

Conservation of Momentum

Design Your Own

OBJECTIVES

- **Measure** the mass and velocity of two carts.
- **Calculate** the momentum of each cart.
- **Verify** the law of conservation of momentum.

MATERIALS LIST

- 2 carts, one with a spring mechanism
- balance
- metric ruler
- paper tape
- recording timer
- stopwatch

When a spring-loaded cart pushes off against another cart, the force on the first cart is accompanied by an equal and opposite force on the second cart. Both of these forces act for exactly the same time interval. So, in the absence of other forces, the change in momentum of the first cart is equal and opposite to the change in momentum of the second cart. In this lab, you will design an experiment to study the momentum of two carts having unequal masses. In your experiment, the carts will be placed together so that they will move apart when a compressed spring between them is released. You will collect data from several trials that will allow you to calculate the momentum of each cart and the total momentum of the system before and after the carts move apart.

SAFETY



- Tie back long hair, secure loose clothing, and remove loose jewelry to prevent their getting caught in moving or rotating parts.

PROCEDURE

1. Study the materials provided, and design an experiment to meet the goals stated above. If you have not used a recording timer before, refer to the lab in the chapter “Motion in One Dimension” for instructions.
2. Write out your lab procedure, including a detailed description of the measurements to take during each step and the number of trials to perform. You may use **Figure 1** as a guide to one possible setup. You can use one recording timer for both carts at the same time by threading two tapes through the timer and using two carbon disks back to back between the tapes. Remember to calibrate your recording timer or use a known period for the timer.
3. Ask your teacher to approve your procedure.
4. Follow all steps of your procedure.
5. Clean up your work area. Put equipment away safely so that it is ready to be used again.