2.3 - Uniform Circular Motion

PJ Gibson - Peace Corps Tanzania

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- (2000) Show that the period of a body of mass m revolving in a horizontal circle with constant velocity v at the end of a string of length l is independent of the mass of the object.
- (2000) A ball of mass 100 g is attached to the end of a string and is swung in a circle of radius 100 cm at a constant velocity of 200 cm/s. While in motion the string is shortened to 50 cm. Calculate:
  - The new velocity of the motion.
  - The new period of the motion.
- (2000) A car travels over a humpback bridge of radius of curvature 45 m. Calculate the maximum speed of the car if the wheels are to remain in contact with the bridge.
- (2007) What is meant by centripetal force?
- (2007) Derive the expression $a = (v^2/r)$ where a, v, and r stands for the centripetal acceleration, linear velocity and radius of a circular path respectively.
- (2007) A ball of mass 0.5 kg attached to a light inextensible string rotates in a vertical circle of radius 0.75 m such that it has a speed of 5 m/s when the string is horizontal. Calculate:
  - The speed of the ball and the tension in the string at the lowest point of its circular path.
- (2010) What is the origin of centripetal force for:
  - A satellite orbiting around the Earth.
  - An electron in the hydrogen atom?
- (2010) A small mass of 0.15 kg is suspended from a fixed point by a thread of a fixed length. The mass is given a push so that it moves along a circular path of radius 1.82 m in a horizontal plane at a Steady speed, taking 18.0 s to make 10 complete revolutions. Calculate:
  - The speed of the small mass.
  - The centripetal acceleration.
  - The tension in the thread.
- (2013) Why is it technically advised to bank a road at corners?
- (2013) A wheel rotates at a constant rate of 10 revolutions per second. Calculate the centripetal acceleration at a distance of 0.80 m from the centre of the wheel.

- (2014) Define the term radial acceleration.
- (2015) Mention three effects of looping the loop.
  - Why there must be a force acting on a particle moving with uniform speed in a circular path? Write down an expression for its magnitude.
- (2015) A driver negotiating a sharp bend usually tend to reduce the speed of the car.
  - What provides the centripetal force on the car?
  - Why is it necessary to reduce its speed?
- (2015) A ball of mass 0.5 kg is attached to the end of a cord whose length is 1.5 m then whirled in horizontal circle. If the cord can withstand a maximum tension of 50 N calculate the:
  - Maximum speed the ball can have before the cord breaks.
  - Tension in the cord if the ball speed is 5 m/s
- (2015) Define the term tangential velocity.
- (2016) A boy ties a string around a stone of mass 0.15 kg and then whirls it in a horizontal circle at constant speed. If the period of rotation of the stone is 0.4 sec and the length between the stone and boys hand is 0.50 m ;
  - Calculate the tension in the string.
  - State one assumption taken to reach the answer above.
- (2017) A car is moving with a speed of 30 m/s on a circular track of radius 500 m. If its speed is increasing at the rate of 2 m/s, find its resultant linear acceleration.
- (2017) An object of mass 1 kg is attached to the lower end of a string 1 m long whose upper end is fixed and made to rotate in a horizontal circle of radius 0.6 m. If the circular speed of the mass is constant, find the:
  - Tension in the string.
  - Period of motion.
- (2019) In which aspect does circular motion differ from linear motion?
- (2019) Why there must be a force acting on a particle moving with uniform speed in a circular path?
- (2019) A stone tied to the end of string 80 cm long, is whirled in a horizontal circle with a constant speed making 25 revolutions in 14 seconds. Determine the magnitude of its acceleration.