Examiners' Report
Principal Examiner Feedback

January 2020

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

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January 2020
Publications Code 4PH1_1PR_2001_ER

General Comments

As in the previous series, most students were able to recall the equations and often 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

This question, as a whole, was a comforting start for most.

(a)

The amplitude and wavelength of a wave were easily recognised by nearly all students. In a similar way, most students remembered that water waves were transverse in nature.

(b)

The calculation using the formula $f = 1/T$ was carefully completed by the majority.

Question 2

(a)

Most students calculated the pressure difference correctly in kilopascals.

(b) and (c)

The formula was very well recalled and substituted into correctly by many. Almost all of the errors were either in performing the rearrangement or by incorrectly converting from kilopascals or not converting at all.

Question 3

(a)

It was encouraging to see that most students correctly identified the consumption of alcohol by the driver as the factor affecting thinking distance. Slightly fewer recognised that the speed of the vehicle affected both thinking and braking distance.

(b)

Virtually all students recalled the formula linking work done, force and distance and were able to apply it correctly using the data in the question.

(c)

Q3(c) caused the most problems. The correct energy store from the list in the specification that has increased for the brakes was the thermal store. There are only four possible choices for the method of energy transfer from the truck to the brakes listed in the specification; electrical, mechanical, by radiation and by heating. In this case, the correct answer is mechanical.

Question 4

There were very many excellent descriptions of the life cycle of Betelgeuse, possibly due to the star being in the news for dimming considerably at the time of the paper. Most of the stages were recalled well, with the protostar phase being the most common omission. Very few students got the stages in any sort of wrong order. A few thought, incorrectly, that Betelgeuse would end its life as a white dwarf, confusing the steps with that for a star similar in mass to the Sun.

Question 5

(a)

Most students were successful if they used the supplied formula linking v, u, a and s. Responses that assumed that the average speed was 16 m/s scored zero, included those that attempted to find the acceleration due to gravity and did not assume it was 10 m/s^2 .

(b)
Ideas about forces relating to terminal velocity are comprehensively learnt. A common misconception is that as the ball falls it will reduce in speed. In fact, the ball continues to accelerate albeit at decreasing value for the acceleration until it reaches terminal velocity. Better students related this to an ever-decreasing resultant force due to the increasing drag force.

Question 6

(a)
Correctly answered by the majority, with only a few students either putting the voltmeter in series with the LDR or getting the symbol mixed up with that of an ammeter.

(b)
The formula in Q6(b)(i) was universally remembered correctly and subsequently correctly substituted into by many. The current was given in milliamps, which meant that a significant number of students evaluated the voltage incorrectly by a factor of one thousand, scoring just one mark for Q6(b)(ii). Usually the student's response, if incorrect, was bigger than 1.5 V, which made answering Q6(b)(iii) tricky. The key physics point here is that the voltage of the LDR and the voltage of the fixed resistor must add up to give the cell's voltage.

(c)
The most common score for Q6(c)(i) was one mark, with most students correctly describing that as the light intensity increases, the resistance of the LDR decreases. Approximately a quarter of the students provided a suitable qualifying statement such as the relationship was non-linear or that the resistance decreased at a decreasing rate. The relationship is not inversely proportional merely because one variable goes up as the other goes down.

Q6(c)(iii) proved very difficult. Many responses attempted to use the idea that voltage and current were directly proportional to each other, which is only true for the fixed resistor. Just as in part (b), the voltage of the LDR and fixed resistor add up to give the voltage of the cell. The current in the circuit has increased, so the fixed resistor voltage must have increased, hence the voltage across the LDR must decrease.

Question 7

This question was very well answered. It tested recall the definition of the volt and two key formulae, which the majority of students did well. Errors in the rest of the question were limited to incorrect conversions or erroneous re-arrangement of the formulae.

Question 8

(a)
This question focused not on which measurements were required to find the density of an irregular shape but rather how to make those measurements. As a result, the most common mark for this part was 3 marks, often for the correct idea of a displacement method and use of a balance.

The specification mentions 13 experiments explicitly. It is expected that students have had first-hand experience of these experiments - further details are available in the practical skills guide book:
https://qualifications.pearson.com/content/dam/secure/silver/all-uk-and-international/international-gcse/biology/2017/teaching-learning-materials/biology-chemistry-physics-Core-Practical-Guide.pdf

(b)
Q8(b) was completed very well including giving the answer to two significant figures in item Q8(b)(ii). Almost every student that completed Q8(b)(ii) also completed Q8(b)(iii) correctly. Successful students

spotted that the sample was probably made of quartz, since the density of the sample closely matched that of quartz.

Question 9

(a)

The properties of the alpha particle were recalled well, including that the alpha penetrates poorly into material. An important idea, for part (iii) was that the alpha needed to penetrate through more than a few millimetres of air in order to reach the workers. Since alpha particles cannot do this, they cannot reach the workers. This is an example of where the student needs to link the property or the physics (more generally) to the context to score high marks. Approximately half of the students remembered that ionisation is defined by an atom that has either lost or gained electrons.

(b)

Recall of the definition of the term half-life was very good. There was a range of different methods for calculating the activity of the source after three half-lives, many of which were successful. Some students mistakenly used the 210 from the name of the isotope in the calculation.

Question 10

(a)

As for previous questions, the formula was learnt well and used proficiently. The commonest error was to miss out the 'sine' from the formula. In part (iii), many students linked the angle of incidence to the previous parts and remembered that the incident ray would undergo Total Internal Reflection. This gave a small angle of incidence at the next boundary, which meant that the ray would then emerge and refract away from the normal. This last step was missed by most.

(b)

The experiment at the heart of Q10(b) is a common, traditional experiment referred to in the practical guide and explicitly in the specification. There was a focus on how to collect the data, rather than on what data was needed. The graph was completed carefully by many students yet there were flaws in the final analysis to arrive at the refractive index. Students are encouraged to revise how to find the gradient of a line of best fit, and to use as much of the line as possible, i.e. use a large triangle to find the change in the 'y' variable and the change in the 'x' variable.

Question 11

(a)

Students were told in the question that the volume of the gas had increased and so, would not have gained any credit for suggesting this. A minority of students correctly stated that this would decrease how often the particles would hit the walls of the container and fewer still linked this to the idea of a reduced force on the walls. 'Hit the walls less' was a common near-miss.

(b)

The calculation used the formula given on the formula page. Once correctly suggested, many students completed the calculation correctly, although perhaps with an incorrect power of ten.

(c)

The most likely way that students scored a mark for this item was by mentioning that there was a pressure difference between the air inside the balloons and the air in the jar. A very small number of students linked this pressure difference to force on the material on the balloon, and hence causing an extension, i.e. an expansion.

Question 12

(a)

Fleming's left hand rule was correctly used by the majority of candidates.

(b)(i) and (b)(ii)

Most students used the correct formula relating mass, weight and gravitational field strength. though many did not get the correct unit for the final answer. This was largely because the conversion from grams to kilograms and newtons to milli-newtons was inaccurately attempted.

Q12(b)(ii) was worth 5 marks, so was certainly more involved than dividing the given force by the given mass. Such an item would have been worth a maximum of 3 marks. The largest proportion of students used the formula 'resultant force = mass x acceleration' yet did not include the weight of the wire as part of the resultant force. Students are encouraged to draw a small diagram for questions involving more than one force, so that the correct resultant can be spotted. In this case, there would have been an upwards force of 34 mN and a downwards force of 65 mN, giving a resultant force of 31 mN **downwards** rather than an upwards resultant of 34 mN.

(b)(iii) and (b)(iv)

The command word for Q12(b)(iii) is 'explain' and the student was required to go into more depth about a chosen method for increasing the magnetic force, rather than stating two individual methods.

Students answered Q12(b)(iv) well, correctly suggesting that alternating current should be used. Rather fewer explained that that was because the current direction would change.

Paper Summary

Based on the performance shown in this paper, students should:

- 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 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 incorrect.
- 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 particular 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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