

Activity

Design Your Own Experiment

Swinging Energy

Lab Preview

Directions: Answer these questions before you begin the Activity.

1. What advantage does a rubber stopper have over a cork stopper as the bob of the pendulum?

2. State the law of conservation of energy.

Imagine yourself swinging on a swing. What would happen if a friend grabbed the swing's chains as you passed the lowest point? Would you come to a complete stop or continue rising to your previous maximum height?

Recognize the Problem

How would you design an experiment to answer the questions in the situation described above?

Form a Hypothesis

Examine the diagram in your text. How is it similar to the situation in the introductory paragraph? Hypothesize what will happen to the pendulum's motion and final height if its swing is interrupted.

Goals

- **Construct** a pendulum to compare the exchange of potential and kinetic energy when a swing is interrupted.
- **Measure** the starting and ending heights of the pendulum.
- Use the law of conservation of energy to explain observations.

Possible Materials

ring stand and ring
support-rod clamp, right angle
30-cm support rod
2-hole, medium rubber stopper
string (1 m)
metersticks
graph paper

Safety Precautions

Be sure the base is heavy enough or well anchored so that the apparatus will not tip over.

Test Your Hypothesis

Plan

1. As a group, write your hypothesis and list the steps that you will take to test it. Be specific. Also list the materials you will need.
2. **Design** a data table on a separate sheet of paper.
3. Set up an apparatus similar to the one shown in the diagram in your text.
4. **Devise** a way to measure the starting and ending heights of the pendulum. Record your starting and ending heights in a data table. This will be your control.
5. **Decide** how to release the stopper from the same height each time.
6. Be sure you test your swing, starting it above and below the height of the cross arm. How many times should you repeat each starting point?

Activity (continued)**Do**

1. Make sure your teacher approves your plan before you start.
2. Carry out the approved experiment as planned.
3. While the experiment is going on, write any observations that you make and complete the data table.

Analyze Your Data

1. When the stopper is released from the same height as the cross arm, is the ending height of the stopper exactly the same as its starting height? Use your data to support your answer.

2. **Analyze** the energy transfers. At what point along a single swing does the stopper have the greatest kinetic energy? The greatest potential energy?

Draw Conclusions

1. Do the results support your hypothesis? Explain.

2. **Compare** the starting heights to the ending heights of the stopper. Is there a pattern? Can you account for the observed behavior?

3. Do your results support the law of conservation of energy? Why or why not?

4. What happens if the mass of the stopper is increased? Test it.

Communicating Your Data

Compare your conclusions with those of the other lab teams in your class. **For more help, refer to the Science Skill Handbook.**