Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

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Pearson Edexcel International GCSE
In Physics (4PH1) Paper 2P

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General Comments

As in examinations for previous specification, most students were able to recall the equations and usually they handled the related calculations well. Students who gave the best practical descriptions usually appeared to be writing from first-hand experience. Responses to the longer questions showed that the less able students tend to struggle when assembling a logical description or when asked to offer more than one idea. There was a wide range of responses and it was good to see that many students could give full and accurate answers.

Question 1

Many candidates are now familiar with the new section on astrophysics, introduced to the specification in 2017. 'Red-shift in galaxies' was commonly recognised as evidence of the Big Bang theory, with 'cosmic microwave background detected in all directions' less commonly so. It was typical of candidates to include 'cosmic rays from space' as further evidence, which is not true.

The concept of absolute magnitude has been asked in a couple of cycles now and candidates are more comfortable with the idea at a fixed distance. The correct distance is 10 parsecs or 32.6 light years however this knowledge is not required yet many candidates knew it.

Far fewer candidates knew that not only will the surface temperature of the Sun decreases but also the brightness will increase.

Question 2

A wide range of specific advantages of hydroelectric power stations were acceptable and candidates by and large remembered at least one of them. In previous examinations, as in this case, vague references to pollution, global warming or cost were rejected.

Energy transfers and stores continues to be challenging for candidates although many are familiar with GPE or the gravitational store reducing when water flows out of a reservoir.

Clarity was also required for the term 'power'. Energy 'in' a given time is still an energy, whereas an energy 'per unit time' is clearly a rate of energy transfer. Only the latter was acceptable. Specific expressions for power, such as $P = VI$ for electrical power, were not general enough. The calculation itself was performed very well on average. There were some that did not convert one day into the correct number of seconds. Most candidates remembered that MW stood for 1 million watts and performed the conversion effortlessly as required.

Question 3

Item 3(a) is challenging to get exactly right. Key to success here is to remember that heating a system will change the energy stored within the system and raise its temperature or produce changes of state (specification item 5.8P). Temperature is also related to average kinetic energy (KE) of particles so suggesting that KE increases during a change of state is incorrect.

Candidates scored very well, on average, for item 3(b). The best answers included reference to the directly proportional relationship between average particle KE and kelvin temperature for 3(b)(i). The idea that gas particle collisions *with each other* contribute to gas pressure is a consistent misconception. Many candidates successfully read off the graph correctly and had some valid attempt at the final section. The most straightforward approach was to use the formula on page 2 of the paper, although a significant minority tried to either extrapolate the line and read off the relevant pressure (which was quite difficult to achieve accurately) or to use the gradient of the graph (somewhat easier to get correct with sufficient mathematical skill).

Question 4

Almost all candidates balanced the nuclear equation correctly. Rather fewer realised that no neutrons are produced in this fusion reaction. Very few indeed went on to say that neutrons were required for this fusion to take place and so could not continue in the absence of product neutrons.

Candidates expressed the difference between nuclear fission and nuclear fusion very well, especially if they specifically mentioned nuclei rather than atoms. This is explicitly mentioned in specification points 7.18 and 7.24.

Question 5

Candidates have become more adept at spotting which variables are the independent, dependent and control variables in investigative science. In this case, however, the position of the mass hanger is being changed by the student and so must be the independent variable. No credit was given for stating that the equipment must be the same.

Candidates can plot data points and draw straight lines of best fit confidently, especially with data such as in this question with so little scatter. Candidates should check, however, that the same number of points are above and below the best fit line.

Descriptions of trend lines remains challenging for many candidates. Inverse proportion is a special relationship and is reserved for such relationships as that between volume and pressure of a fixed mass of gas at constant temperature. A common response was that the two forces in this question were inversely proportional, solely because one line went up and the other went down. This is inconsistent with both lines being straight and meant that candidates who mentioned inverse proportion had contradicted themselves. Describing the trends is precisely that: no mention of explaining why they are that particular trend is necessary. Describing the direction of change and whether that change is uniform or non-linear is often sufficient.

The final part of this question is difficult to explain successfully without reference to the principle of moments. Teachers could support their students by insisting that moments are taken about a specific point i.e., when the mass hanger moves away from point A, the distance from point A increases which in turn increases the clockwise moment of the weight of mass hanger about point A. Candidates who had answered correctly in all other respects did occasionally confuse moment and momentum, negating otherwise good answers.

Question 6

Candidates clearly understood electromagnetic effects to a solid, basic level. The majority demonstrated their ability to manipulate the relevant equation and show their working carefully in parts (b)(i)-(iii). The principal reason for lower marks on part (b)(iv) was imprecise language: references to increase the voltage or turns were common yet did not specify whether this should affect the primary or secondary coil.

Question 7

The use of electrostatics in paint spraying is well-documented. The candidate must still read the question carefully to make sure they are giving answers that are relevant to the specific context given.

In this case, many candidates mentioned that the paint particles (rather than just the pain) becomes positively charged although fewer related this to the idea that the paint particles will therefore repel each other. There were some high-level answers in terms of electrostatic induction in the object being painted.
Item 7(b) proved challenging. In this context, earthing is about the ability of electrons to flow either up or down an earth wire to neutralise the object being earthed. This is the same as in other contexts such as safe use of household appliances although here, safety is not the prime reason for earthing.

Question 8

Almost all candidates chose a microphone as the extra piece of required apparatus. It was reassuring to see that candidates referred to the process of gaining a steady trace which is correct experimental technique yet does not directly answer the question. As in previous examinations, the process of determining the frequency needs knowledge of the number of squares a waveform takes up and how that should be multiplied by the time base value.

Candidates know the range of human hearing very well. The process of calculating the time period was not always as successful yet applying the conversion from time period to frequency correctly enabled many candidates to gain the rest of the marks.

On the paper’s final item, 8(b)(ii), most candidates succeeded in changing the time period to four squares. Rather fewer, however, remembered to scale the amplitude correctly.

Summary Section

Based on the performance shown in this paper, students should:

- Take care when drawing diagrams to add labels and draw accurately.
- Either build or simulate circuits in which the number of components changes and noting the effect on the currents and voltages in or across those components.
- Ensure that they have either seen or performed the practicals named in the specification where possible.
- Take note of the number of marks given for each question and use this as a guide as to the amount of detail expected in the answer.
- Take note of the command word used in each question to determine how the examiner expects the question to be answered, for instance whether to give a description or an explanation.
- Be familiar with the equations listed in the specification and be able to use them confidently.
- Structure multi-step calculations as simply as possible to facilitate checking at each stage.
- Recall the units given in the specification and use them appropriately, for instance frequency.
- Be familiar with the names of standard apparatus used in different branches of physics.
- Practise structuring and sequencing longer extended writing questions.
- Show all working so that some credit can still be given for answers that are only partly correct.
- Signposting working with words may help with structuring calculations clearly.
- Be ready to comment on data and suggest improvements to experimental methods.
- Take care to follow the instructions in the question, for instance when requested to use ideas in the answer.
- Take advantage of opportunities to draw labelled diagrams as well as or instead of written answers.
- Allow time at the end of the examination to check answers carefully and correct basic slips in wording or calculation.

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