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Examiners' Report
Principal Examiner Feedback

January 2023

Pearson Edexcel International GCSE
In Physics (4PH1) Paper 2PR

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Question 1
Most candidates were able to correctly identify absolute magnitude as the correct label for the y-axis in Q1(a). Identifying the regions P, Q and R also proved to be straightforward for most candidates, with two thirds able to correctly identify all three regions. It was surprising to see some weaker candidates write two astronomical objects against each letter, which suggested that they had misinterpreted the question or did not understand Hertzsprung-Russell diagrams. In Q1(c), most candidates were able to identify the left-hand side of the diagram, but some said too much and lost the mark e.g., top left. Candidates were aware that the blue/white stars were hot, as are the red/orange stars but often comparisons such as hottest/hotter were missing.

Question 2
Only a third of all candidates scored the mark in Q2(a). Incorrect responses often suggested that purple has the shortest wavelength, which suggested a misconception of the colours of light. Q2(b) was answered to a generally high standard, but some candidates did not appreciate the nature of a 2 mark question and only said enough to score 1 mark for giving a simple hazard or effect of UV radiation. Q2(c) proved to be straightforward, and most candidates were awarded full marks. Marks were usually lost for incorrectly rearranging the formula, often before any substitution of the data was made. Candidates should be reminded to substitute data first if they find rearranging formulae problematic as they will usually be awarded a mark for this if the substitution is correct.

Question 3
Slightly less than half of all candidates could name an appropriate instrument to measure a force in Q3(a)(i). Incorrect answers often suggested a data logger or a balance. Candidates often find the distinction between independent, dependent and control variables challenging, and this was evident in the responses to Q3(a)(ii) and Q3(a)(iii). Some candidates wrote the variables the wrong way round when identifying the independent and dependent variables. Some candidates wrote too many control variables instead of writing one control variable. Some of these responses were perfectly correct and got the mark but some of them included independent and dependent variables, so couldn't get the mark.

In Q3(b), friction/rubbing was usually mentioned although some candidates referred to friction between the material and the rotating drum. The idea of unlike charges attracting was well known although some candidates mentioned poles rather than charges. Weaker candidates focused on generic 'electrostatic forces' rather than electron transfer, or the movement of positive / negative charges. Only a few candidates described the transfer of electrons and the resulting charge states. Some candidates thought induction was involved and some thought charge was being transferred to/from the barrel of the dryer.

It was pleasing to see most candidates identify a bar chart as the most appropriate type of graph in Q3(c). However, only a quarter of all candidates could support this with an appropriate reason. Q3(d) was answered to a very high standard and most candidates could recall the correct formula and use

it to calculate the charge transferred. The lack of rearrangement led to this calculation being straightforward, but a small number of candidates made a power of ten error due to the data being presented in standard form.

Question 4

Candidates performed well in Q4(a)(i)-(iii) with most scoring full marks. Some lost marks for not converting milliamps to amps, whilst others lost marks in Q4(a)(iii) for overcomplicating the calculation, which demonstrated a lack of understanding of parallel circuits. Most candidates calculated the correct current in Q4(a)(iv). However, many candidates added voltages together and divided by the sum of the resistances to obtain an incorrect answer, which was treated as a physics error and scored zero.

Candidates found Q4(b) very challenging. There was confusion between parallel and series circuits with a common response being the current is the same in a series circuit with no comparison with the current in the parallel circuit. The idea of the total voltage being the same was not well known. Candidates' responses tended to be of three types, roughly equally split in frequency.

- Those that understood and could explain how resistors in series will have higher resistance than those same resistors in parallel; these answers often scored MP1 and MP2 and sometimes the third mark for referencing V = IR.
- B: Those that thought that ''in a series circuit the current was the same everywhere'' and therefore this meant the same as when the components were arranged in series, so the current would not be changed.
- C: The third group was those that are simply confused by the entire topic and their answers were understandably jumbled.

Question 5

Most candidates scored at least 1 mark in Q5(a) for a correct statement about the voltage decreasing. More able candidates included the idea about the current increasing to score the second mark. In Q5(b), most candidates scored at least 2 marks for calculating the power(s) correctly. They often lost the third mark by not saying that the two values of power were (approximately) equal. Most candidates justified the equality of input and output with a simple mathematical statement. Fewer opted for a ratio or percentage idea showing approximately 100%. The calculation in Q5(c) was completed to a high standard. However, a common error was in the rearrangement of the formula even when the substitution was correct. Some candidates only gave 32 as their final answer and even though this was to 2 s.f. it was rounded incorrectly, and the final mark was withheld. Among the unacceptable answers in Q5(c)(i) the phrase 'turns ratio' was a common occurrence.

Question 6

Q6(a) was very well answered with many candidates scoring all the marks. Only a few suggested plotting a graph and determining c from the gradient. A common error was the use of weight instead of mass, and rarely did candidates refer to waiting for the temperature to rise to a maximum after the heater was switched off. Some decided to boil the water. A lot of time

was spent on diagrams that usually added nothing to their responses. Others used unreasonably short periods of time or tried to utilise the value for specific heat capacity given in the next part of the question by specifying the heating of 1kg of water by 1°C.

A significant majority of candidates scored full marks in Q6(b)(i). However, Q6(b)(ii) was much more demanding, and most candidates did not score any marks at all. The idea that air has a smaller specific heat capacity than water was deduced by some candidates although the idea of energy conservation was rarely seen as was the idea of thermal energy being lost to the surroundings. Very few candidates attempted to quantify their answer. Several did not understand the question as they wrote about energy transfer being mainly convection and conduction.

Question 7

Q7(a) was usually answered correctly. However, some candidates were unsure which formula to use, and mistakes were also made when rearranging formulae. Many candidates misinterpreted the command word "state" in Q7(b) and attempted to calculate the force on the metal block. The best responses in Q7(c) referred to an increased time producing a smaller acceleration. Weaker responses simply referred to the presence of a paper crumple zone. The crumple zone seemed to split the candidates equally into 2 groups. Those who answered in terms of a longer time and smaller acceleration and those who said it acted like a cushion to reduce the force.

Question 8

Candidates found Q8(a) surprisingly difficult. Many candidates referred to objects being further away from Earth, rather than moving away from Earth and these responses did not score. It was pleasing to see candidates score highly in the graph work in Q8(b)(i)-(ii) and the linked calculation in Q8(b)(iii). Identifying the anomalous point was usually correct as was the drawing of a straight line. Many candidates were able to quote the correct formula in Q8(b)(iii), but the reading of $\Delta\lambda$ from their graph was often inaccurate. 0.75 was chosen by many and an incorrect rearrangement by others which both lost marks. The final calculation caused a lot of confusion and only the most able candidates obtained correct values.
Common errors were:

- Misreading the graph value at 0.75 Mpc.
- Not reading the graph at all (using 0.75 Mpc in the formula).
- Incorrect formula rearrangement.
- Subtracting 0.03nm from another value to get a change in wavelength.
- A power of ten error.

Q8(b)(iv) was intentionally challenging and differentiated well at the highest grade boundaries. It was generally poorly answered with many blank scripts. However, the idea of velocity increasing with distance was known by some, although very few candidates referred to galaxies moving away from each other.

Paper Summary

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

- Attempt all questions in the examination, even if they are unsure of the quality or accuracy 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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