edexcel

Examiners' Report/ Principal Examiner Feedback

Summer 2015

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

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

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2015
Publications Code UG042403

Examiner's Report International GCSE Physics 4PH0 1PR

Overview

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 were able to give full and accurate answers.

Question 1

Most students were able to compile detailed descriptions of what happens in the nuclear fission of uranium. Students could recall that daughter nuclei and neutrons are released in the process, although there was some difficulty in relating a neutron being absorbed by the nucleus to the nucleus subsequently splitting. Many students referred to the neutron being 'fired' or 'shot' at the nucleus, without going further to describe the interaction between the neutron and the nucleus itself.

In part 1 (b), most students could correctly kinetic energy as the type of energy acquired by the daughter nuclei in nuclear fission.

Question 2

In part 2 (a), the majority of students were able to gain credit by referring to the advantage of independent control over lamps in a parallel circuit. However, most students experienced difficulty in giving further advantages and resorted to giving additional examples of independent control. Many students assumed that all the lamps would have the same brightness, despite the different currents shown in the diagram.

Students displayed a much stronger understanding of parallel circuits by correctly evaluating the total current in the circuit in part 2 (b).

Two thirds of students gave excellent explanations of how a fuse protects a circuit to gain full marks in part 2 (c). On occasion, imprecise language such as 'fuse blowing up', 'fuse burns' and 'circuit breaking down' hindered students' capacity to be awarded marks. Several candidates' explanations referred to metal cases where there was no such case in the question. Although it is encouraging to see students learning explanations comprehensively, they would also benefit from being taught how to interpret information provided and apply their knowledge in unfamiliar scenarios.

The calculation in part 2 (d) allowed students to showcase their quantitative evaluation skills and most did so with great success.

A common error in part 2 (d) (ii) was using the current calculated in a previous part of the question to arrive at an erroneous result of 317 W. Such students need to read each question carefully to ensure they are extracting the correct information from the question. In part 2 (d) (ii) the conversion of minutes into seconds caused a small number of students difficulty and it was also surprising to see a relatively high number of students being unable to recall the unit of energy. However, overall, this question was tacked exceptionally well.

Part 2 (e) introduced students to two-way switching and it was very encouraging to see almost all students correctly interpret the circuit diagram to identify when the lamp would light. However, fewer students could relate this circuit to an application in their own homes.

Question 3

The majority of students were able to interpret the diagram as showing the refraction of a light wave. When asked how the light wave changes when it passes in to glass in part 3(a) (ii), students were comfortable with the idea of the light wave changing direction but there was ambiguity in descriptions of other wave properties changing. For example, several students identified that the speed of the wave changes, but their descriptions were not specific enough in that they did not say the speed decreased. This limited students' capacity to gain full marks in this part of the question. Students had clearly been taught ray diagrams well and so the vast majority were able to draw the normal and label the angle of incidence successfully.

Question 4

The first part of this question assessed students' understanding of the electromagnetic spectrum and its applications. In the three multiple choice questions, only the first posed students any significant degree of difficulty, with a quarter of students being unable to identify ultraviolet as the shortest wavelength of the options presented to them. The common incorrect answer given was microwaves, possibly due to students confusing smallest frequency with shortest wavelength.

In part 4 (b) (i) the majority of students were able to give a use of gamma radiation in hospitals but their descriptions were limited by not giving any relevant supporting details in their answer. For example, many students knew that gamma radiation was used to treat cancer, but their answers rarely included the name of the process (radiotherapy) or that the gamma radiation must be focused for the treatment to be successful.

In part 4 (b) (ii) students experienced a similar difficulty in that their answers rarely contained the higher level of detail required to secure both marks. In general, students need to interpret questions posed as 'describe' or 'explain' as requiring an answer containing more than a single point.

The final part of this question, 4 (b) (iii) saw students largely confusing gamma rays with X-rays in the preventative measures that can be taken to reduce the risks to doctors. The use of lead shielding, aprons and general ‘protective equipment’ was commonplace in students’ answers, but would not be suitable in the case of gamma radiation due to its higher penetration power.

Question 5

Two thirds of students could successfully extract both the independent and dependent variables from the prediction given in the question. When tasked with suggesting control variables, students demonstrated a high level of understanding of the investigation and could identify two correct factors. Most students could also select two necessary pieces of apparatus from the list given in part 5 (c), although a surprisingly large number of students did not see it necessary to use a newtonmeter in the investigation, despite weight being the independent variable.

