Examiners' Report/
Principal Examiner Feedback

January 2015

Pearson Edexcel International GCSE
in Physics (4PH0) Paper 2P

Pearson Edexcel Certificate
in Physics (4PH0) Paper 2P

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General comments

As in previous examinations for this 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 response and it was good to see that many students were able to give full and accurate answers.

Question 1

Most students could convert between kilovolts and volts and were successful in part 1(a). Fewer students realised that high voltage transmission improves efficiency and less than half chose the correct response for part (b). However, the purpose of a transformer is much better understood and nearly all students were successful in part 1(c)

Question 2

The vast majority of students could identify the comet, the planet and the Sun shown on the diagram in part 1(a). A few confused the comet and the planet, perhaps because they were unsure of shapes of the orbits. Most students were able to point out that the two orbits intersect and gained the first mark in part 2(b). Far fewer went on to explain that a collision would also rely on simultaneous arrival or could be predicted from the speed difference of the comet and the planet. A weak response, seen fairly often, was that the planet and comet would be attracted to each other by gravitational force and that this would be the cause of the collision.

Question 3

It was clear from their responses that many students have a fairly good understanding of electrostatics. More than half of the students identified friction as the initial cause of the charging process in part (a). Fewer were able to include the idea of electron transfer in their explanation.

Responses to part (b) were more assured, with nearly all students identifying a possible danger in part 2(b)(i). Explanations of the use of the earth connection for part 2(b)(ii) generally began well with the idea that there is a current, or charge moves, in the earth wire. Many went on to link this successfully to the idea of electrical discharge. A few responses were spoiled by reference to “electricity” rather than charge or current and some students gave inappropriate descriptions of the role of an earth wire (and fuse) in a domestic appliance.

Question 4

Most students gave an acceptable estimate of the length of the rubber bands shown in the photograph for part 4(a)(i). When invited to suggest in part 4(a)(ii) why their value may be inaccurate, the majority could give at least one good reason. These seemed to come either from careful examination of the photograph or from recalling common sources of error previously encountered during experimental work. For instance, parallax and zero errors were commonly given and perfectly acceptable reasons. Nearly all students gave some response here and common misunderstandings in weaker answers included ideas that repeating the estimate or controlling a variable would be of help in this instance.

Only a third of student's correctly linked the idea of a fair test to the control of a variable in part 4(b). Most of the acceptable responses mentioned the constant 5N force. Some correctly suggested keeping a property of the rubber bands constant - the same thickness, for instance. Many incorrect responses suggested repetition of the experiment as a means to ensure fairness.

In part 4(c)(i), students who stated that the number of rubber bands is not a continuous variable were rewarded. Those giving an alternative correct description, that this number is the independent variable, also gained this mark. The question establishes the discontinuous nature of the independent variable and students were expected to draw a bar chart. Many students chose to draw a line graph and still received some credit. Graph work was generally of a high standard and, other than drawing a line graph, the most common error was to omit the unit for length.

Most students could give a creditable description of the relationship in part 4(c)(iii) and very few left this space blank. Most responses included the idea of the inverse relationship, although few went on to mention that this was non-linear. The relationship was most commonly described through a pattern statement, such as, "as the number of rubber bands increases, the stretched length decreases."

Question 5

Only half of the students could convert between the kelvin and celsius temperature scales successfully. The most common errors in part 5(a) were mistakenly subtracting 273 or omitting the minus sign after a correct calculation.

Some students did not realise the importance of including a comparative description when stating ways in which arrangement and motion of the molecules change as the helium becomes a gas. Two thirds of students gave a worthwhile response to part 5(b)(i). Marks given were for comparative statements such as the molecules "spreading out more", "getting further apart" or "moving faster." Basic statements, such as "the molecules move fast", might show a little understanding, but they were not accepted as describing the change. However, most of the students did well here and a quarter of them gained full marks.

When asked to sketch the graph, most students correctly drew a straight line of positive gradient passing through the origin to gain both marks for part 5(b)(ii). A few students scored only one mark, usually for drawing an incorrectly curved line that nevertheless passed through the origin.

