

Lab 8A: Conservation of Energy

Name: _____

Date Due: _____

Period: _____

Purpose:

Materials

1. Ramps
2. Collision carts
3. 10.0N Ion spring scales
4. 30.0 cm rulers
5. Ticker tape
6. Spark timers

Procedures

1. Set up a ramp so that one side is set on 3 science text books. Measure the height at the top of the ramp in meters (you will likely have to convert cm into m). Record the height in your data table.
2. Measure the height of the bottom of the ramp in meters. (Measure from the back of the cart)
3. Calculate the difference in height between the top and bottom of the ramp to determine “h” for the E_p calculation.
4. Measure the force, due to gravity, acting on the collision cart using a spring scale. Determine the mass of the cart using $F=mg$, where F is force in Newtons (N), m is mass (kg) and g is acceleration due to gravity (9.8m/s^2).

5. Attach a piece of ticker tape to the back of your cart so that the length of the ticker tape extends close to the end of the ramp. (no need to measure this)
6. Make sure that the bumper on the cart is aimed forward.
7. Turn on the spark timer and then let the cart roll from the top of the ramp to the bottom. The ticker tape should be dragged through the spark timer which is **set on 60Hz**.
8. Mark the last dot on the ticker tape with a pencil. Count backward from this point to the 7th dot and mark this position with a pencil. (there should be 7 dots total). The time interval from the 1st dot to the 7th dot is 0.1s.
9. Measure the distance between the 1st and 7th dot in meters (you will likely measure in cm and convert to m)
10. We can determine the velocity of the cart at the bottom of the ramp by dividing the distance (measured in meters) by the time (measured in seconds). $V=d/t$

Table 1. Measurements of collision cart and ramp

Top of ramp height (m)	
Bottom of ramp height (m)	
Difference in height or “h” (m)	
Mass of Collision Cart (kg)	
Distance between 1 st and 7 th dots (m)	
Time between 1 st and 7 th dots (s)	0.1s

Questions

Answer the following questions using full sentences.

1. Determine the gravitational potential energy of the cart at the top of the ramp by **using the “difference in height”**. Recall that $E_p = mgh$

2. Use the E_p to predict the theoretical velocity of the cart “v”.

3. Determine the actual velocity of the cart. Recall that $v = d/t$

4. Determine the E_k of the cart just before it hit the bumper at the bottom of the ramp. Recall that $E_k = 0.5mv^2$ (Use v from question #3)

5. Determine the percent efficiency of the cart.
Recall that percent efficiency = energy output/energy input x 100%

Conclusion: The conservation law for energy says that energy cannot be created nor destroyed, so why is there a difference in the E_p from question #1 and the E_k from question #4?
