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Examiners' Report/ Principal Examiner Feedback

Summer 2013

International GCSE
Physics (4PH0) Paper 1P
Science Double Award (4SC0)
Paper 1P

Edexcel Level 1/Level 2 Certificate
Physics (KPH0) Paper 1P
Science (Double Award) (KSC0)
Paper 1P

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General
Many students scored very well across all aspects of this paper, indicating thorough preparation fully covering the specification. Numerical work was usually handled very well, including simple rearrangement of equations. Questions relating to experimental work and other skills covered by AO3 often allowed students greater freedom of expression and examiners were pleased to see many responses that indicated the students had experience of practical physics and were able to describe their ideas clearly. However, a number of blank responses were also seen and some responses to the longer, more extended questions indicated a lack of preparation in depth. There is evidence that some students do not see each question as **structured** and tackle each part as a discrete question.

Question 1
This question proved to be an accessible start to the paper for most students with over 80% gaining all 4 marks. In part (a), some students chose the definition of 1 volt rather than the definition of 1 watt. Students were less likely to confuse the definition of 1 pascal.

Question 2
The majority of students were able to correctly order by wavelength the three given types of the electromagnetic spectrum and identify two other types. The most common answers were the ends of the spectrum: gamma and radio.
However the uses of ultraviolet were less well known. Many students gave two examples from marking point 4, eg a fluorescent lamp and a tanning machine rather than two distinctly different applications. In Q2 (c)(ii), only a minority of students were able to gain both marks. The most common error was to write 'burns the skin' instead of 'sunburn'.

Question 3
Part (a) of this question allowed students to demonstrate their knowledge of magnetic fields. It differentiated effectively as students needed to be precise in both their drawing and their prose in order to gain full marks. Despite gaining the marks in Q1 on magnetism, a few students gave conflicting arrows and divergent lines in part (a)(i). In part (a)(ii), the most common reasons for not gaining full marks were: assuming iron filings gave direction and/or omitting necessary detail in the method e.g. use of more than 1 line.
Part (b) produced much more variable responses. Less than 50% of students gained both marks. It was observed that some students did recognise that this part was about (electro) magnetism and gave responses about the rod getting hot.

Question 4
In part (a), the majority of students were able to identify one possible reason why the student's conclusion was untrue. Often the reason given was that the mass had suffered damage which led to loss of mass. Less often the reason given was the idea of rounding. About 20% of students

mentioned a zero or tare error which is not the same as a calibration error. Only a few students went on to identify a second reason. This is possibly due to an incorrect assumption that a simple statement of 'the student was incorrect' would gain a mark.

Part (b) was much better answered with over 50% the students gaining all three marks. However, many students wrote at too great a length and depth for what was a quite straightforward description of a simple practical procedure.

Question 5
This was another well answered question with over 50% of students gaining all 5 marks and a further 25% gaining 4 of the marks. It was pleasing to note that for the most part students structured their response logically and mentioned suitable measuring instruments and the relevant equation.

Question 6
It was not surprising that over 95% of students gained the first mark in this question.

Part (b)(i) was also well answered. A few students mistakenly calculated the speed of the Earth rather than Mars or omitted the factor of '2π'. In part (b)(ii), a number of students found difficulty with expressing their ideas coherently. However, it was pleasing to note that many students gained both marks for a clear labelled diagram.

It was evident that many students did not link the two parts of (c) together. In part (i), the majority of students correctly evaluated the time as 567s. A few however lost a mark for attempting the 'reverse calculation' (ie where 600s was used as the time, 170 000 000 m was used as the distance and they obtained a value for the speed of light which was close to 300 000 000 m/s). Only a few students then went on to use the 600s as part of their response to part (ii). Hence only 20% of students gained both of the marks in Q6(c)(ii).

Question 7
Approximately half the students were able to draw the symbol for a thermistor accurately. Some students drew the variable resistor symbol. However the equation for voltage was well known as was the method for transposing the equation to find resistance. Over 60% were able to gain all three marks. A few students tried to use the 80°C in their calculation, rather than realising that this was a hint to look at 80°C in part (c).

Nearly two thirds of the students gained 3 or more marks for a detailed comparison of two graphs. It was pleasing to find that many students could apply AO3 analysis skills in this situation. Students who gained full marks did so because in addition to identifying trends in the data (eg as the temperature increased the resistance decreased), they also quoted specific data points (eg both components had the same resistance at 80°C)

Question 8
The majority of this question was numerically based, and so was generally very well done. A few students made a mistake in (a)(iii). Similarly a few students did not quote the equation for KE correctly and thus failed to gain any of the marks in (b). There were also a few mistakes evaluating the 'v^2'.

