Examiners' Report

Principal Examiner Feedback

Summer 2018

Pearson Edexcel International GCSE

In Physics (4PH0) Paper 1PR

Pearson Edexcel International GCSE

in Science Double Award (4SC0) Paper 1PR

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Examiner Report International GCSE Physics 4PH0 1PR

General Comments

As in previous examinations for this specification, most students were able to recall the equations and usually they handled the related calculations well. Students 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 students 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 students could give full and accurate answers.

Question 1

Candidates showed they could identify common circuit symbols in the first question of the examination paper. The first two symbols (cell and lamp) were well known but some students confused the resistor with a fuse and the LDR with a variable resistor and hence lost some marks.

Question 2

Two thirds of all candidates were able to score both marks in part 2(a) by giving two of the allowed comparisons between the orbits of Mercury and Earth. Most common errors involved giving non-comparative responses or giving vague answers, which covered the same marking point twice. For example, it was common to see statements such as “Mercury has an elliptical orbit” without making the comparison to Earth’s orbit. Part 2(b) required candidates to be more specific as the comet’s orbit was sometimes closer to the Sun and sometimes further from the Sun than the orbit of Earth. Consequently, only a quarter of all candidates were able to score both marks. The most commonly seen correct answers were that the radius of the comet’s orbit varied (but the Earth’s did not) and that the speed of the comet varied (but the speed of the Earth did not).

Question 3

Candidates did not struggle to interpret the Sankey diagram in part 3(a) and 95% chose the correct response in the multiple-choice question. The mark scheme for part 3(b) allowed candidates to choose either a macroscopic or microscopic explanation as to why the heating element heated up and good understanding was communicated. Candidates who did not score full marks should try to focus their language and be precise with keywords. For example, describing ‘electricity’ flowing through the coil was not deemed sufficient as a flow of current.

Three quarters of all candidates successfully completed the ‘show that’ calculation in part 3(c) and were awarded full marks for clearly laid out working. Some candidates lost a single mark for incorrectly rounding their answer to 10.8A. Whilst a specific number of significant figures is not required (unless specified in the question), it is expected that candidates should be able to round numbers correctly to whatever number of significant figures they choose. The following explanation of the function of a fuse was well known. The most common mistake was to refer to a generic “large current” rather than one that was excessive or *too* large.

Question 4

Candidates showed excellent knowledge of image formation in a plane mirror and most were able to select the two correct statements from the choice available in part 4(a). In part 4(b) candidates were assessed on their measuring skills and knowledge of angles of incidence and refraction. It was good to see most candidates taking care to take accurate measurements and obtain values within the permitted ranges for both angles. The most common error was not measuring angles from the normal for one or both angles.

Although most candidates knew the equation in part 4(c)(i), a large number omitted the sine function and hence lost the mark. Most candidates knew the experiment in 4(c)(ii) and provided good detailed descriptions. The structure of the question helped them, and some chose to answer the three bullet points as separate paragraphs. Although most knew they should take repeat readings they did not clearly say whether they repeated the same angle or different angles. Similarly, many candidates said they should draw a graph and measure the gradient. However, they did not say what they should plot or they plotted i against r, so failed to score MP8 or MP9.

Question 5

Most candidates could recall and use the equation in part 5(a) and units were well known. Only a few rounding errors were seen, which resulted in a one mark penalty. The following calculation in part 5(b) proved more challenging and some candidates did not know to convert time into seconds. Approximately a quarter of all candidates lost a mark for this reason. A small minority of candidates lost marks for using incorrect symbols when writing the equation. There is no necessity for using symbols but, if symbols are used, it is essential that they are the correct standard ones. The use of C for current or charge is not permitted. In part 5(b)(iii) most candidates realised that the mobile phone would take more time to charge if a longer cable were used. However, less than half went further than this by giving a relevant supporting explanation. Some candidates argued that the current would have a greater distance to travel, but this was not given credit as it was not linked to the cable having more resistance.

