Examiners' Report
Principal Examiner Feedback

Summer 2025

Pearson Edexcel International GCSE
in Physics (4WSD6) Unit 6PR

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General Comments

As in the previous (linear) examination series, most candidates were able to make good use of the additional formula sheet or recall the equations from memory, and many handled the associated calculations competently. Unfortunately, some lost accuracy due to premature rounding

Practical questions were best answered by candidates who appeared to be writing from first-hand experience, with clear, structured responses that followed the expected procedure.

Responses to longer, explanatory questions were mixed. Stronger candidates were able to write coherent, logically sequenced answers using correct scientific terminology. Less successful responses were often brief, disorganised, or confused key concepts.

Compared to previous papers in the linear series, a significant proportion of candidates appeared not to be fully prepared for some aspects of the exam, particularly those involving data analysis and the application physics in unfamiliar contexts. It was also noted that there were many blank responses. Nevertheless, it was encouraging to see many candidates who were able to give full and accurate answers, supported by clear reasoning and the correct use of scientific language.

Comments on Individual Questions

Q1(a)(i) – Most candidates were able to achieve this mark, as it required simple transcription from the provided data sheet. However, a number omitted “sin” from their final equation.

Q1(a)(ii) - Generally reasonably answered, with well set out working. Where candidates made errors in rearrangement they were able to receive a mark for substitution, since in most cases the workings were presented well, which is commendable. Some candidates failed to use the sin function for i or incorrectly used the sin function on 1.6. It is worth noting that an answer rounding to 8.1 could be achieved by using an incorrect method, so showing working was important in demonstrating that the correct method had been used.

There were a significant number of candidates who chose to round the number part way through the calculation, preventing further marks from being awarded. It is strongly recommended that candidates be encouraged to only round numbers at the end of calculations, and to include the unrounded values in their responses.

Q1(b) - Many candidates struggled to express the movement of the wave from a high to low refractive index, sometimes choosing to mention that the fibre was a high density but not making the statement comparative. Most commonly, candidates correctly described the relative densities, and many candidates were well versed in the stock phrase ‘at an angle of incidence greater than the critical angle’ which was pleasing. Some candidates noticed the idea of reflection and stated the law of reflection rather than the relationship between angle of incidence and critical angle.

Q1(c) - Common mistakes were to confuse the information with the light ray, and to interpret total internal reflection because of a mirror-type surface, rather than an attempt to cross a boundary with a decrease in density. The idea of further reflections was rarely clearly expressed, with benefit of doubt being applied in a few cases. ‘Reflected in the fibre’ was a common answer, a phrase which could be made clearer by emphasising the idea that the ray of light remains within the fibre. It was pleasing to see correct terminology being used, however when answering a question about wave behaviour (TIR), candidates should clearly distinguish between the ray of light and the information, as the two are not the same concept.

Q2(a) – Many candidates were able to score at least one mark on this question, however there were some weak and somewhat confused definitions. It is recommended that candidates practice and can recall key definitions for terms such as this.

Q2(b) – This was straightforward for some candidates, who were able to identify the missing parts of the spectrum.

Q2(c)(i) - Many candidates expressed this concept in terms which were too simplistic i.e. 'food absorbs microwaves' or 'microwaves heat water'. A common phrase was the 'food is being heated up internally from the inside out'. It was clear that many candidates were not prepared for explanations relating to water molecules, and where candidates did attempt to express the correct ideas a significant proportion stated that the radiation causes molecules to vibrate, which implied that the molecules were not already vibrating.

Q2(c)(ii) – The idea of shielding was communicated by candidates in a variety of ways. Most candidates missed the marks by stating a feature of the microwave (e.g. "it has a door") rather than specifically addressing the safety of the user.

Q3(a) – Most candidates were able to score all three of these marks.

Q3(b)(i) - Working was almost always seen where candidates gained full marks. Rearranging of the equation proved tricky for some candidates, and in most cases the substitution mark was scored where working was provided. The instruction to answer in standard form was too often not followed, and candidates are encouraged to re-read the question once an answer has been provided, to ensure such instructions are noticed and adhered to.

Q4(b)(ii) - This is the first time that "order of magnitude" has been assessed on either the linear or modular qualifications despite it being part of the mathematical requirements for the specification. The phrase is not one which is well understood by most candidates. It was pleasing to see this accurately expressed by those who had understood what they were being asked to do.

Q4(a) - It was pleasing to see most candidates refer to a material which is difficult to magnetise and demagnetise. Whilst this leads to these materials being suitable for use when making permanent magnets, this does not mean the material itself is necessarily a permanent magnet. This is a subtle but key difference between a magnetically hard material and a permanent magnet.

Example:

Material that is hard to magnetise but keep their magnetisim for a long time.

This response scores 1 mark for the idea of a permanent magnet.

Q4(b) - Many candidates chose to use correct methods of determining the shape of a magnetic field, either by iron filings or plotting compasses. Opportunities were missed to state that the iron filings need a tap to the surface they are on to allow the shape to form, and where no compass was used the candidate could not answer the part of the question which related to direction. Several candidates appeared to confuse the ideas of a permanent magnet and a compass.

Example:

Place a piece of paper under a permanent magnet, then place a compass on the corner of the magnet on the north pole, draw a dot wear the compass ~~pet~~ needle points at, then place the compass on the dot you drew and draw another dot ~~wear~~ where the needle points and repeat till you get the shape and direction.

This response covered all three marking points.

Q4(c) - Four lines were required. Mostly reasonably correct shapes were drawn, and the direction of the arrows was generally reasonable. Most often the meeting / crossing of field lines prevented the scoring of full marks.

Q4(d) - It was very clear that some candidates had learned this definition, and others attempted to describe what a uniform magnetic field meant to them, or the location between two bar magnets. It is strongly encouraged that candidates learn key definitions, so they can recognise when to apply them in their answers. Parallel lines and evenly spaced lines often scored on their own.

Q5(a) - "The time taken" was a very commonly scored marking point, however the expression of what exactly halved in this time was often not sufficiently clear. Often it was the radioactive substance, rather than the activity of the radioactive substance, and too often the idea of the time it takes to halve an atom (or nucleus) appeared.

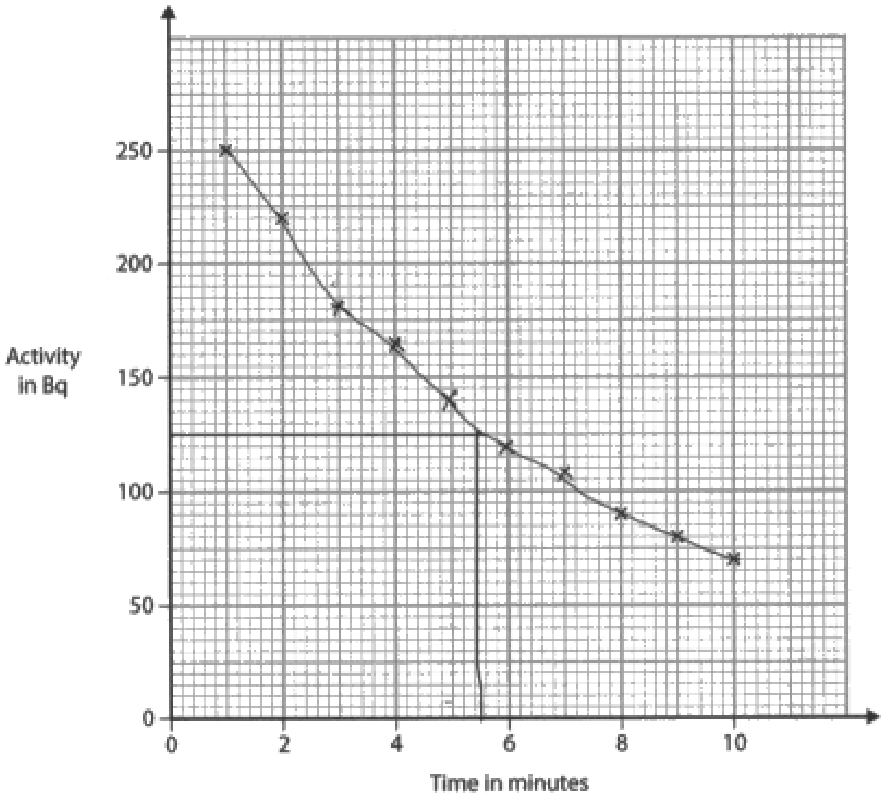
Q5(b)(i) - Mostly plotted correctly but take care to calculate what one division is worth before plotting.

Q5(b)(ii) - A surprising number of attempted 'curves' were two or three straight lines joined together. Too often candidates were 'joining the dots' or providing very thick lines which had been drawn multiple times over.

Q5(b)(iii) - Showing workings on the graph was common, but not universal. Reading from a graph is very easy to annotate, and these annotations demonstrate the skill being applied. The most common result was around 5.8 minutes, where the candidate had correctly halved 250 and read off the relevant value from the x-axis, but failed to notice that 250 occurred at 1 minute, so a reading of 5.8 minutes from the graph would give a half-life of 4.8 minutes. Some candidates spotted this issue and extrapolated the graph back to 0 minutes, and others picked two other points on the graph where one value of activity was double the other value.

Example:

A student has started to plot the results on the grid.



