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Examiners' Report
January 2010

GCE Physics 6PH07

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Publications Code US022978

Overview

This paper is designed to assess international candidates' familiarity with practical physics, including the essential skills of planning experiments and analysing results. As this is a 'practical' examination, the appropriate number of significant figures and correct units are expected. It was clear that many candidates had been prepared well for these tasks by excellent teaching in centres. The questions are designed to give sufficient information to allow candidates to understand what may be unfamiliar experiments. It was clear from the answers from a minority of candidates that they were reproducing the details of 'standard text book' experiments rather than answering the questions set.

Section A

The five multiple questions in questions 1, 2 and 3 were answered correctly by the majority of candidates.

Section B

The highest scoring candidates were not necessarily those who wrote the most words: bullet points are acceptable. The space and mark total given for answers in section B is an indication of the length of answer expected. Candidates should be reminded that they should not need to exceed the space provided, unless their writing is unusually large. They should also be urged to include diagrams in their answers, whether or not they are requested in the question.

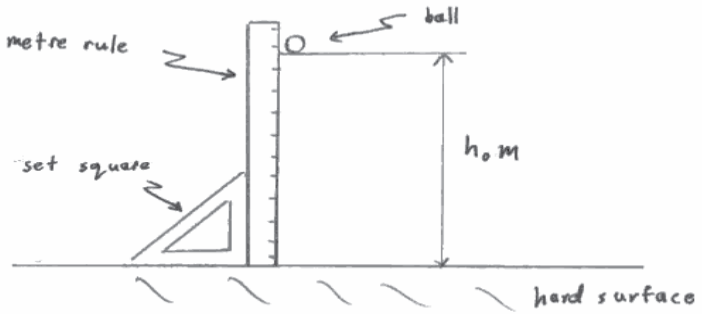
Comments on Individual Questions

Question 4

This question concerned a simple experiment: full marks could have been gained by describing the use of a metre rule, ball and a hard surface and two measurements of heights. Many candidates described experiments which were unnecessarily complex. Candidates who described experiments involving trolleys did not gain any marks.

4 A student wants to determine the percentage loss of kinetic energy after a ball dropped from a fixed height has bounced once on a hard surface. The student makes the assumption that the initial gravitational potential energy of the ball will all be converted to kinetic energy just before the ball hits the hard surface.

Describe an experiment which could be carried out to achieve this. State one precaution the student should take to improve the accuracy of the results.



- Use a metre rule to measure the height at which the ball is dropped from, h_0 m
- The ~~m~~ ball is released and the maximum height after rebound is recorded, h_1 m
- The experiment is repeated to obtain an average of h_1 m
- The initial kinetic energy ~~is~~ = ~~mgh_0~~, $KE_0 = mgh_0$
- kinetic energy after rebound ~~= mgh_1~~, $KE_1 = mgh_1$

- Percentage loss of kinetic energy is calculated

$$\frac{KE_0 - KE_1}{KE_0} \times 100\% = \frac{mgh_0 - mgh_1}{mgh_0} \times 100\%$$

$$= \frac{h_0 - h_1}{h_0} \times 100\%$$

- use set square to keep the metre rule up right to reduce parallax error

(Total for Question 4 = 5 marks)

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Examiner Comments

This response gains full marks. It includes a clear labelled diagram and a succinct description of the experiment, including the treatment of the results.

Question 5

In part (a) most candidates drew and labelled correct circuit diagrams using conventional symbols and realised the need to include a power source. Some weaker candidates confused micrometers and microammeters.

