (4PH0) Paper 1P

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General

On the whole, students demonstrated that they could recall facts and equations (with a few notable exceptions) but were less proficient at applying these in new situations. There was evidence that students who had experience of laboratory work gained good marks on questions targeted at AO3 (experimental methods, data processing, variables etc.). Generally, students made few numerical mistakes in their calculations. However, they should be reminded that S I units are normal, and that **all** quantities involved should be in S I when substituted into equations. There was evidence that many students are not exposed to a range of graphs to display different types of data, but instead are trained to use line graphs.

Question 1 household electricity

This question proved to be a suitably straightforward start to the paper for most students, with over 75% gaining all three marks. The most common mistakes were to choose fuse for parts (a) and (c).

Question 2 radioactivity

In parts (a) and (bi), less than 5% of students failed to gain a mark. However, the rest of the question proved to be more problematic for the majority of students. In (bii), less than 30 % knew that alpha particles are most ionising because they have a larger relative charge or larger relative mass compared to beta or gamma.
Students similarly struggled with all parts of (c), which was surprising as the random nature of decay and background radiation has been much better answered on previous papers. About 15 % gained full marks for part (c).It is possible that a somewhat different application caused students to think this question harder than it actually was despite the fact that this was placed at the start of the paper.

Question 3 sound waves

Both multiple choice questions were well done with over 75% success rate. Parts (bii /biii) proved to give more challenge with under 40 % gaining both marks for the frequency and time period calculations.

Question 4 distance time graph and speed calculation.

This was an application of a distance time graph. It was surprising that many students could not read the distance of 6.1 m in (ai). Few students were able to adequately relate that 'stationary' was equivalent to a horizontal line on the graph. Some students described adding up all the times (in minutes and seconds) rather than just counting the number of horizontal lines on the graph.

In (b), the equation was well known. However, many students substituted incorrect values into the equation. Commonly, the time was wrong. Students used (8-0.8) rather than the seven minutes which was given in the stem of the question. Further, students left the time in minutes and then quoted the speed in m/s, hence they lost the mark for a matching unit. Just less than 25% of students gained 5 or more marks for question 4.

Question 5 convection

Many students (nearly 40%) were able to describe convection in good detail gaining four or five marks. Conversely, nearly one quarter of students failed to gain any marks. There was evidence that students are still using inappropriate terminology such as '*air particles* expand and become less dense' instead of '*air* expands and becomes less dense'. This type of mistake was penalised.

Question 6 practical skills

In part (a), most students were able to identify the anomalous result and then go on to calculate an average. Common errors in this section were: including the anomalous result in the average and failing to round the average to a suitable number of SF.
In parts (bi and bii), almost all students (83%) were able to name 'bar charts' in (i) but were unable to explain that such charts were most suitable for discrete data. The relationship needed in (biii) was described by a pattern sentence by over 75% of students, but very few described the non-linearity.
In part (c), many students were able to gain some marks by describing a displacement method, with nearly 40 % gaining 3 or 4 marks. However, almost an equal number of students failed to gain any marks for this section.

Question 7 pressure and kinetic theory

Part (a) was well done by the majority of students with about 50 % gaining full marks. Students who gained 4 of the 5 marks usually had made a mistake with units and failed to convert kPa to Pa in their working and hence quoted a value of force in N which was incorrect by a factor of a thousand.
In parts (b) and (c), over two thirds of students gained some marks for relevant detail about kinetic theory. In (b), the random nature of gas particle movement was often omitted and in (c), many students mistakenly answered in terms of ' p.v = constant'.

Question 8 energy transfers

The calculations in part (ai) and (aiv) were well done, but a number of students failed to gain the mark in part (i) because they wrote 'gravity' rather than 'g' or 'gravitational field strength'. A few students were unable to select the correct equation for (iv) from the list given on page 2 of the exam paper. In part (iii), over 40 % of students were unable to gain a mark for an explanation of energy conservation. Another 40 % were able to gain one mark for a statement of the type of energy 'lost' without saying to what or where the energy was lost.

Part (b), the stages in the energy transfer from gravitational potential energy to electrical energy were not known by over one third of students. A number of students mistakenly described a thermal energy conservation for example in a gas fired power station. However, over a quarter of students were able to describe a logical sequence of energy transfers.

Question 9 density

The equation and calculation proved to be accessible for the majority of students with about 60% gaining full marks in part (a). For a large proportion of the rest, a mark was often lost because of an incorrect unit. The multiple choice question in (b) was found to be more difficult as just 50% gained the mark. There was no pattern to the incorrect choices.

Question 10 electrical circuits-practical skills

The majority of students were able to gain some marks in part (a) for identifying that the two meters had been swapped. However, many students failed to word their answers with sufficient precision or detail: phrases such as 'the voltmeter is in the wrong place' or 'the battery is wrong' were not given credit.

