Examiners' Report

Principal Examiner Feedback

Summer 2017

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

Pearson Edexcel Certificate in
Physics (KPH0) Paper 1P
Science (Double Award) (KSC0) 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.

Question 1 Alpha particles and electrons

This question proved to be a suitably straightforward start to the paper for most students. However alpha particle repulsion proved to be less well understood as over 30% of students gave incorrect responses in parts (bi) and (bii). The application based question (biv) was well done as 80% of students correctly identified high ionising ability.

Question 2 Thermal energy transfer

Most students found that the conduction question in part (a) was straightforward, with ¾ gaining full marks and a further 10% gaining 1 mark for failing to give a suitable qualifier. However, students found parts (b) and (c) more difficult. The question on 'emission' was often answered as 'absorption' with just over ¼ of students gaining both marks.

Part (c) concerned thermal energy transfer by convection. In part (i) weaker students failed to differentiate between air particles and air which was shown by erroneous phrases such as 'the air particles expanded.' Unlabelled diagrams were not given credit. Both of these errors resulted in a wide spread of marks with over ¼ of students failing to gain any marks. Part (ii) was poorly attempted with just over 1/3 of students correctly identifying surface area as the key design factor.

Question 3 The electromagnetic spectrum

It was pleasing to note that the AO1 part of this question was well done with almost 95% of candidates correctly identified the missing region of the spectrum and 80% also correctly identified gamma as having the shortest wavelength. Many students also could identify that the frequency decreases with increasing wavelength but less than 25% could explain why the relationship occurs. In (d) over 80% correctly identified infrared radiation.

The application based part (e) was slightly more difficult. As with the ultrasound question in a previous paper, some students struggled to express their ideas about the distance the microwave travelled. Over 25% failed to gain any marks in (ei). In part (ei), half of the students made a sensible suggestion why the aerial rotates.Question 4 Electrical safety

Many students found this question difficult. In part (ai), some students confused electrical insulation with thermal. Part (aii) was the best answered as 45% of students gained both marks. Students often confused the purpose of earthing and double insulation in parts (aiii) and (aiv) and just under 40% failed to gain a mark.

Many students were able to give at least one advantage of using a circuit breaker instead of a fuse, but 25% failed to gain a mark.

Question 5 Energy and efficiency

It was quite disappointing to find that many students concentrated on the devices in the power station rather than the energy transfers involved. Less than 25% of students gained three or more marks for part (a). There was a further 25% who gained two marks. Many students found it difficult to sequence the energy sources even with the diagram provided.

The objective questions in parts (b), (c) and (d) were quite well done, as was the calculation of overall efficiency. Here the common error was to recall the equation incorrectly.

Question 6 LDR and practical skills

This question was primarily targeted at practical skills and many parts proved to be accessible for most students. Although the investigation was unfamiliar, nearly 60% were able to suggest a sensible reason for using a darkened room. In part (aii) naming the different variables was found quite difficult with just under 15 % success rate. The independent variable was the one which was most commonly identified.

It was pleasing to note that most students could both identify the anomalous reading and discarded it when calculating the average reading. The graph plotting was also well attempted by the majority of students: over 2/3rd gained four or more marks. Common errors included: using a nonlinear scale (by omitting the '70' on the distance axis), omitting units on the axes and joining the points with straight line sections.

It was also pleasing to find that in part (di) over 80% of students were able to gain one or more marks for describing a relationship between distance and current. Students should be reminded that this type of two-mark question requires more than a simple pattern sentence, the linearity or lack thereof should be discussed and that 'negative correlation' is insufficient to describe a relationship.

About 2/3 of students could extrapolate from the current/distance curve to the resistance of the LDR. Almost 60% of students failed to gain a mark in part (e). A third of students were able to identify that the tracing paper would reduce the light level, but could not describe what would happen to curve.

<u>Question 7 Terminal velocity and practical skills</u>

Many students found most of this question relatively straightforward apart from the start and end parts. In part (a) there were some unusual labels for the forces although the upforce and downforce were drawn as equal in size. Unfortunately, many students confused the terms 'weight' and 'gravity' and so lost a mark.

The explanation in part (aii) was well attempted as nearly 60% of students gained two or more marks. A common mistake was to omit that terminal velocity is constant.

Both parts of (b) proved to be accessible for most students. The best of the responses showed some brevity: these students gave the outline of the investigation without over complications. Students should be advised to concentrate on the instructions given as some students only responded to two of the three directives.

Only 20% of the students gained marks part (e). The link between the type of variable and the type of graph was not well understood. There was some evidence to suggest that this was centre dependent.

<u>Question 8 Movement of a truck</u>

Students found this question relatively straightforward. In part (a), over 70 % gained the mark, but some students lost the mark due to unusual suggestions such as 'the reduce the rain' or to 'increase the downward force'.

In linked calculations in part (b), the most common errors were to select the wrong distance in the work calculation and to fail to convert the weight into newtons instead of kilonewtons. Less than 5% failed to gain a mark. Similarly, the calculations in part (c) were also accessible although some students omitted to use the factor of ½ for part of the area under the graph line.

The final calculation in (d) gave a good range of marks with nearly 70 % gaining three or more marks. Often the error was to forget to include the factor of 6 to account for the six wheels.

Question 9 Refraction of light through a prism

This question proved to be one of the most difficult for the students and showed that understanding of refraction and critical angle is limited.

In part (a) while 80% of students could recall term 'normal' less than 40% of students could give a reason for shining light into the prism at 90° or for using monochromatic light.

In part (b), there were quite a few students who could not measure the angle correctly. The equation was often quoted without sines in (bii) but then correctly used in (biii).

Part (c), tested recall and application of the term critical angle. This proved to be challenging. In part (i) lack of precision was common with many students forgetting to mention that the critical angle was inside the glass. In part (ii) less than 30% showed any reflection back into the glass.

Question 10 Nuclear fission and beta decay

This question proved to be more challenging than expected. It was surprising that under 30% of students could explain what is meant by fission in part (ai). The calculation of the number of neutrons released was much better attempted and it was pleasing to see that most students set out their method carefully.

The rest of part (a) also proved to be poorly attempted. Students gave incomplete explanations in part (aii) finishing after the first fission or blithely stating 'and so on' or 'and this repeats'. Almost 50% of students failed to gain a mark. Part (aiv) was a little better, but many students omitted to refer to the equation.

The effect of beta decay on nucleon number was also poorly understood or explained with just over 50% failing to gain a mark. While the rest of the students did know that the mass number remains constant, under 15% of students could explain why.

Question 11 Electromagnetic induction

This question was quite well attempted although there was the inevitable confusion with the motor effect particularly in part (bi).

Nearly 40% of students could identify two separate changes needed to produce a positive voltage in part (a). A similar number could also give a reasonable explanation of induction. Increasing the induced voltage was also well known.

However, only the most able students made progress with the energy transfers in part (biii). The most common error was to confuse the energy needed by the load with the energy input to the coil.

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 misquoted. 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 or how to transform it.

3. While many students are very proficient at substitution into equations, they are less so with transforming the equation. In a similar manner, many students make mistakes when converting power of tens in units. There is no requirement that students work in standard form, but students should know what the standard prefixes mean. It is strongly recommended that this be an area of focus during revision.

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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