Pearson Edexcel

Examiners' Report

Principal Examiner Feedback

Summer 2018

Pearson Edexcel International GCSE
in Physics (4PH0) Paper 1P

Pearson Edexcel International GCSE
in Science Double Award (4SC0) Paper 1P

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Examiner Report International GCSE Biology 4BI0 1B

General

On the whole, students demonstrated that they could recall facts and equations (with a few notable exceptions) but were less proficient at applying these in new situations. There was evidence that students who had experience of laboratory work gained good marks on questions targeted at AO3 (experimental methods, data processing, variables etc.). Generally, students made few numerical mistakes in their calculations. However, they should be reminded that S I units are normal, and that all quantities involved should be in S I when substituted into equations.

Question 1 - Astronomy

This question proved to be a suitably straightforward start to the paper for most students with three quarters of students gaining full marks for part (a) and 90% of students being successful with part (c). Students were less successful in identifying the gravitational force acting on the Moon: just 70% correctly realised that the force is attractive not repulsive.

Question 2 - Energy transfers and Hooke's law

In part (a), the number of students who correctly identified the energy type dropped from an average of 75% for words 1, 2 and 4 to 63% for word 3. This may be because students failed to take note of the instruction 'Each word may be used once, more than once or not at all'.

Part (b) was designed to test AO3 skills. There was evidence of poor examination technique as some students repeated the stem of the question in their response rather than giving a logical method. Marks were also lost when the response stated 'measure the spring' without reference to length. Some students gave answers referring to the forces rather than the effects of length of adding masses to the spring. There were a few students who attempted a description for the whole trampoline.

It was pleasing to note that the AO1 part of this question was well done with over 60% gaining both marks. A further third of the students gained a single mark. In many cases this is because students did not take sufficient care and either missed the origin or drew a bumpy line. There were a few students who drew a line representing a spring which did not obey Hooke's law.

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Question 3 - Use of main electricity

This question proved to be straightforward for most students with over 90% gaining full marks for each section of part (a). There was some incorrect rounding seen, with some students truncating answers in the evaluation.

In part (b), it was pleasing to note that many students gained full marks for clear labelled sketches of a.c. and d.c. Other students were generally successful with their attempt to describe the differences. Seventy percent of students gained both these marks. Some confusion was evident between change of direction and change of size of the current. There was also some confusion between d.c. and digital electronics with students stating that dc went from 1 to 0 or switched on and off.

In part bii, it was surprising to note that only 55% could name a source of direct current. Unsuccessful students gave appliances that used a direct current rather than sources of it or answers relating to the generation of electricity in power stations.

Question 4 - Determination of density

As expected many students were able to write a coherent description of how to find the density of a solid with nearly 70% gaining four or five marks. Many of these students took advantage of the space to draw a diagram, unfortunately not all of these were labelled. For the rest of the students there were some common errors e.g. confusing weight and mass, failing to give sufficient practical detail or having the formula missing or incorrect. Some students got confused over the displacement method thinking it directly measured density instead of volume and some students thought that it was enough to know if the steel was more/less dense than water based on whether the steel floated or not. Just over 10% failed to gain any marks here.

Question 5 - Resistance and practical skills

This question was primarily targeted at practical skills and not all parts proved to be accessible for students. Overall, students seemed confused by the terminology. There was some evidence that this was centre-dependent.

In part ai, only 25% could describe how to improve the precision of measurement. Students frequently answered in terms of accuracy. It was clear that students were unsure of the difference between the two ideas, there were many occasions when an answer relevant here was found in the next question and vice versa.

The responses in part aii were better with some sensible suggestions to improve the accuracy. Over 45% of students gained two or more marks. A number of

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candidates mentioned repeats and averaging, incorrectly here. Other frequently seen incorrect answers were using string to measure or using a different wire.

The question asked in part bi concerned the reason for control of the current to a small value. Only the most able students were able to make good progress with this application of the heating effect of a current. It was a relatively poorly answered question in terms of full marks as just under 15% of students gained full marks. Some students gained one mark for the idea of the wire changing temperature, but the second mark, the consequence on resistance, was very rarely seen. There were a significant number of instances of incorrect science being used to support reasoning. In many cases it appeared as though students were not clear as to what was being asked for in the answer, for example considering electrocution as an answer. On occasions students appeared to alight upon something creditworthy by accident rather than design.

In part bii, students were a little more successful with over 20% gaining full marks. In previous series similar questions have been asked based on a graph rather than a results table. Hence this was a little more difficult. Most students gained MP2 (filling the gap in the results) or MP4 (taking results in smaller intervals). A few students unfortunately did not gain a mark for 'repeats' as they did not mention averaging or checking for anomalies.

In general graph work was good and students were able to demonstrate the skills that they had acquired. A few students only plotted six of the seven points, some seem to have been confused by their own scale. Other common errors include: non-linear scales, poorly chosen, scales which made plotting hard e.g. going up in 3s, points which were too large and similarly lines which are too think or bent.

