

Chapter 12 Forces and Motion

Exploration Lab

Investigating a Balloon Jet

In this lab, you will examine the relationships among force, mass, and motion.

Problem How does a jet-powered device move?

Materials

- string, 3 m in length
- drinking straw
- 4 long balloons
- masking tape
- stopwatch
- meter stick
- 2 threaded nuts
- 2 chairs

Skills Applying Concepts

Procedure 

1. Insert the string through the straw and tie each end of the string to the back of a separate chair. Pull the chairs apart until the string is tight and horizontal.
2. Blow up the balloon and then hold the balloon's opening closed. In the data table, record the length of the balloon. Have a classmate attach the balloon lengthwise to the straw, using tape.
3. While continuing to hold the balloon's opening closed, slide the balloon jet to the end of the string.
4. Release the balloon. Measure the time during which the balloon jet moves. Measure the distance that the balloon jet travels along the string. Record the distance and time values in the data table for 0 Nuts Used, Trial 1.

DATA TABLE

Number of Nuts Used	Trial Number	Time (seconds)	Distance (centimeters)	Average Velocity (cm/s)
0	1			
0	2			
2	1			
2	2			
Length of inflated balloon (centimeters)				

5. Repeat Steps 2 through 4 with a new balloon. Make sure to inflate the balloon to the same size as in Step 2. Record your results in the data table for 0 Nuts Used, Trial 2.
6. Repeat Steps 2 through 5 twice more with a new balloon. This time, tape two nuts to the balloon before releasing it. Record your results in the data table for 2 Nuts Used, Trials 1 and 2.
7. Calculate and record the average velocity for each trial. The average velocity is equal to the distance divided by the time.

Analyze and Conclude

1. **Applying Concepts** Use Newton’s second and third laws to explain the motion of the balloon jet.

2. **Analyzing Data** How did adding mass (nuts) to the balloon jet affect its motion?
