This is a practice test for test #3. Although the problems on your test may be similar to these, you are responsible for all the material we have covered.

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.

Although you may use additional sheets of paper which should be turned in with your test, please write (neatly) your answers on the pages where the problems are presented.

(1) An object floats with 25% of its volume submerged in fluid 1 while it floats with 75% of its volume submerged in fluid 2. If fluid 1 is water which has a density of $\rho = 1000 \frac{kg}{m^3}$, what is the density of fluid 2?

(2) A string has a total length of 10 m and a total mass of 0.05 kg. If the string has a tension of 13N applied to it, what is the speed of a transverse wave on this string?

(3) A mass (m=1 kg) is attached to a spring (k=25 N/m) and is at an initial position x_0=0.1m and has an initial velocity v_0=0 m/s. Find: (be sure to provide correct SI units).
(a) the frequency of oscillation, f.
(b) the amplitude.
(c) the energy.

(4) On Mars, where $g_{Mars} = 3.63 \frac{m}{s^2}$, a pendulum has a period of 1 s.
(a) What is the length of the pendulum?
(b) What would be the period of this pendulum on the Earth where $g_{Earth} = 9.8 \frac{m}{s^2}$?

(5) Two piano strings of the same length and the same mass per unit length are vibrating in the first mode of oscillation. The tension in one string is 0.2N more than the first which had a tension of 1.5N. What is the beat frequency which is observed if the first string has a frequency of 660Hz?

(6) Suppose a piano wire or length 1 m is tied between two fixed points. Assume the wave speed is $v = 350\ \frac{m}{s}$. Find the frequencies of the first 3 modes of oscillation on this string.

(7) An open organ pipe of length L=1m is resonating in its lowest mode of oscillation with a frequency of ${}^{\text{open}}f_1 = 170\ \text{Hz}$. If one end of the pipe is closed, what would be the lowest frequency of oscillation observed $\left({}^{\text{closed}}f_1 = ?\right)$?

(8) A solid disk and a hollow disk, both of radius R and mass M are rolled down an inclined plane without slipping, starting from rest, through a height h. Find the ratio of the velocities $\frac{V_{\text{solid}}}{V_{\text{hollow}}}$ at the bottom of the ramp. Then answer the following question based upon your answer: which one gets to the bottom of the ramp first? The moments of inertias are:

$$I_s = I_{\substack{\text{solid}\\\text{cylinder}}} = \tfrac{1}{2}MR^2$$

$$I_H = I_{\substack{\text{hollow}\\\text{cylinder}}} = MR^2$$