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Examiners' Report/
Principal Examiner Feedback

Summer 2014

Pearson Edexcel International GCSE in Physics (4PH0) Paper 1PR

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Summer 2014
Publications Code UG039752

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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 responses and it was good to see that many students were able to give full and accurate answers.

Question 1

Most students could identify the wavelength and amplitude of the wave. However, far fewer could give both a similarity and a difference between transverse and longitudinal waves. The responses to the correction exercise in 1(b) were generally good, showing that most students had gained a thorough understanding of the electromagnetic spectrum.

Question 2

About half of the students could state the correct ultrasound frequency for part 2(a)(i). Weaker responses usually included a non-matching unit (e.g. 96 kHz in place of 96 MHz) or showed confusion between frequency and time period (e.g. 1.04×10^{-8} Hz). In part 2(a)(ii), students found it difficult to relate the removal of plaque to the vibration and assumed that the tool was being used as a scraper. Suggestions regarding the use of the water tended to be better, and responses to part 2(a)(ii) showed that many students realised that the water would cool the tip or act as a medium for the waves.

In part 2(b) most students could identify ultrasound imaging as an example of wave reflection and went on to state the correct equation linking speed, frequency and wavelength. Nearly all students went on to complete the calculation correctly, but about half of them found it difficult to convert their result from Hz to Mhz. Most students could suggest at least one difference between ultrasound and ultraviolet waves in part 2(c).

Question 3

Most students chose the correct equation from the list on page 2 of the question paper and many went on to calculate the electrical energy successfully in part 3(a)(i). Fewer were able to give their answer to two significant figures, however. Nearly all the students recalled the gravitational potential energy equation for part 3(a)(ii) correctly and were able to substitute appropriate values. A few spoiled their equation by stating “gravity” in place of “g” and many found it hard to reconcile the units properly, either leaving the mass in grams or the height in centimetres. Most responses to 3(a)(iv) gained a mark for the basic idea of energy dissipation to the surroundings, but very few included some further detail relating to energy transferred to other parts of the system. The weakest responses merely rephrased the question, stating that the electrical energy was more than the GPE.

There was a wide range of responses to part 3(b). Most students could make a basic point or two about the movement of the coil, but far fewer were able to assemble a logical explanation of the process. The most successful responses usually began by linking ideas of current and magnetic field and ended by linking ideas of force and direction.

Question 4

There were some excellent responses to part 4(a) and about a quarter of the students gained full marks for their work on the prism. Most students drew rays that were correctly refracted across the prism, but a substantial minority omitted to construct a proper normal and thus limited their subsequent scoring. A common error was to place the normal at right angles to the incident ray. Responses to part 4(a)(iv) often suggested the correct refraction after incidence, but rarely included any mention of emergence.

Graph plotting and reading was generally good, showing that many students had made a careful preparation for this part of the examination. The most common error was to draw a line that included all of the points rather than avoiding the obvious anomaly. However, most candidates were able to identify the points on the graph to within tolerance and realised that as the sugar concentration increased so did the refractometer reading – but only a few realised that the relationship was non-linear.

Question 5

Most students gave good responses to the first four parts of this question. If they did miss any points, it was usually because they confused the dependent and independent variables in part 5(b). Most students responded to part 5(e) with a general idea for improving experimental technique, but less than half of them gave a procedure that was specific to the investigation in this question.

Most students could label at least one of the forces correctly for part 5(f)(i). However, some labelled the downward force as mass. There were some excellent explanations of the motion of the cup cake case in part 5(f)(ii), with around half of the students gaining full marks here. The weaker responses generally gained some credit, usually for realising that it was a situation where terminal velocity was achieved.

Question 6

Parts 6(a) and 6(b) gave students the opportunity to show their understanding of atomic and nuclear structure. Most students had prepared well and nearly all offered creditable responses. They found it much harder to explain the nuclear physics terms in part 6(c), and only about a quarter of students gained full marks here. The main difficulty was with the term “unstable” and many offered confused chemical ideas.

Nearly all students coped well with the decay equation in part 6(d). Many of the responses merited full marks and even the weaker ones tended to show that the students have a good understanding of the nature of the alpha particle and the way to balance a nuclear equation. Applying their understanding to the unfamiliar situation of electron capture in part 6(e) was a challenge for many students, but there were some excellent responses and nearly all were able to gain some credit for their response.

Question 7

Most students gave only one advantage of the parallel circuit in part 7(a)(i). This was usually the idea that a lamp could fail without turning the others off. Some students subsequently repeated this same idea, using different words.

Most students showed good understanding of the working of a fuse and their responses tended to gain full marks for a well-structured logical explanation. The students that gave a weak response as to the purpose of a fuse, for instance describing it simply as a “safety device”, usually went on to give a similarly basic explanation of the working of a fuse in 7(a)(iii). A number of candidates used the word “overflow” to mean a current that had exceeded the fuse rating. This particular usage should be discouraged since it may not convey the student’s meaning to every examiner with full clarity.

In 7(b), the majority of students calculated the current correctly and chose the appropriate fuse. Errors usually came from the use of mismatched units during substitution. Even when their calculation was incorrect, a student could still receive some credit for choosing the fuse most suited to the current value they found. Most students gave only one advantage of the circuit breaker in part 7(b)(iv). This was usually the idea that a circuit breaker could be reset without replacement. Again, many students went on to repeat the same idea in different words.

Part 7(c) was intentionally difficult. Students needed to think carefully about the nature of the relationship (i.e. that it is a non-linear one) before choosing their response.

Question 8

In part 8a, three quarters of the students drew a perfect circuit diagram or made just a single error. Common errors were to omit the power supply or to use the wrong symbol for the thermistor. The vast majority of students showed the voltmeter connected appropriately. Although some of the experimental descriptions appeared confused, most of the responses for part 8(a)(iii) were good, with two thirds of the students gaining three or more marks. Weaker responses tended to be generalised rather than directly related to the specific investigation shown in the question.

The graph shown in part 8(b) gave the students a choice between straight or curved lines of best fit. The points were deliberately plotted so that neither choice was unequivocal. The students responded well to this challenge and two thirds of them were able to justify their particular choice, which was usually the curve. They found it more difficult to suggest a reason for collecting new data at 10°C, with only a third of the students able to offer a worthwhile suggestion.

Most students identified at least one of the graphs in part 8(c), with a sizeable minority recognising all three.

Question 9

About half of the students gained full marks for part 9(a). Most students handled the calculation in part 9(b) well and most gained full marks. Those who lost a mark usually did so by choosing an inappropriate unit for the pressure. The novel situation in 9(b) allowed students to apply a range of relevant knowledge and most responses to 9(b)(iii) scored at least one mark. It was very pleasing to see that almost a third of the students could link their ideas into a logical explanation that gained all three of the marks available.

The last two parts, 9b(iv) and 9(v), were intended to be difficult. It was a novel situation and students needed to realise that the apparatus shown was a thermometer and that a difference in liquid levels was related to a difference in bulb temperatures. However, the responses were generally thoughtful and about half of the students were able to gain some credit for these two parts.

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 use particular 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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