POPPY SCHOLARS · PHYSICS OF THE UNIVERSE

Home lab 5 · Unit 5 · about 40 minutes

Where does the energy go when a ball bounces and every bounce is lower than the one before?

Name _____ Date _____

MATERIALS

You supply everything. Tick each item as you gather it.

- ☐ A tennis ball or a rubber ball
- ☐ A kitchen scale to find the mass of the ball
- ☐ A meter stick taped vertically to a wall, and a phone camera (slow motion helps) to read the bounce heights
- ☐ A hard, flat floor, paper and a calculator

SAFETY

Do the bounce test where it is safe to move around and nothing breakable is nearby. Watch your footing, and keep the ball away from other people's faces.

PROCEDURE

1. Weigh the ball on the scale and convert to kilograms. Tape the meter stick vertically to a wall, with the 0 mark on the floor.
2. Hold the ball so that its bottom is at the 1.00 m mark. Record your phone video, then release the ball from rest without pushing it.
3. Play back the video, and read the highest point (the bottom of the ball) after each bounce, from bounce 1 to bounce 4. Record the heights in meters.
4. Repeat the drop 3 times and average the heights for each bounce, if you can.
5. Compute the gravitational potential energy mgh at the top of each bounce, and the fraction of the energy kept in each bounce (the height ratio).
6. Compute the speed just before the first impact and just after it using $v = \sqrt{(2gh)}$, and the ratio of these speeds.

RECORD YOUR DATA

Stage	Height (m)	Energy mgh (J)	Height ÷ previous height
Drop height	1.00		
After bounce 1			
After bounce 2			
After bounce 3			
After bounce 4			

Write the mass of your ball in kilograms, and the speeds before and after the first bounce.

LAB REPORT

Write a report that gives your table, calculates the energy at each height and the energy lost in each bounce, and finds the speed ratio for the first bounce. Explain, with the law of conservation of energy, where the lost energy went, and say what a graph of the heights would look like.

Report the numbers you actually got, even when they disagree with the lesson. Write on the lines, or type your report on the website and send it to a teacher there.

Question and hypothesis *State the question in your own words, what you expect to happen, and why you expect it.*

Method *What you changed, what you measured, what you kept the same, and how many trials you ran.*

Observations *Describe what you saw, including anything unexpected. Your data tables are added to the report automatically.*

Calculations *Show each calculation step by step, with units.*

Claim and reasoning *Answer the question using your numbers, then explain why, using the science from the unit.*

Limits and next step *What could have affected your results, and one change you would make next time.*