

OBJECTIVES

- **Measure** background radiation using a nuclear-lab station.
- **Measure** the activity of a radioactive substance using a nuclear-lab station.
- **Determine** the half-life of a radioisotope.

MATERIALS LIST

- cesium-137/barium-137 isogenerator set
- dropper
- liquid soap
- nuclear-lab station, including counter, timer, variable high voltage, absorber set, and sources
- small disposable culture dish
- support base and rod
- symmetrical clamp

The half-life of a radioactive element is the time it takes for half a given number of atoms of the element to decay. In this experiment, you will measure the activity of a radioisotope with a short half-life, using a nuclear-lab station over a period of 10 s. You will plot the resulting data on a graph, and you will calculate the half-life from points on the graph.

SAFETY

- **Do not eat or drink anything in the laboratory. Never taste chemicals or touch them with your bare hands.**
- **Tie back long hair, secure loose clothing, and remove loose jewelry. Put on a lab apron and goggles.**
- **Do not allow radioactive materials to come into contact with your skin, hair, clothing, or personal belongings. Although the materials used in this lab are not hazardous when used properly, radioactive materials can cause serious illness and may have permanent effects.**
- **Dispose of chemicals as instructed by your teacher. Never pour hazardous chemicals into a regular waste container. Never pour radioactive materials down the drain.**
- **Wash your hands thoroughly when you finish your work and before you leave the laboratory.**

PROCEDURE**Preparation**

1. Read the entire lab, 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 2 columns and 31 rows. Label this table *Data Table*. Label the columns *Time (s)* and *Total Count*. In the first column, label the 2nd through 31st rows in increments of 10 from 10 to 300. Above the table, make a space to record the *Background Count (s⁻¹)*.
3. Turn on the nuclear-lab station. Even when no radioactive substances are near the station, counts will register. This is caused by background radiation. Take the radiation count for 10 min, and divide the total by 600 s (10 min \times 60 s/min). This calculation will give you the background count per second. Record this value in your data table.