Heat Loss Lab

Purpose: To determine the percentage of the total energy lost when various objects roll down a ramp.

Your goal of this lab is to determine which of various objects; ping pong ball, rubber bouncy ball, metal ball bearing, large ball bearing, etc. is the most efficient when rolling down the ramp. You will need to measure the mass of the various balls, choose a height to release the balls and use the photogates to find the velocity at the bottom of the ramp.

Hypothesis and explanation on which ball will be the most efficient:

Data:

Ball 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

mass:\_\_\_\_\_\_\_\_\_\_\_\_\_\_ diameter of ball:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Height change of ball:\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| Trial | Time through photogate |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |

Ball 2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

mass:\_\_\_\_\_\_\_\_\_\_\_\_\_\_ diameter of ball:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Height change of ball:\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| Trial | Time through photogate |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |

Ball 3: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

mass:\_\_\_\_\_\_\_\_\_\_\_\_\_\_ diameter of ball:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Height change of ball:\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| Trial | Time through photogate |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |

**Lab Report Due next week on Tuesday 11/3. For this lab, DO NOT AVERAGE YOUR DATA UNTIL THE END. No Graph is needed for this lab Report but an Energy Histogram MUST be included.**

**Post Lab Problems:**

1. A box of mass 10 kg is pushed with a horizontal force of 200 N for a distance of 5 m. The surface of the floor has a coefficient of friction with the box of µk = 0.4
	1. What is the amount of Work done on the box by the horizontal force?
	2. Heat is the work done by friction, so the equation for heat is: $H=f(∆x)$. Using that equation, what is the Heat loss as the box slides the 5 m?
	3. What is the final velocity of the box? (Use conservation of Energy, not Newton’s 2nd Law and kinematics.)
2. A ball of mass 0.5 kg is thrown straight up with an initial velocity of 20 m/s. It reaches a maximum height of 18 m. What was the average force of air resistance during its rise to the maximum? (**0.656 N**)
3. A car of mass 1500 kg is going 70 mph (1,609 m = 1 mi) when it slams on its breaks and skids to a stop. If the car stops in a distance of 71.34 m, determine the coefficient of kinetic friction between the tires and the road, USING ENERGY! (**0.7**)
4. The figures below represent identical toboggans that have traveled down a snowy hill. The toboggans all have the same speed at the bottom of the hill. Assume that the horizontal surfaces that they travel along are frictionless except for the shaded areas, where the coefficient of friction is given. These shaded areas have different lengths as shown.

Rank these situations on the basis of the speed of the toboggans as they reach point *P*.

Greatest 1 \_\_\_\_\_\_\_ 2 \_\_\_\_\_\_\_ 3 \_\_\_\_\_\_\_ 4 \_\_\_\_\_\_\_ 5 \_\_\_\_\_\_\_ 6 \_\_\_\_\_\_\_ Least

Explain your reasoning: