4.

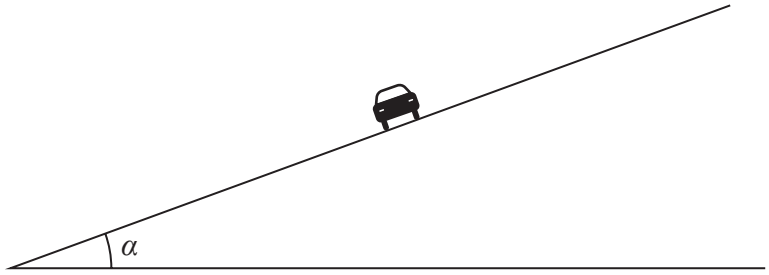


Figure 4

A car is travelling round a circular track. The track is **banked** at an angle α to the horizontal, as shown in Figure 4.

The car and driver are modelled as a particle.

The car moves round the track with constant speed in a horizontal circle of radius r.

When the car is moving with speed $\frac{1}{2}\sqrt{gr}$ round the circle, there is **no** sideways friction between the tyres of the car and the track.

(a) Show that $\tan\alpha = \frac{1}{4}$

(5)

The sideways friction between the tyres of the car and the track has coefficient of friction μ, where $\mu < 4$

The maximum speed at which the car can move round the circle without slipping sideways is V.

(b) Find V in terms of μ, r and g.

(7)

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Question 4 continued

(Total for Question 4 is 12 marks)