There were some excellent responses to part 5 (d) and those students gaining full marks were largely those who had clearly undertaken a significant amount of practical work themselves. The idea of weighing the car(s) or finding their mass was less common in answers but most wrote correctly about changing the mass of the car in order to investigate the prediction. Often pupils wrote about the need to perform repeats, however, they did not describe what they would then do with the repeat data, for example to calculate an average or remove anomalies. The vast majority of responses contained the key measurements necessary to determine the speed of the car, but a small number of students did not then describe how the speed would be calculated.

Question 6

The circuit diagram in part 6 (a) was answered well by students and the vast majority were able to gain at least two marks for their completed circuit. Some students were unable to recall the correct circuit symbol for a resistor, although most were able to place it in series with the lamp as required. There was some confusion in the correct placement of the ammeter and voltmeter in the circuit, although the voltmeter caused greater difficulty, due to it needing to be placed in parallel with the resistor.

The graph drawing exercise in part 6 (b) was completed to a very high standard with clear, accurate graphs constructed. Most students demonstrated their understanding of how to treat anomalous results and very few students included the anomaly when drawing their line of best fit. Students could comfortably recall the equation linking voltage, current and resistance and went on to successfully calculate the resistance of the resistor. In the small number of instances where students lost marks, they were generally for incorrectly rearranging the equation or for minor error in graph construction, for example failing to label axes correctly or for an isolated plotting error.

Question 7

All but a handful of students could recall the equation linking force, mass and acceleration and most went on to successfully calculate the force on the sledge. A small number of students lost marks by attempting to convert the mass into grams or change the mass to weight. Although two thirds of students could suggest an additional force acting on the sledge, resulting in the man's force needing to be greater than their calculated value, a surprising number of incorrect responses were seen in part 7 (a) (iii). Some students suggested that the force calculated was the force to just get the sledge moving and hence suggested that the extra force was needed for acceleration, despite the previous question. Others wanted to include the mass of the person pulling the sledge.

In part 7 (b) only half of the students gained the mark for recalling the correct equation; the most common issue was the omission of 'change in velocity' in the equation. However, students showed that they were confident in answering calculations of a 'show that' nature and produced a sufficiently high level of working to gain both marks for the calculation, giving their answers to at least two significant figures as expected.

It was very encouraging to see many students cope extremely well with the distance calculation in part 7 (c) (i), particularly given that using velocity-time graphs to determine distance has been a very challenging concept in previous examination series. However, students do need to pay closer attention to the scale of the graph to ensure they do not make careless errors when reading off values. Almost all students could recall the equation linking average speed, distance and time and went on to use this, together with their previously calculated distance value, to correctly calculate the average speed of the sledge.

Question 8

The molecular explanation of how a gas exerts a pressure on the walls of its container was answered well by students, with the majority gaining at least two marks for their response. Students would benefit from specifically linking the molecules' collisions with the walls to the force which is produced. The calculation in part 8 (b) was intentionally challenging, requiring a unit conversion and correct evaluation of the pressure difference before using the equation. Slightly more than half of all students gained full marks for this calculation. Most others lost only a single mark, commonly for not converting kPa to Pa, or by using the wrong pressure difference. A smaller number of students were unable to be awarded the mark for the equation, due to their use of the word 'gravity' to represent the gravitational field strength, g.

Question 9

This question required students to demonstrate their knowledge and understanding of magnetic fields and how they can be used to produce a force. Most students were able to convey the necessary understanding of a uniform magnetic field in part 9 (a) but it was surprising to see a significant number of students not use a ruler to draw what they knew should be straight lines. Students would also benefit from greater attention to detail when drawing such fields, particularly given that the field lines should have been equally spaced and parallel.

Part 9 (b) (i) required students to suggest why the wire used must be thick when carrying a current of 10 A. Students found this question difficult and only a third of students could relate the large current to potential heating effects on the wire. The explanation in part 9 (b) (ii) differentiated well and only the most able students were able to compile explanations warranting full marks. A large number of students confused the situation with electromagnetic induction and the mention of field lines being ‘cut’ was commonplace. Students would benefit from the use of key words such as ‘interacts’ when describing how the two magnetic fields result in a force. However, students were more comfortable in offering ways of reducing the force on the wire in part 9 (b) (iii), with over two thirds gaining both marks. Students do need to be careful with their choice of language; for example, ‘smaller magnets’ was used frequently to mean magnets with weaker field strength.

Question 10

This question required students to use data presented in a table to draw comparisons between, and evaluate values for, different planets in the solar system. Almost all students were able to identify that Venus has approximately the same diameter as Earth and three quarters of students recognised that Jupiter has the largest gravitational field strength due to having the largest mass. The majority of those students who lost the mark in part 10 (b) did so because they did not use the superlative, using phrases such as ‘it has a large mass’, or because they did not associate mass as being the key factor.

