

# Mark Scheme (Results) Summer 2008

GCE

GCE O Level Physics

7540/01

## 7540/01 O-LEVEL PHYSICS MARK SCHEME - JUNE 2008

Question Number	Answer	Mark
<b>1(a)</b>	<ul style="list-style-type: none"> <li>• 25 000 N or 24 500 N or 24 525 N <b>UP</b></li> </ul> <p><b>Notes</b></p> <ul style="list-style-type: none"> <li>- Unit required N kgms<sup>-2</sup> kgm/s<sup>2</sup></li> </ul>	<p><b>1</b></p> <p style="text-align: right;"><b>(1)</b></p>

Question Number	Answer	Mark
<b>1(b)</b>	<ul style="list-style-type: none"> <li>• single <u>downward</u> arrow intended to be vertical and straight passing through or in line with C labelled <b>W</b> or <b>mg</b> (or 25 000 N, 24 500 N or 24 525 N)</li> </ul>	<p><b>1</b></p> <p style="text-align: right;"><b>(1)</b></p>
<b>1(c)</b>	<ul style="list-style-type: none"> <li>• single arrow parallel to slope pointing <u>up</u> the slope</li> <li>• between lower half of front wheel and bottom of road surface labelled <b>F</b> <b>dop</b></li> </ul> <p style="text-align: center;"><b>Note</b></p> <ul style="list-style-type: none"> <li>- maximum of 1 mark if shown on back wheel only</li> <li>- pointing down the slope scores zero</li> </ul>	<p><b>1</b></p> <p><b>1</b></p> <p style="text-align: right;"><b>(2)</b></p>
<b>1(d)</b>	<ul style="list-style-type: none"> <li>• single <u>upward</u> arrow intended to be straight and <u>perpendicular</u> to ground/slope</li> <li>• passing through or in line with front tyre labelled <b>R</b> <b>dop</b></li> </ul> <p style="text-align: center;"><b>Note</b></p> <ul style="list-style-type: none"> <li>- maximum of 1 mark if shown on back wheel only</li> </ul>	<p><b>1</b></p> <p><b>1</b></p> <p style="text-align: right;"><b>(2)</b></p>

Question Number	Answer	Reject	Mark
<b>1(e)</b>	<ul style="list-style-type: none"> <li>• tip / fall over/ roll / turn over/ tumble/topple/tipple /tilt/rotate <b>OWTTE</b></li> </ul>	move backwards or downwards	<b>1</b>  <b>(1)</b>

**(Total 7 marks)**

Question Number	Answer	Acceptable Answers	Mark
2(a)	<ul style="list-style-type: none"> <li>zero</li> </ul> <p style="text-align: center;"><b>Note</b></p> <ul style="list-style-type: none"> <li>ignore units</li> </ul>	<ul style="list-style-type: none"> <li>nothing</li> <li>none</li> <li>0</li> <li>no momentum</li> </ul>	<p style="text-align: center;">1</p> <p style="text-align: center;">(1)</p>

Question Number	Answer	Mark
2(b)	<ul style="list-style-type: none"> <li>Vector (quantity)</li> </ul>	<p style="text-align: center;">1</p> <p style="text-align: center;">(1)</p>

Question Number	Answer	Mark
2(c)(i)	<ul style="list-style-type: none"> <li><math>30 \times 3.2</math></li> <li><math>= 96 \text{ kg m/s or Ns UP nwn}</math></li> </ul> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>ignore any minus sign</li> </ul>	<p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">(2)</p>
		Acceptable Answers
2(c)(ii)	<ul style="list-style-type: none"> <li><math>96 \text{ kg m/s or Ns UP only once in (c)(i)(ii)}</math></li> </ul> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>ignore minus sign</li> </ul>	<ul style="list-style-type: none"> <li>same as (i)</li> </ul> <p style="text-align: center;">1</p> <p style="text-align: center;">(1)</p>
2(c)(iii)	<ul style="list-style-type: none"> <li><math>= 96</math> (ecf from (i) or (ii)/40 or <math>40v = 96</math>)</li> <li><math>= 2.4 \text{ m/s UP nwn}</math></li> </ul> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>ignore any minus sign</li> </ul>	<p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">(2)</p>