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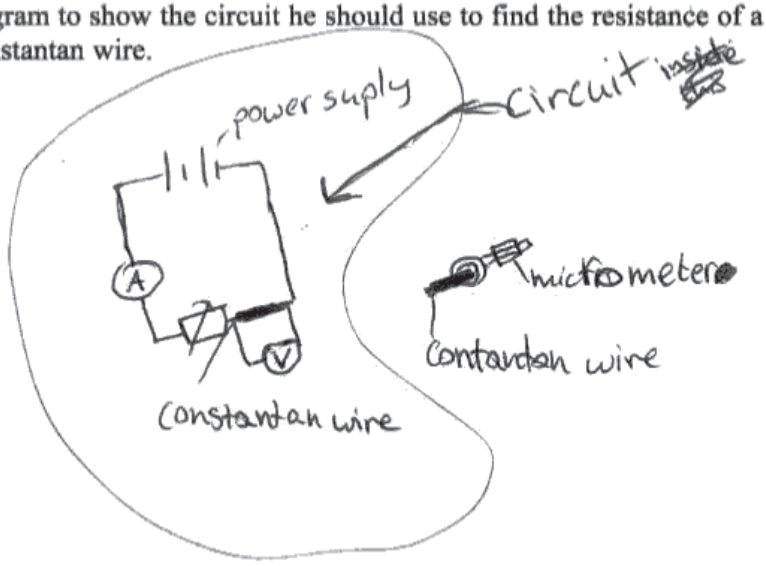
Examiner Tip

It is important to use a ruler when drawing circuit diagrams.

5 A student is doing an experiment to find the resistivity of constantan. His apparatus includes a length of constantan wire, an ammeter, a voltmeter, a variable resistor and a micrometer.

(a) Draw a circuit diagram to show the circuit he should use to find the resistance of a fixed length of constantan wire. **(2)**



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Examiner Comments

It is not necessary to draw a micrometer.

Part (b) (i) only required candidates to say that the gradient would be used. For part (ii) the majority of candidates understood that a graph allows a line of best fit to be drawn which will allow outliers to be identified and results to be averaged.

In part (c) some candidates explained **how** a metre rule would be used rather than **why**.

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Examiner Tip

Check whether the question is asking for an explanation of **how** or **why** an instrument should be used.

(c) State and explain what additional instrument he should use to measure the length *l* of the wire.

(2)

He should use a metre rule and a set square to measure the length of the wire. The set square is placed at right angle to the metre rule and the wire.

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Examiner Comments

This candidate only scored one mark because there was no explanation of why a metre rule was a suitable instrument. A reference to the length of the wire and measurement to the nearest mm was expected for the second mark.

Although part (d) was answered well by the majority of candidates, some missed the necessity to measure diameter in order to calculate the area of the wire.

(d) (i) State what further measurement the student would need to take to determine the resistivity of the wire.

Area of cross-section of the wire

(ii) Show how the student should use his measurements to calculate a value for the resistivity of constantan.

(3)

$R \propto l$ ... (i) [when 'A' is constant]

$R \propto \frac{1}{A}$ ... (ii) [when 'l' is constant]

$\therefore R = \frac{\rho l}{A}$ [where ρ is a constant]

$\rho = \frac{RA}{l}$

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Examiner Comments

The candidate should have stated 'diameter' in part (i) and in part (ii) explained how to find the area using the diameter and so only gained one mark rather than three.

Question 6

Part (a) of this question was generally well done, although not all candidates indicated how the wires were to be arranged: a sketch of the arrangements they had in mind would have helped to gain marks. For the situation described it was length that was required in part (b). Candidates who had mentioned this in part (a) were awarded the mark on this occasion but this is not always possible. In part (c) the word 'safety' was sometimes overlooked and an accuracy precaution was described instead. Part (d) allowed candidates to demonstrate their understanding of k.

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Examiner Tip

The example below is a good clear answer but it is not necessary to repeat wording given in the question.

(d) The wires are going to be used to hang pictures on a wall in an art exhibition.

Explain why knowing a value for *k* may be useful.

(1)

If k is known then ~~it can be assumed~~ we would know how much load the wire can take before breaking.

Question 7

Many candidates gained high marks on this question: graphs and gradients were generally well tackled. However, not all candidates used as a large a scale as possible nor drew a large triangle on their graph to find the gradient.

