Examiners' Report
Principal Examiner Feedback

November 2023

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

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General Comments
As in examinations for previous specification, most students were able to find the formulae and usually they handled the related calculations well. Candidates 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 candidates 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 candidates could give full and accurate answers.

Question 1
Many candidates remembered the salient points of fission and fusion. Only a small number entirely confused the two processes. The most common misconception was that of the two processes, nuclear fission is where a nucleus absorbs a neutron, rather than nuclear fusion.

In item 1(b), very large numbers of candidates remembered that nuclear fusion requires high temperature and pressure. In an attempt to explain those conditions, many candidates merely repeated the question, i.e. mentioning that they were to overcome the effects of the repulsive force, rather than suggesting that the nuclei needed high KE or high speed or that the high pressure caused the nuclei to be closer to each other. References to high energy without specifying an idea of the kinetic energy were ignored.

Question 2
Part 2(a) provided little challenge to most candidates.

In comparison, part 2(b) discriminated well. For item 2(b)(i), mentioning that the support’s distance from the centre of gravity was decided to be merely repeating the question. Candidates needed to mention the force that was applied by the supports. By far the most straightforward way of explaining this concept is to consider taking moments about the centre of gravity, rather than about either of the support points. By applying the principle of moments, candidates can see that the moments of the support forces X and Y must be equal.

Candidates answered item 2(b)(ii) rather better. This item is similar to similar questions on this concept in that force X decreases and force Y increases. Again, taking moments about the position of the ice is worth exploring. Note that the command word here is ‘describe’, which is a signal for the candidate to describe changes, rather than repeat the logic of the previous item, which requires an explanation.

Candidates completed the specific heat capacity questions successfully, with only minor errors involving conversion of grams to kilograms or an incorrect calculation of the temperature difference. Both errors were taken into account and were examples of 'errors carried forward'.

Question 3
Very many candidates provided a very good description of how to determine the specific heat capacity (SHC) of water, which is one of the proscribed practicals in the specification. Higher level responses included finer details such as

- measuring the mass of water effectively, rather than merely stating ‘measure the mass of water’

- correctly naming a mass-measuring instrument, e.g. balance, scales (not scale)
- describing how to calculate the energy supplied using E = VIt
- being explicit about how to calculate the SHC

Candidates performed the calculation in item 3(b)(i) well, notwithstanding errors with standard form.

Candidates realised that there were several different processes by which the energy from the heater is not all retained in the thermal store of the water. Not all of them were clear about how this was happening: they could have been clearer by mentioning which process or which object was increasing an energy store.

Question 4
Providing the candidates used the formula sheet on page 2 effectively, item 4(a) offered little challenge. The only error candidates usually made was either not converting the 2.5 hours into seconds at all, or getting that conversion incorrect by missing a factor of 60.

Candidate made very good attempts at explaining the workings of a transformer in item 4(b). At this stage of the paper, precision of language becomes somewhat more important. The principal misconception is that the current from the primary coil somehow travels through the iron core and then directly into the secondary coil. Educators might consider carefully explaining that the two coils are electrically isolated from each other. Furthermore, the secondary current does not have a magnetic field that interacts with the field from the core, at least not in a creditworthy way. The logic should be clear that the changing field from the core induces a voltage in the secondary.

Candidates answered item 4(c) well, provided the understood the point of the question, namely that it asks for a change in the primary coil, not in the primary circuit. This meant that ideas involving increasing the primary current, voltage or power were not appropriate.

Question 5
Candidates almost universally answered item 5(a) correctly. Those that did not subtracted 273 rather than added 273.

For item 5(b)(i), most candidates appreciated that water was changing state when the temperature was not changing, in sections B and D. A significant fraction misunderstood the graph and assumed that the water was changing state during sections A, C and E.

Items such as item 5(b)(ii) regarding the structure of different states in terms of particles are relatively common. There was a wide variety of styles of answer which required professional judgement to award fairly. Either in words or in diagrams, the structure of a gas should be clearly more random than that of a solid. Equally, it should be clear that there are no large gaps between particles in a solid. The most successful candidates drew two diagrams that were clearly titled “solid” and “gas”.

Candidates answered item 5(b)(iii) poorly by comparison. The crucial link here is that temperature (in kelvin) and KE of particles in an object are directly proportional. If the temperature does not change (as shown in sections B and D) then the KE store of the particles cannot change.

Question 6
Candidates approached most items in question 6 with considerable skill. Virtually all candidates stated the principle of conservation of momentum in item 6(a), although a tiny minority confused the concepts of moment and momentum. Apart from errors in the powers of ten, items 6(b)(i)-(iii) were well answered.

Candidate made slightly harder work of item 6(b)(iv). The additional formula sheet provided the starting point so virtually all candidates could gain some credit. The rest of the response required some algebra, remembering to convert the millinewton into newtons and then substituting correctly. A significant portion of candidates lost the final, independent mark by forgetting to give their answer to 2 significant figures.

Item 6(c) was deliberately targeted to be accessible to candidates of higher ability. Candidates provided useful insight into their misconceptions. The principal misconception was the idea that objects require force for them to keep moving. Here the spacecraft is travelling through space and so will continue to do so unless there is a force. A change in velocity will happen regardless of how big that force is. Here the force is applied for a long period of time, so the change in velocity can in fact be quite big.

Question 7
The majority of candidates correctly identified a microphone as the necessary piece of equipment to connect to the oscilloscope to detect a sound wave. Abbreviations such as ‘mike’ or ‘mic’ were acceptable.

In item 7(b), determining the period of a wave from an oscilloscope trace is one of the named practicals in the specification (3.27P). Encouragingly, learners appear to have witnessed this or completed the practical themselves. There were many correct responses yet plenty of candidates that did not measure the number of squares for one period sufficiently accurately. Once the period was calculated, candidates tended to do well on item 7(b)(ii). If the candidate calculated a frequency then it was invariably used correctly in part (b)(ii).

Again, the formula was included on the additional formula sheet for item 7(c)(i). Item 7(c)(ii) went well, provided the candidate correctly identified how to measure the amplitude of the trace.

Question 8
Very few candidates linked the idea of maximum red-shift to the idea of highest recessional speed. For star B, this is when star B is at the position directly to the right of the centre of the orbit.

In contrast, candidates made very good attempts at calculating the velocity of the galaxy using the formula given on page 2. A common misconception was to use the longest wavelength of 561 nm in place of the correct reference wavelength of 550 nm. Candidates used algebra successfully to make the galaxy velocity the subject of the formula. While knowledge of the speed of light is not required, candidates may find it useful to remember that no object can travel faster than the speed of light, which was given in the question.

Summary Section

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

- Take care when drawing diagrams to add labels or titles.
- 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.
- Structure multi-step calculations as simply as possible to facilitate checking at each stage.
- Recall the units given in the specification and use them appropriately.
- 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 partly correct. This is particularly important when dealing with a prefix in front of an SI unit or when dealing with numbers in standard form.
- Signposting working with words may help with structuring calculations clearly.
- Take advantage of opportunities to draw labelled or titled 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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