The line graph was well answered on the whole with about 70% of students gaining 3 or more marks. Common errors included: using an inappropriate scale (e.g. 0 ,1.5, 3, 4.5, 6 etc), omitting units on the axes and joining the points with straight line sections. It was therefore surprising that only one third of students gained the mark for reading datum from the graph in part (bii). In part (biii), the majority of students were unable to relate a curve in the graph to a change in temperature of resistance.

In part (biv), most students failed to understand the significance of the phrase 'what else' as they wrote at length describing where to place the ammeter and voltmeter instead of concentrating on a method for keeping temperature constant. Another common mistake was to describe a method for variation of resistance with length. It was noticeable that the most highly achieving students in this section seemed to have done this experiment in a laboratory or as a simulation.

Question 11 refraction

Over 80% of students were able to correctly identify the angle of refraction in part (a). In part (b), the majority of students wrote at length about how to set up the apparatus which had already been shown as set up. Marks were only gained for naming apparatus not shown in the diagram and for describing how to deal with the data obtained. Only about 30% of students gained 3 or 4 marks for this part.

Question 12 terminal velocity

About 75% of students gained the mark in (a) for naming terminal velocity. However, a majority of students failed to read the question with sufficient care and described what happens to the box as it fell rather than describing the forces at constant velocity. Less than 25% of students gained 3 or more marks. The most common errors included not stating the direction of the forces involved and confusion the terms weight, mass and gravity. It was also noticeable that some students used inappropriate phrases such as 'the box fell until the acceleration was equal to the weight' i.e. they equated different physical quantities. (This fundamental error was also observed in responses to question 13.)

Question 13 forces and kinetic energy

Labelling forces in part (ai) was not well done as over one third of students failed to gain a mark. Frequently this was because the force arrows were not labelled but sometimes this was because the labels were inappropriate e.g. a down arrow labelled 'gravity' or 'mass' rather than 'gravity force' or 'weight'. The placement of arrows was also problematic for some students. The explanation of why a rolling ball comes to a stop was also quite poorly done, with less than 25% of students gaining 2 or more marks. Students were given credit for either an explanation purely in terms of forces or in terms of forces and energy. Mostly, students did not use technical terms with sufficient precision or detail. This was also apparent in (b) where the terms drag, and friction were used interchangeably and students also stated that 'there is no friction in the air'. Only 30% were able to gain a mark in (b).

In part (c) the 75% of students who were able to quote the equation correctly were often able to make substantial progress in the calculation. Common mistakes included omitting to change from g to kg (hence the matching unit is incorrect), incorrect rearrangement of the equation, and failure to take the square root correctly. There were many varied but credit worth suggestions for part (cii).

Question 14 electromagnetic induction

Part (a) of this question was very poorly answered by the majority of students. Only a few seemed to realise that the question was about induction. In part (ai), students often wrote the answer to part (aiii) and vice versa. About 15% of students gained full marks for each part. Students would be well advised to read the stem of each question very carefully. Part (aii) was somewhat better answered with just over 25% gaining the mark. Part (b) was more accessible for students as about 85% of students gained at least some marks with over 20 gaining all 3 available marks. Almost all students realised that the trace would show an alternating voltage which decayed. A few drew this so poorly that it was not possible to award the mark. The larger amplitude was also generally well shown. However students often found it difficult to draw the lower frequency consistently across the diagram.

Question 15 reflection, speed and graph analysis

The recall and simple application parts of this question (i.e. parts (a) and (b)) were well done with over 50 5 gaining full marks. A common error in part (b) was to neglect the factor of 2 as the time given was to the Moon and back. Generally, unsuccessful students attempted to use the equation for orbital speed rather than the simpler distance time equation.
The analysis of the graphical data in part (c) proved to be challenging for even the most able students. In part (ci), less than 20 % of students gained 2 or more marks. Frequently students misinterpreted the graph as showing the variation during a day rather than over a month. The amount of knowledge about the Moon needed to answer this question was minimal, but many students wrote answers where their comments about the graph contradicted this minimal knowledge. Other students simply omitted part (ci) and attempted part (cii) which was slightly better answered with about 40% gaining the mark.

Recommendations for improvement

1. Wherever possible, centres should ensure that students do the suggested practicals. If this is not possible for whatever reason, students should be encouraged to use good simulations, some of which are available with minimal cost online.

2. Some equations are not well known, e.g. the equation for kinetic energy is often confused with the equation for momentum. It is strongly suggested that students be tested regularly on recall of equation. Students can't gain marks for calculations if they don't know the equation of how to transform it.

3. Students should practice different types of data analysis e.g. from graphical data and from text or tables. There has been at least one of these on all recent examination papers in this subject as it is forms part of the require AO3 skills.

4. Students should also practice recognising areas where poor technical vocabulary loses otherwise easy marks. This can be done by for example giving students (photo)copied but otherwise unidentified sections from internal examinations where they can try to spot errors. Teachers can discuss why confusing say power and energy loses marks. Teachers can also see such areas by reading the notes section on the mark schemes.

Grade Boundaries

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