

Lab 5: Conservation of Energy

Purpose

To explore the relationship between Work, Potential Energy and Kinetic Energy, and to show that energy is conserved when you lift a cart up a hill and then release it from the top.

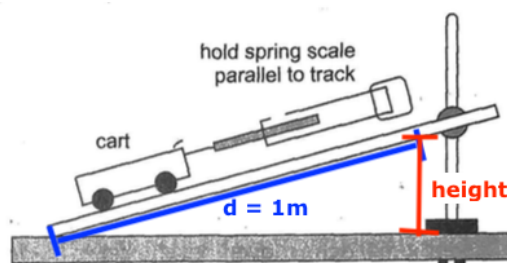
Introduction

When you push a cart uphill, you are doing work (W) on it. That work is energy being transferred into the cart's potential energy (PE) as it gains some height. If you release the cart at the top of the hill, the potential energy then gets transformed into the cart's kinetic energy (KE) as it gains speed rolling down the hill. If conservation of energy is true then the following equation must hold

$$W_{\text{lifting cart}} = PE_{\text{at the top}} = KE_{\text{at the bottom}} \quad \text{Eq. 1}$$

Procedure

1. Set one end of the track on top of the support rod so that the inclination is 10° .
2. Measure the height from the table to the 1 m (100 cm) mark on the track.
3. Using the force/spring scale, measure the force needed to pull the cart along the track. For this step make sure the force/spring scale is parallel to the track.
4. Lift the car all the way to the 1 m (100 cm) mark.
5. Release the cart and measure its speed at the bottom of the track using a photogate and the Smart Timer.
6. Repeat step 2 to 5 raising the inclination to 15° and then 20° .



Data Collection

d = distance = 1 m

m = mass of cart = _____

Name: _____

Physics 1 - Miguel Rocha

Date: _____

Inclination	F = force	h = height	v = velocity
10°			
15°			
20°			

Analysis

- For each of the inclinations calculate the work done to lift the cart (W), the Potential Energy at the 1 m (100 cm) mark (PE), and the Kinetic Energy at the bottom of the track (KE). Use the equations below for each of these quantities, **BE CAREFUL WITH THE UNITS!**

$$W = Fd,$$

$$KE = \frac{1}{2}mv^2,$$

$$PE = mgh,$$

where $g = 9.8 \text{ m/s}^2$.

Inclination	W	PE	KE
10°			
15°			
20°			

- How does the **KE** you measured compares to the **PE** and the **Work** you did on the cart? Does Eq. 1 holds? If not, does the difference depends on inclination?
- What factors do you think may cause for there to be a difference between **KE**, **PE**, and **Work**?