مشروع مصر القومي للنهضة العلمية
Egypt's National Project for Scientific Renaissance

مدينة زويـل للعـلوم والتكنـولوجيـا
Zewail City of Science and Technology

ZEWAIL CITY
ESTABLISHED 2000
INAUGURATED 2011

Spring-2018 Phys101
Assignment 12
**Check MateringPhysics for other problems**
Due date: 13 May 2018.

Discussion questions

1- If a pendulum clock is taken to a mountaintop, does it gain or lose time, assuming it is correct at a lower elevation? Explain your answer.

2- For a simple pendulum, clearly distinguish between v (the angular velocity) and v (the angular frequency). Which is constant and which is variable?

3- At what point in the motion of a simple pendulum is the string tension greatest? Least? In each case give the reasoning behind your answer.

4- In designing structures in an earthquake-prone region, how should the natural frequencies of oscillation of a structure relate to typical earthquake frequencies? Why? Should the struc- ture have a large or small amount of damping?

5- A simple pendulum is suspended from the ceiling of a stationary elevator, and the period is determined. Describe the changes, if any, in the period when the elevator (a) accelerates upward, (b) accelerates downward, and (c) moves with constant velocity.

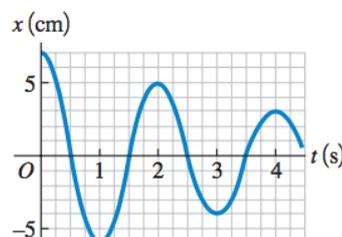Hint: Consider extreme cases such as when the elevator is freely falling with acceleration = g.

Problems

6- A large block P executes horizontal simple harmonic motion as it slides across a frictionless surface with a frequency of f 1.50 Hz. Block B rests on it, as shown below, and the coefficient of static friction between the two is 0.600. What maximum amplitude of oscillation can the system have if block B is not to slip?
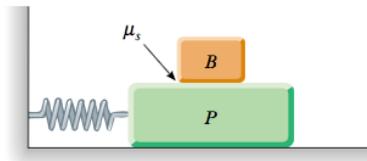

7- A mass is vibrating at the end of a spring of force constant 225 N/m. The figure below shows a graph of its position x as a function of time t.

  (a) At what times is the mass not moving?
  (b) How much energy did this system originally contain?
  (c) How much energy did the system lose between $t = 1.0$ s and $t = 4.0$ s? Where did this energy go?

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8- A pendulum of length L and mass M has a spring of force constant k connected to it at a distance h below its point of suspension. Find the frequency of vibration of the system for small values of the amplitude (small). (Assume that the vertical suspension of length L is rigid, but neglect its mass.)
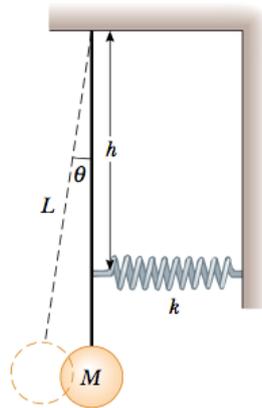
9- A square object of mass *m* is constructed of four identical uniform thin sticks, each of length *L*, attached together. This object is hung on a hook at its upper corner. If it is rotated slightly to the left and then released, at what frequency will it swing back and forth?