

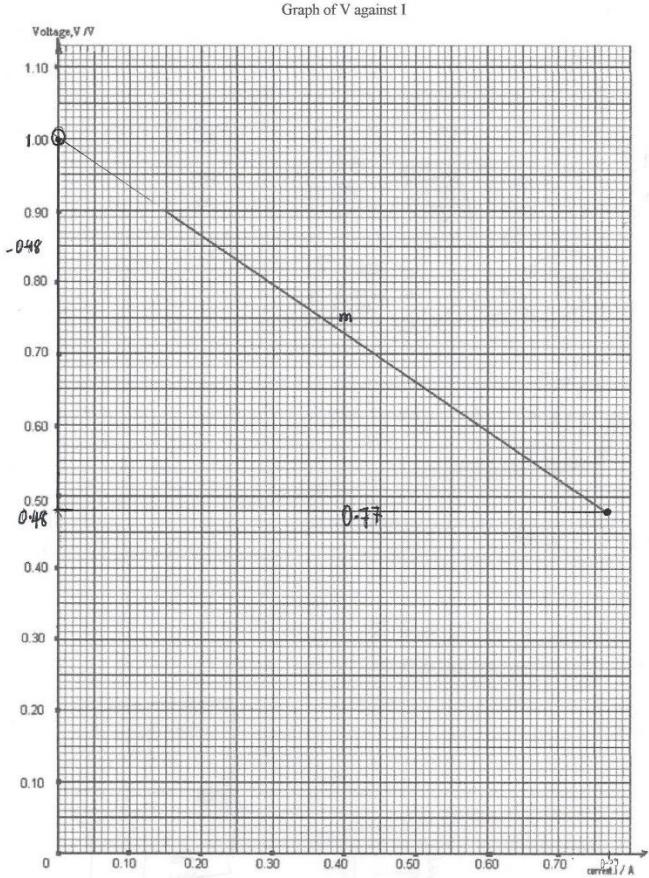
MARKING SCHEME
SPM PHYSICS TRIAL PAPER 3
SEPTEMBER 2015
(Physics 4531/3)
SMJK YU HUA KAJANG
SEPTEMBER 2015

QUESTION 1

No	Marking Criteria	Marks																		
(a) (i)	Manipulated Variable Mass . m	1																		
(ii)	Responding Variable Diameter, d	1																		
(iii)	Constant Variable Density / Height	1																		
(b)	Zero error = - 0.02mm																			
(i)																				
(ii)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Mass m / g</th> <th style="text-align: center;">Diameter , d / mm</th> <th style="text-align: center;">d^2 / mm²</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">5</td> <td style="text-align: center;">3.64 + 0.02= 3.66</td> <td style="text-align: center;">13.40</td> </tr> <tr> <td style="text-align: center;">10</td> <td style="text-align: center;">5.15 + 0.02 = 5.17</td> <td style="text-align: center;">26.73</td> </tr> <tr> <td style="text-align: center;">15</td> <td style="text-align: center;">6.31 + 0.02 = 6.33</td> <td style="text-align: center;">40.07</td> </tr> <tr> <td style="text-align: center;">20</td> <td style="text-align: center;">7.29 + 0.02 = 7.31</td> <td style="text-align: center;">53.44</td> </tr> <tr> <td style="text-align: center;">25</td> <td style="text-align: center;">8.15 + 0.02 = 8.17</td> <td style="text-align: center;">66.75</td> </tr> </tbody> </table>	Mass m / g	Diameter , d / mm	d^2 / mm ²	5	3.64 + 0.02= 3.66	13.40	10	5.15 + 0.02 = 5.17	26.73	15	6.31 + 0.02 = 6.33	40.07	20	7.29 + 0.02 = 7.31	53.44	25	8.15 + 0.02 = 8.17	66.75	1 1 1 1 1
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(iii)	Zero Error	1																		
(c)	Draw a graph of d^2 against m (Straight Line thro origin) 	4																		

