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Mark Scheme (Results)
Summer 2010

GCE

GCE Physics (6PH07) Paper 1

Unit 3B: Exploring Physics

International Alternative to Internal Assessment

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Question Number	Answer	Mark
1(a)	C	**(1)**
(b)	B	**(1)**
	Total marks for question 1	**2**

Question Number	Answer	Mark
2(a)	A	**(1)**
(b)	D	**(1)**
	Total marks for question 2	**2**

Question Number	Answer	Mark
3(a)	A	**(1)**
	Total marks for question 3	**1**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>4</td><td>1 mark for each appropriate idea explained. Do not credit converse for a second mark: see table for examples. Do not penalise incorrect comments.
1 mark for each correct row to a maximum of 4

<table>
<tr><th>Idea</th><th>Datalogger</th><th></th><th>Liquid-in-glass + Stopwatch</th><th>Mark</th></tr>
<tr><td>Number of Readings</td><td>Advantage – large number of readings or small time interval between readings.</td><td>or</td><td>Disadvantage - small number of readings
Or large time interval between readings</td><td>1</td></tr>
<tr><td>Graph</td><td>Advantage - drawn automatically</td><td></td><td></td><td>1</td></tr>
<tr><td>Simultaneity</td><td>Advantage – simultaneous reading of temperature and time.</td><td>or</td><td>Disadvantage – reaction time (means readings are not simultaneous)</td><td>1</td></tr>
<tr><td>Conduction</td><td>Advantage – metal is a good conductor.</td><td>or</td><td>Disadvantage – glass is a poor conductor</td><td>1</td></tr>
<tr><td>Power supply</td><td>Disadvantage – power supply (or electricity) needed.</td><td>or</td><td>Advantage – no power supply required</td><td>1</td></tr>
<tr><td>Errors</td><td>Disadvantage – may be zero or systematic errors</td><td>or</td><td>Disadvantage – may be random, systematic or parallax errors</td><td>1</td></tr>
<tr><td>Transport</td><td></td><td></td><td>Advantage – easily transportable</td><td>1</td></tr>
<tr><td>Breakages</td><td></td><td></td><td>Disadvantage – easily broken</td><td>1</td></tr>
<tr><td>Cost</td><td>Disadvantage - expensive</td><td></td><td>Advantage - cheaper</td><td></td></tr>
</table>
</td><td>(4)</td></tr>
<tr><td></td><td>Total marks for question 4</td><td>4</td></tr>
</table>

Question Number	Answer	Mark
5(a)	Calculation using one pair of values (e.g. 0.18 s and 159 mm) Identifies $s = 0.5at^2$ or $s = ut + 0.5at^2$ with $u = 0$ Substitution of s and g, t and g, or s and t Correct evaluation of t, s or a for chosen values <u>Examples:</u> $t = \sqrt{}(2 \times 0.071 \text{ m} / 9.8 \text{ m s}^{-2}) = 0.12$ (s) $s = 0.5 \times 9.8 \text{ m s}^{-2} \times (0.18 \text{ s})^2 = 0.159$ (m) $a = 2 \times 0.012 \text{ m} / (0.05 \text{ s})^2 = 9.6$ (m s^{-2})	**(1)** **(1)** **(1)**
5(b)	<u>Examples:</u> • Hold/drop the rule vertically • Drop the rule cleanly • Release from rest • Ensure your fingers are just at the end of the rule • Practice • Repeat • Use the same bit of your fingers for measurement • Avoid parallax errors in the reading **Do not reward contradictory statements**	**(1)** **(1)** **(1)** **(1)** **(1)** **(1)** **(1)** **(1)** **(max 3)**
5(c)	Value, uncertainty – I mark each Value : 0.19 (s) Absolute uncertainty seen or implied: $\pm$ 0.01 if anomalous result ignored or $\pm$ 0.06 if not Allow uncertainty as percentage eg 5(.3)% or 37(.5)% Note 0.16 ± 0.06 scores second mark only 0.19 ± 0.06 scores first mark only	**(1)** **(1)**
	Total marks for question 5	**8**

Question Number	Answer	Mark
6(a)	Calculation correct plus unit Example of calculation: $\pi d^2/4 = \pi\ (0.12 \times 10^{-3})^2/4 = 1.1(3) \times 10^{-8}\ m^2$ (or $1.1(3) \times 10^{-2}\ mm^2$)	**(1)**
6(b)	1 mm (in 100 mm) is reasonable (allow 1/100 or 1%)	**(1)**
6(c)(i)	ρ and A are constants or ρ/A is constant $R \propto l$ or comparison to $y = mx + c$	**(1)** **(1)**
6(c)(ii)	• 41.9 x answer for (a) (ignore inconsistent units) • answer in range $4.55 - 4.80 \times 10^{-7}\ \Omega$ m • correct answer to 2 sig fig	**(1)** **(1)** **(1)**
6(d)	Valid points, do not reward single word responses Ignore comments on length **2 max** Examples: • Small diameter or diameter only measured once • Any zero error • Kinks in wire • Contact resistance • Resistance of connecting wires • Accuracy of ohmmeter	 **(1)** **(1)** **(1)** **(1)** **(1)** **(1)** **(max 2)**
	Total marks for question 6	**9**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>7(a)</td><td>Refraction towards normal (r > 0) at first face, away at second
Angle of incidence and refraction marked correctly <u>at first face</u></td><td>(1)
(1)</td></tr>
<tr><td>7(b)</td><td>Mark the emergent ray OR Mark the point of emergence
Appropriate joining up statement to give path of ray through block</td><td>(1)
(1)</td></tr>
<tr><td>7(c)</td><td>Too few values
Limited range
Should use protractor with 0.5 degree markings
Repeat measurements <u>at second face</u></td><td>(1)
(1)
(1)
(1)
(max 2)</td></tr>
<tr><td>7(d)</td><td>Correct completion of sin i and sin r rows
(values consistent to 2 or 3 sf and penalise rounding errors)

<table>
<tr><td>i / °</td><td>20</td><td>30</td><td>40</td><td>50</td></tr>
<tr><td>r / °</td><td>15</td><td>20</td><td>26</td><td>32</td></tr>
<tr><td>sin i</td><td>0.34/0.342</td><td>0.50/0.500</td><td>0.64/0.643</td><td>0.77/0.766</td></tr>
<tr><td>sin r</td><td>0.26/0.259</td><td>0.34/0.342</td><td>0.44/0.438</td><td>0.53/0.530</td></tr>
</table>
Suitable scales, starting at zero
Labels on axes
Correct plotting of points using sensible scale</td><td>(1)

(1)
(1)
(1)</td></tr>
<tr><td>7(e)</td><td>Line of best fit

Valid comment on whether the line should / should not go through the origin

<u>Example of calculation:</u>

when i = 0, r = 0, therefore should
sin i = n sin r, therefore should
sin i ∝ sin r (or <u>directly</u> proportional), therefore should
maybe systematic error, therefore not</td><td>(1)

(1)</td></tr>
<tr><td>7(f)</td><td>Large triangle ≥ 60 mm horizontally to determine gradient
Answer in range 1.35 - 1.64</td><td>(1)
(1)</td></tr>
<tr><td></td><td>Total marks for question 7</td><td>14</td></tr>
</table>

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