This print-out should have 14 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 10.0 points

It takes 2.16 J of work to stretch a Hooke's-law spring 8.09 cm from its unstressed length.

How much the extra work is required to stretch it an additional 15.6 cm? Answer in units of J.

002 (part 1 of 2) 10.0 points

The force required to stretch a Hooke's-law spring varies from 0 N to 51.6 N as we stretch the spring by moving one end 5.88 cm from its unstressed position.

Find the force constant of the spring. Answer in units of N/m.

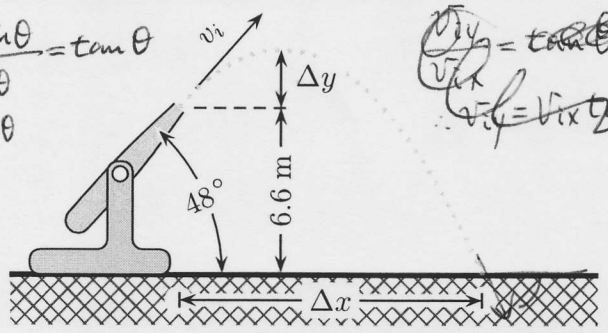
003 (part 2 of 2) 10.0 points

Find the work done in stretching the spring. Answer in units of J.

004 (part 1 of 6) 10.0 points

A projectile of mass 0.425 kg is shot from a cannon, at height 6.6 m, as shown in the figure, with an initial velocity v_i having a horizontal component of 6 m/s.

The projectile rises to a maximum height of Δy above the end of the cannon's barrel and strikes the ground a horizontal distance Δx past the end of the cannon's barrel.



Determine the vertical component of the initial velocity at the end of the cannon's barrel, where the projectile begins its trajectory. The acceleration of gravity is 9.8 m/s^2.

Answer in units of m/s.

005 (part 2 of 6) 10.0 points

Determine the maximum height Δy the projectile achieves after leaving the end of the cannon's barrel. Answer in units of m.

006 (part 3 of 6) 10.0 points

Find the work done by the gravitational force on the projectile during the motion in its trajectory. Answer in units of J.

007 (part 4 of 6) 10.0 points

Find the magnitude of the velocity vector when the projectile hits the ground. Answer in units of m/s.

008 (part 5 of 6) 10.0 points

Find the magnitude of the angle (with repect to horizontal) the projectile makes when impacting the ground. Answer in units of °.

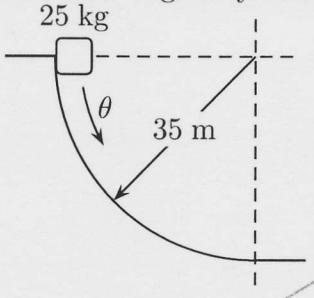
009 (part 6 of 6) 10.0 points

Find the range Δx of the projectile. Answer in units of m.

010 10.0 points

Starting from rest at a height equal to the radius of the circular track, a block of mass 25 kg slides down a quarter circular track under the influence of gravity with friction present (of coefficient μ). The radius of the track is 35 m.

The acceleration of gravity is 9.8 m/s^2.



If the kinetic energy of the block at the bottom of the track is 4500 J, what is the work done against friction? Answer in units of J.

011 10.0 points

A spring with a force constant of 5.2 N/m has a relaxed length of 2.62 m. When a mass is

attached to the end of the spring and allowed to come to rest, the vertical length of the spring is 3.73 m.

Calculate the elastic potential energy stored in the spring. Answer in units of J.

$U_{spring} = \frac{1}{2} k x^2$

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012 (part 1 of 3) 10.0 points

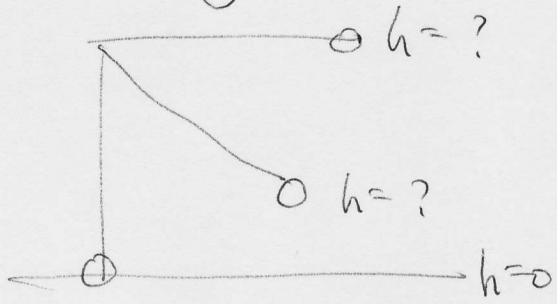
A 40.0 kg child is in a swing that is attached to ropes 2.20 m long.

The acceleration of gravity is 9.81 m/s^2.

Find the gravitational potential energy associated with the child relative to the child's lowest position under the following conditions:

a) when the ropes are horizontal. Answer in units of J.

$U_{gravity} = mgh$



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013 (part 2 of 3) 10.0 points

b) when the ropes make a 33.0° angle with the vertical. Answer in units of J.

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014 (part 3 of 3) 10.0 points

c) at the bottom of the circular arc. Answer in units of J.