29 Conserving Your Energy

Experiment

Purpose

To measure the potential and kinetic energies of a pendulum in order to see whether energy is conserved

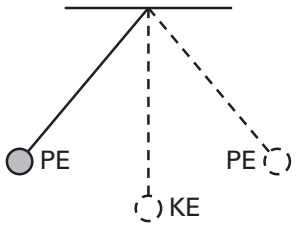
Required Equipment/Supplies

ring stand
pendulum clamp
pendulum bob
balance
string
meterstick
photogate timing system

Discussion

In Activity 28, Cut Short, you saw that the height to which a pendulum swings is related to its initial height. The work done to elevate it to its initial height (the force times the distance) becomes stored as potential energy with respect to the bottom of the swing. At the top of the swing, all the energy of the pendulum is in the form of potential energy. At the bottom of the swing, all the energy of the pendulum is in the form of kinetic energy.

The *total energy* of a system is the sum of its kinetic and potential energies. If energy is conserved, the sum of the kinetic energy and potential energy at one moment will equal their sum at any other moment. For a pendulum, the kinetic energy is zero at the top, and the potential energy is minimum at the bottom. Thus, if the energy of a pendulum is conserved, the extra potential energy at the top must equal the kinetic energy at the bottom. For convenience, potential energy at the bottom can be defined to be zero. In this experiment, you will measure kinetic and potential energy and see if their sum is conserved.



Procedure

Step 1: Devise an experiment with the equipment listed to test the conservation of energy. Write down your procedure in the space following. Include a diagram of your pendulum and label it with all the quantities, such as the height, potential energy, kinetic energy, speed, and so on.

Step 2: Perform your experiment. Record your data below in the form of a table.

Analysis

1. What units of potential energy did you use for the pendulum bob?

2. What units of kinetic energy did you use for the pendulum bob?

3. List the sources of error in your experiment. Which one do you think is the most significant?

4. Based on your data, does the total energy of the pendulum remain the same throughout its swing?