Question 6

The quality of graph work seen was excellent in this paper and two thirds of all candidates were able to gain full marks in parts 6(a)(i)-(iii). Where marks were lost, this was usually due to omitting axes labels, plotting errors or poor curves of best fit. Most candidates could also offer a sensible description of the relationship between the variables in part 6(a)(iv). More able candidates went on to a give a higher level description involving use of the term ‘inversely proportional’ or ‘non-linear’. A small minority of candidates stated that the variables were “inversely related”, which was not deemed sufficient to describe the relationship.

In part 6(b) two thirds of all candidates could give a sensible improvement to the data collected in the experiment. It was common to see suggestions of repeating the experiment, which was not credited without an accompanying further detail. The calculation in part 6(c) was straightforward, since it involved no rearrangement of the equation. However, a small number of candidates did not know the equation and hence could not be given any credit.

Question 7

Most candidates realised that the question about the knife in part 7(a) involved its contact area with the vegetables and therefore compiled sensible explanations. When giving an explanation involving the effect of one variable on another, it is important to include the physics that links them together. For example, saying that decreasing the contact area increases the pressure was given two marks. However, candidates that also included the equation that links the variables together (pressure = force / area) were given a further mark.

Although it was clear that most candidates knew why gases exert pressure on their containers, candidates found it more challenging to explain how this pressure changes when gas leaves a container. Those who structured their answers around particle collisions went on to score well in part 7(b)(i). It was especially pleasing to see candidates attempt the challenging and unusual calculation in part 7(b)(ii) with so much success. Two thirds of all candidates were able to construct a suitable mathematical equation involving the number of balloons and go on to solve it correctly.

Question 8

The calculation in part 8(a) was completed to a high standard. Most mistakes centred on either not knowing the equation or incorrectly converting kilograms to grams. Although many variants were permitted as the answer to part 8(a)(iii), some candidates were too vague in their response. For example, “away from the pulley” was not specific enough as it did not necessarily mean to the left. Although most candidates realised that friction involved the wheels and the string in part 8(a)(iv), many gave bald answers without saying it was between two named surfaces.

The calculation in part 8(b) was completed without mistakes by three quarters of all candidates. Candidates who lost marks did so because they did not realise that the kinetic energy gained was the same as the gravitational potential energy lost or because they used the term ‘gravity’ in the equation instead of gravitational field strength.

Question 9

The majority of candidates attempted to use the given equation and many substituted the correct values and obtained the correct answers to both parts. Most common errors were for using the incorrect value for the radius of the Earth, but credit was given for further correct rearrangement and substitutions. In both cases the final answer was carried forward and often led to the correct answer for the number of revolutions in part 9(b). It was pleasing to see over 90% of all candidates being able to choose at least two correct statements about the satellites in part 9(c) and hence show that they can interpret previously unseen data correctly.

Question 10
Candidates found part 10(a)(i) very challenging and most showed little awareness of why certain types of graph should be constructed. Some candidates did gain credit for stating that the line graph offered a better way of identifying anomalies and could also be used to predict untested results. It is important that candidates are aware of the different types of data (categoric, ordered, discrete, continuous) and which types of graph should therefore be constructed. At the very least, some awareness of the difference between continuous and non-continuous data is expected. Those candidates who understood the term accuracy gave sensible suggestions in part 10(a)(ii). The most common answers referred to taking measurements at eye level to avoid parallax errors. Part 10(a)(iii) proved more challenging, although a quarter of all candidates realised that some background light was present or that the change in the reading was too small to be shown due to the resolution of the meter.

Part 10(b) discriminated well between candidates of differing ability levels. Most candidates knew that they had to maintain the thickness of sun cream but some thought that having the same mass, same thickness and same area would count as three marks. Similarly, some wanted to control the distances between each of the parts separately. Although most knew that they should control the properties of the plastic sheet they did not always refer to thickness or transparency. Some wanted to keep the time constant presumably because adverts for sun cream talk about all day protection.

