Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

Summer 2019

Pearson Edexcel International GCSE
in Physics (4PH1) Paper 1PR

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Examiner Report International GCSE Physics 4PH1_1PR

General Comments

As in pre 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 could give full and accurate answers.

Question 1

A large proportion of candidates did not answer item 1(a)(i) at all. This idea has been asked before in the same way in the previous specification. Roughly a quarter of candidates remembered that the force on the orbiting star was gravitational in nature and directed towards the centre of the star. It was encouraging that the new content about the link between star colour and surface temperature was understood by the majority of the candidates in item 1(c). In item 1(d), most candidates also correctly recalled the life cycle of stars much more massive than the Sun. Those that did not often recalled the life cycle of stars of similar mass to the Sun.

Question 2

Most candidates correctly recalled, in item 2(a)(i), that the moderator was present in nuclear reactors in order to slow down neutrons. Those that did not either confused the moderator with the control rods or missed off mentioning about neutrons. In item 2(a)(ii) most candidates realised that neutrons needed to be absorbed or prevented from escaping, yet about a fifth correctly understood that this was the function of the outer walls or concrete shielding.

The ideas of contamination and irradiation are new to the specification and were tested in item 2(a)(iii). Just over half of the candidates reversed these two ideas or presented ideas that were not connected to the question. The idea of irradiation proved difficult to verbalise, yet candidates had a far better idea of how to describe contamination.

Nuclear fission is also a new idea to the specification and was tested in item 2(b). About two-thirds of candidates identified that nuclear fusion takes place in stars, with approximately equal proportions correctly expressing that fusion was the combination of two smaller nuclei to form a larger nucleus. Rather fewer candidates mentioned that this released energy and fewer still knew that this was due to a mass loss.

Approximately a third of candidates gave full and complete descriptions of the conditions required for nuclear fusion, with some candidates not giving the high pressure condition. Higher level responses included reasons why the conditions of high pressure and temperature were required.

Question 3
Ideas about isotopes, proton number and neutron number were tested extensively in the previous specification and here in items 3(a), 3(b) and 3(c)(ii). The half-life calculation in item 3(c)(i) was correctly answered by just over half of the candidates, showing excellent arithmetic skills. Nearly two-thirds of candidates could complete the nuclear equation in item 3(c)(ii). Successful candidates remembered that first of all, the alpha particle has 4 nucleons, including 2 protons, then deducing that two beta particles were required to balance the equation.

Question 4
Ideas about energy stores and energy transfers are also new to the specification, although correct descriptions using the previous style descriptions are acceptable. In item 4(a)(i), most candidates understood that the correct energy transfer was by radiation or described an acceptable EM wave instead. Virtually all candidates correctly identified this causes an increase in the average speed of the particles. In item 4(b)(i) most candidates also described why the pool would start to cool down, either because it was not receiving radiation any more, or rather less frequently, because the water temperature was greater than the surrounding atmosphere.

Item 4(b)(ii) tested concepts surrounding conduction and convection, which were tested extensively in the previous specification. It is always helpful to identify which of two objects has the higher temperature as well as the nature of the materials either surrounding or between the two objects under consideration. In this case, the relevant materials were the trapped air between the cover and the plastic cover itself. From there a correct statement about convection or conduction could be deduced.

Question 5
The vast majority of candidates used excellent practical skills in item 5(a). They correctly measured the diameter of the object at least twice, calculated the mean of those measurements and then calculated the cross-section area of the object. Those that did not score full marks tended to either measure once only or used the diameter instead of the radius in the formula $A = \pi r^2$.

Three-quarters of the candidates drew perfectly acceptable circuit diagrams in item 5(b). A small number put the voltmeter in series with the putty, which is incorrect.

Candidates' skill with data-handling continued in item 5(c). A few ignored the instruction to give the resistance to 3 significant figures in part (i) and a quarter of candidates either misplotted one (or more) points or drew a low-quality curve of best fit. The remaining three-quarters of candidates had chosen appropriate scales and plotted data well. The curves of best fit often had a fair distribution of points above and below the curve as well as sufficient smoothness.

Over half of all candidates scored either 0 or 1 mark for item 5(d). Generally speaking, responses included low-level ideas about series and parallel circuits. This question required a comparison of the two circuits, one with a single cylinder and then another circuit with an extra cylinder. Some candidates correctly noted that the voltage across each cylinder did not change compared with the circuit with only one cylinder. This can only happen if the current in each cylinder is the same as that in the previous circuit. This implies that the current in the cells must double to achieve this. Knowledge of the formulae for combinations of resistors is not on the specification, although it might be helpful for centres and candidates to discuss the ideas behind those formulae.

Question 6
In item 6(a), the formula relating mass, density and volume was recalled well, with a large majority of candidates recalling it and being able to rearrange it successfully to arrive at the correct volume.

Item 6(b) was also very well-answered, although some candidates did not convert the height into metres correctly.

Question 7
Item 7(a) demonstrated that a large proportion of candidates have good experience of devising their own experiments. The most common score was full marks. The question was specific about requiring references to an independent and dependent variable - otherwise excellent answers scored 4 marks because these references were not clear or not present at all. Answers including light-gates and cameras scored well if they were accompanied by some idea of how those pieces of equipment were going to be used and how the data from them was going to be processed.

The previous specification tested the idea of why a bar chart may or may not be a suitable representation of data on numerous occasions. The key idea to determining this is whether the independent variable is categoric (or discrete) or not, since variables of this nature are likely to be plotted on a bar chart.

Question 8
Item 8(a) was answered well - most candidates correctly identified that weight and air resistance were both forces and were equal in magnitude. In item 8(a)(ii), successful candidates worked out what one large square of area underneath the graph represented and then deduced that the area was somewhere between 7 and 12 large squares.

Item 8(b) tested familiar ideas about forces and the condition for terminal velocity, ie that the resultant force is zero. Most candidates recalled much of the detail here. Very few candidates identified that the thermal store was increasing as the gravitational store decreased i item 8(c). The kinetic store cannot be increasing in this case as the jumper is at constant velocity, as stated in the question.

Question 9
The term 'wavefront' was new to the specification. Item 9(a)(i) required knowledge of wavefronts as well as refraction. The majority of candidates answered this well, often by realising that the wavefronts in air and in water must join up at the boundary between the two media and that waves bend towards the normal when they enter a medium where the speed is lower.

Item 9(b) showed again that this practical, named on the specification, had been completed by many candidates for themselves or that they had seen it performed. Normal lines were well-constructed and the angle measured expertly. The calculation in item 9(c)(iii) was also well performed, provided that the candidate remembered the correct equation. Most candidates made reference in item 9(b)(iv) to Total Internal Reflection and at least one of the conditions for TIR to happen, usually that the angle of incidence was greater than the critical angle. Somewhat less well-remembered was the idea that the ray must already be travelling in the slower medium at first.

Question 10
Item 10(a) caused few problems as almost all candidates recalled the ideas about drag and resultant force.
Items 10(b)(i) and 10(b)(ii) also contained familiar ideas and were completed very well. Many students had excellent attempts. Item 10(b)(iii) included another formula new to the specification. Again, students handled the new material with skill. If the candidate used the formula given, then they were likely to complete the item successfully. Muddling up minus signs was condoned on this occasion, however it is important to identify which quantity is *v*, the final velocity, in this case 0 m/s, and *u*, the initial velocity, in this case 18 m/s. A minority of candidates tried a different approach, calculating the stopping time correctly as 2.4 s, but then getting stuck. The correct answer can be achieved, by remembering that the appropriate speed is the average speed, ie 9 m/s.

In item 10(b)(iv), candidates often identified factors that would contribute to a change in braking distance yet often did not refer to what change in that factor would be required to give a longer braking distance. For example, a larger mass would give a larger braking distance.

The most common score for item 10(c) was full marks. Candidates employed two different but equivalent approaches as outlined in the markscheme in roughly equal proportions. About a third of candidates scored no marks, yet could have scored something by stating the correct formula relating acceleration, change in velocity and time taken and substituting in the given values.

Question 11
Item 11(a) tested the familiar experiment of how to show the field line pattern and direction surrounding a bar magnet. Approximately three-quarters of all candidates scored at least two marks out of three. The hardest marking point to achieve was how to show the direction of the field, ie to verify that the field lines go from the North pole to the South pole of the magnet. Candidates should make specific reference to the idea that this can only be achieved by a compass.

In item 11(b), most candidates remembered that the field lines go from the North pole of the magnet to the South pole of the magnet. About a quarter of candidates, in item 11(b)(ii), explained that the increased distance between the field lines with increasing distance from the magnetic poles indicates that the magnetic field is getting weaker.

Just over half of all candidates scored all of the marks for item 11(c). Many candidates scored zero, however, because they made no reference to the data at all, as directed by the question.

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.
- 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 itemly correct.
- 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 itemicular 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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