(Total 7 marks)

Question Number	Answer	Mark
3(a)	<ul style="list-style-type: none"> <li>1.5 mm or 1½ mm or 0.15 cm UP</li> </ul>	1 (1)

Question Number	Answer	Acceptable Answers	Mark
3(b)(i)	<ul style="list-style-type: none"> <li>0 to 16 (N)</li> </ul>	<ul style="list-style-type: none"> <li>up to 16 (N)</li> <li>0 to 2 (mm)</li> <li>up to 2 (mm)</li> </ul> <p><i>Reject</i> 4 to 16(N)/0.5 to 2(mm) 16 or 0-2 N</p>	1 (1)
3(b)(ii)	<ul style="list-style-type: none"> <li>(extension not load) goes up in even steps/uniformly/constantly/ extension (directly) proportional to weight*</li> </ul> <p>ora at value <math>\geq 16</math> (or 2) extension is not proportional to weight / extension at 20 should be 2.5 / weight at 3.4 should be 27.2 <i>reference to elastic limit should be ignored here</i></p> <p>*allow load/mass/force/tension as alternative for weight</p>		1 (1)

Question Number	Answer	Mark
3(c)(i)	<ul style="list-style-type: none"> <li>returns to original length/shape/state/ extension zero</li> </ul> <p><i>do not allow 'length' returns to zero</i></p>	1 (1)
3(c)(ii)	<ul style="list-style-type: none"> <li>permanently stretched/ does not fully return / none</li> </ul> <p>/same <i>do not allow 'longer'</i></p>	1 (1)
3(d)	<ul style="list-style-type: none"> <li>1 (mm)/ 8 (N) / (c)(i) not passed <u>elastic</u> limit</li> <li>3.4 (mm)/ 20 (N) / (c)(ii) had passed <u>elastic</u> limit</li> </ul> <p><b>Note</b> maximum of 1 mark if one reference is made to a point or limit without calling it elastic limit 'elastic limit' must be seen once to get both marks <i>independent of (c)</i></p>	1 1 (2)

(Total 7 marks)

Question Number	Answer	Acceptable Answers	Mark
4(a)(i)	<ul style="list-style-type: none"> <li>0.3 J or 0.30 J Ws UP</li> </ul> <p><b>Note</b> allow units in upper or lower case</p>	0.3 J/s 0.3 joules per second 0.3 Js <sup>-1</sup>	1   <b>(1)</b>

Question Number	Answer	Mark
4(a)(ii)	<ul style="list-style-type: none"> <li>0.3 x 100/40 or 0.3 / 40% = 0.75 J(/s) (no mark as given in question) No UP</li> </ul> <p>(0.3/0.75) x 100 = 40(%) 40% of 0.75 (J) (= 0.30 (J))</p>	1   <i>Note</i> <b>Accept</b>  <b>(1)</b>

Question Number	Answer	Mark
4(a)(iii)	<ul style="list-style-type: none"> <li><math>m \times 10 \times 1.5</math> or <math>m \times 15</math></li> <li>= 0.75</li> <li><math>m = 0.05 \text{ kg}</math> or <math>50 \text{ g}</math> UP <i>nwn only accepted answer</i></li> </ul> <p><math>m \times 10 \times 15 = 0.3</math> giving <math>m = 0.02 \text{ kg}</math> scores 1</p>	1 1 1  <b>(3)</b>

Question Number	Answer	Acceptable Answers	Mark
4(b)	<ul style="list-style-type: none"> <li>heat</li> </ul> <p><b>Note</b> <b>ignore</b> <b>any</b> <b>reference to</b> <b>sound energy</b> <b>or friction or</b> <b>temperature</b></p>	<ul style="list-style-type: none"> <li>- thermal</li> <li>- infra red</li> <li>- IR</li> <li>- internal</li> </ul>	1   <b>(1)</b>

(Total 6 marks)

Question Number	Answer	Acceptable Answers	Reject	Mark
5(a)	<ul style="list-style-type: none"> <li>(move) faster</li> </ul>	<ul style="list-style-type: none"> <li>quicker</li> <li>greater speed</li> <li>greater velocity</li> <li>increased <u>kinetic</u> energy</li> </ul>	<ul style="list-style-type: none"> <li>more</li> <li>e faster</li> <li>ises</li> </ul>	<p>1</p> <p>(1)</p>

Question Number	Answer	Mark
5(b)	<ul style="list-style-type: none"> <li>any reference to Kelvin temperature or attempted conversion using 273</li> <li>Kelvin temperature does not double</li> </ul> <p>or 50° C (in K) is not double 25° C (in K)</p> <p><b>Note</b> 50° C = 323 K and 25° C = 298 K so 323 K is not double 298 K or 596K (323°C) is double 298 K</p> <p><i>scores both marks</i></p>	<p>1</p> <p>1</p> <p>(2)</p>

Question Number	Answer	Mark
5(c)	<p><i>action of removing moisture e.g.</i></p> <ul style="list-style-type: none"> <li>absorbs or removes moisture/ water /water vapour/ dehydrating agent/drying agent</li> </ul> <p><i>consequence</i></p> <ul style="list-style-type: none"> <li>dries (trapped) <u>air</u></li> </ul>	<p>1</p> <p>1</p> <p>(2)</p>

(Total 5 marks)

Question Number	Answer	Mark
6(a)(i)	<ul style="list-style-type: none"> <li>• repulsion / repel</li> <li>• similar charges/both negative/negative charges</li> </ul> <p><b>Notes</b>            'like charges repel' scores 2 marks            'unlike charges repel' scores 1<sup>st</sup> mark</p>	1 1  (2)


Question Number	Answer	Mark
6(a)(ii)	<ul style="list-style-type: none"> <li>• <u>bigger</u></li> </ul>	1  (1)

Question Number	Answer	Mark
6(b)(i)	<ul style="list-style-type: none"> <li>• <math>0.0080 = 5000 \times Q</math></li> <li>• <math>Q = 0.0000016 \text{ C}</math> UP/ <math>1.6 \times 10^{-6} \text{ C}</math></li> </ul>	1 1  (2)
6(b)(ii)	<ul style="list-style-type: none"> <li>• <math>0.0080 = 2 \times t</math></li> <li>• <math>t = 0.004 \text{ s}</math> / <math>4.0 \times 10^{-3}</math> UP</li> </ul> <p><i>Reject</i> <math>2 = 5000 \times t</math>, <math>t = 0.0004 \text{ s}</math> (<math>4.0 \times 10^{-4}</math>)</p>	1 1  (2)

(Total 7 marks)



Question Number	Answer	Mark
7(a)	<ul style="list-style-type: none"> <li>• ammeter in correct position</li> <li>• voltmeter in correct position appropriate to candidate's circuit</li> </ul> <p><b>Notes</b></p> <ul style="list-style-type: none"> <li>- incomplete circuit with one connecting lead missing scores zero</li> <li>- ignore 'small' gaps in circuit.</li> <li>- V may be across power supply provided there is no added resistance in the circuit</li> <li>- V may be across A and resistor</li> <li>- both meters in series scores 1<sup>st</sup> mark</li> <li>- ignore switches and other components</li> </ul>	<p>1 1</p> <p>(2)</p>

Question Number	Answer	Mark
7(b)	<ul style="list-style-type: none"> <li>• voltmeter or V or </li> </ul> <p>allow phonetic spelling</p>	<p>1</p> <p>(1)</p>