A large number of students did not respond with a description of how the apparatus shown in part 5(c) could be used in the investigation. Instead they tended to limit their response to a theoretical discussion of the relationship between of gas pressure, temperature and volume. Many went on to suggest a conclusion that the investigation might yield, without describing how any results would be obtained. These responses tended to receive low marks, usually gained for mentioning that that it would be appropriate to draw a graph of the results or occasionally for stating kelvin temperatures should be used.

Students who interpreted the thrust of the question correctly, usually went on to score well. The first three marking points (ways to measure temperature and volume and some means of changing temperature) were the most often gained, either through descriptions or by making clear and labelled additions to the diagram. Most of these responses also included some idea of repeated measurements or averaging. The very best responses also addressed other marking points, for instance, giving some thought given to the way the length of the air column related to its volume, or how a range of results would be obtained.

Question 6

Nearly all students stated a correct equation in part 6(a)(i) and about three quarters of them went on to calculate successfully in the other parts. Even where the first calculation was incorrect, students often made proper use of their value in part 6(a)(iii) and received some credit.

There were many vague responses to part 6(b), only about a third of students did well here. Weaker responses included ideas of the suitcase "becoming still" or an argument in terms of it gaining kinetic, thermal or sound energy and therefore losing GPE. Better responses showed students communicating that they realised the height decreased or that centre of mass was lower. Few students went on to link this to why the GPE would decrease frequently.

Nearly all students stated a correct equation in part 6(c)(i) and almost half of them went on to calculate successfully in part 6(c)(ii). The successful students tackled the calculation methodically. Where the final calculation was unsuccessful, it was still possible to reward appropriate technique, such as setting out the principle of moments or calculating on the clockwise moment correctly.

The examiners noted that some of the weaker responses showed no difference between the two equations tested in parts (a) and (c) of this question. When they set out to multiply a force by a distance, students should clarify whether they mean the distance moved in the direction of the force or the perpendicular distance to the pivot.

Question 7

Nearly all students were able to identify the mass number correctly, but few went on to give a good explanation of the meaning of "half-life" in part 7(a). Most students know that half-life is a time, but many seem uncertain about which particular time is meant. The clearest and most frequently correct definitions were given in terms of halving the activity or count rate. Responses given in terms of mass or decaying nuclei, for instance, often lacked clarity as to what was actually halving. About half of the students were able to give a full and clear explanation of half-life.

Surprisingly few students gave a specific response about the harm caused by strontium-90 in their response to part 7(a)(iii). Simple ideas about the harmful effects of radiation were accepted for the first mark, but few of the responses showed this. Students were then expected to relate their idea to the context of the question to achieve full marks. Comments about the nature of the radiation, or the relatively long half-life of the isotope were accepted here. Whilst about half were able to mention an appropriate harmful effect, far fewer students went on to complete the explanation.

The majority of students completed the decay equation correctly in part 7(b(i) but most found it difficult to explain the relationship between the isotopes given in the last part of the question. A small number of students realised that they were simply isotopes of different elements but most of those failed to give the further detail required to gain the second mark.

Question 8

The responses to part 8(a) were generally very good. Most students responded confidently, giving a range of correct similarities and differences for radio waves and x-rays. The most common similarities given were their speed in a vacuum and their transverse nature. The most common accepted differences related to frequency, wavelength or energy. A few responses were spoiled by assigning the difference in frequency or wavelength incorrectly.

Most candidates recognised that the signal shown in part 8(b)(i) was not a digital signal, but many struggled to communicate their reasons why this was so. Some settled incorrectly on the "arbitrary units" label as a reason whilst others gave a vague statement about the signal varying, rather than pointing out, for instance, that more than two values were shown. Those who chose to mention the shape of the signal in their response usually argued successfully. Some weaker responses failed because they simply described a digital signal, without properly relating it to the context of the question.

Parts 8(b)(ii) and 8(b)(iii) produced a wide range of response. The best answers showed correct calculations and identified the proper unit. Weaker responses showed the skill of averaging, but little more. Where the first calculation was incorrect, students often made proper use of their value in part 8(b)(iii) and received some credit.

Summary Section

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

- 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
- Be familiar with the equations listed in the specification and be able to use them confidently
- Recall the units given in the specification and use them appropriately, for instance pressure
- Be familiar with the names of standard apparatus used in different branches of physics
- Practice 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
- Be able to identify independent, dependent and control variables and 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 describe an investigation rather than to discuss theory 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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