CAMBRIDGE INTERNATIONAL A LEVEL • PHYSICS 9702

Topical Questions

Unit 12: Circular Motion

Past Papers 2021 – 2025

QUESTION PAPER 2 Questions

Prepared by

Waseem Ahmad

A Level Physics Teacher

Author of ***Practical Mastery: Cambridge 9702 Paper 3***

www.examspath.com

Question 1

(a) With reference to velocity and acceleration, describe uniform circular motion.

.....

.....

..... [2]

(b) Two cars are moving around a horizontal circular track. One car follows path X and the other follows path Y, as shown in Fig. 1.1.

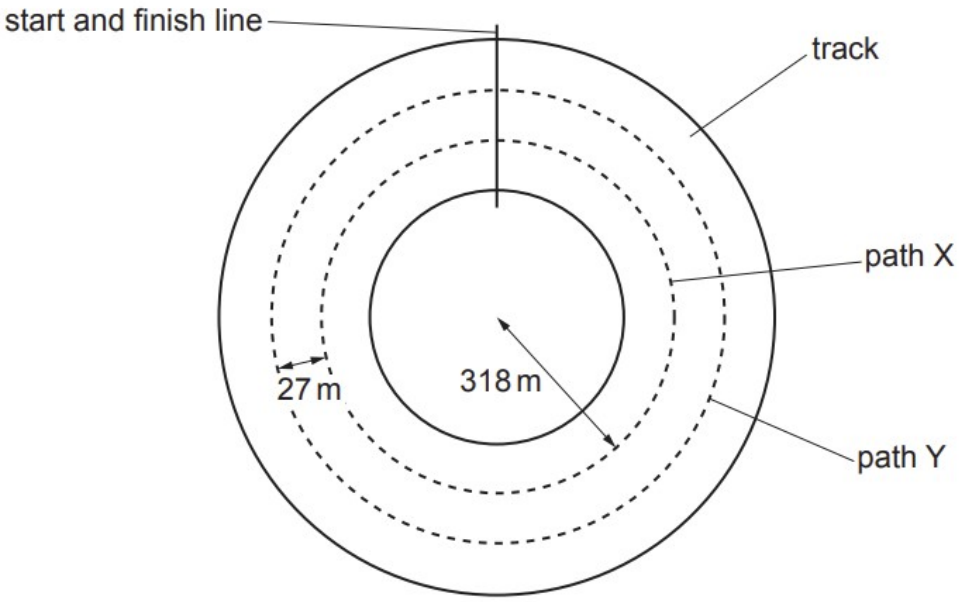


Fig. 1.1 (not to scale)

The radius of path X is 318 m. Path Y is parallel to, and 27 m outside, path X. Both cars have mass 790 kg. The maximum lateral (sideways) friction force F that the cars can experience without sliding is the same for both cars.

(i) The maximum speed at which the car on path X can move around the track without sliding is 94 m s^{-1}.

Calculate F.

F = ... N [2]

(ii) Both cars move around the track. Each car has the maximum speed at which it can move without sliding.

Complete Table 1.1, by placing one tick in each row, to indicate how the quantities indicated for the car on path Y compare with the car on path X.

Table 1.1

	Y less than X	Y same as X	Y greater than X
centripetal acceleration			
maximum speed			
time taken for one lap of the track			

[3]

[Total: 7]

Question 2

(a) State what is meant by *centripetal* acceleration.

.....

.....

..... [1]

(b) An unpowered toy car moves freely along a smooth track that is initially horizontal. The track contains a vertical circular loop around which the car travels, as shown in Fig. 1.1.

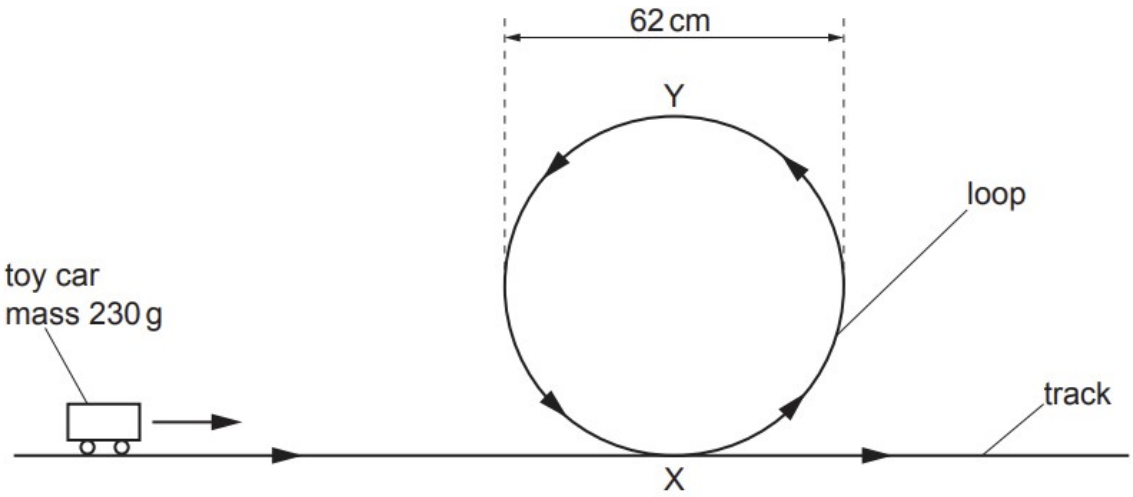


Fig. 1.1

The mass of the car is 230 g and the diameter of the loop is 62 cm. Assume that the resistive forces acting on the car are negligible.

(i) State what happens to the magnitude of the centripetal acceleration of the car as it moves around the loop from X to Y.

..... [1]

(ii) Explain, if the car remains in contact with the track, why the centripetal acceleration of the car at point Y must be greater than 9.8 m s^{-2}.

.....

.....

..... [2]

(c) The initial speed at which the car in **(b)** moves along the track is $3.8\,m\,s^{-1}$.

Determine whether the car is in contact with the track at point Y. Show your working.

[3]

(d) Suggest, with a reason but without calculation, whether your conclusion in **(c)** would be different for a car of mass 460 g moving with the same initial speed.

.....

.....

..... [1]

[Total: 8]

End of Question Paper • Waseem Ahmad, A Level Physics Teacher • examspath.com