



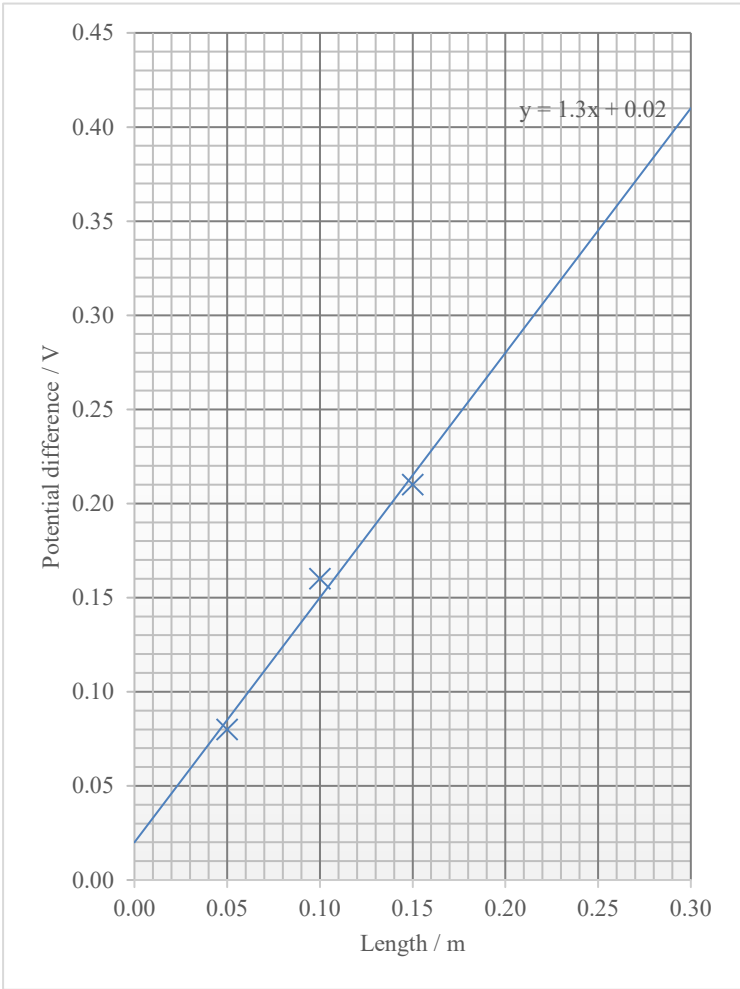
Mark Scheme (Results)

October 2019

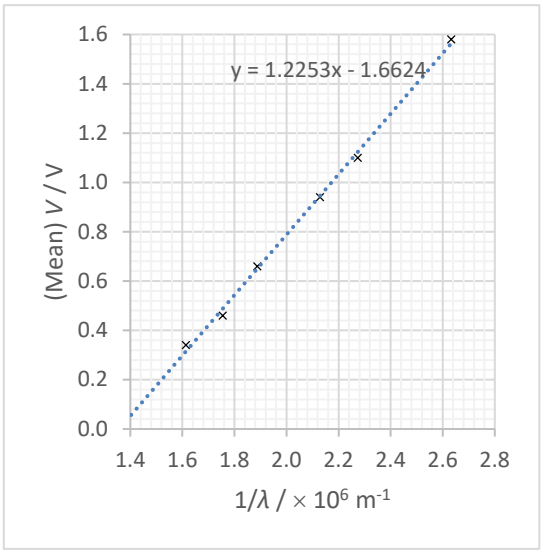
Pearson Edexcel International Advanced Level
In Physics (WPH13) Paper 01
Practical Skills in Physics I

