

OBJECTIVES

- **Measure** motion in terms of the change in distance during the period of a recording timer.
- **Compare** the speed and acceleration of different falling masses at different stages of free fall.
- **Compare** the experimental value for the average acceleration to the accepted value for free-fall acceleration.

MATERIALS LIST

- C-clamp
- masking tape
- meterstick
- recording timer and paper tape
- ring stand
- set of hooked masses
- stopwatch

In the laboratory, you can use a recording timer to determine the velocity and acceleration of bodies moving in one dimension. A recording timer measures the time it takes an object to move a short distance by making marks at regular time intervals on a strip of paper attached to the moving object. As the paper tape is pulled through the timer, the distance between two dots on the tape is the distance the tape moved during one back-and-forth vibration of the clapper. The time required for one back-and-forth motion of the clapper is called the *period* of the timer.

In this experiment, you will first calibrate a recording timer by determining an average value for its period. You will then use the recording timer to determine the average velocity and average acceleration of falling bodies of different masses.

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. Falling 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 six columns and five rows. In the first row, label the first two columns *Trial* and *Mass (kg)*. The space for the third through sixth columns should be labeled *Distance (m)*. Under this common label, columns 3–6 should be labeled *A–B*, *C–D*, *E–F*, and *G–H*. In the first column, label the second through fifth rows 1, 2, 3, and 4.
3. If you are not using a datasheet provided by your teacher, prepare a second data table with three columns and five rows in your lab notebook. Label this table *Calibration*. In the first row, label the columns *Trial*, *Time (s)*, and *Number of Dots*. Fill in the first column by labeling the second through fifth rows 1, 2, 3, and 4 for the number of trials.