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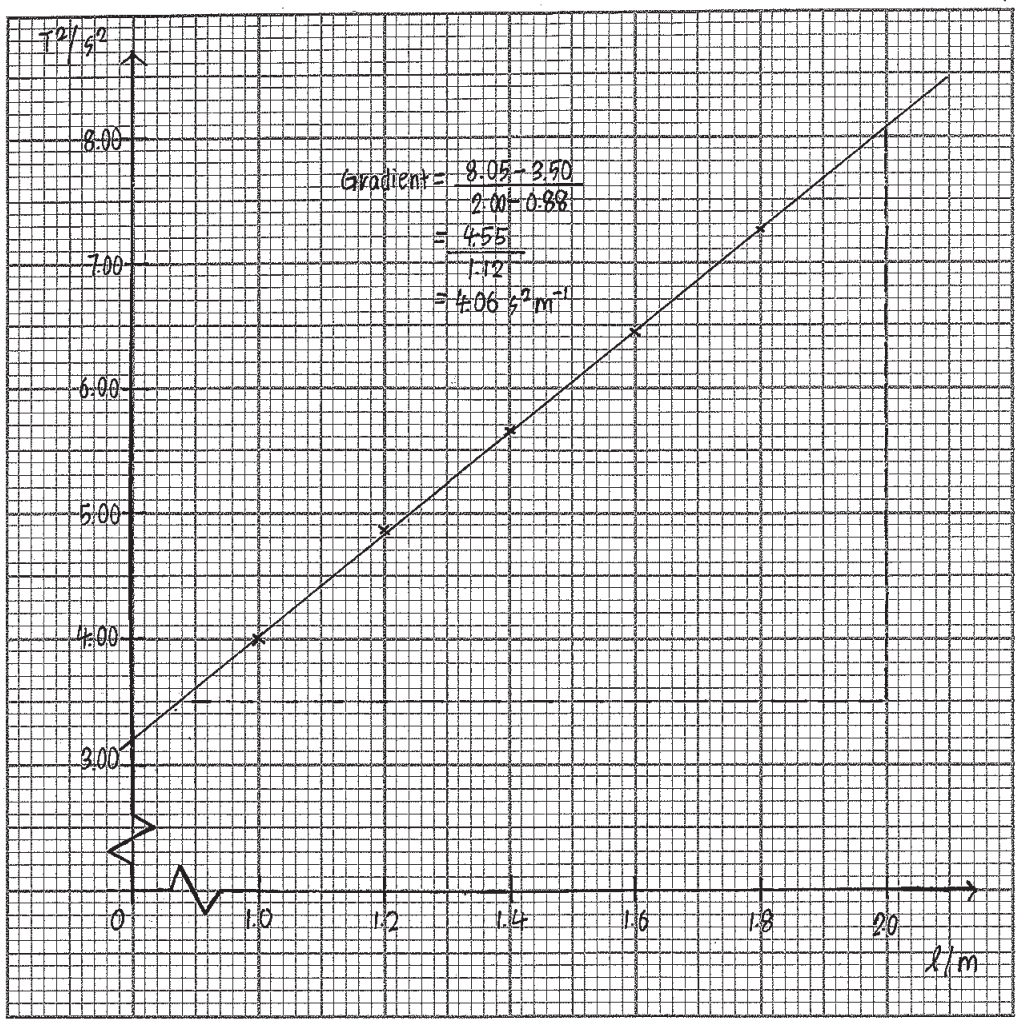
Examiner Tip

Use as a large a scale as possible and show clearly how the gradient has been calculated.

(b) Plot a graph of T^2 against l. Use the extra column in the table for your values of T^2.

(6)



(c) Use the equation to show why the graph is a straight line.

(1)

$T = 2\pi\sqrt{\frac{l}{g}}$

$T^2 = 4\pi^2\left(\frac{l}{g}\right)$

- Since $\frac{4\pi^2}{g}$ is constant, $T^2 \propto l$
- Hence, the graph is a straight line

(d) Use your graph to determine a value for g.

(3)

Gradient = $4.06\ s^2 m^{-1}$

$g = \frac{4\pi^2}{\text{gradient}}$

$= 9.72\ m\ s^{-2}$ ✓✓✓ 3

(e) The accepted value for g is $9.81\ m\ s^{-2}$. Calculate the percentage difference between the value you have determined and the accepted value.

(1)

Percentage difference = $\frac{9.81 - 9.72}{9.81} \times 100\%$ ✓

$= 0.9\ \% \approx 1.0\ \%$ 1

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Examiner Comments

This is a good graph with a clear indication of how the graph has been used for part (d). However, the candidate has lost a mark in part (c) as the horizontal scale of the graph could have been twice as big.

6PH07

Grade	Max. Mark	A	B	C	D	E
Uniform boundary mark	60	48	42	36	30	24
Raw boundary mark	40	29	25	21	17	14

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