Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

January 2021

Pearson Edexcel International GCSE
Physics (4PH1) Paper 1P and Science (Double Award) (4SD0) Paper 1P

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Question 1
This question discriminated well between students who had revised this area of the specification and those who had not. The most common error seen was thinking the core of the star expands when fusion stops, rather than contracts.

Question 2
Most students knew the formula in Q2(a)(i) but there was some inconsistency in the symbols being used, which was marked generously at this stage of the paper. The first calculation in Q2(a)(ii) generally yielded the correct answer of 26m/s. Very few students got the algebra incorrect. However, Q2(a)(iii) proved more demanding; some students were not able to convert 1 hour into seconds or 1km into metres and these arithmetical errors caused the students to give some very unusual answers to the calculation. Most students were able to give the correct conversion into km/hr and also the conclusion.

Some students attempted to answer Q2(b)(i) with a repeat of the stem, with the words rearranged. Many were able to score the alternative answer to the second marking point, 'line on graph straight' but very few scored the first marking point by explicitly linking the gradient to being equivalent to the acceleration. The following calculation in Q2(b)(i) saw most students gaining the mark for the formula, with the most common error being the omission of *change in* velocity. It was pleasing to see students perform well in the subsequent calculation in Q2(b)(iii) although some students did not note that the initial velocity was 5m/s.

Question 3
Most students knew that one bulb failing would cause all the bulbs to turn off in a series circuit in Q3(a). It was pleasing to see that most students could also give a sensible advantage of a series circuit in Q3(b) with the most common correct answers focusing on one switch controlling the circuit or the circuit just being simpler.

Students answered the first part of the linked calculations in Q3(c) well and most calculated the correct current in each bulb. The following calculation in Q3(c)(iii) proved much more challenging and most students dropped at least one mark, usually for failing to factor in the 7 bulbs but sometimes also for not converting the time from hours to seconds.

There were a fair number of good answers in Q3(d), where the student could be seen to make the logical steps to gain a full answer using MPs 1, 3 and 5 or sometimes 4. Weaker students often got stuck on MP1 and were unable to explain further or got the logic the wrong way round.

Question 4
Students found Q4(a) surprisingly challenging and less than half were able to secure the mark. Stating the fuse being connected in series with the Earth wire was the most common incorrect response. Q4(b) was answered to a much higher

standard and most students could give two electrical safety features. Most students performed the calculation in Q4(c) correctly with incorrect calculations usually due to incorrect formulae being used. There was some variation with the units, mostly correct, but with some guesses unrelated to electricity.

Q4(c)(iii) proved to be a challenging question, as most students wrote about the macroscopic idea of current rather than electrons. Most who started on the right path missed the resistance mark and went straight for the second two marking points. The resistance mark was sometimes given by implication with very few stating directly "the coil/wire has resistance." However most students missed this idea completely and wrote about the wire being some kind of extension to the hairdryer through which hot air flowed.

Q4(d) was well-answered and the best answers made the three marks in a very simple single sentence that picked up the key words from the mark scheme. Most did this and have clearly learnt this section of the specification. Weaker answers tended to focus on preventing electrocution.

Question 5
The majority of students could give a suitable safety precaution for working with radioactive sources and also an instrument for detecting radiation. Despite the definition of a half-life being recall of knowledge, students encountered difficulties communicating the specific property that halves during one half-life in Q5(d)(i).

Question 6
Answers to Q6 fell into two groups, those that knew what the practical was about and therefore developed an answer based on the structure in the stem, and those (quite a large number) students who did not realise they were expected to design an investigation. Instead, many of these described the energy changes involved in the process instead.
Some students thought that throwing the ball down was a way to increase the temperature of the ball. There were also some other inappropriate heating methods such as heating a rubber ball with a Bunsen burner.
Weaker responses lacked detail, normally missing out on the marks for high quality data because they had focussed on marking points one to five. Sometimes only one response that had relevance from each section was seen, the most commonly scored marking points were MP1, MP3/4 and MP8. MP2 was surprisingly scored less than expected. MP7 was seen sparingly among the students' responses.

Question 7
Most students were able to score at least one mark in Q7(a) for correctly labelling the top of magnet Y with a north pole. However, it was uncommon to see a student who knew that the spacing of field lines in a uniform field is equal. Q7(b)(i) generally scored full marks for MP1 and MP3, but all three marking points were seen frequently. Many students also seemed to understand the general idea of

what was needed to answer Q7(b)(iv). Students tended to lose marks for not knowing what a mN was in N and also for difficulties in rearranging an equation. Some students added, rather than subtracted, the forces but then continued correctly, with some power of ten (POT) errors. In Q7(b)(v) the second marking point was seen most frequently, with many students scoring one of the two marks available. The third marking point was seen in more able students' answers and the first marking point was very rarely seen. This question discriminated well overall.

Question 8
Some students were able to score a mark for the second marking point in Q8(a). The other marking points were seen, but less frequently. In a number of cases responses focussed on the x axis, which did not score, as clearly the student did not read the question properly. There were lots of kinetic theory *explanations* of the relationships in Q8(b), but lacking *descriptions* as was asked in the question. This question scored marking point one in many cases and there were few instances where zero marks were scored. Most students were also able to describe graph 1 but fewer graph 2. In some cases, it was not at all clear which graph was being referred to in the answer.

Most students were able to gain the first marking point in Q8(c) and then back it up with marking point two. There were students that seemed to be answering a different question in this space, as their answers had no relevance to the question asked. Some failed to realise the significance of -273°C and thought that absolute zero was a temperature below which solids formed.

Q8(d)(i) involved reading off the graph and it was unusual not to give this mark. The recall of the formula was generally correct in Q8(d)(ii), however when it came to actually using it, many students forgot to square the speed. Standard form was also an issue for many students. Q8(d)(iv) was very well-answered and most students scored both marks for very well drawn straight lines through the origin. Very few freehand straight lines were seen.

Question 9
Some students were not awarded the mark in Q9(a)(i) for not taking enough care to draw their reflected ray at the correct angle. The multipart question (Q9(a)(ii)-(iv)) was answered well by those students who knew the formula and could use it properly.
The first part was generally correctly answered, with a few reversing the two angles. Applying error carried forward (ECF) meant that there was little effect in part (iv) if students had measured the wrong angles in part (ii). Many students forgot the 'sine' in the formula for refractive index in (iii) and lost the mark, but then remembered it again to do part (iv). There were therefore some students that scored zero for (iii) and full marks for (iv). Q9(a)(v) proved to be much more of a challenge compared to the previous section. Students that had actually done the experiment were at an advantage and appeared able to give relevant points from

the mark scheme. MP2,3 and to a lesser extent 4 were seen quite often. MP5 was seen but very rarely and MP1 was not really seen as many students fell into the repeat the experiment type answer that they used in earlier questions. Some students referred to using the method of finding the angles using the optical pin method, despite the question being about a ray of light.

Many students got the second marking point in Q9(b) with fewer the third, normally as a result of poor drawing and not realising the rays should be parallel. The first marking point was scored by many. On average two marks were scored mainly for MP2 and then either of MP1 or 3.

Question 10

Most students knew that black was a good / better absorber in Q10(a) but very few made mention of radiation, instead referring to heat energy. The answers to Q10(b) varied considerably. There were some excellent answers scoring MP2,3 and 4 in quick succession and then one of MP5 or 6. Four-mark answers were seen quite often and for many students the idea of the air being heated, expanding, becoming less dense etc. was clearly understood. Where students experienced difficulty was in starting along the lines of considering particles; those that did were prone to then say the particles expanded, became less dense etc.

Question 11

This was a calculation that in many cases gave either full marks or was very poorly performed. The calculation gave some students problems because of rearranging the density formula incorrectly. Q11(a) was better answered than Q11(b). Some students were able to score intermediate marks because of ECF. In part (a) the main errors were in using the wrong formula and for not rounding to 3 significant figures. In part (b) the main error was using the wrong mass.

Students found the final question on the paper justifiably challenging. Answers to the question were quite limited. MP2 was by far the most common answer followed by MP4. The others were rather less common. Often, the responses were more about the person's ability to carry out the experiment than about the suitability of the method. Many students discussed the accuracy of the cylinder/bottle and human error in reading the cylinder/balance/water spillage. It was clear that the bottle method was new to many students as they made comments to the effect that the bottle was misshapen or that water would leak from the stopper.

Paper Summary

Based on their performance in this examination, students are offered the following advice:

- Attempt all questions even if the student is unsure of their response.
- 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 formulae listed in the specification and be able to use them confidently.
- Know the SI units for physical quantities and be able to convert from non-SI units to SI units when required.
- Show all working so that some credit can still be given for answers that are only partly correct.
- Take advantage of opportunities to draw labelled diagrams as well as, or instead of, written answers.
- Be ready to comment on data and suggest improvements to experimental methods.

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