Interactive Lab Conservation of Energy
Name_____ Block____

This is a multipart Interactive Lab. When you come to the angry policeman  wait for the whole class before continuing, there will be class discussions at points.

1. State the physics definition of **Work**.

_____

_____

_____

2. State the physics definition of **Kinetic Energy**.

_____

_____

_____

3. What role does Work play in the transfer of Energy?

_____

_____

_____

Part 1 During this part you are going to investigate how one form of energy turns into another. You will use a simulation that allows a cart to move down a frictionless incline and then take a jump at the bottom. The goal of the simulation is for the cart to jump through the hoop. Your goal is to find a relationship between the beginning height of the cart and the KE of the cart at the bottom of the incline.

Open the shortcut "IL Con Energy 1" on one of the lab stations.

Open the simulation contained in this section. **Do Not follow the directions in the simulation follow these instructions.**

Fill in the Chart by doing multiple trials in the simulation. Put a star next to the trial that is successful in getting the cart through the hoop but continue doing trials until the chart is complete. You need to hit pause on the simulation to record the speed of the cart while it is on the flat bottom part of the track. The mass of the cart is 100 Kg.

Initial Height (m)	Speed at bottom (m/s)	KE at bottom (J)
2.0		
3.0		
4.0		
5.0		
6.0		
7.0		
8.0		
9.0		
10.0		

1.1 What relationship do you see between the Initial height of the cart and the KE at the bottom of the track?

_____

_____

_____

1.2 Based on what you have seen and stated, find a mathematical relationship between the Initial Height and the KE at the bottom of the track.

Part 2 During this part you are going to investigate the same situation but this time taking it out of the physics world and into the real world. A non-conservative force, friction, has been added to the cart. The goal is the same to get the cart through the hoop.

2.1 What was the height in part 1 that was successful? _____

2.2 What was doing work on the cart to transfer the cart's PE to KE?

_____

_____

2.3 Given that there is now a non-conservative force on the cart, friction, do you think the cart will need more or less energy at the beginning to have the same KE at the bottom of the track? Explain your answer.

_____

_____

_____

Open the shortcut "IL Con Energy 2" on one of the lab stations.

Open the simulation contained in this section. Notice that the cart is going to start from a height of 9.0 meters and will have an initial speed that you set. **Do Not follow the directions in the simulation follow these instructions.**

Try the simulation once without changing any values. Record the information asked for below.

Initial Speed	Initial Height	Height at bottom	Speed at bottom

2.4 Using this information and what you know about Work, KE, PE and Conservation of Energy show that the simulation is programmed correctly.

2.5 Calculate what speed the cart needs to have at the initial height to make it through the hoop. Show all work including substitution with units.

Solution

Try your solution in the interactive.

2.6 Did your solution work? _____, if not keep trying until it does and record the final solution.

Part 3 Now you are ready to take it to the final level! In this part you are in the real world again but rather than a fixed height and changing the initial speed you will be placing the cart at an initial height up the track.

3.1 Calculate the height that cart needs to have initially to make the jump. Here are some facts: The incline is at an angle of 55^{o} to the horizontal, the cart has a mass of 100 Kg, the frictional force is a constant 125 N and again the cart needs a speed of 12.5 m/s at the bottom.

Solution

Open the shortcut "IL Con Energy 3" on one of the lab stations.

Open the simulation contained in this section.

Try your solution in the interactive.

3.2 Did your solution work? _____, if not keep trying until it does and record the final solution.

Summary
What did you learn?