

Lab 9 - Conservation of Energy

Name _____

Partner's Name _____

I. Introduction/Theory

The purpose of this lab is to study how energy is conserved between potential and kinetic forms. A rubber band will be used as a spring. Previously we studied spring forces using Hooke's Law. Hooke's Law states that the relationship between F_s and s is

$$F = -ks.$$

Where F_s is the force of the spring, k is the spring constant, and s is the distance the spring is displaced from equilibrium. Likewise the potential energy of the spring is given by

$$PE_{\text{Spring}} = \frac{ks^2}{2}.$$

In this lab, the potential energy of the spring will be converted into kinetic energy of motion. The kinetic energy of a body is

$$KE = \frac{mv^2}{2}.$$

Where m is the mass of the body in motion and v is the speed of that body. A body in motion can also exchange its types of energy between kinetic and gravitational potential forms. The gravitational potential energy of a body is

$$PE_{\text{gravity}} = mgy.$$

Where g is the acceleration of gravity at the surface of the earth and y is the height of the body.

II. Equipment

- Rubber band
- Precision Weight Scale (fish scale)
- Protractor
- Ruler
- Meter Stick
- Triple Beam Scale
- String

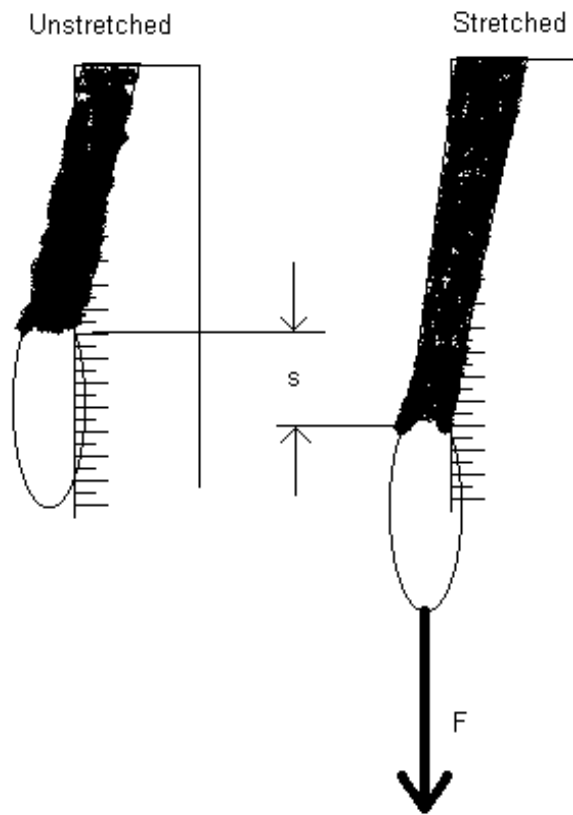


Figure 1

III. Procedure and Data

- A. Using the Precision Weight Scale investigate the force needed to stretch the rubber band. The range of displacements should not exceed ~ 10 cm or cause the rubber band to fail. Investigate the rubber band in the context of Hooke's Law. The goal of this step is to measure the spring constant of the rubber band. Figure 1 shows a method to accomplish this. In the space below neatly record the procedure, data, and spring constant determined.

Spring Constant _____ \pm _____

B. Weigh the rubber band and record its mass.

Mass _____

C. Measure the distance the rubber band must be stretched such that it can be shot from some reference point (the floor, table top, etc.) directly up to just reach the ceiling. Clearly show your calculations in the space below. Record this displacement, the potential energy stored in the rubber band, and the change in the rubber bands potential energy when reaching the ceiling.

Displacement _____ ± _____

Rubber Band's PE _____ ± _____

Gravitational PE _____ ± _____

IV. Analysis

A. Calculate the fraction of the rubber band's spring potential energy transferred to the kinetic/potential energy of the rubber band.

_____ ± _____

B. What other forms of energy could the rubber band's spring potential energy have been transferred to? List these forms below.

V. Conclusions (summarize and include any physical principles observed in the experiment)