Hot Wheels Energy Lab WS 3

Conservation of energy stopping distance lab

The purpose of this lab will be to demonstrate that energy is conserved in a system, moving from gravitational potential energy to kinetic energy to work (from friction). You will need three pieces of track, a stand, a hot wheels car, and a small box. A photo gate will also be used later during this lab.

Attach the top of the ramp to the stand and secure the other end onto the table, with room for the car and box to stop at the end. Position the box directly at the end of the ramp to catch the car when it comes.

Height of ramp: _____ meters

If energy is conserved, gravitational potential energy initially should equal kinetic energy at the bottom of the ramp. This means the equations for the two values can be set equal to each other. Calculate the speed the car should be traveling at the bottom of the ramp.

Show your work:

Predicted Velocity: _____ m/s

Using the photo gate, measure the actual speed of the car at the bottom of the ramp and calculate percent difference.

Observed Velocity: _____ m/s

Percent difference: _____%

Why is there a difference? _____

To determine if energy is conserved during stopping, the force of kinetic friction must be found. Using a spring scale, pull the car and box combination across the surface horizontally and record the force resisting the motion.

Kinetic frictional force: _____ Newtons

Using this value as well as the value of work that will be done to stop the car (you will need to measure the mass of the car and calculate kinetic energy at bottom of the ramp) calculate what the stopping distance should be. Use the OBSERVED velocity, not the predicted. Mass of car: _____ kg

Show your work:

Predicted Stopping distance: _____ meters

Measure the stopping distance experimentally (several trials) and determine percent difference.

Observed stopping distance (average of trials): _____ meters

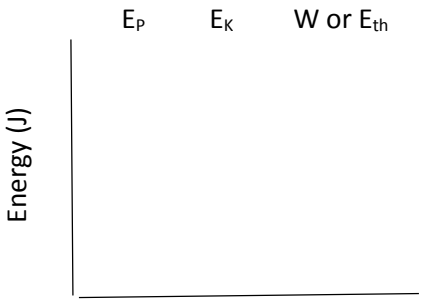
Percent difference: _____ %

Why might your observed stopping distance differ significantly from your prediction? Explain:

Show how energy is distributed in the system at different points in time on the following (bar) graphs use experimental values for energy (from actual speed, actual stopping distance etc.)

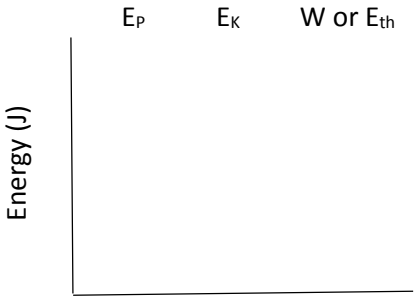
(E_P= gravitational potential energy, E_K= Kinetic energy, Work or E_{th} = work/heat from friction)

Car is at top of ramp



Is energy conserved in this system? Why or why not?

Car at bottom of ramp



Car is at rest