

Laboratory #5

Energy, Work, and Power

Part A. I am More Powerful Than a Ford Mustang!

Concepts

Energy, Work, Power

Introduction

Ever wonder if you can be more powerful than a Ford Mustang? Now is your opportunity to find out! The concept of horsepower (the English unit for power) tells you how much energy a car generates in a given time period. In this Lab, you will learn how to measure horsepower and how to relate it to an everyday object--yourself. So get your running shoes on! You will have your chance to show up a Mustang. By the way, the 2002 Ford Mustang Coupe GT has 260 horsepower.

Procedure

- Start by sending your partner to the very top of the stairwell in Parker Hall (3 R).
- Have the same partner give you a 'marks, get set, go!'
- Run the stairs as fast as you can to the top of the stairwell and meet your partner, who will be timing your run with a stopwatch.
- Record the time.
- Weigh yourself.
- Determine the distance between the 1st floor and the 3rd floor.
- Record your results and answer the lab questions about the power you expended.

Part B: Soap Box Derby

Concepts

Conservation of Energy; Work Done by Friction; Transfer of Energy

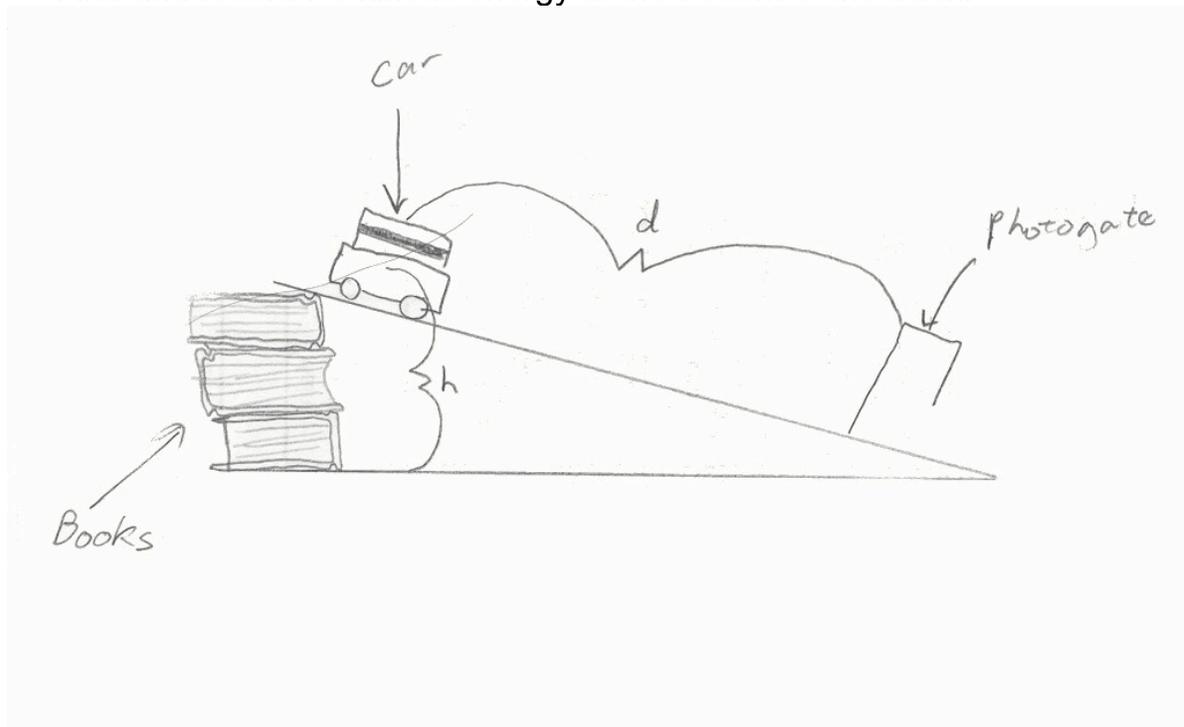
Introduction

You've learned that energy is always conserved. Energy only changes form and never just disappears. In this Lab, you will get to witness this phenomenon first hand. An easy way to do this is to simply drop something or let it slide down an inclined plane and witness the potential energy transfer to kinetic energy.

