

Chapter 8: Energy**Conservation of Energy**

23 Cut Short

Purpose

To illustrate the principle of conservation of energy with a pendulum.

Required Equipment/Supplies

3 ring stands
pendulum clamp
string
steel ball
rod
clamp

Discussion

A pendulum swinging to and fro illustrates the conservation of energy. Raise the pendulum bob to give it potential energy. Release it and the potential energy is converted to kinetic energy as the bob approaches its lowest point. Then, as the bob swings up on the other side, kinetic energy is converted to potential energy. Back and forth, the forms of energy change while their sum is constant. Energy is conserved. What happens if the length of the pendulum is suddenly changed? How does the resulting motion illustrate energy conservation?

Procedure

Step 1: Attach a pendulum clamp to the top of a ring stand set between two other ring stands, as shown in Figure A. Attach a steel ball to a piece of string that is nearly as long as the ring stand is tall.

Make pendulum.

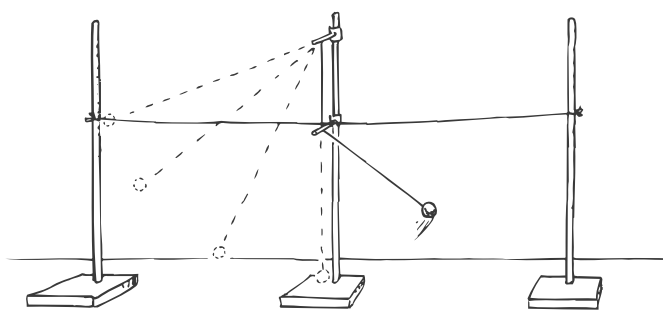


Fig. A

Step 2: Tie a string horizontally from one empty ring stand to the other, as shown in Figure A. The string should be about two-thirds as high as the pendulum clamp. *Set up level string.*

Attach crossbar.

Step 3: Attach a rod to the central ring stand at the same height as the horizontal string (Figure A). The rod should touch the pendulum string when the string is vertical.

Predict height.

Step 4: Predict what height the ball will reach if the ball is released at the same height as the horizontal string and the pendulum string is stopped by the rod. Check one:

Prediction	Observation	
<input type="checkbox"/>	<input type="checkbox"/>	a. The ball will go higher than the horizontal string.
<input type="checkbox"/>	<input type="checkbox"/>	b. The ball will go just as high as the horizontal string.
<input type="checkbox"/>	<input type="checkbox"/>	c. The ball will not go as high as the horizontal string.

Release pendulum.

Step 5: Release the pendulum! Record whether you observe a, b, or c.

Raise rod.

Step 6: Predict what would happen if the rod were attached higher than the string. Perform the experiment to confirm or deny your prediction.

Prediction: _____

Observation: _____

Lower rod.

Step 7: Predict what would happen if the rod were attached lower than the string. Perform the experiment to confirm or deny your prediction.

Prediction: _____

Observation: _____

Analysis

1. Explain your observations in terms of potential and kinetic energy and the conservation of energy.

2. Is there an upper limit on how high the rod can be? If so, explain why you think there are limits.

3. Is there a lower limit on how low the rod can be? If so, explain why you think there are limits.