Question Number	Answer	Mark												
7(c)(i)	<table style="width: 100%; border: none;"> <tr> <td style="text-align: center;"><b>A</b></td> <td style="text-align: center;"><b>B</b></td> <td></td> </tr> <tr> <td style="text-align: center;"><math>4 + 4 = \underline{8}</math></td> <td style="text-align: center;"><math>\frac{1}{4} + \frac{1}{4} = \underline{\frac{1}{2}}</math></td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;"><math>\frac{1}{8} + \frac{1}{4} = \frac{3}{8}</math></td> <td style="text-align: center;"><math>R = 2</math></td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">total = <math>\frac{8}{3}</math> (<math>\Omega</math>) or 2.67 (<math>\Omega</math>) allow 2.6 or 2.66 or 2.7 or <math>2 \frac{2}{3}</math></td> <td style="text-align: center;">total = <math>4 + 2 = 6</math> (<math>\Omega</math>)</td> <td style="text-align: center;">1</td> </tr> </table>	<b>A</b>	<b>B</b>		$4 + 4 = \underline{8}$	$\frac{1}{4} + \frac{1}{4} = \underline{\frac{1}{2}}$	1	$\frac{1}{8} + \frac{1}{4} = \frac{3}{8}$	$R = 2$	1	total = $\frac{8}{3}$ ( $\Omega$ ) or 2.67 ( $\Omega$ ) allow 2.6 or 2.66 or 2.7 or $2 \frac{2}{3}$	total = $4 + 2 = 6$ ( $\Omega$ )	1	
<b>A</b>	<b>B</b>													
$4 + 4 = \underline{8}$	$\frac{1}{4} + \frac{1}{4} = \underline{\frac{1}{2}}$	1												
$\frac{1}{8} + \frac{1}{4} = \frac{3}{8}$	$R = 2$	1												
total = $\frac{8}{3}$ ( $\Omega$ ) or 2.67 ( $\Omega$ ) allow 2.6 or 2.66 or 2.7 or $2 \frac{2}{3}$	total = $4 + 2 = 6$ ( $\Omega$ )	1												
	<p><b>Note</b></p> <ul style="list-style-type: none"> <li>- No UP</li> <li>- <u>A or B</u> correct scores 2</li> <li>- <b>A and B</b> correct scores 3</li> <li>- If neither <b>A</b> nor <b>B</b> is correct but the top line is correct for <u>either</u> <b>A</b> or <b>B</b> (8 or <math>\frac{1}{2}</math> seen) scores 1</li> </ul>	(3)												

Question Number	Answer	Mark
7(c)(ii)	<ul style="list-style-type: none"><li>• A</li></ul>	1 (1)

(Total 7 marks)

Question Number	Answer	Mark
8(a)(i)	<ul style="list-style-type: none"> <li>line with arrow going N to S</li> </ul> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>line may be straight or curved</li> <li>line must be seen both above and below wheel</li> <li>length of line must be greater than half <b>SN</b> distance</li> <li>line may be invisible where passing through wheel</li> <li>additional lines must not cross or have an arrow pointing S to N</li> </ul>	<p>1</p> <p>(1)</p>

Question Number	Answer	Mark
8(a)(ii)	<ul style="list-style-type: none"> <li>(lines) of flux / magnetic field (lines) are cut</li> <li>voltage/emf / current <u>induced</u></li> <li>metal is conductor</li> </ul>	<p>1</p> <p>1</p> <p>1</p> <p>(3)</p>

Question Number	Answer	Mark
8(b)	<ul style="list-style-type: none"> <li>any part slopes downwards</li> <li>correct curvature throughout</li> </ul> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>graph consisting of two straight lines sloping downwards scores 1<sup>st</sup> mark</li> </ul>	<p>1</p> <p>1</p> <p>(2)</p>

Question Number	Answer	Mark
8(c)(i)	Yes	<p>1</p> <p>(1)</p>

Question Number	Answer	Mark
8(c)(ii)	<ul style="list-style-type: none"> <li>electrical or kinetic energy to heat / internal energy <b>dop</b></li> </ul> <p><i>allow</i> 'when a current flows heat is produced' / 'current heats up'</p> <p><i>ignore</i> 'friction'</p>	<p>1</p> <p>(1)</p>

(Total 8 marks)

