



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 ²	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"> • series • incomplete 	1 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 m/s	1	
4 b)	32,000 m/s ²	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'
SECTION B		45 MARKS	
6 a) (i)	X – ammeter	1	
	Y – voltmeter	1	

6 a) (ii)	Thermometer	1	
6 a) (iii)	1. Circuit is switched on 2. Water is heated until it reaches 60°C 3. Voltage is noted on voltmeter 4. Current is noted on ammeter 5. $R = V/I$ is used	5	1 mark 1 mark 1 mark 1 mark 1 mark
6 a) (iv)	Water is stirred to ensure a uniform temperature throughout the water	1	Accept any other suitable precaution
6 b) (i)	Correct drawing	5	1 mark for correct labelling of axes 1 mark for graph title 1 mark for correct plotting of graph 1 mark for drawing a correct curve 1 mark for correct size of graph
6 b) (ii)	440 Ω	1	440 $\pm 10 \Omega$
7 a) (i)	<ul style="list-style-type: none"> 0.1575 kgm/s 0.1575 kgm/s 	2 2	Accept '0.16 kgm/s'
7 a) (ii)	Yes because the total momentum before is equal to the total momentum after.	1 1	Give no marks if answers in a(i) are missing or incorrect
7 a) (iii)	Friction	1	Accept 'air resistance'
7 b) (i)	0 kgm/s Both gliders are at rest	1 1	Accept '0'
7 b) (ii)	0 kgm/s Total momentum of gliders after collision is equal to total momentum before collision	1 1	Accept '0'
7 b) (iii)	3 m/s	2	Give 1 mark for using negative momentum to indicate different directions of glider
7 b) (iv)	Action Reaction	1 1	
8 a) (i)	The speed of light decreases	1	
8 a) (ii)	Correct drawing	2	
8 a) (iii)	Total internal reflection	1	
8 a) (iv)	<ul style="list-style-type: none"> Critical angle has to be exceeded Occurs in the denser of the two media 	1 1	
8 a) (v)	Any relevant application	1	
8 b) (i)	Correct drawing	4	1 mark for correct position of focus 1 mark for correct drawing of two rays 1 mark for arrow signs 1 mark for correct location of image
8 b) (ii)	real, inverted, enlarged	1,1,1	
8 b) (iii)	magnification = 3 ± 0.2	1	

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.