HOOKE'S LAW

Saddleback College Physics Department

1.0 Purpose

To verify Hooke's law and calculate the spring constant.

2.0 Theory

The force due to a spring stretched (or compressed) a distance Δx from the equilibrium position is given by the following expression:

$$\vec{F}_s = -k\Delta\vec{x}$$

where *s* = (force exerted by) spring
k = the spring constant (in N/m)

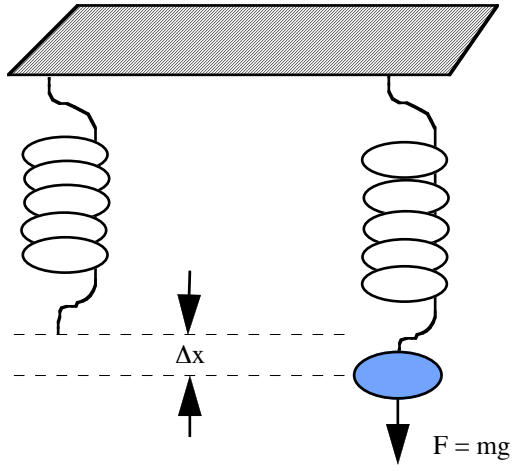
3.0 Procedure

3.1 Equipment

meter stick, spring, weights, clamp, rods and suspension clamp

3.2 Position Measurements

• Set-up the equipment as shown below:



• Hang a weight from the end of the spring. For the long spring use weights ranging from 0.5 kg to 2 kg and for the short spring use weights ranging from 2 kg to 4 kg. Make sure you do not select too heavy of a weight or the spring will permanently stretch.

• Measure the distance (Δx) the spring is stretched from its equilibrium position (x = 0).

• Repeat the above measurement for at least 7 more weights.

4.0 Analysis

• For each weight, calculate the force ($F = mg$, $g = 9.8 m/s^2$) exerted on the spring by the Earth's gravitational force.

• Plot the force *F* versus the distance the spring is stretched (Δx). Based on Hooke's law your graph should follow a straight line.

• Draw a best-fit line between the points and calculate the slope of the line. The slope of the line will correspond to the spring constant *k*.

• Compare your experimental value(s) of *k* with the actual value(s) of *k* for your spring. (Long Spring k = 23 N/m & Short Spring k = 98 N/m)

• Do your results agree with Hooke's law (i.e. is *F* directly proportional to *x*)?