CHAPTER 5

Skills Practice Lab

Conservation of Mechanical Energy

OBJECTIVES

- **Determine** the spring constant of a spring.
- **Calculate** elastic potential energy.
- **Calculate** gravitational potential energy.
- **Determine** whether mechanical energy is conserved in an oscillating spring.

MATERIALS LIST

- **Hooke's law apparatus**
- **meterstick**
- **rubber bands**
- **set of masses**
- **support stand and clamp**

A mass on a spring will oscillate vertically when it is lifted to the length of the relaxed spring and released. The gravitational potential energy increases from a minimum at the lowest point to a maximum at the highest point. The elastic potential energy in the spring increases from a minimum at the highest point, where the spring is relaxed, to a maximum at the lowest point, where the spring is stretched. Because the mass is temporarily at rest, the kinetic energy of the mass is zero at the highest and lowest points. Thus, the total mechanical energy at those points is the sum of the elastic potential energy and the gravitational potential energy.

A Hooke's law apparatus combines a stand for mounting a hanging spring and a vertical ruler for measuring the displacement of a mass attached to the spring. In this lab, you will use a Hooke's law apparatus to determine the spring constant of a spring. You will also collect data during the oscillation of a mass on the spring and use your data to calculate gravitational potential energy and elastic potential energy at different points in the oscillation.

SAFETY

- **Tie back long hair, secure loose clothing, and remove loose jewelry to prevent their getting caught in moving or rotating parts. Put on goggles.**
- **Attach masses securely. Perform this experiment in a clear area. Swinging or dropped masses can cause serious injury.**

PROCEDURE

Preparation

1. Read the entire lab procedure, and plan the steps you will take.
2. If you are not using a datasheet provided by your teacher, prepare a data table in your lab notebook with four columns and seven rows. In the first row, label the first through fourth columns *Trial, Mass (kg), Stretched Spring (m),* and *Force (N)*. In the first column, label the second through seventh rows *1, 2, 3, 4, 5,* and *6*. Above or below the data table, make a space to enter the value for *Initial Spring (m)*.
3. If you are not using a datasheet provided by your teacher, prepare a second data table in your lab notebook with three columns and seven rows. In the first row, label the first through third columns *Trial, Highest Point*