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Examiners' Report
Principal Examiner Feedback

Summer 2024

Pearson Edexcel GCE
In Physics (8PH0)
Paper 02: Core Physics II

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Introduction

This paper assessed topic 4, Materials, and topic 5, Waves and Particle Nature of Light. The paper provided candidates with the opportunity to demonstrate progression from GCSE and consolidate their knowledge at the end of the first year of the A Level qualification.

Section A, a total of 56 marks, consisted of 8 multiple-choice questions and questions of differing style and length, drawing on a range of different concepts. Section B, a total of 24 marks, consisted of two synoptic questions drawing on content from the whole of the AS specification.

Practical skills and knowledge of aspects of each of the core practicals were assessed throughout. Application of practical skills was also assessed in other familiar or unfamiliar contexts.

Section A

	Comment	Percentage of correct responses
Q1	Looking at the relationship between phase difference and path difference, in terms of wavelength. Answered correctly by most. Of those who gave an incorrect response, all the incorrect distractors were seen.	62%
Q2	The use of the negative convention for the focal length and, hence, power of a diverging lens was less familiar to candidates. The most common incorrect answer being C.	40%
Q3	Most candidates gave the correct response. The most common incorrect response was B. This had an incorrect arrangement.	70%
Q4	The difference between a real and a virtual image was answered well. The most common incorrect response was C.	83%
Q5	The most common incorrect response was A.	63%
Q6	Responses A, C and D are all units for breaking stress, but A and C are not given in S.I. base units. All responses were seen but C was the most common incorrect response.	62%
Q7	The need here was for candidates to use the relationship upthrust = weight of fluid displaced and to substitute density = mass/volume and the equation for the volume of a sphere. All incorrect responses were seen.	78%
Q8	When the planes of polarisation of the two filters are perpendicular, then no light is transmitted through both the filters. Most common incorrect response was A.	76%

Q9(a)

When the object distance is very large, at infinity, the incoming rays can be considered to be parallel, and the image will be formed at the focal point of a converging lens. Some candidates started to use the thin lens formula but did not know how to proceed due to a lack of a numerical value for the object distance.

Q9(b)

The arrow to represent the object at X was drawn below the principal axis to represent the situation in the telescope. This confused many candidates who did not then know how to draw the required rays to locate the image. It was most likely those candidates, who understood *why* these rays are drawn, who were more successful with this question.

Q10(a)

A similar question, as on previous papers, on the pulse-echo technique. This was answered well, with most candidates remembering to halve the time or double the calculated distance. A common mistake was neglecting to convert the time from ms to s.

Q10(b)

This is so there is enough time for a pulse to be received before the next pulse is transmitted. Otherwise, the receiver cannot link the received pulse with the time that it was transmitted. A common response was with reference to interference/superposition which is not relevant here.

Q10(c)

Most candidates made the link between a high frequency and short wavelength but rarely linked this to a greater resolution/detail.

Q11(a)

Core practical 8. As has been observed previously, some candidates confuse d and n in the equation. On the whole, this was well answered with candidates remembering to give a conclusion at the end of their calculation.

Q11(b)

The de Broglie wavelength of an electron is much smaller than the wavelength of light. Therefore, the gaps in the diffraction grating would be too large to show diffraction. Many candidates ignored the hint and did not add calculations to support their answer. Those who used calculations answered this question well.

Q12(a)

This was answered well.

Q12(b)(i)

When deriving an expression, it is important to show all steps in the derivation clearly. This was the main reason for marks not being awarded. The best starting point, in this case, was Young modulus = stress/strain and to continue from there, writing down all steps.

Q12(b)(ii)

The calculated answer was not exactly equal to any of the Young modulus values given but candidates stated, correctly, that copper was the closest. Unit conversion of mm to m, and GPa were the main reason for marks not being awarded.

Q12(b)(iii)

Many hints were given in the stem of part (b) designed to help students access the marks here. Some students were able to recognise suitable changes but were not able to justify these changes. Some candidates could correctly recognise that the wire would break at a smaller stress but not able to link this to how it may affect the graph.

Q13(a)

This is rote learning from spec 51 and was generally well answered, with over 60% gaining 2 marks.

***Q13(b)**

A question assessing core practical 4. Candidates were familiar with describing what would happen to the two ball bearings but were less well able to explain why in terms of the forces. Candidates focused on the time each ball bearing would be falling, commenting on which one hit the bottom first, instead of describing conditions for terminal velocity. All IC points were accessed, although IC3 was not commonly seen.

Q13(c)(i)

This calculation was well answered.

Q13(c)(ii)

Many candidates started with the equation for viscous drag to justify the viscous drag force decreasing with a lower viscosity. However, they ignored the fact that the terminal velocity will increase and so the viscous drag force is proportional to both viscosity and terminal velocity.

Q14(a)

The question told the candidates that this was about the photoelectric effect. Evidence of an understanding of the photoelectric effect was apparent, but many had difficulty applying this to the context of the moon dust. A common approach was to discuss ionisation and electrons leaving atoms rather than electrons being released from the surface of the dust particle.

Q14(b)

To answer this challenging question, candidates first needed to realise that the number of dust particles that become charged is linked to the rate at which photons are incident on the surface - the intensity. The diagram was attempting to show that the middle ray covered a smaller area, but many candidates did not realise this. Marks could still be gained by discussing intensity.

Q14(c)

Candidates were very successful at answering this question, with around 60% gaining 3 marks.

Q14(d)

A challenging multi-step calculation. Initially, they needed to calculate the weight in order to determine the mass. However, many candidates used trigonometry calculations, treating the weight as if it were the resultant force of the two forces mentioned in the question. Weight is a downward force and so perpendicular to the electrostatic force. The resultant force of these two forces is given in the question. Those who drew a sketch of the forces were often more successful in using trigonometry to find the direction of the acceleration. A clearly labelled angle on the diagram followed by a correct calculation was sufficient. Calculating an angle with no indication of which angle has been determined was insufficient.

Q15(a)

There are two ways to approach this question: calculate the critical angle and compare with 45° , or calculate a refractive angle at the glass-air interface and compare with 90° . Both approaches were seen with successful outcomes. However, a significant number calculated both and then compared their critical angle to their calculated refractive angle, instead of the angle of incidence given in the question.

Q15(b)(i)

Many candidates did not treat this circuit as a potential divider but gave generic responses relating to the resistance of the LDR and failed to score marks. There was a misunderstanding that the number of conduction electrons was determined by the resistance of the thermistor, rather than the intensity of the light.

Q15(b)(ii)

This was generally answered well, with around 35% of candidates gaining 3 marks. A significant mistake was to confuse the two resistances. As it was the last question on the paper, candidates may have been rushing to finish and did not read the question carefully enough.

Summary

Based on their performance on this paper, students should:

- Practice showing the steps within a derivation.
- Revise what is meant by electrical resistance, as the ratio between potential difference and current.
- Evaluate practical techniques, and especially to consider suitable adaptations when the requirements of the practical are changed.
- Revise how the rate of incident photons determines the intensity of light.

