CAMBRIDGE INTERNATIONAL A LEVEL • PHYSICS 9702

Topical Questions

Unit 12: Circular Motion

Past Papers 2021 – 2025

MARK SCHEME 2 Questions

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Question 1 — Mark Scheme

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Question	Answer	Marks
1(a)	constant speed **or** constant magnitude of velocity	**B1**
	acceleration (always) perpendicular to velocity	**B1**
1(b)(i)	$F = mv^2 / r$ **or** $v = r\omega$ **and** $F = mr\omega^2$	**C1**
	$F = 790 \times 94^2 / 318$ $= 22\,000$ N	**A1**
1(b)(ii)	centripetal acceleration: same	**B1**
	maximum speed: greater	**B1**
	time taken for one lap of the track: greater	**B1**

Question 2 — Mark Scheme

Question	Answer	Marks
1(a)	acceleration perpendicular to velocity	**B1**
1(b)(i)	decreases	**B1**
1(b)(ii)	(acceleration of) $9.8\,m\,s^{-2}$ is caused by weight of car **or** centripetal force must be greater than weight of car	**B1**
	(acceleration > $9.8\,m\,s^{-2}$) requires contact force from track **or** (centripetal force > weight) requires contact force from track	**B1**
1(c)	$\frac{1}{2}mv_Y^2 = \frac{1}{2}mv_X^2 - mgh$	**C1**
	$a = v^2 / r$	**C1**
	$v_Y^2 = 3.8^2 - 2 \times 9.81 \times 0.62$ so $v_Y = 1.5\,m\,s^{-1}$ $a = 1.5^2 / 0.31 = 7.3\,m\,s^{-2}$ (which is less than $9.8\,m\,s^{-2}$) so no	**A1**
	or	
	$v_Y = \sqrt{(9.81 \times 0.31)} = 1.74\,m\,s^{-1}$ so $v_X^2 = 1.74^2 + 2 \times 9.81 \times 0.62$ $v_X = 3.9\,m\,s^{-1}$ (which is greater than $3.8\,m\,s^{-1}$) so no	**(A1)**
1(d)	acceleration is independent of mass so makes no difference **or** mass cancels in the equation so makes no difference	**B1**

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