

Eduqas Physics GCSE
Topic 4.3: Safety in
public transport
Mark Schemes for
Questions by topic

1.

Question			Answer / Explanatory Notes	Marks Available
3.			<p>Indicative content: The advantage is that the time taken for the given journey is reduced from 4 h to 3.5 h with the increase in speed. The disadvantage is that in the event of an emergency stop being necessary, the total stopping distance is increased from 96 m to 121.5 m, increasing risk of serious injury or death. Relevant factors clearly explained, e.g. tiredness, related to time or speed / separation from vehicle in front. Increased momentum at higher speed related to increased force on vehicle and occupants in the event of a collision.</p> <p>5 - 6 marks The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</p> <p>3 – 4 marks The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</p> <p>1 – 2 marks The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</p> <p>0 marks The candidate does not make any attempt or give a relevant answer worthy of credit.</p>	6
			Question total	[6]

2.

Mark	Answer	Accept	Neutral answer	Do not accept
6	<p>Indicative content: If the vehicle is travelling faster then the thinking distance is increased and the braking distance is also increased. This means that the overall stopping distance is greater (or the converse for a vehicle travelling more slowly). If the brakes are worn (or poor road surface conditions) the thinking distance is unaffected but the braking distance is increased. This again leads to an increased stopping distance (or the converse for new brakes). If the driver has drunk alcohol or is tired the reaction time is bigger and so the thinking distance is greater. Although the braking distance is unaffected the overall stopping distance is greater.</p> <p>5-6 marks The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</p> <p>3-4 marks The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</p> <p>1-2 marks The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</p> <p>0 marks The candidate does not make any attempt or give a relevant answer worthy of credit.</p>			

3.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)	1	15			
	(ii)	1	36 [m]			
	(iii)	2	Increases [distance] (1) because it travels further in the <u>same time</u> (1) The 1st mark must be linked to the 2nd mark.	Thinking <u>time is the same</u> (1) so distance increases (1) / Thinking distance and overall stopping distance increase (1)		Takes you longer to think / Thinking distance and braking distance increase
(b)		2	<u>Thinking</u> distance increases (1) <u>braking</u> distance unchanged (1)	Both distances increase / The data increases (1)	Stopping distance References to time Ignore any reasoning References to overall stopping distance	
(c)		3	$2 \times 40 = 80$ (1) <u>80ecf</u> (1) $\frac{80}{31}$ $= 2.58$ [s] or 2.6 [s] (1)	$\frac{40}{31} = 1.29$ (2) $\frac{80}{70}$ (1) [=1.14] Any number divided by 31 award 1 mark only 2.5 [s] on its own award 2 marks		$\frac{40}{70} = 0.57$
(d)		2	Overall stopping distance <u>is 96 m</u> (1) which is <u>more than 80 m / 16 m more / more than 2 gaps</u> (1) The 1st mark must be linked to the 2nd mark.	which is more than 40 m / more than a gap (1)	Reference to braking distance	
Total		11				

4.

Question	Answer	Marks	Guidance
3	<p>[Level 3] Detailed explanation of cause of collision injury AND explains actions of seat belts and air bags. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Simple explanation of cause of collision injury AND explains action of either seat belts or of air bags. Detailed explanation of cause of collision injury without action of either seat belt or air bag max 3 marks. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Description of collision OR explains action of seat belts OR explains action of air bags. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to A* Indicative scientific points may include:</p> <p>Detailed explanations of cause of collision injury</p> <ul style="list-style-type: none"> • Use of work done = force x distance • Use of change of momentum = force x time • Longer time causes smaller force, related to change in momentum <p>Simple explanation of cause of collision injury</p> <ul style="list-style-type: none"> • passenger has momentum in moving car • force from car reduces passenger momentum • passenger injured by force if big enough • Longer time causes smaller force <p>Description of collision</p> <ul style="list-style-type: none"> • passenger stopped/injured by car dashboard/windscreen • car stops suddenly <p>Seatbelt</p> <ul style="list-style-type: none"> • provides force to stop passenger • stretches during collision • increasing time for slowing down passenger • reducing force on passenger • because force = momentum change/time <p>Airbag</p> <ul style="list-style-type: none"> • expands suddenly at collision • provides force to stop passenger • collapses slowly / cushioning • increasing time for slowing down passenger • reducing force on passenger • because force = momentum change/time <p>Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.</p>
Total		6	

5.

Question number	Answer	Notes	Marks
7 (a)	Any 2 from air bags; side impact beams/bars; crumple zones /collapsible bumpers; collapsible steering column /wheel;	Allow references to strong / laminated / safety glass ignore unqualified bumpers	2
(b) (i)	Any four from MP1. same momentum change (with or without a seatbelt); MP2. (but) time of impact increases; MP3. (which) reduces rate of momentum change; MP4. (therefore) reducing the (average) force; MP5. the seat belt stretches (during collision); MP6. (which) increases the area over which the force acts; MP7. (hence) pressure on body reduces;	Ignore • references to momentum reducing • word equation	4
(b) (ii)	A sensible suggestion; e.g. there is a higher momentum (transfer in collision) there is a larger force during impact straps have a greater area over which force acts larger area of straps reduces the pressure		1

(c)	Momentum (of car and dummy) reduces to <u>zero</u> ; OR All momentum is absorbed by the Earth;		1
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