Physics 21

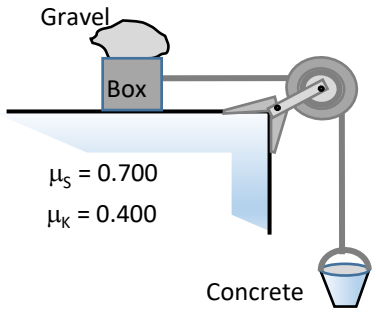
Assignment No. 7 **Chapter 7**

Problem -1

At a construction site, a 65.0 kg bucket of concrete hangs from a light, but strong, cable that passes over a light pulley and is connected to an 80.0 kg box on a horizontal roof. The cable pulls horizontally on the box, and a 50.0 kg bag of gravel rests on top of the box. The coefficients of friction between the box anf the roof are shown.

a) Find the friction force on the bag of gravel and on the box.

b) Suddenly a worker picks up the bag of gravel. Uae energy conservation to find the speed of the bucket after it has descended 2.00 m from rest.

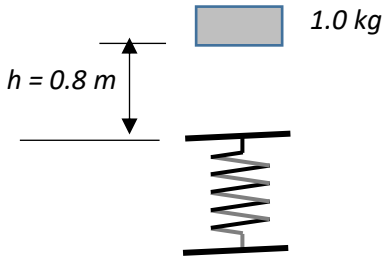


Problem -2

A spring of negligible mass has force constant k = 1600 N/m.

a) How far must the spring be compressed for 3.20 j of potential energy to be stored in it?

b) The spring is placed vertically with one end on the floor. A 1.0-kg book is the droped from a height of 0.80 m above the top of the spring. Find the maximum distance the spring will be compressed.



Problem -3

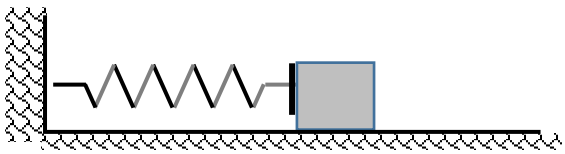
A 2.0-kg piece of wood slides on the surface shown. The curved sides are perfectly smooth, but the rough horizontal bottom is 30 m long and has a kinetic friction coefficient of 0.20 with the wood. The piece of wood starts from rest 4.0 m above the rough bottom.

a) Where will the wood eventually come to rest?

b) For the motion from initial release until the piece of wood comes to rest, what is the total amount of work done by the friction?

Problem -4

A 2.50-kg block on a horizontal floor is attached to a horizontal spring that is initially compressed 0.030 m. The spring has a force constant 840 N/m. The coefficeint of kinetic friction between the floor and the block is 0.40. The block and spring are released from rest and the block slides along the floor. What is the speed of the block when it has moved a disatnce of 0.0200 m from its initial position? (At this point the spring is compressed 0.0100 m.)



Problem -5

In an experiment, one of the forces exerted on a proton is $\underline{\boldsymbol{F}} = -ax^2\underline{\boldsymbol{i}} + by\underline{\boldsymbol{J}}$ where a = 12 N/m^2, and b = 10 N/m.

a) How much work does $\underline{\boldsymbol{F}}$ do when the proton moves along the staright-line path from point (0.10 m,0) to the point (0.10 m, 0.40 m)?
b) along the staright-line path from the point (0.10 m, 0) to the point (0.30 m, 0) ?
c) along the staright-line path from the point (0.30 m, 0) to the point (0.10 m, 0) ?
d) Is the force F conservative? Explain. If $\underline{\boldsymbol{F}}$ is conservative what is the potential-energy function for it? Let U = 0 when x = 0, y = 0
e) along the staright-line path from the point (0.30 m, 0) to the point (0.10 m, 0.4 m) ?

Problem -7

A rock slides from A to B along the inside of a frictionless hemispherical bowl as shown. The mechanical energy is conserved. Why? Ignore air resistance.