Many students answered the final part of this question well with just 10% failing to gain a mark. 60% of students gained full marks (proportional being more popular than linear), 30% of students stated the general relationship for 1 mark. Where second mark was attained it was usually for 'directly proportional' rather than for 'linear'. A number of students mentioned correlation (which did not gain credit), however they tended to redeem themselves by explaining in some detail the relationship so then scored the marks.

<u>Question 6 - The electromagnetic spectrum</u>

The entire question was well answered by the majority of students. Over 80% gained the mark in part a. The common error was that 'gamma' was selected, indicating a confusion in the understanding of the range.

In part b, two thirds of students gained both marks. Students frequently merged two answers 'travel at the same speed through a vacuum', scoring both marks in one sentence. Common errors here were 'amplitude' and 'frequency'.

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Many students scored well in part c. Students who got 5 or 6 marks gave very clear answers with good use of technical vocabulary e.g. cause cell mutations, skin burns, internal heating. This was evidence that centres had taught the syllabus carefully. A number of students appeared not to have read the question carefully and focused on the harmful effects rather than the uses; such students limited themselves to 3 marks. The most common parts of the spectrum focussed on were the higher frequency radiations.

Some students didn't give enough detail to get credit for 'harm' for gamma or x-ray e.g. by just responding 'it causes damage'. Some students mixed up uses and harm for UV and IR. There was little evidence of understanding about the relative energies and dangers or the radiations. Other common errors included 'microwaves are ionising radiation', 'gamma is used for chemotherapy' and 'radio waves affect wildlife'.

Question 7 - Terminal velocity

Nearly 80% of students gained full marks in parts ai and aii showing that recall of most equations remains good. A few students lost a mark for incorrect units. In part aiii, it was surprising that only half of the students were able to name the gradient at the feature that shows acceleration. A similar proportion of students knew that the height travelled was area under the graph and could calculate the area of triangle to find this distance. Other students used 'd=s x t' with s as the maximum speed rather than the average speed.

In part b, it was not unusual to find that good answers included all seven marking points: just over 50% gained all five marks. However, there were some common errors that that marred otherwise good responses. These errors show either poor exam technique or conceptual problems which need to be addressed by centres.
Examples of poor technique include describing the line rather than answering the question and discussing energy rather than forces as requested. Examples of conceptual problems include confusing acceleration with force (e.g. acceleration balances air resistance or acceleration equals drag) and incorrect use of the term 'resultant force'.

Question 8 - Thermistor and lamp

Part a proved to be quite straightforward. Most students knew the symbol for thermistor, those that did not usually substituted a variable resistor. There were only a few examples of voltmeters in series and voltmeters misplaced over the battery instead of the lamp.

In part b the formula, like many of the others on the paper, was well known and was quoted correctly. In a small number of cases the formula was wrongly rearranged. The calculation did not fare as well as expected as students very rarely converted correctly from mA to A. There were also incorrectly rounded answers seen e.g. 7.08. Both of these errors caused students to lose marks so just over 50% gained full marks.

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Part c proved to be more testing also with quite a few examples of incorrect physics or incorrect technical vocabulary seen. Just over a quarter of students gained full marks. Good responses correctly mentioned current in thermistor rather than voltage. Some students gained just two marks by linking the brightness to just one of the variables. There were some very well-ordered logical answers seen, linking the three ideas.

A considerable number of students had the action of the thermistor the wrong way around with regard to the temperature e.g. suggesting that increasing its resistance increased the resistance of the circuit and made the light brighter. Some just ignored the thermistor altogether or discussed how the temp of the room affected the resistance of the filament light. Regrettably this was a question where there was a lot of poor or inaccurate language e.g. current can flow better, flow faster or flow slower.

Part d was also found to be tasking with about a third of the students gaining the mark. Students frequently answered this in terms of the brightness of the lamp decreasing. When referring to the current, a common error was the idea of the current being shared between the two components. Another common error was to refer to current remaining the same everywhere in a circuit, rather than thinking about the addition of a component.

Question 9 - Magnetic fields

Very few students failed to gain the mark for part a. There were also good responses seen in part bi. Here however some students made life difficult for themselves by drawing far too many lines with a greater risk of inconsistent spacing between them. The best diagrams had fewer lines. A considerable number gave a sketch which, due to spacing and lack of parallel lines, scored just the arrow mark. It is evident that some candidates are not aware of the difference between a diagram and a sketch.

In part bii, just over a quarter of students gained the mark. Often this was due to imprecise answers such as 'add more lines'. The other main reason was describing alterations to the magnets (e.g. stronger magnets, steel magnets) or their spacing.

Question 10 - Americium isotopes and the smoke detector

The first three parts (ai, aii and aiii) scored very well with over 85% of students gaining these marks. Clearly candidates were able to understand these concepts well. Many students performed equally well when balancing the equation in part b.

Part c was a little more challenging as just over half of the students gained both marks. It was evident that some candidates had confused different types of decay in answering this question. Other students 'hedged bets' stating one changed and the other did not.

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Part d was much more challenging as over 50% of students failed to gain a mark frequently due to lack of precision in their responses. Students should be advised that at this point in the paper technical vocabulary is essential: 'absorbed' not 'blocked' and 'cannot penetrate' not 'cannot travel through'. There was evidence that some students did not understand how a smoke detector actually works.

