**General Physics eJournal 4**

**Newton’s 2nd Law: F = ma**

**Instructions:**

Follow the Writeup and fill out the eJournal as you complete the lab activities. Submit your eJournal report by uploading the completed WORD or PDF document to our class Learninghub site. If the Learninghub site is down, email the completed report file directly to a lab TA.

**Preliminaries:**

* Title:
* Name(s):
* Date:
* Time In & Out:

**Plan:**

**Hypothesis**

Sketch free-body diagrams of an object with mass, m, free to slide on an inclined plane. Use your free-body diagrams to derive the acceleration of Eq. 5 of the Writeup.

Form a hypothesis regarding the force, F, and acceleration of the cart, a, – sketch a hypothetical graph of F vs. a and convince yourself that the slope will be m, the mass of the loaded Hot Wheels car. Include these sketches (images) and derivations (images or typed out) in this eJournal.

*Insert images of your sketches*

**Experiment Outline**

Briefly describe your plan for testing your hypothesis.

**Equipment List**

* List
* Equipment
* Here

**Action:**

Describe the techniques used in Lab 3 to collect data by responding to the bullet point questions:

* How did you measure the mass of the loaded car?
* How did you measure the inclination angle?
* How did you measure the force exerted down the track?
* How did you measure the acceleration?

*Insert labeled image of your apparatus*

**Results:**

Record the mass of the loaded Hot Wheels car.

Mass of Car + Pennies: m = \_\_\_\_\_\_\_\_\_\_\_\_ kg

Fill in Table I with the angle, force, and acceleration data collected in Lab 3. Give the table an appropriate title.

**Table I: (Write appropriate title)**

|  |  |  |
| --- | --- | --- |
| **θ (degrees)** | **Force (N)** | **Acceleration (m/s2)** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Analysis:**

Plot force vs. acceleration and fit a straight line to determine the slope.

*Insert graph of F vs a*

Slope = \_\_\_\_\_\_\_\_\_\_\_\_ kg

R = \_\_\_\_\_\_\_\_\_\_\_\_

Compare the slope of the graph with the mass of the loaded Hot Wheels car by computing the percent error.

%Error = $\frac{\left|mass - slope\right|}{mass}×100\%$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_%

Interpret and comment on your correlation coefficient, R.

**Conclusion:**

Interpret your results in light of your hypothetical predictions. How similar were the results? Explain how the results of this lab apply to either a) the force of parking brakes on a car parked on a steep hill or b) the braking force (friction brakes or engine brakes) required for a semi-truck driving down a steep hill. How might you improve this experiment or explore it further?