11. SIMPLE HARMONIC MOTION AND A VERTICAL SPRING

Equipment List:

- Vertical spring apparatus
- Weight sets and hangers
- Timers

Introduction:

This lab examines the relationship between the period of the oscillation of a vertical spring and the mass of the hanging bob. As well, the stiffness of the spring must be determined.

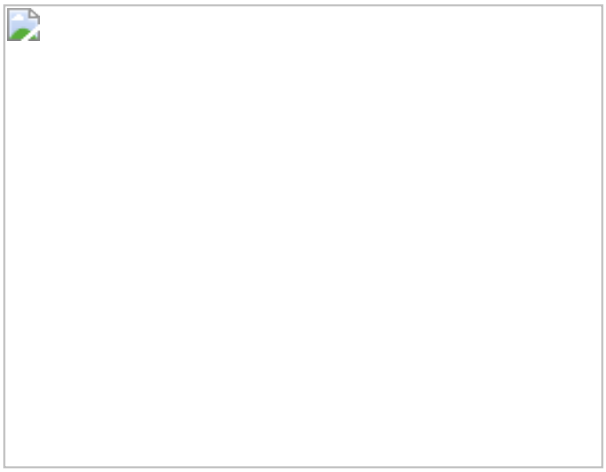
Theory:

From Newton's Laws derive a formula that relates the period of the motion of the mass on a spring to the mass of the hanging weight and the stiffness of the spring.

Procedure:

Finding the stiffness of the spring (method 1):

1. Set up the apparatus as shown in the diagram to the right.



2. Increase the mass of the hanging weight and measure the resultant change in the position of the pointer against the mirrored background ruler provided with the apparatus. Use the mirror qualities of the ruler to align the actual pointer to the image of the pointer in the mirror. by moving your head back and forth and up and down you can align the two images. When these two images are aligned, parallax error has been minimized.

Will this reduce the systematic uncertainty or the random uncertainty in the measurements taken with the ruler?

3. Construct a graph where, from your examination of the theoretical formula already derived, will yield a straight line. From the same formula, relate the stiffness of the spring to the slope of the graph. Use linear regression.

Finding the stiffness of the spring (method 2):

1. Measure the period for at least five different masses. That's five periods for five masses.

Graph the results as a linear function. Perform a linear regression on the data and find the value of the stiffness of the spring with an uncertainty.

Analysis:

With uncertainties in both values, compare the stiffness of the spring in terms of a confidence level.