



SECTION A		40 MARKS	
Question	Answer	Marks	Additional Guidelines
1 a) (i)	Correct drawing of normal	1	
1 a) (ii)	Correct drawing of reflected ray	1	
1 b)	Correct labelling of angles	2	
1 c)	Correct position of image	1	
1 d) (i)	equal to	1	
1 d) (ii)	virtual	1	
1 d) (iii)	cannot	1	

2 a)	16 m/s	1	Accept '16'
2 b)	40 s	1	
2 c)	0.4 m/s <sup>2</sup>	2	Accept '0.4'
2 d)	Correct working	3	1 mark for using area under graph 2 marks for correct working
2 e)	Newton's first law	1	Accept 'law of inertia'

3 a)	<ul style="list-style-type: none"> <li>• series</li> <li>• incomplete</li> </ul>	1	Accept 'broken, cut, open'
3 b) (i)	5 Ω	1	Accept '5'
3 b) (ii)	2.4 A	1	Accept '2.4'
3 b) (iii)	7.2 V	1	Accept '7.2'
3 c) (i)	Circuit showing lamps connected in parallel	2	
3 c) (ii)	parallel	1	

4 a)	0	1	
4 b)	32,000 m/s <sup>2</sup>	2	Deduct 1 mark for missing or incorrect unit
4 c) (i)	3.6 kgm/s	2	Deduct 1 mark for missing or incorrect unit
4 c) (ii)	0.0025 s	3	1 mark for use of correct equation Accept '0.0025'

5 a) (i)	longitudinal	1	
5 a) (ii)	parallel	1	
5 a) (iii)	does not depend	1	
5 a) (iv)	reflected	1	
5 b)	0.8 s	2	Give 1 mark only if answer is 0.4s Accept '0.8'
5 c)	170 m	2	Accept '170'

<b>SECTION B</b>		<b>45 MARKS</b>	
<b>6 a) (i)</b>	cells ammeter thermistor thermometer	<b>1</b> <b>1</b> <b>1</b> <b>1</b>	Accept 'batteries'
<b>6 a) (ii)</b>	decreases	<b>1</b>	
<b>6 a) (iii)</b>	Voltmeter	<b>1</b>	
<b>6 a) (iv)</b>	2 1 3	<b>1</b> <b>1</b> <b>1</b>	
<b>6 b)</b>	Correct drawing	<b>6</b>	1 mark for correct labelling of axes 1 mark for graph title 2 marks for correct plotting of graph 1 mark for drawing a correct curve 1 mark for correct size of graph

<b>7 a) (i)</b>	Speed decreases from air to glass	<b>1</b>	
<b>7 a) (ii)</b>	Correct drawing	<b>2</b>	
<b>7 a) (iii)</b>	Total internal reflection	<b>1</b>	
<b>7 a) (iv)</b>	Any relevant use such as in endoscopy, etc.	<b>1</b>	
<b>7 b) (i)</b>	Correct drawing	<b>3</b>	1 mark for correct drawing of each ray 1 mark for arrow signs
<b>7 b) (ii)</b>	Correct drawing	<b>1</b>	
<b>7 b) (iii)</b>	$4 \pm 0.2$ cm	<b>1</b>	
<b>7 b) (iv)</b>	real, inverted, magnified	<b>1,1,1</b>	
<b>7 b) (v)</b>	$m = 2 \pm 2$	<b>2</b>	

<b>8 a) (i)</b>	• 0.12 kgm/s • 0 kgm/s	<b>2</b> <b>1</b>	
<b>8 a) (ii)</b>	0.12 kgm/s	<b>1</b>	
<b>8 a) (iii)</b>	0.12 kgm/s	<b>1</b>	
<b>8 a) (iv)</b>	0.4 m/s	<b>3</b>	
<b>8 b) (i)</b>	Seat belts / crumple zones	<b>1</b>	Any suitable safety feature
<b>8 b) (ii)</b>	Seat belts restrict a person from moving forward by inertia / help to increase the time of impact Crumple zones help to spread out the impact of a collision force over a certain time	<b>2</b>	Any one
<b>8 c) (i)</b>	- 800 N	<b>3</b>	1 mark for inserting correct values for m, v, u and t 1 mark if answer is 800 N
<b>8 c) (ii)</b>	Decrease	<b>1</b>	

**Please Note:** When marking questions that involve calculations, apply the 'follow through' rule. This means that when a student gives a wrong value for part (a) of a question and then uses the value of (a) in the subsequent calculations, marks should be deducted for part (a) only but allocated for the subsequent parts if these are correct.