The lack of precision was also evident in the definition in part ei. Only a third of students gained both marks often for succinct definitions in terms of activity. A further half of the students were able to gain the first marking point. Students made incorrect references to substance or particles, or a single atom or nucleus. Some thought that it was the time taken for half an atom to decay. Part eii was targeted at the more able students. Less than 20% gained two or more marks. Many candidates lost marks by repeating the stem, then not including enough detail in their answers and expecting the examiner to fill in the gaps for the consequences e.g. "short half-life means that it won't work properly". Some thought that the fact that beta was emitted instead of alpha that it was enough to say that the detector wouldn't work as it was designed for alpha only. Some candidates got the working the wrong way round i.e. beta particles needed to reach the source for the alarm. E.g. smoke alarm wouldn't go off if the source had decayed. The misconception that once a half-life has passed the radioactivity will be too little was often seen.

<u>Question 11 - Light waves in water</u>

This question was found to be more accessible than similar questions in previous years. In part a, two thirds of students gained three or more marks. The usual errors were seen: 'reflaction', measuring angles from the surface rather than from the normal. Part b was also accessible: two thirds of students gained both marks for a clear diagram; it was rare to see diagrams where the ray did not leave the water thus scoring no marks. In part bii, the single word was invariably correct, but some students did refer to 'reflaction'.

The equation in part ci was less well known than other equations on this paper: the 'sin' was missing in a significant number of responses seen and some students gave the Snell's law equation instead. The calculation did cause some problems with sine^{-1} and with rounding to 3 s.f. There were a few cases where students mis-copied the data. Many students who were successful in parts ci and cii were able to score both points for part ciii with a standard form of words relating reflection occurring if the angle of incidence was greater than the critical angle. However, there were some very unusual answers which showed a weak understanding of the meaning of the critical angle. Approximately one third of all students gained full marks for all parts of part c. Overall it was pleasing to note the improvement in this topic compared to previous series.

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Question 12 - The steam engine

In part a, over 70% of students answered correctly. Some students did not give an individual example – using a generic term such as 'fossil fuels' or 'nuclear.

Part b, was more challenging with two thirds of students gaining one or no marks. The biggest problem was that students did not answer the question asked about why the pressure increased with temperature increase. Instead it was evident that some candidates trotted out a general answer relating to the kinetic theory in general i.e. they explained why there was a pressure in a gas. For those students who attempted the correct explanation, lack of precision lost marks e.g. particles move around *more* instead of particles move around with *greater speed*; *steam* gains KE instead of *particles* gain KE; *more* collisions with the walls instead of collides *more often* with the walls. There was also confusion about particles colliding with more force and more force exerted. There were some erroneous ideas seen such as 'successful collisions' and the number of steam particles increasing.

In part c, the formula tripped up rather more candidates than expected with quite a few students giving 'P = F x A' as the answer. For the calculation, there was a lot of 'sloppy' work seen e.g. not changing 1.45 MPa into Pa or getting the conversion factor wrong; using the pressure value as the force.

Most students gained the first mark in part d. There were sadly still some students giving 'heat' but over 90% gave the more acceptable answers from the mark scheme. In part dii, many students clearly knew how to extract information from a Sankey diagram with over 50% gaining full marks. However, some students didn't seem confident with what they were doing as there were many random calculations on the page. Some students who did not gain full marks for the correct answer missed out on intermediate marks e.g. missing out on the equation mark as it was not written down correctly i.e. just energy out / energy in. Where working was given, the majority were measuring the width of the arrow and so were able to gain those partial marks. There were also instances where students who calculated areas or used the wrong side of the diagram.

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Recommendations for improvement

1. Wherever possible, centres should ensure that students do the suggested practicals. If this is not possible for whatever reason, students should be encouraged to use good simulations, some of which are available with minimal cost online.

2. Some equations are not well known, e.g. the equation for critical angle. It is strongly suggested that students be tested regularly on recall of equation. Students can't gain marks for calculations if they don't know the equation or how to transform it.

3. While many students are very proficient at substitution into equations, they are less so with transforming the equation. In a similar manner, many students make mistakes when converting power of tens in units. There is no requirement that students work in standard form, but students should know what the standard prefixes mean. It is strongly recommended that this be an area of focus during revision.

4. Students should practice different types of data analysis e.g. from graphical data and from text or tables. There has been at least one of these on all recent examination papers in this subject as it is forms part of the required AO3 skills.

5. Students should also practice recognising areas where poor technical vocabulary loses otherwise easy marks. This can be done by for example giving students (photo) copied but otherwise unidentified sections from internal examinations where they can try to spot errors. Teachers can discuss why confusing say power and energy loses marks. Teachers can also see such areas by reading the notes section on the mark schemes.

This is especially so for the vocabulary needed for AO3 skills.

6. It is recommended that students practise standard extended writing questions such as Q4. When students compare their own responses to the published mark schemes they can note where they can improve their own standard.

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