Question Number	Answer	Mark						
9(a)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>proton</td> <td>1800 - 2000</td> <td>1 or +1</td> </tr> <tr> <td>neutron</td> <td>1800 - 2000</td> <td>0 or zero or no charge or neutral</td> </tr> </table> <ul style="list-style-type: none"> <li>• both charges correct</li> <li>• both masses correct</li> </ul>	proton	1800 - 2000	1 or +1	neutron	1800 - 2000	0 or zero or no charge or neutral	1 1 <b>(2)</b>
proton	1800 - 2000	1 or +1						
neutron	1800 - 2000	0 or zero or no charge or neutral						

Question Number	Answer	Mark
9(b)	<ul style="list-style-type: none"> <li>• gamma (rays) / <math>\gamma</math> / X-rays / X /ultra violet/UV / gama</li> </ul>	1 <b>(1)</b>

Question Number	Answer	Mark
9(c)(i)	<ul style="list-style-type: none"> <li>• electron</li> </ul>	1 <b>(1)</b>

Question Number	Answer	Mark
9(c)(ii)	<ul style="list-style-type: none"> <li>• greatest charge: mass ratio or smallest mass /size or smaller mass/size      <b>ora</b></li> </ul> <p style="text-align: center;"><b>Note</b></p> <p><i>independent of (i)</i> i.e 'protons(or neutrons) because they have least mass' scores the mark</p>	1 <b>(1)</b>

**(Total 5 marks)**

Question Number	Answer	Mark
10(a)(i)	<ul style="list-style-type: none"> <li>• diffraction</li> </ul> <p><b>Notes</b> <i>Allow</i></p> <ul style="list-style-type: none"> <li>- diffraction</li> <li>- defraction</li> <li>- deffraction</li> </ul>	<p>1</p> <p>(1)</p>

Question Number	Answer	Mark
10(a)(ii)	<ul style="list-style-type: none"> <li>• wavelength and gap of similar size /wavelength larger than gap <b>ora</b></li> </ul>	<p>1</p> <p>(1)</p>

Question Number	Answer	Mark
10(b)(i)	<ul style="list-style-type: none"> <li>• <math>300\,000\,000 = f \times 0.060</math></li> <li>• <math>f = 5\,000\,000\,000 \text{ Hz or } s^{-1} \text{ or } 5 \times 10^9 \text{ Hz or } s^{-1}</math></li> </ul> <p><b>UP</b></p>	<p>1</p> <p>1</p> <p>(2)</p>

Question Number	Answer	Mark
10(b)(ii)	<ul style="list-style-type: none"> <li>• wavelength small(er)/gap bigger than wavelength/frequency high(er)</li> </ul>	<p>1</p> <p>(1)</p>

**(Total 5 marks)**

Question Number	Answer	Mark
11(a)(i)	<ul style="list-style-type: none"> <li>• through centre of lens</li> <li>• parallel to principal axis to LL then through principal focus</li> </ul> <p><b>Notes</b></p> <ul style="list-style-type: none"> <li>• allow any correctly drawn ray from any part of object to corresponding part of image</li> </ul> <p><i>ignore</i></p> <ul style="list-style-type: none"> <li>- arrows</li> <li>- further rays</li> <li>- rays along principal axis</li> <li>- drawn outline of lens</li> </ul>	<p>1 1</p> <p>(2)</p>
11(a)(ii)	<ul style="list-style-type: none"> <li>• F in appropriate place with evidence e.g. where appropriate ray cuts principal axis</li> </ul>	<p>1</p> <p>(1)</p>

Question Number	Answer	Mark
11(a)(iii)	<ul style="list-style-type: none"> <li>• real</li> </ul>	<p>1</p> <p>(1)</p>

Question Number	Answer	Mark
11(b)(i)	<ul style="list-style-type: none"> <li>• The size of the image is less than before</li> </ul>	<p>1</p> <p>(1)</p>

Question Number	Answer	Mark
11(b)(ii)	<ul style="list-style-type: none"> <li>• real</li> </ul>	<p>1</p> <p>(1)</p>

(Total 6 marks)

TOTAL FOR PAPER: 70 MARKS