

Workbook



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Angular Momentum

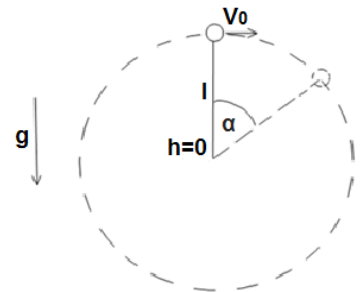
Equation and Laws Conservation

Questions

1) Ball Rotating.

A ball of mass m is attached to a string of length l and is rotating in a circle perpendicular to the ground. The velocity of the ball at its maximum height is v_0 .

- Find the torque acting on the ball as a function of the angle α .
- Find the angular momentum of the ball as a function of α .



2) Ball in a Cone.

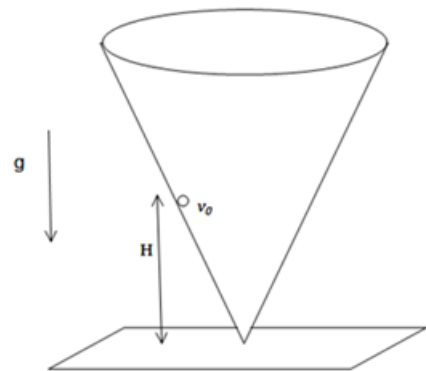
A small ball rolls through a cone which is attached to the ground via its tip. The initial velocity of the ball is v_0 in the horizontal direction tangent to the side of the cone.

The initial height of the ball is H .

Find the maximum height which the ball will reach.

The cone is stationary.

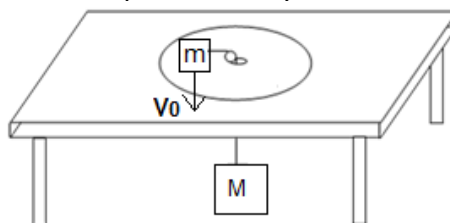
A cubic equation will be accepted as an answer.



3) Ball Attached to Hanging Mass.

A mass m moves on a frictionless table. The mass is attached via a string of length L , which is threaded through the center of the table, to another mass M which hangs in the air. At $t = 0$ mass M is at rest and mass m is a distance R from the center of the table, travelling at v_0 tangent to the radius.

Write an equation for the conservation of energy and angular momentum and find the differential equation which is dependent only on the size r .

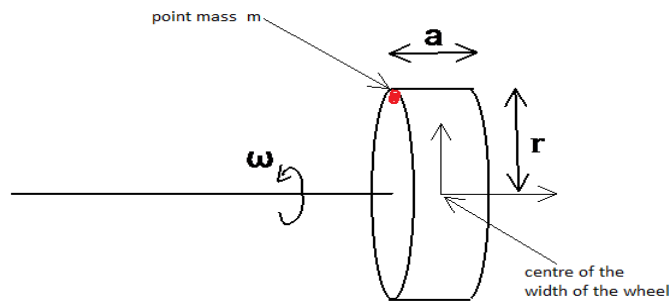


End of Chapter Questions

4) Point on Wheel.

A wheel of radius R spins with a constant angular velocity, ω .
 The wheel has width a . The origin is at the centre of the width of the wheel.
 A point mass, m , is attached to the top of the wheel (see diagram)
 and rotates with the wheel.

- a. Show that the angular velocity of the mass is dependent on time.
- b. Show that the change in angular momentum is given by the moment of force of the centrifugal force.



5) Rod Rotates at an Angle.

A rod of length L and mass M rests at angle θ° relative to the z -axis.
 The rod rotates about the z -axis at a constant angular momentum ω .
 What moment of force is acting on the rod?

