

- 1 (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.

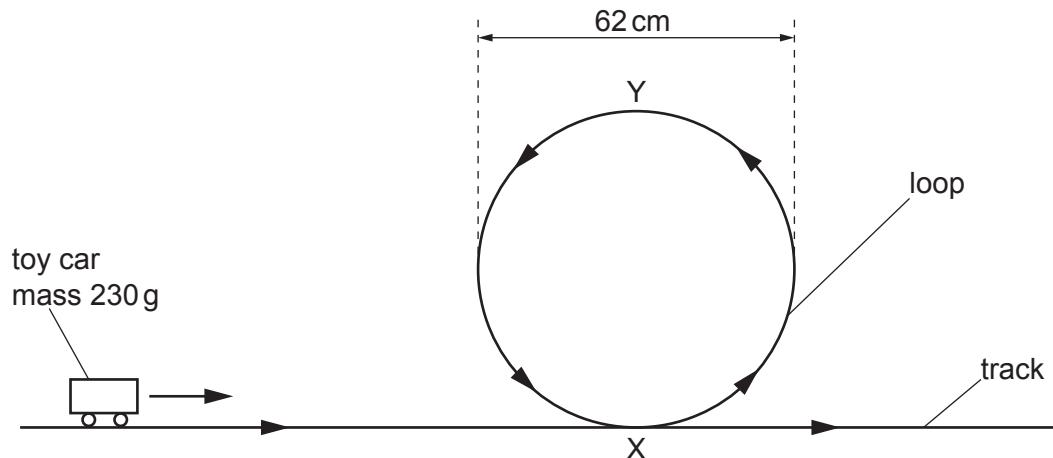


Fig. 1.1

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  $9.8 \text{ ms}^{-2}$ .

.....  
.....  
..... [2]

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

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]