Question 11
The multiple-choice questions in parts 11(a) and 11(b) were well-answered and 80% of all candidates were able to make the correct choice. Many candidates managed to address at least three of the six marking points in part 11(c). Most realised that rays B and C were refracted and gained a mark even though they thought that ray A was not refracted because it did not change direction. In talking about ray A, candidates often did not make it clear that it did not change direction when leaving the water.
Many communicated that ray C deviated more than ray B. Most of those candidates who noted that ray D was reflected also went on to say it was totally internally reflected because the angle of incidence was greater than the critical angle. Common errors included confusion between the terms *refraction* and *reflection* and using them in the wrong contexts. Some candidates just did not go into enough detail in their descriptions to merit the four marks on offer.

Question 12

Candidates found completing the nuclear equation in part 12(a)(i) challenging due to not knowing the mass and atomic numbers of a neutron. Those that did usually went on to balance the equation to find the mass and atomic numbers of the unknown particle on the right-hand side. Most candidates were then able to correctly identify particle X as a proton in part 12(a)(ii). The comparison of the carbon isotopes in part 12(a)(iii) was poorly answered and many candidates reiterated information they had already been given in the question. There was also confusion seen in part 12(a)(iv) as to what happens during beta decay. Most candidates realised that something stayed the same and something increased, but only a quarter of all candidates knew which ones and gave sufficient detail by saying that the atomic number increases by one.

The determination of the half-life in part 12(b) was answered to a much higher standard and most candidates were able to find the half-life of carbon-12 to within the permitted limits. It was surprising to see only a third of all candidates communicate that radioactivity measurements needed correcting due to background radiation in part 12(c)(i). Those candidates that were awarded the mark in 12(c)(ii) usually communicated the idea of a fair test. Some thought that having the same mass samples would produce the same activity, despite the samples being of different ages.

Many candidates struggled to write a coherent answer in part 12(d), which revealed a weakness in their knowledge of carbon dating. Most realised that the remaining activity would be very low or too small to measure. They often failed to relate the half-life obtained in part 12(b) to the age of the bone. Some realised that the graph showed a very low level after 35 000 years and so would be even lower after this time. Some candidates claimed that bones are made of calcium and so contain no carbon-14 or that there are no living dinosaurs to measure and compare activities with.

Question 13

Most candidates were able to interpret the diagram in part 13(a) to give some relevant statements about conduction. Many candidates could score all three marks. Usually this was for saying that copper was the best conductor and plastic was an insulator and linking this to a correct reference to the number of wax rings melted or not. It was clear that few candidates had seen the experiment in part 13(b). Many candidates were distracted by the metal disc and discussed at length how it stopped the thermal energy moving. The most common valid answer seen was for saying that hot water would rise, sometimes accompanied by stating that this was because it was less dense. Better candidates stated that water and glass were poor conductors. In part 13(c), most candidates knew that brass was a better thermal conductor than wood but only very few could link this to why the paper did not burn on the brass side of the apparatus. A significant number thought that the paper on the wood side burned because the wood was flammable.

Question 14

Over 90% of all candidates were able to give the correct equation in part 14(a)(i) for pressure difference. A few lost the mark for writing 'gravity' rather than 'gravitational field strength' or the correct symbol, *g*. Most candidates realised that the pressure of the water at the bottom of tube B (point Y) was lower than the other tubes because the water level was lower. However, only a quarter successfully linked this to the equation to complete their explanations. The Bernoulli tube in this question was unfamiliar to candidates and hence only the most able understood that the water must travel faster in part 14(a)(iii) if the same volume flowed through the apparatus each second. Over half of all candidates thought that the narrowing of the tube at point Y added additional frictional forces, which slowed the water down.
The scenario in part 14(b) was challenging. Although a significant number of candidates realised that the air coming through the straw was travelling faster, most assumed that this increased the pressure between the balloons but did not explain why they came together as shown.

Summary Section

Based on the performance shown in this paper, students should:
- Take care when drawing diagrams to add labels and draw accurately.
- 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.
- Recall the units given in the specification and use them appropriately, for instance frequency.
- 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.
- Be ready to comment on data and suggest improvements to experimental methods.
- 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.
- Allow time at the end of the examination to check answers carefully and correct basic slips in wording or calculation.

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