Examiners' Report
Principal Examiner Feedback

Summer 2019

Pearson Edexcel International GCSE in Physics (4PH1) Paper 2PR

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 2019
Publications Code 4PH1_2PR_pef_20190822

Examiner Report International GCSE Physics 4PH1_2PR

General Comments

This was the first examination of paper 2R for the new International GCSE Physics specification. Questions were set to assess candidates' knowledge, understanding and application from all eight topics in the specification.

- Topic 1 - Forces and Motion
- Topic 2 - Electricity
- Topic 3 - Waves
- Topic 4 - Energy Resources and Energy Transfer
- Topic 5 - Solids, Liquids and Gases
- Topic 6 - Magnetism and Electromagnetism
- Topic 7 - Radioactivity and Particles
- Topic 8 - Astrophysics

The examination was written to assess across the full range of grades from 1 to 9. Consequently, some questions were written to be challenging whilst others were designed to be more straightforward and accessible. A range of different question types were included in the examination such as objective and multiple choice, calculations and both short and long written responses. Approximately 20% of the marks available in the examination were for candidates' demonstrations of experimental skills and understanding. Two of the four additional required practical investigations were assessed in this examination.

Successful candidates were well-acquainted with the content of the specification and could recall facts whilst applying their understanding to new and complex situations. They were competent in performing quantitative work, could recall relevant formulae and rearrange these formulae to obtain the correct answer. Successful candidates also showed evidence of undertaking all the required practicals themselves and could produce detailed, coherent methods whilst recalling the relevant results of these experiments.

Less successful candidates showed gaps in their knowledge of topics and had limited experience or the ability to recall information from the required practical tasks. These candidates often did not address the demands of the question by overlooking the importance of the command words being used.

Question 1

The vast majority of candidates could give an example of a fossil fuel in Q01(a)(i). The most common erroneous response was “nuclear”, but this was only seen in a small number of cases. The multiple-choice questions Q01(a)(ii) and Q01(a)(iii) were answered to a high standard and three quarters of all candidates answered both questions correctly. Q01(b) discriminated well between candidates and most candidates scored at least 2 marks, demonstrating that they had revised and learned the advantages and disadvantages of solar power. Weaker candidates were not specific enough in their responses and referred to solar power being expensive or weather dependent, which

were not given credit. The best candidates structured their responses carefully to provide a clear set of specific advantages, followed by a set of specific disadvantages.

Question 2

Surprisingly, only three quarters of all candidates knew that sound waves are longitudinal in Q02(a). However, candidates communicated a much higher level of knowledge in Q02(b)(i) and the majority were awarded both marks, usually for their high-quality diagrams. Some candidates drew the particles in a liquid too far apart and often were not awarded the second mark unless the comparison between the separation of particles was clear in the written part of their response. Candidates found Q02(b)(ii) more challenging and, although most candidates knew that the particles being closer together allowed the faster transmission of sound, many were not awarded the second mark due to not referring to the vibrations of particles being passed on.

Q02(c)(i)-(ii) was answered to a high standard, with the vast majority of candidates knowing the correct formula and using it correctly to calculate the wavelength. A small number of candidates made mistakes when rearranging the formula and only scored a mark for substituting the values correctly. Q02(c)(iii) was challenging, but allowed the more able candidates to demonstrate the extent of their understanding of the Doppler effect. A significant number of candidates thought that the change in the frequency of sound from the buzzer was caused by the position of it being closer or further away from student B, rather than the buzzer **moving** towards or away from student B. The best answers were carefully structured to address all elements of the question including what would happen when the speed of rotation increased, which was ignored by the majority of candidates.

Question 3

Candidates showed good understanding of electrostatics in Q03(a) and three quarters of all candidates chose the correct response in Q03(a)(i). Candidates had clearly investigated some of the effects of charged objects and a large range of plausible demonstrations were suggested in Q03(a)(ii). A small minority of candidates only scored 1 mark due to suggesting that a charged rod would repel a stream of water. The weakest candidates suggested that magnets could be used, which were not given credit.

Most candidates were able to score 2 marks out of 3 in Q03(b), although a very low proportion of candidates achieved MP1, showing that they did not appreciate the small size of the forces involved and the need for suspension to see the effects of these forces. Some candidates suggested that a GLE could be used to detect both positive and negative charge, but their methods would not have worked and these were not given credit.

Question 4

Q04 discriminated well between candidates and this new area of the specification had clearly been well-learned by most candidates. Most responses communicated the correct

stages in the evolution of stars of similar mass to the Sun and also in the correct order. Those candidates who commented on the changes in temperature and brightness often gained marks for describing the correct changes in temperature, but gave incorrect statements about the brightness. Candidates were expected to interpret this information from the absolute magnitude scale of the Hertzsprung-Russell diagram and many candidates incorrectly assumed that a more negative absolute magnitude corresponded to a dimmer star. The best candidates produced well-structured responses that presented all the evolutionary stages in the correct order, whilst commenting on the changes in temperature and brightness between each stage.

Question 5

Q05(a) was answered to a high standard and approximately half of all candidates were able to gain full marks. A significant number of candidates misread the question and gave 420 s as the time of heating. However, they usually then used this value correctly in the calculation in Q05(a)(ii) to only lose 1 mark overall. It was pleasing to see the majority of candidates convert the value of 39 kJ into standard units, but this was the other main factor that caused candidates to lose marks in this part of the question.

More than half of all candidates scored full marks in the specific heat capacity calculation in Q05(b). Candidates knew to use the formula from the front of the examination paper and went on to use this correctly, setting out their working clearly so that their method was easy to follow. Weaker candidates used time instead of temperature in the formula and these responses were not given credit. A small number of candidates did not convert kilojoules to joules, resulting in a 1 mark penalty.

Question 6

Most candidates knew the correct name for the transformer in Q06(a) and could give a suitable suggestion for improving reliability in Q06(b)(i). Although the majority of candidates scored all 3 marks in Q06(b)(ii), a significant number lost a mark for including units in the body of the table, rather than only in the headings. Candidates are expected to be able to construct simple results tables and there is no need to include additional columns for the experiment number or equivalent ideas. Examiners expected to see a results table containing only two columns in this instance. Candidates found it difficult to suggest an improvement for precision in Q06(b)(iii) and this suggested that there is a lot of misunderstanding surrounding this experimental term. Improvements to precision are achieved through the use of a more sensitive instrument or one that measures to a greater number of decimal places (if the instrument is digital).

Q06(c) was answered to a high standard and the vast majority of candidates identified the incorrectly plotted data point and drew an appropriate line of best fit. Whilst most candidates gave a correct pattern statement to gain the first mark in Q06(c)(iii), only the most able candidates gave more detailed descriptions such as “directly proportional” or “linear relationship”. Candidates produced some excellent quantitative work in Q06(d) and the majority were awarded all 4 marks. A small number of candidates experienced

difficulty rearranging the correct formula and would have benefited from more practise rearranging this (and similar) formulae.

Question 7

The formula in Q07(a)(i) was well known and most candidates went on to use it to gain full marks in the following calculation. Weaker candidates did not change the value of 170 g into standard units and lost 1 mark. Q07(b)(i) was challenging and those candidates who could not set up a conservation of momentum problem only scored 1 mark for finding the momentum of the black ball after the collision. The best candidates were meticulous in showing their working and clearly knew to subtract the black ball's momentum from the initial momentum of the white ball to arrive at the correct final answer. A surprising number of candidates assumed that the white and black balls coalesced after the collision and these responses were not given credit. Candidates demonstrated a good understanding of Newton's Third Law in Q07(b)(ii) and the majority scored both marks. Where candidates lost a mark, it was usually due to not knowing the direction of the force on the white ball.

Question 8

Most candidates were able to score at least 3 marks in Q08(a)(i)-Q08(a)(iii). Mistakes were mostly made when failing to convert millimetres to metres or when not appreciating that the energy transferred was the same as the work done. The standard of work produced by candidates in this part of the paper was, however, generally very high.

Candidates found Q08(a)(iv) challenging. Approximately a third of all candidates scored a single mark for recognising that the air molecules would gain energy in their kinetic store, but very few quoted the relationship between kinetic energy and temperature to gain the second mark. A significant number of candidates referred to the pressure-temperature relationship for a gas, which did not answer the question in terms of molecules.

Very few candidates gained the mark in Q08(b). Most of those who did referred to energy lost to the surroundings. Candidates here often referred to particles escaping the piston to explain why the combustible material didn't ignite.

Summary Section

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

- 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 formulae listed in the specification and be able to use them confidently.
- 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.

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom