Examiners' Report/ Principal Examiner Feedback

Summer 2015

Pearson Edexcel International GCSE in Physics (4PH0) Paper 1P
Science Double Award (4SC0) Paper 1P

Pearson Edexcel Level 1/Level 2 Certificate in Physics (KPH0) Paper 1P
Science (Double Award) (KSC0) Paper 1P

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Examiner's Report International GCSE Physics 4PH0 1P

Overview

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 Nuclear Reactor

This question proved to be a suitably straightforward start to the paper for most students, with nearly 95% of candidates gaining the first mark. A further 70% of candidates correctly identified that control rods absorb neutrons. The most common mistake here was to give option D (slowing the neutrons).

Question 2 Linear Movement

This was an application of a velocity time graph. It was not surprising that nearly 90% of candidates could correctly read the velocity in (a) (i). However 1/3rd of candidates could not relate velocity=0 m/s as stationary and hence determine the time as 10s. The most common error was to add all the times for which the slope was zero.

Both of the calculations in (b) and (c) were well done with over 75% success rate.

Part (d) proved to give more challenge with under 50% of candidates gaining both marks for the distance under the graph explanation. Although not required, credit was given to numerical attempts where clear working was shown.

Question 3 Home Lighting Circuits

Almost 95% of candidates correctly identified the fuse symbol and a further 80% could state an advantage of parallel circuits.

More candidates found difficulty with part (b), an explanation of alternating current. Here the most commonly omit detail was the continuous or periodic nature of A.C.

In part (c), many candidates attempted to work the calculation in hours rather than in the correct S.I. unit of seconds. However, it was pleasing to note that many of the successful candidates also attempted to round their answer even if they did so to 3.S.F rather than the 2.S.F used in the question. Nearly 2/3rds of candidates were successful with (c) (ii). There was no particular pattern to the erroneous responses.

Question 4 Electrical Hazards in the Kitchen

It was surprising that so many candidates struggled with this question.

Examination techniques seemed to be missing: the layout of the question with three numbered sections would suggest that there were probably two marks available for each section. However many candidates simply stated or listed perceived hazards and did not discuss them, hence limiting themselves to three marks. Other candidates gave the same hazard (mixing water and electricity) for several different devices, rather than giving three different hazards: this again limited the marks available. Some candidates did give different hazards, but the same consequence e.g. water in contact with a socket can cause a shock and damaged equipment can cause a shock. This again limited the marks awarded.

Question 5 Stretching a Spring - Practical Skills

Part (a) proved to be unexpectedly difficult for most candidates with only 20% of candidates gaining both marks. It was not uncommon to find that the candidate had attempted only one answer. Similarly naming the dependent variable was found difficult with just over 50% success rate. It was also surprising that less than 50% of candidates could explain how to calculate force from mass. Few mentioned the relevant equation or how to change mass into kg from g.

The graph plotting and use of graph was much better attempted by the majority of candidates: over 70% gained seven or more marks. Common errors included: using an inappropriate scale (e.g. 0, 1.5, 3, 4.5, 6 e.t.c), omitting units on the axes and joining the points with straight line sections. There were a few candidates who extended their line to the wrong axis, and thus gave the extension when the force was zero.

The final part of this question was also shown to be problematic for the majority of candidates. Only 15% of candidates could explain whether the spring obeyed Hooke's law, although a further 40% gained one of the marks most commonly for stating that the line did not pass through the origin.

Question 6 Magnetic Fields

Candidates found this question relatively straightforward. There were the usual mistakes in each part of the question: in (a) tapping the card to help align the iron filings was often omitted; in (b) lack of care with the detail of the field lines such as crossing lines or contradictory arrows; in (c) insufficient field lines or non-parallel lines.

Question 7 Energy and Forces

Part (a) was well done by the majority of students with over 55% gaining full marks. However, it was unfortunate that candidates who got the equation wrong, often then lost all the marks. A common error was to write ‘gravity’ instead of gravitational field strength. Another common mistake was to not realise the equivalence of gpe and work done.

In part (b) (i), about 25% of candidates could not draw and label either of the two forces correctly. 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. There was some evidence to show that this was centre dependant.

As expected, the calculation was well done by over two thirds of candidates, but there were the inevitable mistakes in the equation and processing the calculation. Only one third of candidates recognised that an unbalanced force is needed to cause deceleration.

Question 8 Particle Theory
The majority of students were able to gain good marks throughout this question with the exception of part (e) (ii).

In part (b), over 35% gained full marks with a further 30% gaining two marks. Candidates showed understanding of the random motion of particles hitting the walls but were less clear about how these impacts cased a pressure.

The density and calculation proved to be very accessible which was not the case with part (e) and in particular (e) (i) where less than 40% could suggest what happens to the hot air in the balloon when the balloon climes higher. This could be because candidates attempted (e) (i) without reference to the stem of the question i.e. that the balloon is higher in the sky.

Question 9 Emission of Thermal Energy

The vast majority of candidates found this question very difficult. There were many attempts at an explanation involving all three thermal energy transfer mechanisms. Just over 15% of candidates gained three or more marks for realising that the key to the question was the difference in emission between white and dark surfaces. Only a few mentioned infra-red radiation. Over 50% did not gain any marks for this question.

Question 10 Objects in the Solar System

Over 90% of candidates were able to correctly identify the size order of astronomical objects. It was unexpected that candidates found parts (b) (i) and (b) (ii) to be quite difficult: in part this was due to lack of technical vocabulary.

The calculation in part (c) was well done, but it was unfortunate that some candidates did not use the correct equation which had been given on page two. There were also candidates who omitted to round their answer to 2.S.F as required.

Only the most able made reasonable attempts to explain why Enceladus and Deimos have similar orbital periods. The most common error was to respond that it was due to the differing sizes of the planets they orbited.

Question 11 Gamma Radiation

Over 80% of candidates were successful in part (a) (i). Unfortunately, there are still many candidates who stumble with the definition of half-life and only gain the mark for the time part of the definition.

Part (b) is another instance where nearly 40 % of candidates did not get full marks due to poor examination technique- in this case there were two marks available for a 'suggest' question. Some candidates attempted to write two ideas but failed because of lack of precision e.g. 'alpha particles have a short range and are easily stopped' without adding 'by the patient'. The majority of candidates found part (c) (i) to be very difficult with fewer than 20% managing to gain one or both marks. Again, lack of precision and technical vocabulary was part of the cause: candidates often mentioned 'atoms decaying' rather than 'nucleus decaying'. The final part of this question was well done with over 55% gaining all three marks. A further 15% gained part marks for showing an appropriate method.

Question 12 Total Internal Reflection and Refraction in a Block

Part (a) was designed to be a straightforward lead into calculation on refraction. However, many candidates struggled to give an adequate definition of total internal reflection with over 40% failing to gain any marks. Similarly fewer than 25% were able to state two used of TIR. Once more, some of this was due to lack of technique and detail: 'in a prism and in a periscope' was not enough but 'in a prism in a periscope and in a prism in a camera' did gain the marks.

The multiple choice question, part (b) (i) had a success rate of nearly 60%. The equation and calculation performed at about the same level. Common errors included giving sin i / sin r = n instead of the critical angle equation, and inability to handle 1/sin 42°. A few students used 25° instead of 42° for the value of the critical angle.

Question 13 Waves

Most candidates made a very good start to this question with nearly 80% gaining two or more marks in part (a). The larger amplitude was also generally well shown. However students often found it difficult to draw the lower frequency consistently across the diagram.

Part (b) asked for a non-standard method to determine the speed of sound: the distance was comparable to those used in the ‘echo’ method but the time needed was the interval as used in the ‘microphone’ method. It was pleasing to note that many candidates made good attempts with about 50% gaining three or more marks. The need for a loud sound was noticed as was the time interval. Lower scoring candidates did not make mistakes in their method, rather they omitted further detail.

The calculation in part (c) was well done, with over 80% gaining three or more marks. Here the most common reason for losing a mark was to fail to change the frequency into Hz from MHz. Candidates should be reminded to work in SI units when the answer line gives SI units.

Part (d) was more challenging; with fewer than 50% gaining credit for stating that the two waves have different speeds.

Question 14 Thermistor and Graph Analysis

Part (a) (i) of this question was well answered by the majority of candidates. However, the reasons for keeping the voltage constant and including a variable resistor where not well understood: about one third of candidates gained these marks.

The analysis of the graphical data in part (b) proved to be challenging for even the most able students as less than 20% of students gained 2 or more marks. Candidates would be well advised to quote data correctly in their responses rather than giving broad statements such as ‘the temperatures don’t match the current all the time’.

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. In a similar manner, students should be encouraged to learn standard definition such as 'half-life'.

4. 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 required AO3 skills.

5. 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.

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