Pre-Lab Assignment -20pts **Newton's Law of Motion**

Read the entire lab & Complete Pre-Lab in your lab composition notebook.

Do not write on the backs of pages.

The first page is for Teacher Sign-offs that occur at various points in the lab:

Use the following format/example for the Teacher Signature Sign-off page.

You'll need to read the lab and create a table similar to the example below based on the # of sign-off points for the lab.

Teacher Signature Sheet for ...feeling Sluggish

Question Number	Section	Teacher signature
-----	Pre-lab	
7	Procedure	

(this is only a partial table...you must READ through the lab and determine all the sign-offs)

The second page begins the Pre-lab:

The pre-lab should follow the steps below:

Be sure to "label" each Heading of the pre-lab

Title of lab and unit (Newton's Laws of Motion)

- **Definitions: "Define" the following terms: force, mass, inertia, First Law of Motion.**
- **Purpose: In a sentence, write the purpose of the lab.**
- **Procedure: In a numbered list write what you will be doing.**
- **Diagram: Sketch and label the set-up of the investigation.**
- **Preliminary Questions: Write and answer all preliminary questions.**
- **Have your teacher initial your pre-lab before you begin the lab.**

*****Be sure to have your teacher sign off on the data table at the various check points during the lab.**

…feeling Sluggish!

Introduction

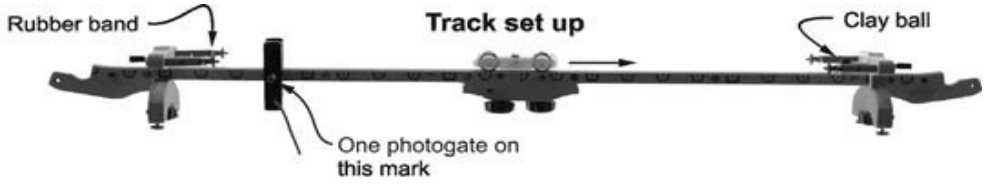
Inertia is the property of an object that resists changes in motion. Inertia comes from mass. Objects with more mass have proportionately more inertia than objects with less mass. A force is a push or a pull, or any action that has the ability to change motion. There can be no change in motion without the presence of a force. Newton's first law states that an object at rest will remain at rest and an object in motion will stay in motion unless acted on by a force. The force of gravity on an object is called weight. Weight is different than mass. At Earth's surface, gravity exerts a force of 9.8 newtons on every kilogram of mass. In this investigation, you will explore Newton's First Law, the law of inertia.

Question for this Investigation:
Why are heavier objects harder to start moving or stop from moving?

Preliminary Questions - To be answered individually.
1. Describe the motion you expect to observe as mass is added to a car traveling along a straight track when force is constant?
2. What is required to start an object in motion?
3. Sketch a speed vs. mass graph of what you expect to observe when force is held constant?
4. What force will cause an object to roll down an incline?
5. Describe the motion you expect to observe as mass is added to a car rolling down an incline?

MATERIALS

* Car and track	* timer and 1 photogate	*mass balance
* physics stand	* clay and rubberband	*3 metal balls



PROCEDURE- Part 1 (2A)
1. Make a data table (3 columns & 5 rows) in your lab notebook. The headings for the columns are: Mass(kg), Time through Photogate(s), Speed(m/s).
2. Set up the long straight track with a rubber band on one end and a clay ball on the other end.
3. Put one photogate about 20 cm away from the rubber band on the square mark just ahead of the car when the car is just touching the rubber band.
4. Adjust the screw so the rubber band deflects about 2-3 centimeters when you pull the car back. This means the same force is applied to each car.
5. Take "trial" data for a few trial runs for each mass. Try to launch the car in a consistent way each time. You will know you have been consistent when the photogate times are within 0.0005 seconds of each other.
6. **Measure the mass** of the car with 0, 1, 2, and 3 steel balls. **Record masses in your data table.**
7. ***Have your teacher approve your mass data before continuing
8. Launch cars of two different masses (0, 1 steel balls) and observe their speeds when they pass through the photogate**. Record the times for each.**

9. ***Have your teacher approve your time for (0, 1) data before continuing.
10. Launch cars of masses (2, 3 steel balls), and observe their speeds when they pass through the photogate**. Record the times for each.**
11. *****Have your teacher approve your data before you continue.*

<u>Analysis</u> (to be completed in your lab notebook)

1. Calculate **(K-U-E-S)** the speed for the different masses. The distance is the width of the car flag (d = 0.01m). **Record the calculated speed values in your data table.**
2. *****Your teacher needs to approve your work before you continue.*
3. Are the speeds for the different masses the same? Explain why or why not.
4. What is the independent variable of this experiment? dependent variable? Explain each answer.
5. Construct a graph using Graphical Analysis of speed vs. mass of the car.
6. ****Have your teacher approve your graph before you print.
7. Save the graph under your student number as "feeling sluggish"
8. Using your graph, describe the relationship between the car's speed and the mass.
9. Print one copy of the graph for the group report.