

A penny is placed 0.2-m from the center of record player which is initially not rotating. When the record player is turned on, it accelerates angularly at a rate of 0.75 rad/s^2 . The moment of inertia of the record player is 0.045 kgm^2 . You can ignore the mass of the penny for its effects on the value of the moment of inertia of the system.

a) Determine the net torque acting on the record player.

b) Determine the linear velocity of the penny after 4 seconds.

c) A group of students conduct an experiment to determine the coefficient of friction between the penny and the record player by measuring the time it takes the penny to fly off the record player. Use their data and calculate the value of the coefficient of friction between the penny and the record player.

Trial	Time to fly off (s)
1	7.7
2	5.4
3	8.0
4	7.6
5	7.9

d) The students wish to increase the time it takes for the penny to fly off the record player. Which of the following changes will result in an increased time before the penny flies off...(choose all that apply)

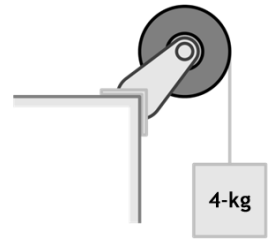
____(i) move the penny closer to the center of the record player

____(ii) decrease the coefficient of friction between the penny and the record player

____(iii) glue two pennies together

____(iv) apply a small torque to the record player in the opposite direction its rotation

A solid pulley ($I = \frac{1}{2}Mr^2$) of mass 0.5-kg and radius 0.25m can rotate without friction on a fixed axis. A massless-string is wrapped around its circumference and is attached to a mass of 4kg. The string does not slip.



a) What is the tension in the cord while the mass is falling?

b) The mass is released from rest. After 3 seconds has passed...

(i) What is the angular velocity of the pulley?

(ii) What is the rotational kinetic energy of the pulley?

c) Which of the following changes could be made in order to decrease the acceleration of the box? Choose all that apply.

____(i) increase the mass of the pulley

____(ii) increase the mass of the block

____(iii) increase the radius of the pulley

____(iv) without changing the mass or radius, change the solid pulley to a hoop

d) Sketch the following graphs.

