LAB 9: EFFICIENCY

QUESTION

What is the efficiency of a bouncing Super Ball?

SAFETY

Keep the rubber ball out of the reach of young children; it is a choking hazard. Do not leave the ball in a place where someone might step on it.

MATERIALS

Bouncy ball, ruler, marbles (several different types)

PROCEDURE

In a perfect world, when a ball is dropped and bounced, all its potential energy would be converted into kinetic energy and then back to potential energy again. The ball would return to the same height from which it was dropped. In the real world, some of that energy is converted into heat in the ball, heat in the ground, friction with the air, and sound. The ratio of the energy after the collision to the energy going into the collision is called the *efficiency* and is usually expressed as a percentage.

$$efficiency = \frac{energy\ out}{energy\ in} \times 100\%$$

In this case, we will define "energy in" as the initial potential energy of the ball, and "energy out" as the final potential energy of the ball. Your teacher will provide the mass of the rubber ball so you can calculate potential energies.

Data Chart

Drop Height	Energy In	Bounce Height 1	Bounce Height 2	Bounce Height 3	Average Height	Energy Out	Efficiency

1. Put removable marks on a wall or door frame at 0.50 m, 1 m, 1.5 m, and 2 m.
2. Drop the rubber ball from each of those heights three times and measure how high it bounces. Average the three measurements.
3. Record your data in a chart similar to the one above.

Post-Lab Questions
1. Did your efficiencies get better or worse as the drop height increased?
2. Estimate how high the ball would bounce if it were dropped from 3.0 m. Show your work and explain your reasoning.
3. How do you think the efficiency of a bouncing marble would compare to the rubber ball? Try it and see. Try several different types of marbles and see if there is a difference.

Extension
There is a law in physics that says that efficiency can never be greater than 100%. But if you were to throw the ball downward, it would bounce higher than your hand. Does this violate that law? Explain why or why not.