

## Hands-On Activity

### Potential Energy of Marbles

In this activity, students will investigate how height can change the potential energy of an object. Students will apply scientific inquiry methods through repeated trials to construct tables to organize data in their notebooks.

#### Suggested Materials

For each group:

- paper-towel tube
- meter sticks, two
- marbles, three of different sizes
- ruler
- masking tape
- books with different thicknesses

Pose these questions to students: *How can you use height to change the potential energy of an object? How will the distance an object moves be related to its original potential energy?* Tell students you have materials for constructing a ramp and marbles for them to use on the ramp. Group students and challenge each group to design an investigation they could carry out to find the answers to these questions.

Let the groups have time to work together to develop a written design to turn in to you. Expect this design to include a data table suitable for recording the distance a marble rolls after it is allowed to descend a ramp positioned to begin at different heights. Evaluate and comment on each design. Be sure that students run multiple trials of each condition they want to test. Then provide the ramp materials and marbles and allow students to perform their experiments. They should construct tables to organize the data similar to the sample table provided here:

	Marble 1			Marble 2			Marble 3		
	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3
Height 1 _____cm									
Height 2 _____cm									
Height 3 _____cm									
Variable									

w Ramp									
Variable w Floor									
Control Test with no ramp									

Once sufficient data has been collected, allow time for groups to work together to analyze, summarize, and display their results and to share their findings with classmates. In a summary discussion, bring up the concept of factors (call them variables) that might affect their results (ramp height, marble size, floor covering), especially when comparing results with other groups. Use this opportunity to discuss and relate how ramp height, among other factors (friction, ramp length), might play a part in determining potential and kinetic energy.

*In this activity, students will demonstrate the following Inquiry Skills:*

- Design Investigations
  - Design and conduct investigations using:
    - Fair test - changing only one variable at a time makes comparisons valid
    - Independent variable - the one variable the investigator chooses to change
    - Dependent variables - what changes as a result of, or in response to, the change in the independent variable
    - Multiple trials - repeated tests with the same variables to check for variability of results
- Evaluate Evidence
  - Draw and support a conclusion by:
    - Using data to determine the cause-effect relationship observed in the investigation
    - Reporting trends and patterns in the data
  - Assess the conclusion by:
    - Comparing results to hypothesis
    - Answering the testable question