When tasked with calculating the density of Neptune, it was pleasing to see students cope so well with the multi-step calculation involved. The majority could recall the correct equation and were also able to process the data given in the table to find the radius of Neptune. When students lost marks, it was largely due to difficulties in processing the data given in standard form or in finding the volume of the planet, despite the equation being given in the question.

The orbital speed calculation in part 10 (d) caused students much greater difficulty and the mode mark for this part was one mark. Although students were able to identify the correct equation from page 2 of the examination paper, identifying the correct data from the table proved challenging. A significant number of candidates used the diameter of the planet in their calculation, rather than the distance from the Sun. Most students were successfully able to convert time from years to seconds, although this also caused some students difficulty.

The evaluation of the statement in part 10 (e) offered students the opportunity to show their ability to analyse data from the table and the question differentiated well. The majority of students recognised that the statement was incorrect and were able to gain at least one mark, but only those who clearly showed that they had used data to make a comparison between two planets were able to gain full marks. It was encouraging to see that many students were also able to draw the correct conclusion; it is the distance from the Sun that determines the period of orbit.

Question 11

This question required students to use information from diagrams and bar charts to give a detailed description of the kinematics of a ball oscillating on a spring. They were specifically asked to refer to energy, speed and position in their answers. Although there were some excellent responses to this question, many students did not fully process what they were being asked and so did not refer to speed in their answers, limiting their ability to gain full marks. Candidates often failed to identify the points at which each energy was at its highest or lowest level, although they often realised that kinetic energy was least or zero joules at the top or bottom, and that this meant the ball was not moving. Very few identified that the ball was moving fastest in the middle. A large number of students wrote about GPE being converted to EPE and vice versa. The mode mark was 4 when students identified GPE being highest (25J) at the top or lowest at the bottom, EPE being highest at the bottom and KE being 0J at the top/bottom and that this meant the ball was not in motion.

In similar questions in future examination series, students would benefit from focusing their descriptions into concise statements as many students wrote large amounts reiterating the same points.

Question 12

This question was set in the context of an investigation into the absorption power of various materials when tested with two different radioactive sources. Students were expected to use the results of the experiment to draw conclusions about the materials and sources. The greatest difficulty encountered by many students was interpreting the count rate information in the table of results. A significant number of students thought the values in the table were the quantities of radiation absorbed, rather than detected and this limited their ability to be awarded high marks in several parts of the question.

In part 12 (a) students appeared unclear as to which safety precautions were necessary when working with radioactive sources. A significant number resorted to saying that all the safety precautions were needed.

In part 12 (b) (i), two thirds of students gained the mark, mostly for recognising the need for a fair test. It was pleasing to see some candidates refer to distance as a control variable and that, if it were varied, the results of the experiment may differ. The majority of students also recognised that background radiation was being measured when no source was used, but some did not develop their answers to include a possible source of background radiation.

Most students correctly identified lead as the best absorber in part 12 (b) (iii), although there were also many who had obviously misinterpreted the data in the table and believed that the count rate showed how much radiation had been absorbed by each material. Therefore there were a number of responses that incorrectly identified wood or paper as the best absorber. Full marks were commonly awarded to candidates who wrote that lead was the best absorber as it gave the lowest count for Ba-133.

The evaluation of the conclusion in part 12 (b) (iv) caused significant difficulty amongst students and only one in ten were able to gain full marks. Some students scored at least 2 marks for this question as they wrote about stone being the best absorber for strontium and the worst for barium. The third mark was more elusive as students failed to use data from the results to prove their argument.

Part 12 (b) (v) was well answered by a significant number of students who wrote that the type of radiation was beta as it could penetrate paper, but not aluminium or lead. Where students incorrectly identified the radiation as alpha it was clear that, again, they had misinterpreted the data table and believed that the count rate showed how much radiation had been absorbed by each material, instead of how much was detected after it.

Only a third of students realised that no reading was taken with Ba-133 and paper as the reading would be too high. A significant number of students thought it would be dangerous to do so. In part 12 (b) (vii) students talked about the isotopes decaying too quickly but did not explain about the count rate needing to be constant during investigation. Some students were able to gain the mark for the idea of it “running out” or needing to be replaced often.

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 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 pressure.
- Be familiar with the names of standard apparatus used in different branches of physics.
- Practice 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 able to identify independent, dependent and control variables and 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.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

Pearson Education Limited. Registered company number 872828
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE