

Happy Fun Ball

Lab 8.4

Purpose

The purpose of this activity is to investigate efficiency.

Required Equipment

- Meter Stick
- Golf Ball
- Ping-Pong Ball
- Tennis Ball
- Super Ball

Discussion

In this experiment you will investigate a cart will be launched with a spring. You will measure the starting potential energy and then find the ending kinetic energy. Finally you will compare how the starting and ending energies of the system and calculate the amount of friction on the system.

Procedure

1. Obtain each of the balls listed in data table A.
2. Record the mass of each ball in data table A.
3. Take turns dropping each of the balls, three time, from a 1-meter height and record the height of their return bounce in data table A.
4. Compute the average bounce height in table A.

Data Table A

Object	Mass (kg)	Drop Height (m)	Bounce Height (m)				Efficiency
			trial #1	trial #2	trial #3	Ave Height	
Golf Ball		1 m					
Tennis Ball		1 m					
Ping-Pong Ball		1 m					
Super Ball		1 m					



Happy Fun Ball**Lab 8.4****Calculating Efficiency**

Efficiency is a ratio of the energy you put in compared to the energy you get out. The more efficient a machine means that less energy is lost or converted into heat and sound.

5. Before the drop, each ball starts with potential energy that converts into kinetic energy and then on the bounce back into potential energy again. As the balls hit the floor they act like springs and compress and then rebound but in this process they convert energy into heat and sound causing the ball not to bounce back to the original height. Calculate the efficiency for each ball and record in data table A.

$$\text{efficiency} = \frac{PE_{\text{ending}}}{PE_{\text{starting}}} = \frac{h_{\text{bounce height}}}{h_{\text{drop height}}}$$

Show your work on a your own piece of paper:

Conservation of Energy

Conservation of energy states that the energy you start with is always the energy you end with. In this part of the activity you will compute and compare the starting and ending energy.

6. Using the formula for potential energy, calculate both the starting and ending energy and record in data table B.

$$PE = mg\Delta h$$

7. Using the formula for conservation of energy, calculate the amount of energy lost to heat and sound and record in data table B.

$$PE_{\text{starting}} = PE_{\text{ending}} + W_{\text{heat and sound}}$$

Data Table B

Object	Starting PE (J)	Ending PE (J)	Heat - Sound (J)
Golf Ball			
Tennis Ball			
Ping Pong Ball			
Super Ball			



Happy Fun Ball**Lab 8.4****Calculate Predicted Bounce Height**

8. Transfer the *Efficiency* for each object from table A to table C
9. Obtain a *Drop Height* from your instructor and record in data table C.
10. Calculate the *Predicted Bounce Height* by multiplying the efficiency by the drop height given by your instructor. Record in data table C.

$$\Delta h_{\text{Predicted}} = \text{Eff} \cdot \Delta h_{\text{drop height}}$$

11. Test each object and record the average of three drops in the *Actual Bounce Height* in table C.

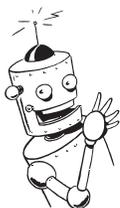
Data Table B

Object	Efficiency (%)	Drop Height (m)	Predicted Bounce Height (m)	Actual Bounce Height (m)	% Error
Golf Ball					
Tennis Ball					
Ping Pong Ball					
Super Ball					

Percent Error

12. Calculate the percent error for each object and record in data table C.

$$\% \text{ error} = \left(\frac{\text{Calculated Height} - \text{Actual Height}}{\text{Actual Height}} \right) \times 100$$



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