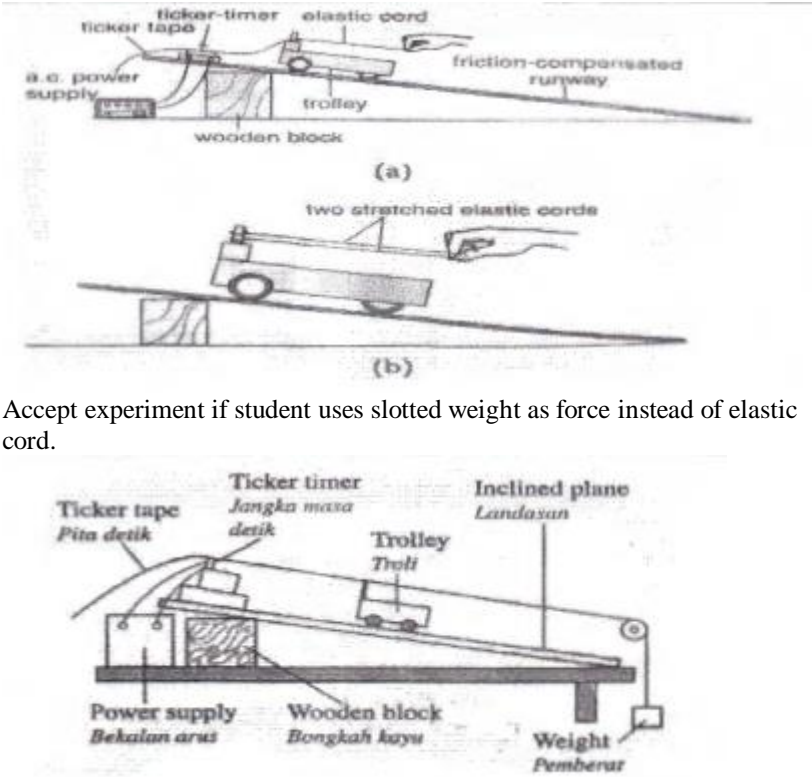
(d)	Relationship between d^2 and m d^2 is directly proportional to m	1
(e)	Gradient of graph Get triangle on the graph. Big or small triangle does not matter. Example: $m = 70/26$ Gradient = $2.69 \text{ mm}^2 / \text{g}$	2
TOTAL TOTAL		16

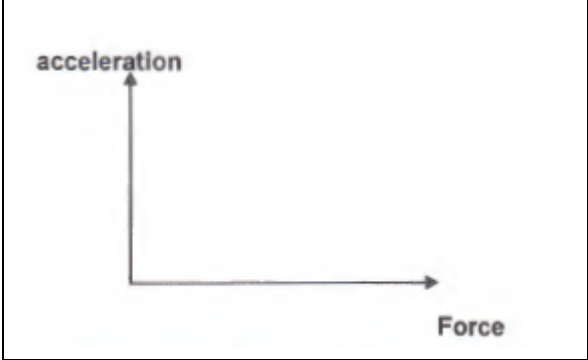
QUESTION 2

No	Marking Criteria	Marks
(a)(i)	Value of V will decrease	1
(ii)	When $I = 0.00\text{A} \rightarrow V = 1.00\text{V}$ Show the extrapolated line on the graph to cut at 1.00V	1 1
a (iii)	Electromotive Force	1
(b) (i)	Show on the graph a triangle drawn Get the value of the Voltage and Current Graph of V against I  $m = V/I$ Answer for $m = 0.675$ (Accept full marks for values of m between 0.655 and 0.695)	3

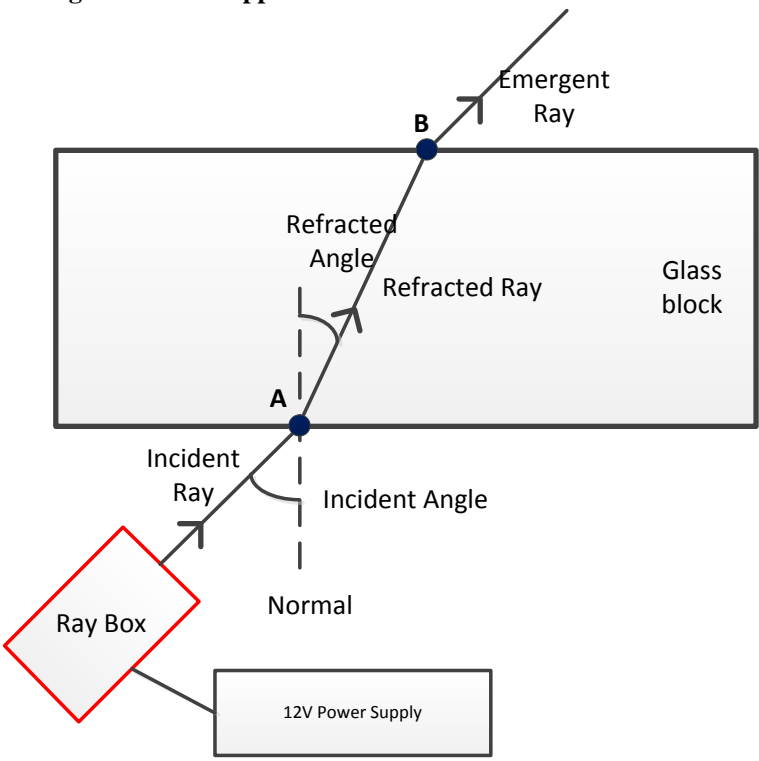
b (ii)	$r = -m \rightarrow r = - (0.675) = \mathbf{0.675 \Omega}$ Accept answers between 0.655Ω to 0.695Ω	1
(c) (i)	Calculate the value of V when $I = 0.90\text{A}$ $1.00 = V + (0.9) (0.675)$ $\rightarrow V = 0.393 \text{ V}$ Accepted values of V between 0.375 to 0.411	2
c (ii)	Ohms Law $R = V/I$. Total resistance R is the sum of fixed resistor P and rheostat value R $0.2 + R = 0.393/0.9$ $0.2 + R = 0.44 \rightarrow R = 0.44\Omega - 0.2\Omega = \mathbf{0.24\Omega}$ Accepted ranges of value of resistance is between 0.22Ω to 0.26Ω	2
TOTAL MARKS		12

