MASS VS. WEIGHT MINI-LAB

Purpose: *Determine the relationship between an object's weight and mass.*

Instructions:

As with previous labs, you will be required to produce and hand in data tables and graphs **on a separate sheet of paper**. Please **DO NOT TAKE MORE THAN 2 TYPES OF OBJECTS AT A TIME**. We need to make sure that every group has objects to use.

Materials:
-   1 Triple Beam Balance
-   1 Electronic Scale
-   Several different objects

Procedure:
1. Title you own sheet of paper with the same title on this handout.
2. Create 2 "ready to use" data tables on your paper. Your data tables will look like this:

TABLE 1: The Mass and Weight of Various Objects

Object	Mass (g)			Weight (N)		
	Trial 1	*Trial 2*	*Trial 3*	*Trial 1*	*Trial 2*	*Trial 3*

TABLE 2: The Average Mass and Average Weight of the Objects

Object	Average Mass (kg)	Average Weight (N)

3. You will need to perform **3 trials** for the mass of each object. To do this, you will measure the mass of 3 objects of the same type (for example, 3 separate bouncy balls of the same size). Use the triple beam balance to measure the mass of the objects. Again, please **do not take more than 2 types of objects at a time** so everyone has access to objects throughout the lab.

4. You will need to perform **3 trials** for the weight of each object. To do this, you will measure the weight of the same 3 objects that you used to measured mass. Use the electronic scales at each lab station to measure the weight of the objects.

5. Repeat steps 3-4 for **AT LEAST 8-10 different types of objects**. If you have time, please take data for each type of object available to you.

6. When you have finished taking data, please place the objects neatly back in their containers. Calculate the average weight **(in N)** and average mass **(in kg!)** for your objects.

7. Open the LoggerPro software. Plot average weight **(in Newtons)** vs. the average mass (**in kilograms**).

8. Fit your data with an appropriate best fit line. On a sheet of graph paper, draw the graph by hand (with proper title, number, axes labels, and units). You may also print the LoggerPro graph from home.

9. On the graph, write the equation of the line (with OUR variables, not x and y).

10. What is the slope of your graph? 1 Newton = $1 \ kg \cdot {m}/{s^2}$. With this is mind, what are the units for your slope?

11. Write a **qualitative description** of the graph. What does the slope of the graph represent? What does this tell us about the relationship between mass and weight?

INFORMAL LAB WRITE UP:

Your completed informal lab write up should include:
- ➔ Mass and Weight Data (Table 1 - #3-5)
- ➔ Calculated Averages (Table 2 - #6)
- ➔ Properly formatted weight vs. mass graph (#7-8)
- ➔ The equation of the best fit line (#9)
- ➔ The slope of the line with units! (#10)
- ➔ Qualitative interpretation of the graph (#11)