Examiners' Report/
Principal Examiner Feedback

Summer 2014

Pearson Edexcel International GCSE
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 show the arrangement of the particles in ice and steam in part 1(a). Some responses for water lacked full clarity, especially regarding the particle separation. The vast majority of responses for this part were worth 3 marks or more.

In part 1(b) most students showed some good understanding. Many knew that ice particles vibrate and that gas particles move randomly, but they found it harder to describe the movement of water particles properly. Some responses included unnecessary additional information about the arrangement of the molecules.

Question 2

It was clear from their responses that many students had practical experience of electrostatics investigations using scraps of paper, running water and the gold leaf electroscope. They were able to include useful detail. However, a significant minority of candidates confused electric and magnetic forces.

Responses to part 2(b) were generally good, with about half of the students describing electron transfer well. A further quarter of the students realised that there was a transfer of negative charge. In addition, most of the students were able to give a creditable response to part 2(c) with many giving practical descriptions that covered all the essential aspects of the investigation.

Question 3

The vast majority of students showed by their responses to parts 3(a) and 3(b) that they could identify all four vectors and scalars, recall the momentum equation, and use it to calculate with confidence. Many students also carefully showed their working. However in 3(c) only about half of the students were able to use the equation from page 2 to calculate the average force on the car during the crash. In the explanation of how seatbelts can reduce injuries, no credit was given for quoting this equation directly, but many students did receive credit for making use of the relationship to link points in their explanation. The best responses also mentioned the concept of rate of change of momentum. It was good to see that very few students overlooked the instruction to use ideas about momentum.

Question 4

Part 4(a) was very well done on the whole, with a large majority of students getting the mark. Those that were unsuccessful had usually stated a conclusion for the experiment, or the hypothesis it was designed to test, rather than the prediction.

Some students focused their responses to part 4(b) on the mechanism of the alpha particle scattering rather than on the anomalous results. However, many were able correctly to contrast the anomalies against the general pattern of results. Most candidates offered sensible ideas about the treatment of anomalous results. Those who recommended simply discarding anomalous results did not always clarify why this might be appropriate.

About half of the students realised in part 4(c) that electrostatic repulsion from the positive charge is the mechanism for scattering, but very few also included the idea that the charge needs to be concentrated in a small space for the scattering to take place as it does. There was a wide range of acceptable responses to part 4(d) and most students were able to score both marks. However, some limited their score by giving the same reason twice.

Question 5

Most students correctly related amplitude to loudness and frequency to pitch in their responses to the multiple choice questions in part 5(a). The unsuccessful responses to this part usually reversed these ideas, mistakenly associating loudness with frequency for instance.
Nearly all of the students could give an example of a transverse wave for part 4(b) and they usually chose a named part of the electromagnetic spectrum. Most of those who missed this mark had mistakenly identified sound as a transverse wave.

Students found it far more difficult to clarify the differences between longitudinal and transverse waves. There was a good understanding that the difference related to a direction, but about half of the students did not describe this adequately. Many students used the words “move” or “movement” to mean either the way that waves vibrate or the way they travel. Sometimes the same word was used twice to describe both features. Another difficulty was the use of words like “horizontal” and “vertical” in place of parallel and perpendicular. Students should take care to use the correct scientific terms in this sort of situation. A few students made sensible use of the space available and drew labelled diagrams to clarify their meaning. This is a perfectly acceptable approach and can gain full marks if both the labels and the directional features are shown correctly.

Question 6

About two thirds of the students entered the correct data into the table for part 6(a)(i). Those who did make an error usually gave 0.27 or 0.38. It is not clear if this was due to incorrect rounding or if these students had unfortunately set their calculators to radians.

The graph work in parts 6(a)(ii) and 6(a)(iii) was well attempted by the majority of students, with nearly three quarters of them gaining five or more marks. The usual range of common errors was seen: points as ‘blobs’; the line of best fit with kinks or curves; and awkward or non-linear scales. There were few plotting errors, but some of these could be traced to a poorly delineated scale where the student had written numbers without indicating the line to which they referred. Errors based on the students’ own data from part 6(a)(i) were ignored so as to avoid any double penalty. For part 6(a)(iii), most students realised that they needed to find the gradient of the line of best fit. Some chose to use a single data point (usually from the table) rather than drawing a suitable triangle and using two data points.

About half of the students were able to suggest in part 6(b) a reason why the graphical method is better. Most of the responses simply mentioned identifying anomalous points, but several students also realised that using a graph ensures that all the data collected can contribute to the final value for the refractive index.

Question 7

Students showed in parts 6(a) and 6(b) that they could calculate well. Around two thirds of them scored full marks for each calculation. Most students stated the equations correctly, so the bulk of calculation errors stemmed from faulty rearrangement. Since the transformer shown was designed to lower the voltage, students might expect there to be fewer turns in the secondary coil. This sort of logical check could have warned those who gave a larger value (e.g. 2509 turns) of a need to recheck their work.

Only a third of the students gained three or more marks in part 7(c). Some of this was due to lack of precision but more often great misconceptions were shown e.g. 'the current travels through the core to reach the secondary coil' instead of the magnetic field in the core interacting with the secondary coil. The fuller responses did show that some students have an excellent grasp of the processes involved. The weakest responses tended to focus on describing uses for a transformer rather than giving an explanation of its working.

Question 8

There was a full range of response to this question. More than half of the students scored two marks, with a further quarter of them scoring three or four.

Most students realised that a solar power station would need a large amount of space and that geothermal energy relies on access to hot underground rocks. Many students included vague responses about solar energy requiring a "sunny climate". Marks were only given when this was further qualified with ideas of hours of sunlight and/or light intensity. Many students rightly pointed out that a geothermal power station is not much affected by climate and received credit. The process of extracting geothermal energy is not well understood by some students and further misconceptions appeared, particularly regarding "poisonous emissions" and a need for a "warm climate to heat the underground rocks".

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 familiar with the list of suggested practicals given in the specification and be able to describe these experiments in reasonable detail
- 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 use particular ideas in the answer
- Take advantage of opportunities to draw labelled diagram 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.

Grade Boundaries

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