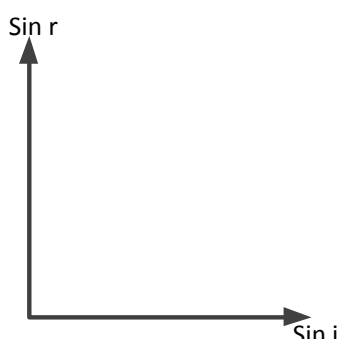
QUESTION 3:

NO	ANSWER	MARK
3(a)	<p>State one suitable inference The acceleration depends on the force or The Force effect the acceleration</p>	1
(b)	<p>State one relevant hypothesis The higher/greater the force. The greater/higher the acceleration</p>	1
(c) (i)	<p>State the aim of the experiment To investigate the relationship between Force and acceleration keeping the mass constant</p>	1
(ii)	<p>State the variables used in the experiment Manipulated variable : Force Responding variable: Acceleration Constant variable: Mass</p>	1 1
(iii)	<p>State the complete list of apparatus and materials Trolley, ticker tape, ticker timer, inclined plane, meter rule, elastic cord, power supply, wooden block</p>	1
(iv)	<p>Draw the arrangement of the apparatus</p>  <p>Accept experiment if student uses slotted weight as force instead of elastic cord.</p>	
(v)	<p>State the method to control the manipulated variable</p> <ol style="list-style-type: none"> 1. The ticker timer is switched on. 2. The trolley is pulled down with one elastic cord that is stretched with a constant length (eg 5 cm) 	1 1

	3. Acceleration of the trolley is obtained based on the ticker tape by using the formula $a = (v - u) / t$													
	<p>State the method of measuring the responding variable</p> <p>4. Repeat the experiment by using 2, 3, 4 and 5 elastic cords all stretched to the same length of 5cm</p>	1												
(vi)	<p>State how the data is tabulated</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Force, F // Number of elastic cord /// No of slotted weight</th> <th>Acceleration, a</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	Force, F // Number of elastic cord /// No of slotted weight	Acceleration, a											1
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(vii)	<p>State how the data is analysed</p> <div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;">  </div>	1												
TOTAL MARKS		12												

QUESTION 4

NO	ANSWER	MARK
4(a)	<p>State one suitable inference The angle of refraction depends on the angle of incidence / <i>The refracted angle depends on the incidence angle</i></p>	1
(b)	<p>State one relevant hypothesis When the angle of incidence increases, the angle of refraction increases</p>	1
(c) (i)	<p>State the aim of the experiment To investigate the relationship between the angle of refraction and the angle of incidence</p>	1
(ii)	<p>State the variables used in the experiment Manipulated variable : Angle of incidence , i Responding variable: Angle of refraction, r</p> <p>Constant variable: Refractive Index of glass block, n or density, same block is used</p>	1 1
(iii)	<p>State the complete list of apparatus and materials Protractor, rectangular glass block, ray box, white paper and Power Supply</p>	1
(iv)	<p>Arrangement of the apparatus</p> 	1
(v)	<p>State one method to control the manipulated variable</p> <ol style="list-style-type: none"> 1. The Power Supply is switched on to operate the ray box 2. The light Ray is directed to the glass block with an initial angle of incidence of $i = 20^\circ$. 	1

	3. Points A and B is marked on the paper																									
	<p>State one method to measure the responding variable</p> <p>3. The path of the emergent ray is drawn.</p> <p>4. Points A and B is joined to measure the refracted ray, r and recorded.</p> <p>5. Repeat the experiment at least 4 times with the values of incidence Angle $i = 30^{\circ}$, 40°, 50° and 60°</p>	1 1																								
(vi)	<p>State how the data is tabulated</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Angle of Incidence, i</th> <th>Sin i</th> <th>Angle of Refraction</th> <th>Sin r</th> </tr> </thead> <tbody> <tr> <td>20</td> <td></td> <td></td> <td></td> </tr> <tr> <td>30</td> <td></td> <td></td> <td></td> </tr> <tr> <td>40</td> <td></td> <td></td> <td></td> </tr> <tr> <td>50</td> <td></td> <td></td> <td></td> </tr> <tr> <td>60</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Note: If students did not put Sin i and Sin r in the tabulation, also correct</p>	Angle of Incidence, i	Sin i	Angle of Refraction	Sin r	20				30				40				50				60				1
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(vii)	<p>State how the data is analysed. Plot a graph of the responding variable against the manipulated variable</p> <p>Plot a graph of the Sin r against Sin i</p> 	1																								
TOTAL MARKS		12																								

THE END
TOTAL 40 MARKS
COMPILED BY PRADEEP KUMAR