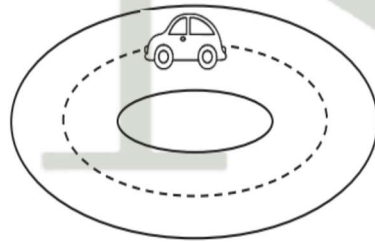


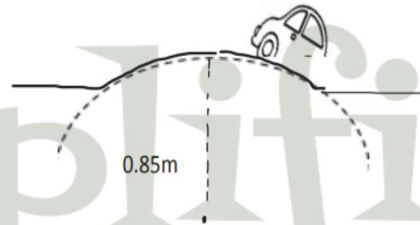
6. An object of mass 0.5kg is rotated in a horizontal circle by a string in 1m long. The maximum tension in the string before it breaks is 50N . What is the greatest number of revolutions per second of the object? [Ans: $1.6 \frac{\text{rev}}{\text{s}}$]
7. A stone with mass 0.8kg is attached to one end of a string 0.9m long. The string will break if its tension exceeds 600N . The stone is whirled in a horizontal circle, and the other end of the string remains fixed. Find the maximum speed, the stone can attain without breaking string. [Ans: $0.75 \frac{\text{rev}}{\text{s}}$]
8. A mass of 0.2kg is rotated by a string at a constant speed in a vertical circle of radius 1m . If the minimum tension in the string is 3N , calculate the magnitude of the speed and the maximum tension in the string. [Ans: 5m/s , 7N]
9. At what angle should a circular road be banked so that a car running at 50km/hr be safe to go round the circular turn of 200m radius? [Ans: 5.5°]
10. A stone is rotated steadily in a horizontal circle with a period T by a string of length l . If the tension in the string is constant and l increases by 1% , find the percentage change in T . [Ans: 0.5%]

Exam Style Questions:

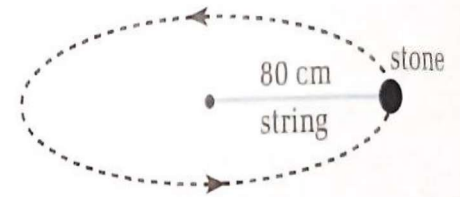
1. A boy is operating a remote-controlled toy car on a horizontal circular track, as shown in The track has a radius of 1.8m and the car travels around the track with a constant speed.



- a. Explain why the car is accelerating, even though it is travelling at a constant speed.
- b. The car has a mass of 0.50kg . The boy now increases the speed of the car to 6.0m/s . The total radial friction between the car and the track has a maximum value of 7.0N . Show by calculation that the car cannot continue to travel in a circular path.
- c. The car is now placed on a track, which includes a raised section. This is shown in The raised section of the track can be considered as the arc of a circle, which has radius r of 0.85m . The car will lose contact with the raised section of track if its speed is greater than v_{max} . Show that v_{max} is given by the relationship $v_{\text{max}} = \sqrt{rg}$



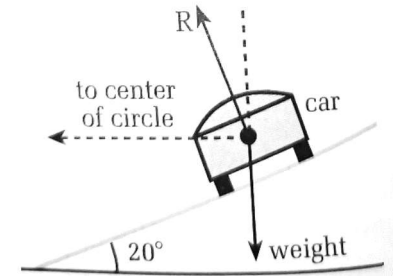
2. The diagram shows a stone tied to the end of the length of the string. It is whirled round in a horizontal circle of radius 80cm . The stone has a mass of 90g and it completes 10 revolutions in a time of 8.2s .



- a. Calculate,
 - i. The time taken for one revolution. [0.82sec]
 - ii. The distance travelled by the stone during one revolution (this distance is equal to the circumference of the circle). [5.03m]
 - iii. The speed of the stone as it travels in the circle. [6.13ms⁻¹]
 - iv. The centripetal acceleration of the stone. [47ms⁻²]
 - v. The centripetal force on the stone. [4.2N]

- b. What provides the centripetal force on the stone?
- c. What is the angle between the acceleration of the stone and its velocity?

3. A car mass 820kg travels at a constant speed of 32ms^{-1} along a banked track. The track is banked at an angle of 20° to the horizontal.



- a. The net vertical force on the car is zero. Use this to show that the contact force R on the car is 8.56kN .
- b. Use the answer from (a) to calculate the radius of the circle described by the car. [Ans: 287m]
- c. Write the one application of the banking of road and write its significance.