Potential and Kinetic Energy Lab

Problem - How do you determine the Kinetic energy (KE) produced by a variety of gram unit masses suspended from a pulley sliding down an angled cord?

Hypothesis - You can calculate the KE of any object using the formula:

\[ KE = \frac{1}{2}mv^2 \quad \text{or} \quad KE = \frac{mv^2}{2} \]

Materials - stop watch, metric tape measure, zip line (angled cord), pulley and cup apparatus, gram unit masses (100 - 500 grams)

Procedure -

1. Measure the length of an angled cord in meters.
2. Place the weight to be tested on the pulley cord system at the higher end.
3. Release the pulley and time it down the cord until it strikes the lower end.
4. Repeat 2 more times for 3 trials and compute average time in sec.
5. Now use the following formula to get the velocity:
   \[ V(\text{avg velocity}) = \frac{S(\text{distance in meters})}{T(\text{time in seconds})} \]
6. Convert grams to kilograms for each weight. (grams / 1000)
7. Now use the KE formula to compute Kinetic Energy. (label answer in Joules)
8. Repeat steps for other masses according to data chart.
10. Find the mass of 2 mystery weights.
11. Predict the velocity of 2 mystery weights based on the Mass vs. Velocity graph.
12. Predict the KE of the 2 mystery weights based on the Mass vs. Kinetic E graph.
13. Confirm your hypothesis by repeating all lab steps for the 2 mystery weights.
<table>
<thead>
<tr>
<th>Trial</th>
<th>Time (t) in seconds</th>
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<tbody>
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**Mass #1** 0.10 kg

**Mass #2** 0.20 kg

**Mass #3** 0.30 kg

**Mass #4** 0.40 kg

**Mass #5** 0.50 kg

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**Mass #1 = .10 kg**

Avg V = s/t =

V = __________ m/s

KE = .5mv^2 =

KE = __________ Joules

**Mass #2 = .20 kg**

Avg V = s/t =

V = __________ m/s

KE = .5mv^2 =

KE = __________ Joules

**Mass #3 = .30 kg**

Avg V = s/t =

V = __________ m/s

KE = .5mv^2 =

KE = __________ Joules

**Mass #4 = .40 kg**

Avg V = s/t =

V = __________ m/s

KE = .5mv^2 =

KE = __________ Joules

**Mass #5 = .50 kg**

Avg V = s/t =

V = __________ m/s

KE = .5mv^2 =

KE = __________ Joules
<table>
<thead>
<tr>
<th>Mass in grams</th>
<th>Mass in kilograms g/1000</th>
<th>Force in Newtons $F = M \times A$ with $A = 9.8$</th>
<th>Work in Joules $W = F \times S$ with $S = \text{LENGTH}$</th>
<th>Power in Watts $Po = W / T$ with $T = \text{Time from Data}$</th>
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<td>400 g.</td>
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<td>500 g.</td>
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Calculate the amount of Potential Energy for each gram unit weight tested using the formula

\[ PE = M \times G \times H \]

- \( M \) = the mass of the object in kilograms
- \( G \) = the acceleration due to gravity at 9.8 meters per second squared
- \( H \) = the height of the object in meters

Then calculate the efficiency of the system by using this formula:

\[ \% \text{EFF} = \frac{KE}{PE} \times 100 \]

<table>
<thead>
<tr>
<th>Mass Kg.</th>
<th>( PE = M \times G \times H )</th>
<th>KE from Lab</th>
<th>%EFFICIENCY</th>
<th>%EFF = ( KE/PE \times 100 )</th>
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