Name: _____

Kinetic & Potential Energy Lab

Purpose:

- To use previous knowledge of velocity to perform kinetic energy calculations
- To practice making accurate measurements involving time.
- To make calculations of gravitational potential energy.
- To determine what affects GPE and KE more.

Part one: Potential Energy

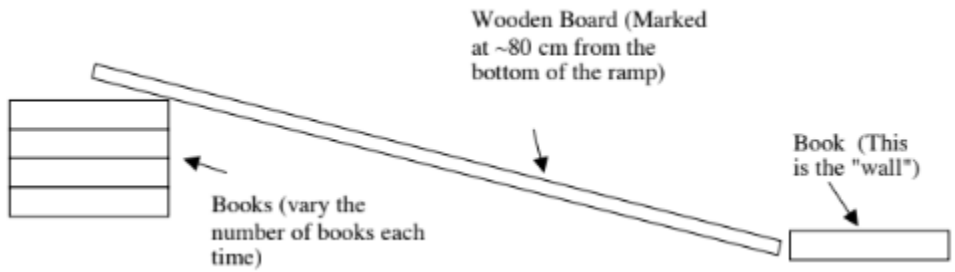
Potential Energy is the mechanical energy of position. In other words, potential energy is how much potential something has to do work. The formula used to measure P.E. is:

$$PE = mgh$$

Where *PE* is Potential Energy, *m* is mass (in kg), *g* is the acceleration due to gravity (9.8 m/s^2), and *h* is the height above the surface of the Earth (in meters).

You decide: How would the potential energy of an object be different on the moon? Why? _____
_____

Instructions: Determine the gravitational potential energy in each situation below. For each trial, place your PASCAR on the 80 cm mark of the track. Your setup should look like the one below.



Mass of PASCAR: _____

Number of Books	Weights on PASCAR	Mass of PASCAR and Weights (kg)	Height of car (m)	PE (Joules)
2	0			
3	0			
4	0			
5	0			
2	1			
3	1			
4	1			
5	1			

Takeaways:

The higher an object is off the ground, the more/less (circle one) potential energy it has.

A matchbox car has more/less (circle one) potential energy than a monster truck.

Part Two: Kinetic Energy

Kinetic Energy is the mechanical energy of motion. In other words, kinetic energy is how much work an object is currently doing. The formula for determining kinetic energy is:

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

Where *KE* is Kinetic Energy, *m* is mass, and *v* is velocity.

You will setup a ramp identical to the one you used in Part One.

Fill in the data table on the following page to determine the kinetic energy for each situation. Remember, release the car with the front wheels a distance of 80 cm from the bottom each time you do a trial.

Ramp with Two Books:

Trial	Weights on PASCAR	Mass of PASCAR and Weights (kg)	Distance Traveled by Car (m)	Time (seconds)	Velocity (m/s)	Kinetic Energy (Joules)
1	0					
1	1					
2	0					
2	1					
3	0					
3	1					

Average KE without Weights: _____ Average KE with Weights: _____

Ramp with Three Books:

Trial	Weights on PASCAR	Mass of PASCAR and Weights (kg)	Distance Traveled by Car (m)	Time (seconds)	Velocity (m/s)	Kinetic Energy (Joules)
1	0					
1	1					
2	0					
2	1					
3	0					
3	1					

Average KE without Weights: _____ Average KE with Weights: _____

Ramp with Four Books:

Trial	Weights on PASCAR	Mass of PASCAR and Weights (kg)	Distance Traveled by Car (m)	Time (seconds)	Velocity (m/s)	Kinetic Energy (Joules)
1	0					
1	1					
2	0					

2	1					
3	0					
3	1					

Average KE without Weights: _____ Average KE with Weights: _____

Ramp with Five Books:

Trial	Weights on PASCAR	Mass of PASCAR and Weights (kg)	Distance Traveled by Car (m)	Time (seconds)	Velocity (m/s)	Kinetic Energy (Joules)
1	0					
1	1					
2	0					
2	1					
3	0					
3	1					

Average KE without Weights: _____ Average KE with Weights: _____

Takeaways:

Mass/velocity (circle one) has a greater effect on the kinetic energy of an object.

Comparison Questions:

1. Compare the Kinetic and Potential Energies for each scenario. How do they compare?

# of Books	Avg. KE with Weights	Avg. PE with Weights	% error

# of Books	Avg. KE without Weights	Avg. PE without Weights	% error

$$\% \text{ Difference} = \frac{\text{Difference}}{\left(\frac{\text{New Value} + \text{Initial Value}}{2}\right)} \times 100$$

$$\text{Difference} \longrightarrow |\text{New Value} - \text{Initial Value}|$$

Sample Calculation for Percent Difference: