Pearson Edexcel

Examiners' Report

Principal Examiner Feedback

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Pearson Edexcel International GCSE

In Physics (4SD0) Paper 1PR

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General Comments
As in examinations for previous 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
Item 1(a) proved to be a gentle opening question, with most candidates scoring either 2 or 3 marks. Those that did not, tended not to know the name of the Solar System. Similarly, in item 1(b), candidates tended to know that the fastest point on any orbit in the Solar System is the closest point to the Sun and that this was all to do with gravitational force.

Item 1(c) was less well answered, commonly by candidates drawing two lines from each of the units of time.

Question 2
Many candidates recognised the correct statements about fission in item 2(a), although some also included at least one of the erroneous statements as well. The most common incorrect statement was referred to daughter “cells” rather than daughter “nuclei”. Items 2(b) and 2(c) were correctly answered by most also. Item 2(d) has been asked before ‘in reverse’ i.e. what happens to a nucleus when beta radiation is emitted. This time, however, the candidate needed to deduce the radiation type from the effect on the nucleus.

Question 3
Most candidates successfully answered the first two parts of item 3(a) and many realised that the effect in item 3(a)(iii) was caused by light and sound travelling at different speeds. Significantly fewer, though, correctly explained what the scientist was seeing, i.e. the light from the explosion.

The description of what is meant by a longitudinal wave (or in previous series, a transverse wave) is still catching candidates out. The best responses made it clear that in waves, something vibrates and that the direction of that vibration relative to the direction of travel of the wave is what distinguishes the two types of waves.

In item 3(c), the large majority of candidates successfully recalled the formula linking KE, mass and speed. Some candidates incorrectly gave the formula for momentum or missed off the ‘squared’ for the speed. Candidates would get 1 mark for arriving at an answer that ignored that the speed was given in km/s and not in m/s. Standard form for this type of question is strongly recommended, as it is in the list of mathematical skills required by the specification.

Question 4
The link between temperature and star surface temperature is new to the specification and has been learnt well, as demonstrated by item 4(a). Star formation, as tested in item 4(b) was less well known. Successful candidates linking the ideas of gas particles being drawn together by mutual gravitation and then referring to nuclei beginning to fuse under that gravitational collapse. Less successful candidates focused solely on the process of nuclear fusion when in fact that was being tested in item 4(c).

Item 4(c) itself was answered well by candidates, especially if they referred to nuclei as opposed to atoms, particles or anything else that might fuse. Some forgot to mention that there was a significant energy release as a product of this process.

In item 4(d), many candidates described correctly the evolution of a star much heavier than the Sun, although some muddled this up with what happens to a star similar to the Sun.

Question 5
Nearly all candidates scored the first mark of the question by stating that if one wire breaks then the rest will continue to work. In item 5(b), similar numbers correctly stated the formula linking power, voltage and current and correctly calculated the total current in the toaster. The power rating was given in kW, which a significant minority missed. The final item of the question used the idea that each of the thin metal wires was in parallel and so the current in each would be 1/48th of the total current.

Question 6
Candidates should be aware that the response 'meter' or 'scale' for any measuring device is insufficient at this level. A better response is 'balance' for measuring mass. Many successful candidates referred to finding the difference in mass between an empty container and a container with the unknown liquid inside.

Item 6(b) tested how a candidate would perform the measurement of a volume. For the majority of liquids, this involves reading to the bottom of the meniscus and having that point at eye level. Vague references to avoiding parallax did not gain any credit.

Item 6(c) was very well answered by the majority of candidates, provided that they remembered to use the formula linking density, mass and volume.

Question 7
The question made it clear that the cats were transferring energy to their surroundings. This means that absorption was not part of the situation and that the emissive properties of the two cats should be compared. Many candidates remembered that fur traps air yet fewer candidates went on to describe that in terms of air being a poor conductor or that trapped air means that conductive losses are reduced.

Question 8
Roughly half of all candidates related the idea of reliability to the process of repeating and averaging results in item 8(a). Item 8(b) showed that similar numbers of candidates are aware of the meaning of a control variable. The voltage cannot be a control variable here, as the question states that the power supply is set to a different voltage each time.

In item 8(c), no credit was given for calculating the distance for the given mass and GPE store increase. Otherwise, candidates completed this question well, especially those that remembered to convert the distance given from centimetres to metres.

Candidates continue to show excellent graph-plotting skills, in the main. Relatively few candidates plotted the graph with switched axes, which did not prevent them from achieving full marks. The data point that caused the most confusion was that with an efficiency of 30.3%, which many misread to be 33%. The curve of best fit was complex, yet many candidates did a good job of drawing a smooth curve followed by a flat portion above a voltage of about 6V. Any errors in final data point that affected the curve beyond this point were taken into account and were not penalised a second time.

Question 9
Most candidates put the voltmeter in parallel with the correct component in item 9(a). A small number put the voltmeter in series with the components, or in parallel with the wrong component. Almost all candidates recognised component X as a light dependent resistor (LDR).

Item 9(c) required the candidate to be careful about which voltage to use. 'Error carried forward' marking was applied to significant numbers of scripts for the wrong voltage across the 4500 ohm resistor, giving a current that was succesfully used in part (iii). Most candidates remembered to convert the resistance into kilo-ohms at the end.

Item 9(d) was answered poorly. This type of responsive circuit has been asked in the both the January 2020 and June 2019 series, and requires knowledge of how either an LDR or thermistor changes resistance and the effect that will have on the total resistance and hence the current of a circuit.

Question 10
The investigation to show the shape and direction of the magnetic field for a bar magnet is one of the 'named' practicals in the specification and was asked here in item 10(a). It was clear which candidates had either witnessed this experiment or had performed it themselves. Those that employed the iron filings approach often scored 1 or 2 marks, usually by forgetting to use a compass to determine the direction of the field lines. Those that employed a compass-only method usually scored at least 2 marks, provided again they were specific about the direction of the field lines or joining up the dots they had recorded.

In item 10(b)(i), the successful candidates distinguished themselves by using correct terminology and connecting the logical strands of the process of electromagnetic induction. Many responses, however, included many random and unconnected ideas, such as the coil of wire's magnetic field or repeating the process that caused the bar magnet to spin in the first place.

The most likely correct answer from candidates in item 10(b)(ii) was that there would be no current if the wheel of the bicycle was not turning. No credit was given for the unlikely scenario that too much current could be generated, thus breaking the lamp.

Question 11

Item 11(a) is an example of a multi-step calculation which necessarily has a higher tariff. If a candidate slightly mis-read the graph to get a braking distance of 80m, rather than the correct distance of 78m, the 'error carried forward' principle was applied again. If the candidate recognised the need to use a formula to link distance, initial speed, final speed and acceleration, then the following calculation usually went well. A common misconception was that the braking and thinking distances were related.

In item 11(b), very nearly all candidates scored the mark for correctly stating that one or both of the two trends showed an increase in distance for an increase in initial speed. It was pleasing to see that more candidates identified the concept of direct proportionality correctly for the thinking distance and articulated the non-linear trend for the braking distance. Rather fewer used data from the graph to support their assertions. A few candidates spotted the link between the quadratic nature of the formula for KE and initial speed.

Question 12

Typically, in item 12(a), candidates made an error in calculating the critical angle by quoting the angle given in the question, rather than finding the angle between the incident ray and the normal line. The formula required in part (ii) was well-remembered and many candidates correctly used their answer to part (i) in part (iii).

Item 12(b) could be answered in multiple ways, either by logic (such as comparing the critical angles of the two scenarios) or by calculation (by calculating the refractive index for water from the data supplied). Both routes required higher-order skills and was equally likely to be successful. The calculation route required a value for the refractive index for water being above 1, so that it could be compared fairly with the value calculated for the refractive index of acetone.

Question 13

Item 13(a) was answered very well by the majority of candidates. Item 13(b) was suitably challenging for the last item on the paper. The central idea for future candidates is that for the egg to experience a downwards force, the air pressure inside the flask must be lower than the air pressure at the time the egg is placed on the flask. Many responses ignored the idea that no air escapes as pointed out in 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 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 specific 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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