Question Number	Answer	Mark
1 (a)	<ul style="list-style-type: none"> Reaction time Or timer not reset to zero (1) 	(1)
1 (b)(i)	<p><u>Student – 2 marks</u></p> <ul style="list-style-type: none"> Students' values of t are within a range of 0.16 s Or calculates mean t and difference to furthest value of t (0.11 s) Or calculates percentage uncertainty for the 5 values (1) Reaction time is comparable to the range Or difference between values can be explained by reaction time (1) <p><u>Teacher – 2 marks</u></p> <ul style="list-style-type: none"> Range of the other 4 values is 0.04 s Or uncertainty of other 4 values is 0.02 s Or calculates percentage uncertainty for the other 4 values Or calculates percentage difference of student 4's value and the mean (1) Comparison between Student 4's value and the range/uncertainty of the other 4 values. Or the (percentage) difference between 0.75 and the other values is large (1) 	(4)
1 (b)(ii)	<ul style="list-style-type: none"> Attempt to calculate mean (using 4 or 5 values) (1) 0.89 s given to 2 s.f. (0.86 s if all 5 values used) (1) <p><u>Example of Calculation</u> Mean time = $(0.88 + 0.87 + 0.91 + 0.88) / 4 = 0.885$ s</p>	(2)
1 (b)(iii)	<ul style="list-style-type: none"> Use of half range (0.02 s) Or difference between mean and the value furthest from mean (1) Percentage uncertainty = 2 % (1) <p>Allow ecf of mean time from 1(b)(ii)</p> <p><u>Example of Calculation</u> Percentage uncertainty = $(0.02 / 0.89) \times 100 \% = 2.247 \%$</p>	(2)
1 (b)(iv)	<ul style="list-style-type: none"> Use of $s = v t$ with $v = 330 \text{ m s}^{-1}$ (1) with a correct maximum time (1) Correct use of factor of 2 (1) Maximum distance value calculated (1) <p>Accept maximum time from table Allow ecf of mean and percentage uncertainty if calculating maximum time value</p> <p><u>Example of Calculation</u> $s = 330 \text{ m s}^{-1} \times (0.91 \text{ s} \div 2)$ $s = 150.2 \text{ m}$</p>	(4)
Total for question 1		13

Question Number	Answer	Mark
2 (a)	<ul style="list-style-type: none"> • Measure the distance at which the plastic sphere lands with a ruler Or measure the launch angle with a protractor (1) • Repeat measurements (for each angle) and calculate the mean d (1) • Plot a graph of d and θ, and use to find θ for maximum d value (1) • Or continue changing θ until d decreases to find maximum (1) • Around the maximum d take measurements for smaller changes in angle (1) 	(4)
2 (b)	<p>Max 2 from</p> <ul style="list-style-type: none"> • Parallax error when reading angle/distance (1) • Angle not zero when launcher is horizontal (1) • Air resistance on the plastic sphere so velocity reduces (1) • v not constant due to friction in the launcher tube (which depends upon angle) (1) 	(2)
	Total for question 2	6

Question Number	Answer	Mark
3 (a)	<ul style="list-style-type: none"> If the rod has uniform diameter it balances (horizontally) with the thread at 15 cm (1) because the mass/moment of the rod either side of the thread is equal (1) Or because the line of action of weight is through the pivot Or because the centre of mass would be at 15 cm (1) <p>Accept “horizontal” as a description of the rod being balanced horizontally</p> <p>Accept “in the middle” as a description of 15 cm</p>	(2)
3 (b)(i)	<ul style="list-style-type: none"> value between 0.40 and 0.45 V (1) 	(1)
3 (b)(ii)	<ul style="list-style-type: none"> Use of ratio of resistance = ratio of p.d. (1) Or Use of $V = IR$ with $R_{\text{rod}} = 0.070 \Omega$ to calculate current (1) $V_{\text{Terminal}} = 1.6 \text{ V}$ (1) <p>Allow ecf for use of their V value from 3(b)(i)</p> <p><u>Example of Calculation</u></p> $V / V_T = R / R_T$ $V_T = (V \times R_T) / R$ $V_T = (0.41 \text{ V} \times 0.27 \Omega) / 0.070 \Omega = 1.58 \text{ V}$	(2)
3 (c)	<ul style="list-style-type: none"> Further readings would make the line of best fit more accurate (1) Giving a more accurate value for the p.d. of the rod (at 30cm) (1) 	(2)
Total for question 3		7

