Examiners' Report
Principal Examiner Feedback

January 2023

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

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Question 1
Candidates found Q1(a) more demanding than anticipated and nearly half were unable to score any marks, usually for answers focusing on Hooke's law rather than elastic behaviour. Those candidates who did score usually understood that the material would return to its original shape or length, but only the most able added the detail that this was when the force was removed. Candidates fared much better in Q1(b) and over a third were awarded full marks. Marks were often lost for inappropriately labelled axes or lines that were not entirely straight.

Question 2
Most candidates could correctly label the poles of both magnets. A mark of 0 was most often awarded when the candidate did not attempt the question, perhaps due to not seeing the question in the first place. Candidates displayed strong understanding in Q2(b) and Q2(c). However, weaker responses in Q2(c) focused on the direction of the field lines, rather than the shape and spacing of them. Some confusion was displayed in Q2(d)(i) and discussion of two magnetic fields interacting was not credited. However, most candidates could score at least 1 mark in Q2(d)(ii) and the most able could show their understanding through phrases such as "turn the wire into a coil". Weaker responses showed confusion between electromagnetic induction and the motor effect and suggestions of increasing the current or voltage were not credited.

Question 3
Q3(a) was answered to a high standard. The majority of candidates could recall the correct formula and went on to rearrange it correctly in the subsequent calculation. Marks were lost most often for not converting the value for work done into joules. Q3(b)(i) proved to be very challenging and only the most able candidates demonstrated an understanding that the Sankey diagram should be drawn to scale. Marks were also lost for not labelling the arrows; the expectation is that the input and both output arrows should be appropriately labelled. Q3(b)(ii) offered an excellent differentiation opportunity despite it being a closed response question. A normal distribution was seen centred around a mode mark of 2.

Question 4
A surprising number of candidates stated electromagnetic radiation (UV rays, infrared rays, etc.) or a type of radiation instead of a source (alpha, beta and gamma) in Q4(a)(i) and were not awarded the mark. It was interesting to note in Q4(a)(ii) that quite a number of candidates overlooked or omitted any mention of the measuring equipment when describing how a quantity would be measured. However, it was pleasing to see in the main that most candidates indicated that they understood the source should not be present when the background reading was taken. There was also some misunderstanding of the idea of background radiation leading to the wrong calculation for correcting the reading. For example, some candidates stated that background - total = corrected count.

Most candidates were able to correctly calculate the mean in Q4(b)(i) and express it to an appropriate number of decimal places and the graph plotting in Q4(b)(ii) was completed to a generally high standard. Some candidates did not draw smooth curves in Q4(b)(iii) due to trying to force their line to pass through every data point. The reading of the count rate in Q4(b)(iv) presented many candidates with problems as they misinterpreted the need to calculate 75% of the initial count rate. However, these candidates were still able to score 1 mark for correctly reading their graph. Q4(c) differentiated well at the major grade boundaries. Candidates who thought about the context were able to reason why it should be gamma as opposed to those who fell back on rote learning who simply made statements about gamma being stopped by lead.

Question 5
Most candidates could answer both multiple choice questions correctly in Q5(a) and Q5(b), but the subsequent calculations proved much more challenging. Most candidates could correctly read at least one of the thinking distance and braking distance from the graph, but less than half knew to add these distances to determine the stopping distance in Q5(c). Despite being able to recall the correct formula in Q5(d)(i), many candidates exhibited difficulties in Q5(d)(ii) due to not knowing where to acquire the appropriate data. This demonstrated a lack of understanding of the connection between reaction time and thinking distance. The calculation in Q5(e) proved most challenging of all and most candidates chose to use an inappropriate combination of formulae ($s=v/t$ and $a=v-u/t$), which resulted in a single mark being awarded if the correctly read value for the braking distance was seen in the working.

Question 6
Two thirds of all candidates answered the multiple choice question in Q6(a) correctly. However, it was surprising to see that only a third of all candidates could correctly draw a correct incident ray for the refraction shown in Q6(b)(i). Most incorrect rays were drawn to the right of where the normal line would be. In Q6(c), most candidates scored a mark for identifying reflection with a pleasing number giving total internal reflection. However for many candidates that was the limit of their knowledge and the relationship of the angle of incidence and critical angle was either missing or incorrect. Very few responses included the reason for TIR being that the core has a higher refractive index than the surrounding material.

Question 7
Although most candidates could identifty component Y as a variable resistor in Q7(a), few understood why it was included in the circuit. Many candidates recalled that its resistance could be varied, but only the most able linked this to the need to vary the current in the circuit or the voltage across the lamp. The linked calculations in Q7(b) were answered to an impressively high standard. Common errors included incorrectly reading the graph in Q7(b)(ii), giving an incorrect unit in Q7(b)(iii) and using an incorrect formula. In Q7(b)(v), most candidates knew that the curve should be a 180° rotation of the original curve, but did not draw their curves carefully enough and lost the second mark due to their curves ending at the incorrect point. Q7(c) proved to be challenging. Many candidates did not know what is meant by alternating current or did not know enough about the properties of a diode to link the two together.

Question 8
Most candidates were able to identify Rigel as the hottest star and correctly link this to it having a blue colour in Q8(a). In Q8(b), most candidates achieving the full six marks had clearly learned the stellar evolutions of both low-mass and high-mass stars to a high level of detail. Weaker candidates understood the stages of initial star formation but could not correctly relate the later stages to Rigel and Sirius. In questions expecting a "discussion", candidates should be reminded that all aspects of the context should be covered in the response. Lots of responses did not refer to Rigel or Sirius at all, which severely limited the number of marks that could be awarded.

Question 9
Measuring the wave properties in Q9(a) showed that many candidates did not understand how to measure amplitude. Many responses were double the expected value or slightly too large, which indicated that candidates did not take enough care when measuring the value accurately. Power of ten errors were very common in Q9(b)(ii) owing to the challenge of converting centimetres to metres, but also that of working with data given in standard form. It was encouraging to see most candidates correctly read the scale of the analogue meter in Q9(c)(i) despite the smallest increments being in intervals of 2. In Q9(c)(ii), nearly half of all candidates did not understand that data from the graph should be used despite this being stated in the question. Some candidates calculated constants for at least two pairs of values but then, surprisingly, concluded that the data supported a conclusion of inverse proportionality. However, it was pleasing to see many candidates complete a full analysis of the data and correctly conclude that it was not inversely proportional due to obtaining different values for the constant.

Question 10
Most candidates were awarded 2 marks in Q10(a) for demonstrating that the hot water would cool down and the cold water would heat up. However, few candidates knew that the rate of cooling/heating would change, which lead to few candidates being awarded the third and fourth marking points.

Candidates struggled to express themselves clearly in Q10(b) and often wrote about temperature rather than energy transfer. Very few seemed to know that both waters would reach thermal equilibrium and energy transfers away from the cup (or not, in case of insulated container) were largely overlooked. Most candidates knew that metals are good conductors but many seemed to think it could, therefore, absorb heat.

Many responses in Q10(c) did not explain what would happen to the results, but knew that the lid would reduce convection or evaporation. However, some candidates understood that the water would (eventually) take longer to cool.

Question 11
Q11(a)(i) was answered to a high standard. Most candidates scored at least 1 mark for indentifying that atoms collide with the walls of the container. More able candidates could link this to the production of a force and then link it correctly to pressure. Q11(a)(ii) was more challenging; most

candidates knew that the atoms would slow down, but few linked this to a reduction in the rate of collisions or the effect on the force on the container. Q11(b) polarised candidates in terms of outcome. More mathematically able candidates coped well with the demands of the unfamiliar formula and the initial stage of calculating the kinetic energy with only the occasional power of ten error limiting an otherwise full marks answer. Other candidates struggled to know where to start due to the deliberate reduction in structuring in the question.

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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