(i) Plot the missing results on the grid.
(1)

(ii) Draw a curve of best fit.
(1)

(iii) Estimate the half-life of the sample using these results.
(2)

half-life = 5.56 minutes

Focusing on part (iii), this demonstrates a case where the candidate has correctly read off the time for an activity of 125 Bq, however has not considered that 250 Bq is the reading after one minute, rather than zero: one mark was awarded for this part. It should also be noted that the “dot-to-dot” line of best fit was not acceptable for part (ii).

Q5(b)(iv) - Most candidates either agreed with the top line of the statement or did not address it at all. Most candidates performed at least two calculations and produced differing ‘constants’. The command word ‘Evaluate’ demands a statement of agreement, and this was sometimes present. Failure to clearly express to which part of the conclusion the candidate was referring led to ambiguity, so loss of marks. The strongest candidates performed more than two calculations, especially where 720 was the ‘constant’ in both cases. This is to be commended and avoided incorrect conclusions in most cases.

Q6(a) - The idea of more frequent collisions was expressed clearly by candidates who appeared to have learned this as a stock phrase. Strong candidates also linked this to the force applied because of these collisions. Many candidates then stated the pressure equation without demonstrating their understanding of how force, pressure and area are linked. Candidates should be encouraged to write in words how a quoted formula applies in the context of the question and not just be satisfied with stating the formula alone.

Q6(b) - Most candidates attempted to use $P_1V_1=P_2V_2$ to calculate the new pressure, however struggled to progress further. Many candidates calculated 25% of 103 but then forgot to add this to the original number to get the 25% increase of the pressure. A lot of candidates converted the pressure from kPa to Pa even though this was an unnecessary step.

Q6(c) - Some candidates referred to the kinetic energy of the gas rather than the molecules. This was a two-mark question, so the candidates who referred to one concept missed an opportunity to gain a second mark. Some candidates referred merely to the energy of the particles rather than the kinetic energy of the particles.

Q7(a)(i) – This question proved extremely challenging to candidates. It was clear that most were unfamiliar with the concept of a decay equation, and many responses contained significant guesswork. Many candidates had the beta particle on the left-hand side of the equation, and a significant number of errors determining the nucleon and proton numbers were seen.

Example:

$^{90}_{39}Y = ^{90}_{40}Zr + ^{0}_{-1}\beta$

This response was correct and scored 3 marks.

Q7(a)(ii) – Many definitions here were extremely unclear, with numerous misconceptions, including several relating to bacterial contamination, were seen. A minority of learners were able to give a clear, accurate comparison.

Q7(b) – Many relevant radiation sources were identified, with only a small proportion of candidates realising that they should mention ionising radiation. Vague statements such as the sun, and references to UV were common.

Q7(c) - Candidates often failed to recognise here that the risk from radioactive waste needed identifying, rather than a risk from the process which produced the radioactive waste, or a general risk of handling radioactive materials. Overly general statements such as 'contamination' needed to be linked with, for example, 'contamination of ground water', and the method of reducing risk needed to be specific to the storage of radioactive waste rather than generalised ideas of shielding. Many answers focused on fission power plants and their shielding, or handling of radioactive sources with tongs and lead-lined aprons. These answers did not answer the question which had been asked.

Example:

By sealing them / putting them inside a container and buried them in a very deep ground to reduce the risk for someone to absorb it.

This response scored one mark for identifying clearly a method for reducing a risk – however the candidate did not go on to explain the nature of the risk, and so did not score a second mark.

Summary

Based on their performance on this paper, candidates should:

- Ensure they include all elements of required equations, such as trigonometric functions like "sin", and avoid premature rounding during multi-step calculations to retain accuracy
- Take care to distinguish between related concepts (e.g., light ray vs. information, or fibre vs. mirror) and avoid vague terminology when explaining physical processes like total internal reflection
- Strengthen their use of key definitions and scientific vocabulary, particularly for terms such as wave, magnetically hard and uniform magnetic field, and be prepared to recall them accurately when required
- Practice communicating practical methods clearly and accurately, including appropriate use of diagrams, showing multiple measurements where relevant, and identifying control, dependent, and independent variables
- Improve graphical skills by selecting appropriate scales, drawing smooth curves instead of joining dots, and annotating graphs to support calculations and interpretations
- Read and respond to command words carefully (e.g., comment, evaluate), ensuring that answers directly address the question and include a clear judgment or statement of agreement where required
- Develop a more precise understanding of nuclear physics and radioactive processes, including correct construction of decay equations, clear comparisons between radiation types, and specific identification of risks related to radioactive waste.

Please refer and link to the International GCSE Physics (Modular) Specification and/or Sample Assessment Materials (SAMs) on the Pearson Edexcel website.

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