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Examiners' Report
Principal Examiner Feedback

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Pearson Edexcel International GCSE
Physics (4PH1) Paper 1P and
Science Double Award (4SD0) Paper 1P

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Question 1

Most candidates were able to score at least two marks across Q1(a) and Q1(b)(i). The most common errors were not drawing the elliptical orbit of the comet such that the star was at its centre, or for drawing the force arrow towards the moon, rather than towards the planet. However, the vast majority of candidates knew that this force was a gravitational force. The calculation in Q1(c) was answered to a high standard and most candidates completed the calculation successfully to score at least two marks. Many candidates did not read the question carefully and failed to give their answer to the required two significant figures. Weaker candidates also made power of ten errors in their calculation as a result of dividing by a number expressed in standard form. Q1(d) proved to be more challenging; most candidates communicated that the blue star would be hotter, but only the most able candidates could correctly link this to how the position of the liquid region would change. Many candidates stated that the liquid would become a gas, but this did not answer the question.

Question 2

The linked calculations in Q2(a) were generally answered to a very high standard. The most common mistake was not recognising that the kinetic energy became gravitational potential energy and so some candidates gave an incorrect response in Q2(a)(iii). Weaker candidates also made mistakes when calculating the kinetic energy in Q2(a)(ii) by not squaring the speed.

Q2(b)(i) proved to be significantly more challenging and most candidates scored no marks in this question. Most incorrect answers showed a straight line of positive gradient passing through the origin, which did not show any understanding of the context. However, most candidates did know that the acceleration due to gravity is linked to the gradient of the graph and gave the correct answer to Q2(b)(ii). In Q2(b)(iii), most candidates gained at least one mark for appreciating that the difference in gravitational field strength is due to the Moon and Earth having different masses (or densities). Only the most able candidates went further in their descriptions or gained a further mark for saying how the gravitational field strengths are different.

Question 3

Q3(a) was answered confidently by most candidates to score at least one mark. Some candidates did not get the second mark because their responses were too vague and referred to risks of harming or safety, rather than the specific risk of shock or electrocution. Some candidates also discussed thermal, rather than electrical, insulation. The following calculation in Q3(b) posed little challenge and the majority of candidates scored full marks. The idea of the circuit breaker being resettable/replaceable was frequently seen in responses to Q3(c), but candidates used all four lines elaborating on this idea and the idea that fuses would need to be replaced and so it costing more. Very few knew that the circuit breaker was more sensitive/faster and those that scored this mark generally were the ones that got

both marks. Candidates often stated that the circuit breaker was “safer” rather than faster.

Question 4

It was pleasing to see nearly three quarters of all candidates successfully recall the unit of activity in Q4(a). Most candidates also scored at least one mark in Q4(b) for either giving a valid source of background radiation or describing it. More able candidates usually did both to secure two marks. Candidates’ definitions of half-life in Q4(c)(i) were usually sufficient for both marks, but weaker candidates gave imprecise descriptions of what is being halved. Candidates should be advised to keep their definitions simple – “the time for the activity to halve” being the most straightforward correct response. However, candidates were able to apply their understanding of half-life more successfully in Q4(c)(ii) and most scored two marks. Weaker candidates sometimes misread the scale on the time axis.

Candidates who read the question carefully in Q4(d) usually performed well by calculating and comparing at least two constants from the data in the graph. Weaker candidates did not attempt to use any quantitative data in their answers, which resulted in no marks being awarded.

Question 5

Most candidates gained both marks in Q5(a), but candidates need to be wary of trying to do too much when answering questions; sometimes drawing more than three lines resulted in losing MP1 due to unequal spacing between those additional lines. Candidates could apply Fleming’s left hand rule with some success in Q5(b) and it was encouraging to see a third of all candidates secure both marks. Weaker candidates knew the force should be vertical, but drew it directed upwards rather than downwards.

The explanation of the motor effect scenario in Q5(c) proved to be one of the most challenging questions in the examination. Many candidates knew that there was a magnetic field around the coil/in the wire when current flowed and that this interacted with the permanent magnetic field so scored 2 marks. However, MP2 was frequently not awarded, due to responses indicating that the field lines had been cut. Candidates then assumed that there was no interaction/force when the coil was vertical. Fewer candidates referred to the force on the individual wires, just the force on the coil as a whole, so did not tend to achieve MP3-5. MP6-8 were rarely mentioned, although some candidates only spotted the lack of commutator and did not explain why the coil moved in the first place.

Question 6

Q6(a) differentiated well between candidates and clearly revealed who had completed this compulsory practical investigation and who had not. Some candidates made no reference to drawing the rays and block on the paper, with a number who perhaps had not had the opportunity to do the practical at all. Lots of candidates achieved the MP3 and MP4 marks. However, few candidates thought to

perform the investigation with a range of incident angles. MP6 was scored in a large number of cases, but with very few referring to a graph, and those that did remember to draw a graph did not then reference the use of the gradient.

Candidates completed the calculation in Q6(b)(i)-(ii) to a high standard. Those candidates who did not score full marks usually experienced difficulties using the inverse sine function to obtain the final value for the critical angle. Candidates found the description of total internal reflection in Q6(b)(iii) surprisingly challenging. Successful candidates usually scored marks for describing at least one of the required criteria for total internal reflection, but attempts at describing total internal reflection itelf (MP1) were usually too imprecise to be given credit.