Procedure

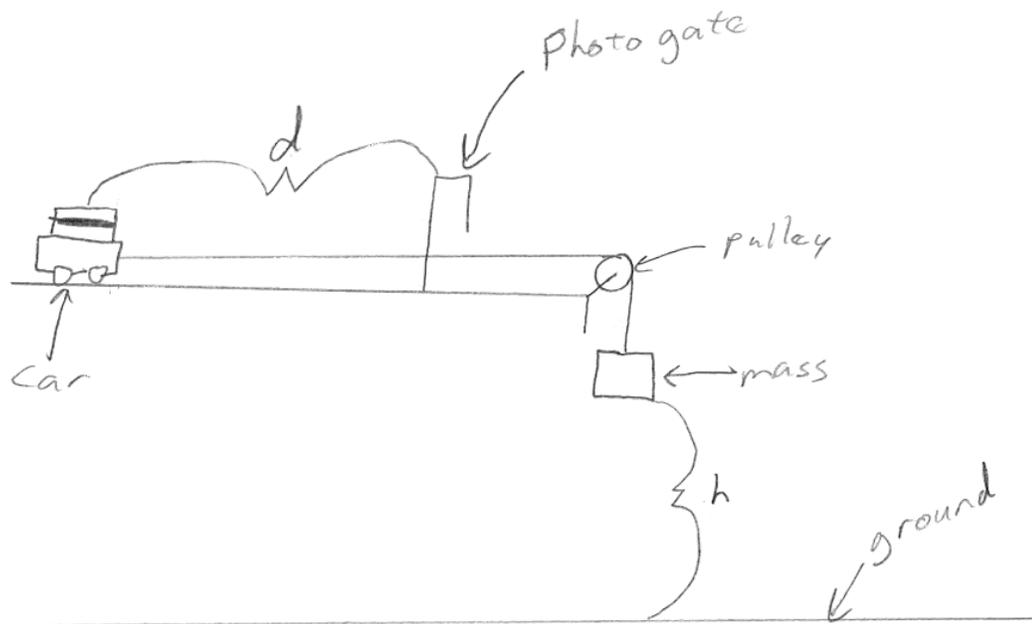
Part 1

- Weigh the car to find the mass.
- Incline the track by using the stand at one end of the track.
- Measure the height of the track.
- Determine the potential energy that the car will have at the top of the track. (remember to subtract the initial height from the final height).
- Put the car at the top and release it.
- Record its velocity at the bottom of the track.
- Find and record it's kinetic energy at the bottom of the track.



Part 2

- Set the track level.
- Attach a weight to a string and attach it to the car over the pulley.
- Measure the height of the weight, Ensure that the mass does not hit the ground before the car goes through the photo gate.
- Find and record the potential energy of the weight.
- Release the car and weight system.
- Record its velocity at the end of the run.
- Find and record kinetic energy of the car at the end of the run.
- Find and record the kinetic energy of the weight at the end of the run.



Lab Reporting Sheet

Laboratory #5

Name: _____

Date: _____

Part A: I am More Powerful than a Ford Mustang!

- Using the equations you've learned in class, determine the potential energy (in joules) you gained by running up the stairs.

- Now that you know how much potential energy you gained, how much work did you do? Use proper units.

- How much power did you expend? What percent of a Ford Mustang's power is this?

- Think of at least one way you could improve your power output. (be sure to use your new physics vocabulary!)

Part B: Soap Box Derby

Part 1

Mass of Car	Height of Track	PE of Car	Velocity at the bottom of the track	KE at the bottom of the track

Part 2

Before Run				After Run			
Mass of Car	Mass of Weight	Height of Weight	PE of Weight	Velocity of Car	Velocity of Weight	KE of Car	KE of Weight

- Based on the law of conservation of energy, what should you notice about PE before and KE after each experiment?
- What do you actually notice about the PE at the beginning compared to the KE at the end of both parts? Why (explain your answer in terms of energy)?
- Based on this lab, why do soapbox derby car builders make their cars as aerodynamic as possible? (Give your answer in terms of energy)
- If you dropped a steel ball off of a 50 m tall building, how fast would it be going by the time it hit the ground? (show your work)