Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

January 2020

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

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January 2020
Publications Code 4PH1_2PR_2001_ER

Question 1

Students demonstrated their knowledge of the uses of the electromagnetic spectrum impressively in Q1(a) and the majority gained all 3 marks. Where students lost a mark, it was typically due to confusion between infrared and ultraviolet uses. The following multiple choice question proved to be marginally more demanding but approximately three quarters of all students chose the correct hazard of microwave radiation. It was encouraging to see most students choose radio waves as their answer to Q1(c) and, therefore, secure the mark. Incorrect responses usually originated from giving another part of the electromagnetic spectrum.

Question 2

Most students knew that point G was the centre of gravity (or centre of mass) of the table in Q2(a). It was encouraging to see an impressive display of quantitative skills in the following calculation. Most students were able to quote the correct formula in Q2(b) and often gave the correct rearrangement at this point in the question. 109.5N was the most popular correct response in Q2(c), although many students rounded this incorrectly. Some students who used an incorrect distance to get 219N lost a single mark, whilst others were able to divide some force by some distance to score a single mark. The majority of students knew Newton's Third Law and communicated their understanding successfully in Q2(d). Incorrect responses usually failed to include the idea of the forces being in opposite directions or recited the principle of moments instead. Although Q2(e) was answered with confidence, a significant number of students were not awarded the mark for the direction of the force due to them stating it as "below" or "south". Students need to be clear when giving directions and should aim to use terms such as "left", "right", "up" or "down" in future.

Question 3

This question was answered to a high standard and the vast majority of students were able to score at least 3 marks in Q3(a) and Q3(b). A minority of students could not recall the correct unit for momentum, instead giving answers such as kg/m/s or kgm/s^2. Conservation of momentum was described well in Q3(c), the most common errors being, again, confusion with the principle of moments or attempts to express it with an equation which used incorrect suffixes, e.g. $m_1v_2 + m_2u_1 = m_2u_2 + m_1u_1$. An encouraging number of students correctly completed the final calculation in 3(d). The most common error was forgetting to add the momentum of the neutron. Other common errors included incorrectly assuming that the initial velocity of U-235 was zero or attempting to add the neutron's mass to that of U-236, not realising that the given value already included its mass.

Question 4

Q4(a)(i) was well answered by students with nearly all obtaining 17.1J. Credit was given to students who used 9.8, 9.81 for *g*. Some students incorrectly converted the mass to grams and were awarded one of the marks. Q4(a)(ii) proved difficult

for students and many responses simply quoted from the stem of the question without seeking to explain the origin of the additional 4J of work.

Two thirds of all students knew the kinetic energy formula in Q4(b)(i) and showed excellent mathematical skills to rearrange it to achieve the correct velocity. A small number of students experienced difficulties in rearranging the formula or forgot to take the square root at the end of their working. Q4(b)(ii) proved to be much more challenging and the majority of students either did not know which formula to use or did not multiply the hammer's velocity by its mass when substituting data into the formula. However, more than a third of all students successfully arrived at the correct final answer.

Question 5

Students found Q5(a)(i) challenging. A large number of students did not include a scale on the time axis and this limited otherwise good responses to only one of the three marks. Other errors usually involved either omitting the middle melting section or the final section which stopped well short of 20 minutes. All the possible marking points were seen frequently in Q5(a)(ii). However, a significant number of students only suggested repeating the experiment, which is not worthwhile unless a mean of the data is found. Q5(b) was answered to an exceptionally high standard with more than half of all students achieving full marks. Some students were unable to be awarded the final mark due to attempting to evaluate a final temperature, rather than simply the temperature increase requested in the question.

Question 6

Q6(a) was completed to a very high standard by most students. The formula was well known and most students attempted a valid substitution of data into this formula to achieve at least the first mark in the subsequent calculation. Although a small number of students then experienced difficulty rearranging the formula (typically arriving at an answer of 118 turns), over three quarters of all students went on to achieve full marks.

The most popular answers in Q6(b) gained marks for the idea that step-up transformers increase voltage and decrease current and that transformers reduce energy losses. Unfortunately, some students gave very precise descriptions of the internal design of the two transformers but did not relate this to the transmission of electricity and so could not be awarded any marks. It is important that students carefully read the question being asked to focus their responses appropriately.

Question 7

Although most students recognised the need to have opposing poles facing each other in Q7(a), very few recognised that the two poles needed to be very close together but not touching to produce a uniform magnetic field. Surprisingly, only a third of all students gained the mark in Q7(b)(i). A significant number of students drew their force arrow as a tangent to the circular path, rather than towards its

centre. Unfortunately, most students did not address the need to **accurately** measure the diameter of the path in part Q7(b)(ii) and gave their answer as 6cm. As this implies a measurement accurate to ±0.5cm (and rulers can usually be read to ±0.1cm), this could not be credited with 2 marks. Only a minority of students correctly showed that they had taken a number of readings, averaged these, and quoted their answer to the nearest 0.1cm. An answer of 6.0cm was credited with both marks. However, it was pleasing to see that Q7(b)(iii) was answered correctly by the majority of students. Errors included failing to use the radius of the circular path and either incorrectly or failing to convert centimetres to metres leading to a power of ten error.

Question 8

Most students recognised that the same time period of motion applied to both buzzers in Q8(a)(i), and/or referred to speed = distance/time, but only a small number of students recognised that buzzer B travelled twice the distance of buzzer A. Many students attempted to answer this question by incorrectly referring to different size forces acting on the buzzers. Students found Q8(a)(ii) very challenging. The most common response was that buzzer A had a higher frequency than buzzer B, although this was often incorrectly attributed to the fact that it was closer to the microphone, leading to concerns that students are confusing frequency and amplitude. The next most popular response was to refer to the Doppler effect, although this was seldom accompanied by a correct or relevant explanation.

Nearly half of all students were awarded at least 2 marks in Q8(b). The most common mistakes were either not presenting a final answer in standard form or incorrectly calculating the initial time period from the oscilloscope trace. Weaker students showed little familiarity with using an oscilloscope and did not know how to use the trace to determine a time period.

Q8(c)(i)-(iii) was answered well by most students. However, Q8(c)(iv) was much more demanding and half of all students failed to score at all. Students who did gain marks were mostly comfortable with the idea of the Universe expanding and related this back to the evidence given by faster/further galaxies and their red-shift. Unfortunately, many students could not satisfactorily express the idea that this supported the theory that the Universe originated from a single point a long time ago.

Paper Summary

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

- 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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