Q6(c) revealed errors in measuring angles from the normal and many candidates measured the wrong angle in Q6(c)(i). Although most candidates knew the ray would emerge into the air, only a quarter drew it refracting in the correct direction.

Question 7

Most candidates knew that weight was the other vertical force acting on the submarine in Q7(a)(i). A small minority of candidates incorrectly gave “downthrust” as their response. It was pleasing to see the majority of candidates correctly draw one upward arrow and one downward arrow on the diagram in Q7(a)(ii), which showed a good understanding of the forces involved. However, weaker candidates did not draw these arrows the same length, which showed they either did not appreciate that the forces should be balanced or that the length of the arrows is representative of the magnitude of the forces. The calculation in Q7(b) was answered to a high standard, but only the most able candidates noticed that they should convert their final answer to kPa. Weaker candidates scored no marks as they did not substitute for *g* in their calculation.

Q7(c)(i) was a good question for differentiation, with an approximately equal split between 0 and 3 marks being awarded. Many candidates had learned and revised excellent explanations of pressure and scored full marks. Most candidates knew that the air particles collided with the walls of the storage of the storage tank, but then did not link this to the existence of a force or pressure. Some candidates thought the question was about why the submarine rises upward, and these candidates usually scored no marks. Candidates performed well in the calculation in Q7(c)(ii) and over three quarters of all candidates were able to score at least three marks. This showed a strong ability to rearrange a more complicated formula. Only a third of all candidates knew to convert the temperatures into kelvin and those who did not do this usually lost a single mark.

Question 8

Many candidates were able to describe the difference between transverse and longitudinal waves accurately in Q8(a). However, there were many candidates who knew about perpendicular and parallel (and mostly got the link to transverse and longitudinal the right way round) but did not mention oscillations/vibrations at all

and some who got very confused by the motion/wave direction. Diagrams tended not to score marks as they lacked any labels indicating what was happening.

Q8(b) proved to be slightly more challenging. Many candidates remembered the idea of wavefronts becoming closer together or wavelength decreasing; the idea of the wavelength getting smaller was seen much more often than a description of the wavefronts compressing. Often it was thought that the speed was changing but a mark was sometimes gained for quoting the relevant formula. Many candidates just stated "therefore frequency increases" without the mention of the wave formula or constant speed.

The calculation in Q8(c) was answered to a high standard and more than half of all candidates scored full marks. A significant number of candidates lost a mark for incorrectly rounding their final answer to 5.5×10^{14}. Other candidates lost a mark for introducing a power of ten (POT) error in their final answer, most likely due to using their calculator incorrectly when working with numbers given in standard form.

Question 9

The circuit diagrams drawn in Q9(a) were generally completed to a very good standard. Some candidates made errors when drawing the symbol for a variable resistor, but it was pleasing to at least see some understanding that another component was needed to allow the current to be varied. Weaker candidates also made mistakes when drawing the voltmeter in a suitable position in the circuit.

Mistakes were rarely seen in Q9(b)(i)-(iii). Occasionally, candidates used the wrong value for the current in Q9(b)(iii). However, Q9(b)(iv) proved to be very challenging and highlighted significant misunderstandings in candidates' understanding of series and parallel circuits. Although many candidates identified the circuits as parallel and series respectively, any subsequent knowledge and understanding was reserved for only the responses of the most able candidates. Most candidates attempted to calculate the current in circuit 2 by applying the EMF of the cell to both resistor A and resistor B independently, which showed a lack of understanding of voltages in series circuits. Some candidates did not attempt any calculations, despite the question instructing them to do so.

Question 10

It was surprising to see less than half of all candidates give the correct independent and dependent variables in Q10(a)(i)-(ii). Unusually, incorrect responses commonly included the heater or the coins, which showed a deeper misunderstanding than simply getting the independent and dependent variables the wrong way round. Candidates found it marginally easier to list control variables in Q10(a)(iii), but the reference to validity confused some candidates and they gave answers that did not include control variables. However, candidates answered Q10(a)(iv) more confidently and most scored both marks. Weaker candidates described modifying the original experiment (beyond correcting control variables) and these responses usually scored nothing.

Despite many excellent bar charts being drawn in Q10(b)(i), there were also some notable errors. Lots of candidates lost marks for constructing inappropriate scales for the time axis. Candidates should be advised to avoid multiple of 3 when constructing scales as it makes plotting (and reading) values too difficult. Weaker candidates lost further marks for not labelling their axes appropriately or for making plotting errors (often linked to scales involving multiples of 3). Although many candidates scored the mark in Q10(b)(ii), the majority of candidates did not appreciate why a bar chart is used to display experimental results instead of a line graph. Common incorrect responses included “results are easier and simpler to display on a bar chart”, “bar chart is more accurate/precise than a line graph” and ”bar chart is easier to understand”.

Question 11

Most candidates chose the correct response to the multiple choice question Q11(a). Despite its accessible question type, the final question on the paper, Q11(b), proved to be challenging and most candidates only scored two marks. The order of statements 2 and 3 was frequently seen presented incorrectly. Some candidates also confused statements 1 and 4. The weakest candidates misread the question and placed ticks in the boxes as though some statements were true and others false.

Paper Summary

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

- Attempt all questions even if the candidate is unsure of their response.
- 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.
- 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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