Question Number	Answer	Mark
4 (a)	<ul style="list-style-type: none"> Calculates $\frac{\text{angle of rotation}}{\text{concentration of solution}}$ for two pairs of values (1) Calculates $\frac{\text{angle of rotation}}{\text{concentration of solution}}$ for at least one other pair of values (1) Comparative statement consistent with their values (1) <p>Accept equivalent calculations of $\frac{\text{concentration of solution}}{\text{angle of rotation}}$ or $k = \frac{\text{angle of rotation}}{(\text{concentration of solution} \times \text{depth of solution})}$</p>	(3)
4 (b)	<ul style="list-style-type: none"> Higher power lamp would have a heating effect on the solution (1) Or Higher power lamp would increase the temperature of the solution Heating would cause expansion of the sucrose solution (1) Or heating would cause evaporation of the sucrose solution Which would change the concentration/density (of sucrose solution) (1) 	(3)
4 (c)	<ul style="list-style-type: none"> Comparison between $\text{angle of rotation} = k \times \text{concentration of solution} \times \text{depth of solution}$ and $y = mx (+c)$ (1) Plot a graph of angle of rotation and $\text{concentration of solution}$ Or plot a graph of angle of rotation and $\text{concentration of solution} \times \text{depth of solution}$ (1) Correct method for calculating k for their graph described (1) 	(3)
Total for question 4		9

Question Number	Answer	Mark																					
5 (a)	<ul style="list-style-type: none"> Higher photon energy means higher frequency light Or higher photon energy means using ultraviolet light (1) There is an increased risk when using ultraviolet light Or using visible light is no/low risk (1) <p>Accept any named EM radiation with higher frequency than visible light</p>	(2)																					
5 (b)	<ul style="list-style-type: none"> Use of $W = VQ$ Or $W = eV$ (1) $W = (-)2.5 \times 10^{-19} \text{ J}$ Or $W = 1.58 \text{ eV}$ (1) <p><u>Example of Calculation</u> $W = 1.58\text{V} \times 1.6 \times 10^{-19} \text{ C}$ $W = 2.53 \times 10^{-19} \text{ J}$</p>	(2)																					
5 (c)(i)	<ul style="list-style-type: none"> Correct $1/\lambda$ values to 2 or 3 s.f. (1) Labels axes with quantities and units (1) Sensible scales (1) Plotting (2) Line of best fit (1) <table border="1"> <thead> <tr> <th>λ / nm</th><th>$1/\lambda / \times 10^6 \text{ m}^{-1}$</th><th>Mean V / V</th></tr> </thead> <tbody> <tr><td>380</td><td>2.63</td><td>1.58</td></tr> <tr><td>440</td><td>2.27</td><td>1.10</td></tr> <tr><td>470</td><td>2.13</td><td>0.94</td></tr> <tr><td>530</td><td>1.89</td><td>0.66</td></tr> <tr><td>570</td><td>1.75</td><td>0.46</td></tr> <tr><td>620</td><td>1.61</td><td>0.34</td></tr> </tbody> </table> <p>Accept $1/\lambda$ in nm^{-1} or pm^{-1} at this stage.</p> 	λ / nm	$1/\lambda / \times 10^6 \text{ m}^{-1}$	Mean V / V	380	2.63	1.58	440	2.27	1.10	470	2.13	0.94	530	1.89	0.66	570	1.75	0.46	620	1.61	0.34	(6)
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5 (c)(ii)	<ul style="list-style-type: none"> Calculates gradient using large triangle (1) Use of $h = \frac{\text{gradient} \times e}{c}$ with their gradient (1) $h = (6.2 \text{ to } 7.0) \times 10^{-34} \text{ J s}$ (1) <p><u>Example of Calculation</u> $\text{gradient} = \frac{1.4\text{V} - 0.2\text{V}}{(2.50 - 1.50) \times 10^6} = 1.2 \times 10^{-6} \text{ V m}^{-1}$ $h = \frac{1.2 \times 10^{-6} \times 1.6 \times 10^{-19}}{3.0 \times 10^8} = 6.4 \times 10^{-34} \text{ J s}$</p>	(3)																					
5 (d)	<p>Max two from</p> <ul style="list-style-type: none"> Block out external light sources (1) Use a larger range of wavelengths/frequencies (1) Use filters with a narrower frequency band (1) Use LEDs of known frequency (1) Use more sensitive <u>ammeter</u> (1) 	(2)																					
Total for question 5		15																					