Examiners' Report
Principal Examiner Feedback

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Pearson Edexcel International GCSE
In Chemistry (4PH0) Paper 2P

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General Comments

There were some very talented physicists sitting this examination who could give confident written answers and complete challenging calculations successfully. It was very pleasing to see candidates able to apply their understanding in unfamiliar contexts, especially in the later questions 6 and 7 in this paper. In future papers, candidates would benefit from taking greater care over diagrams when accurate drawing is the key skill being tested. There is a key difference between drawing a diagram that adds to an answer (such as in an experimental method description) and a question that solely asks for a diagram to be drawn or added to. Question 3(a) demonstrated that few candidates realised how important the accuracy of their drawing would be. Overall, the examination proved to be comparable to previous series in terms of difficulty and accessibility.

Question 1

85% of all candidates were able to identify at least two non-renewable energy sources in part 1(a). Although most candidates knew that oil and coal are non-renewable, fewer candidates identified nuclear as a non-renewable source and this was the most common reason for scoring two marks, rather than the full three marks.

Part 1(b) proved to be more challenging than expected and only a quarter of all candidates were able to give a suitable advantage and disadvantage for using fossil fuels to generate electricity. Since the main stem of the question introduced the idea of non-renewability, candidates were not given credit for giving this as a disadvantage. Other reasons for not gaining marks included writing reasons that were too general, for example stating that fossil fuels are "reliable" or "cause pollution". Candidates should be advised to be specific in their responses such as "the output does not depend upon weather conditions" in order to convince the examiner that they genuinely understand the physics of the situation.

Question 2

Candidates performed well in this first calculation in the paper, with over three quarters gaining full marks. In part 2(a)(i) candidates generally lost marks when using incorrect symbols or writing the formula incorrectly with current as the subject. A small number of candidates lost the final evaluation mark in part 2(a)(ii) for incorrectly rounding their answers to 0.02. More significant errors arose from incorrectly rearranging the formula after a successful substitution of the data.

It was pleasing to see almost half of all candidates interpret the two-way switching arrangement in part 2(b) to gain all three marks. The question differentiated well below the top mark and most candidates were able to gain at least one mark.

Question 3
Very few candidates were able to gain full marks in part 3(a), usually due to a poor attempt at the second diagram involving the larger gap in the barrier. However, the majority of candidates gained at least one mark for a reasonable attempt at drawing diffracted wavefronts in the first diagram. Candidates needed to draw accurately to get the second mark and few took enough care over their response to draw wavefronts of the same spacing as before the gap in the barrier. A large number of candidates knew to draw planar wavefronts in the second diagram. However, most did not realise that this was due to there being little to no diffraction when the gap in the barrier is much larger than the wavelength. Consequently, many drew planar wavefronts that were simply too long, given that the waves would spread out very little at all.

The calculation in part 3(b) was completed to a high standard, with over two thirds of all candidates being awarded full marks. The formula was usually written out correctly in words in part 3(b)(i) and, where symbols were used instead, they were usually correct. Some candidates made attempts to calculate the frequency in part 3(b)(ii), but did not take into account that it was stated in the question that the frequency of the waves in each section of the ripple tank was the same. This sometimes resulted in the candidate losing the final mark.

Question 4
There was a clear divide in part 4(a) between candidates who knew the conservation of momentum and those who did not. Most erroneous responses simply restated the question or were attempts at describing the principle of moments. A small number of candidates attempted to answer the question using an equation. However, these were mostly incomplete and did not fully convey that the total momentum before and after a collision were the same.

Candidates found the linked calculation in parts 4(b) and 4(c) challenging, with the latter presenting the highest level of difficulty. Most were able to gain at least one mark in 4(b) for correctly expressing the momentum of ball A before the collision. Those who then went on to correctly apply the conservation of momentum, usually went on to calculate the final correct answer. A surprisingly large number of candidates thought the balls coalesced in the collision, leading to an incorrect final answer. A small number of candidates calculated the correct answer, but only wrote 10 – 8 = 2 in their working. It was assumed that these candidates knew that the masses of the balls cancelled in the calculation and so they were given full credit. However, candidates should be advised to be as thorough as possible in their working to communicate their understanding to the examiner clearly.

Most students gained only a single mark in 4(c) due to expressing one value of kinetic energy correctly. Only candidates working at A* level knew to find all kinetic energies separately and then find the difference before and after the collision.

Question 5
Part 5(a) gave a wide range of marks but fewer marks were gained by candidates than initially expected. The major error by most candidates was to consider that the kinetic energy of the system had increased in some way and this prevented many responses from scoring any marks. A significant number of candidates thought that all the air had been removed from the bell jar, which was condoned when referring to there being no particles remaining outside. However, the idea of there being no pressure outside the bell jar was not allowed and this limited the number of marks awarded. Some candidates knew the effect was to do with pressure differences, but did not link this to the behaviour of molecules. Other responses were not clear whether the changes in pressure were happening inside or outside the balloon and, again, this limited the number of marks awarded.

Candidates were able to interpret the context well in part 5(b) and the majority knew whether the pressure or water level were increasing or decreasing in each sub-part of the question. However, the supporting reasons for each change were less common. Candidates performed best in part 5(b)(i), with over a third gaining both marks. Common misconceptions focused on the surface area decreasing, rather than the volume. In part 5(b)(ii), marks were often lost for using poor vocabulary such as 'air pushes water' rather than air exerting a higher pressure on the water. Part 5(b)(iii) illustrated a poor understanding of the effect of pressure difference, as most thought that the pressure outside the apparatus had to be higher than inside for the water level to fall.

Question 6
Only half of all candidates realised that the weight of the magnet should be found by using the principle of moments in part 6(a). A surprising number thought it could be found from the weight formula, despite its mass not being given. However, those candidates that applied the correct method made impressive attempts and generally gained two or three marks. The most common mistake was using the wrong distance to calculate the moment of the 0.1N weight, which lead to an incorrect final answer of 0.25N.

Part 6(b) required a comprehensive explanation to gain all three marks and the final marking point was the least often seen. Despite this, more than half of all candidates were able to gain either (or both) of the first two marking points due to realising the effect was due to electromagnetic attraction.

Graph work in part 6(c) was completed to a high standard. Where candidates lost marks, it was typically due to not recognising current as the independent variable or omitting units from axes labels. The vast majority of candidates recognised that the result was anomalous in part 6(c)(iii) but few linked this to a benefit of actually repeating the reading. Part 6(c)(iv) was answered to a very high standard and it was impressive to see nearly half of all candidates include a higher-level term in their description to gain both marks. Some confusion was seen in terms of answers relating the current to the weight added, rather than the force produced by the magnetic field. Most candidates recognised that part 6(c)(v) involved scaling the data to complete the estimation. However, very few used the fact that the line didn't go through the origin to apply a correction. Some fantastic answers were seen, which featured finding the equation of the line and then using it to find the weight for a current of 2.0A.

Question 7

Candidates fared well in part 7(a), with over two thirds gaining the marks. Some candidates failed to recognise that $10cm^3$ is a relatively small volume to measure accurately and so were not given credit for instruments such as a beaker.

The calculation in part 7(b) was presented in an unfamiliar context and was designed to challenge the candidates' ability to apply a mathematical model in a new situation. It was very pleasing to see them do this so successfully and, although there were some errors, candidates generally gained high marks. The most common errors were not giving their answer to three significant figures in part 7(b)(i); using the diameter instead of the radius in part 7(b)(ii); and introducing power of ten errors when working with data in standard form.

Summary Section

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

- 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.
- Only use symbols when writing formulae if the symbols are correct.
- Recall the units given in the specification and use them appropriately.
- 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.
- 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.
- Draw diagrams carefully when their accuracy is a key factor, for example in drawing force arrows or wave diagrams.
- Allow time at the end of the examination to check answers carefully and correct basic slips in wording or calculation.

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