In part (c), only a few students used the structure of parts (a) and (b) (work done and KE respectively) to inform their response to part (c). Nevertheless, many students were able to make good progress and gave coherent responses. Over 60% gained 2 or more marks for their explanation.

Question 9
Many students gained credit for appreciating the inappropriateness of a mm scale for a very thin object. Approximately 40% of students gained the mark in (b)(i). However, there was evidence that students added to their response in part (a) after part (b)(i). Part (b)(ii) caused some difficulty with many students. Common incorrect responses included miscounting the sheets, folded sheets and air gaps between the sheets (rather than a gap between the sheets and the ruler).

Part (c)(i) was one of the more demanding questions on the paper with just 45% of the students making progress into the explanation. Better responses mentioned Newton's first or second laws and explained what was meant by constant velocity. It was pleasing to find that over 80% of students could correctly label the diagram with at least two of the three forces. However, only a minority of students identified the concept of dissipation as the correct response for part (c)(iii), with GPE being the most common incorrect response.

Question 10
Over two thirds of students gained 5 or more marks in part (a). Often one of the marks missed was for misreading a scale either in part (i) (speed incorrectly as 45 m/s) or in part (iii) (the times were shown as 20, 90, and 30s). Another common error was to omit the factor of '1/2' when calculating areas. Only a few students used a trapezium method in part (iii). A very small minority of students failed to show their workings for these calculations.

About 60% of students gained 2 or more marks in part (b) for explanations which linked mass and speed to the stopping distance. A very few of the students used the deceleration distance they had calculated in (a)(iii) to prove that faster aeroplanes travelled further.

Question 11
Many students were able to make good progress with parts (a) and (b)(i/ii) of this question. It must be noted however, that using the '$\sin^{-1}$' function on a calculator caused more difficulties than any other mathematical operation on this paper.
Most students found great difficulties in applying and describing the ideas already mentioned in the question to TIR in diamond. Indeed, some students did not mention any of the ideas, and instead gave either a

description of the shape of diamond compared to opal or a description of the relevant opacity/colour.

Question 12

The majority of students were able to calculate the proton and neutron numbers in part (a)(i). The definition of half-life was less well known. Better responses mentioned the activity halving rather than the number of atoms etc. About 40% of students correctly mentioned longest half-life in (a)(iii) as being the reason for the abundance.

In part (b) the products of fission were quite well known. Students should be guided to respond with general facts e.g. 'daughter' nuclei rather than incorrectly quoting specific nuclei. Similarly, students should be advised to stay to the vocabulary of Physics instead of mentioning 'daughter cells'.

In part (c), the functions of the moderator and control rods were confused by many students. Some students omitted to mention what happened to the neutrons in (ii) and gave only a one mark answer.

In part (d) there was a wide variety of responses which showed that the less able students tended to struggle when assembling a logical description or when asked to offer more than one idea. Many students wrote at length but repeated the same ideas. The better responses used technical vocabulary correctly eg half-life, activity level cell mutation and exclusion zone.

Question 13

In the main this question was targeted at AO3. Part (a) showed that about half of the students were confused with controlled and independent variables. However, the responses for part (b) were generally very good. The most common error was to draw a line of best fit which was not balanced with an equal distribution of points along either side of the line. In part (c) just less than 1/3rd of students identified the weight of the ruler as providing a non-zero force.

Question 14

The pressure equation and calculation were well answered with over 75% of students gaining 2 or more marks. The most common error was to leave the height in cm. Similarly over 75% of students gained the mark in (b)(i). Despite the rest of this question being about pressure, it was unfortunate that many students omitted to mention the term 'pressure' in their response to (b)(ii). Hence their explanations lacked the necessary precision. Another common error here was to only mention the reason why the flow stops or why the flow starts but not both.

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
- Be familiar with the equations listed in the specification and be able to use them confidently
- Show all working, so that some credit can still be given for answers that are only partly correct

- When doing ‘show that’ calculations, do them ‘forwards’ to get the required answer and don’t do them ‘in reverse’ by using the answer to return to the numerical data given in the question
- Describe experiments in reasonable detail and be ready to comment on experimental data and methods
- Recall the units given in the specification and use them appropriately, for instance when describing the measurements taken in an experiment
- 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 diagram 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

Grade Boundaries

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