Sec 4 Pure Physics Prelim Marking Scheme (Paper 3)

Section A

Qn	Answer	Marks	Remarks
1(a)	l_A = 2.2 cm or 22 mm l_B = 2.2 cm or 22 mm	1	
1(c)	Use the half-metre rule to check and ensure that the heights from both ends of the metre rule above the bench are equal.	1	
1(d)	L_A = 7.2 cm or 72 mm L_B = 10.2 cm or 102 mm	1 1	
1(e)	Correct calculation of e_A and e_B. e_A = 5.0 cm or 50 mm e_B = 8.0 cm or 80 mm	1	
1(f)	Correct calculation of $\dfrac{e_A}{e_B}$. $\dfrac{e_A}{e_B}$ = 5.0 / 8.0 = 0.625 = 0.63 (2 s.f.)	1	
1(g)	The spring constant and the mass suspended on the metre rule must remain constant. Steps (a) to (f). Repeat steps (b) to (f) to obtain five more sets of values by placing the mass at different positions. Record x, L_A, L_B, e_A, e_B, $\dfrac{e_A}{e_B}$ and 1/x in a table. <table><tr><td>x / cm</td><td>L_A/ cm</td><td>L_B/ cm</td><td>e_A/ cm</td><td>e_B/ cm</td><td>1/x / cm^{-1}</td></tr></table> Plot a graph of $\dfrac{e_A}{e_B}$ against 1/x. Graph is a straight line starting from – 1. Gradient = D Intercept = – 1	1 1 1 1	
2(c)		4	*V* to the closest 0.05 V. [1]

	V / V	I / A	R / Ω		
one lamp	1.30	0.32	4.1		I to the closet 0.01 A. [1]

Correct recording of V and I. [1]

Correct calculation of R with correct number of s.f.. [1] |
| two lamps in series | 1.60 | 0.24 | 6.7 | | |
| two lamps in parallel | 0.90 | 0.52 | 1.7 | | |

2(d)	Correct calculation based on 2(c). (i) resistance = R / 2 = 3.4 Ω (ii) resistance = R x 2 = 3.4 Ω	1 1	
2(e)(i)	When two lamps are connected in series, the combine resistance is higher, resulting in <u>lower current in the circuit, and hence the resistance of the lamps is lower.</u>	1	
2(e)(ii)	When two lamps are connected in parallel, the combined resistance is lower, resulting in lower p.d. across the lamps. The current through the lamps is therefore lower, and the resistance of the lamps is also lower.	1 1	
2(f)	When lamps are connected in series, the <u>potential difference across each one of them is lower</u> as compared to when the lamps are connected in parallel.	1	

Section B

Qn	Answer	Marks	Remarks
3(b)	x = 10 mm	1	To the nearest whole number
3(e)	i = 23° r = 113°	1 1	To the nearest whole number
3(f)	Correct calculation of y y = 0.261	1	3 s.f.
3(g)	<table><tr><td>x / mm</td><td>i / °</td><td>r / °</td><td>y / cm</td><td>1/x / mm⁻¹</td></tr><tr><td>10</td><td>23</td><td>105</td><td>0.261</td><td>0.100</td></tr><tr><td>15</td><td>35</td><td>113</td><td>0.399</td><td>0.067</td></tr><tr><td>20</td><td>42</td><td>116</td><td>0.456</td><td>0.050</td></tr></table>	4	Correct headings [1] Correct measurements [1]

	25	50	121	0.545	0.040		Correct d.p. and s.f. [1]
	30	55	123	0.587	0.033		
	35	61	126	0.649	0.029		Correct calculation of y and $1/x$ [1]
3(h)						4	Axes are correctly labelled with units [1]

Appropriate scale [1]

Correctly plotted points [1]

Best-fit straight line [1] |
| 3(i) | $G = (0.21 - 0.64) / (0.11 - 0.02)$
  $= -4.8$

$C = 0.74$ | | | | | 3

1 | Select two points (coordinates written beside the points) on the line and draw a right-angled triangle using dotted lines [1]

Apply the correct formula [1]

Correct calculation and s.f. [1] |
| 3(j) | y and $1/x$ are linearly related.
As $1/x$ increases, y decreases. | | | | | 1
1 | |
| 3(k) | The holes made by the pins may be too big.
This may affect the drawing of the required lines, and cause inaccuracy in the measurement of the angles.

or

The glass block has bevelled edges.
This may affect the drawing of the lines along its edges, and cause inaccuracy in the measurement of the angles. | | | | | 1
1

1
1 | |