Massachusetts Institute of Technology
Physics Department

8.01X   **Fall 2002**
PROBLEM for EXPERIMENT VS: VIBRATING   SYSTEMS

Handed out: November 6. Due: November 15 at 4 pm.

Mass/Spring Oscillator:

1) For the chain of rubber bands, plot your data of length of chain of rubber bands vs. weight of hanging pennies. Is your data linear? Determine the force constant (spring constant) in SI units in the neighborhood of 150 g by using a best-fit straight line. Use between 180 g and 120 g as a range for your best-fit line. Include your data.

2) Qualitatively, how does the force constant change as the load is increased from zero up to the maximum you used?

3) Describe the motion of the cup when it is both swinging and moving up and down.

Simple Pendulum with One String:

4) What are the length and period of your simple pendulum with one string when you put 50 pennies in the cup?

5) Explain your observations of the effect of different numbers of pennies on the time needed for the amplitude to drop by 50%.

6) Did the period change when you changed the number of pennies in the cup?

7) Plot the square of the period against the length of this pendulum. Compare with theory.

Conical Pendulum

8) Are the period, length and orbit radius of the conical pendulum consistent with your theoretical expectation? (Solve theoretically for the period of the conical pendulum as a function of the angle q the string makes with the vertical, the length L of the string, and g. Remember the cup is undergoing circular motion.)