Fall 2012	Physics 240: UnTest #3	Name _____

Instructions: You have a total of 55 minutes to complete this test.
Answer each of the following questions completely.

Time Start_____ Time finish_____ Pledged_____

You must supply all details that led to your answer. You must provide correct SI units where required.
Do not discuss any aspect of this test with anyone until I return the test.

(1) [a] A string has a mass attached to one end, thus forming a simple pendulum. It is observed that the pendulum has a period of T=5 s. The same string is fully stretched between two poles and nailed at each end and tension is applied until a wave speed of 100 m/s is obtained. What is the frequency of the lowest lying mode of oscillation on the string?

[b] If a mass of 1 kg is attached to a spring, what would the spring constant need to be in order to produce a period of T=5s?

(2) A mass (m=5 kg) is attached to a spring of spring constant k=250 N/m. At t=0, the mass is moving through the equilibrium position with a speed of 10 m/s.

(a) What is then total energy of the system?

(b) What is the amplitude of oscillation?

(c) What is the period (T) of the oscillation?

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(3) Consider a closed organ pipe of length L=2.5 m. Assuming that the speed of sound is 343 m/s, find the frequencies for the lowest lying 3 modes of oscillation.

(4) Suppose a sphere has a moment of inertia given by $I = \frac{1}{3}mR^2$ about an axis through its center of mass. A force $F = bt$ is applied tangent to the sphere which is initially at rest. After a time t, find the following:

(a) what is the angular acceleration in terms of m, R, b and t?

(b) what is the angular velocity in terms of m, R, b and t?

(c) what is the kinetic energy in terms of m, R, b and t?

(d) what is its angular momentum in terms of R, b, c and t?