**The Great Egg Drop!**

**Objectives:**

1. Design a model that will protect an uncooked egg when dropped from various heights (up to two stories).
2. Write a formal lab report discussing how this experiment relates to Newton’s Laws.

**Introduction**

In order to build a successful model, you will need to understand Newton’s Laws of Motion, as well as concepts of force, energy, dynamics, inertia, work, and momentum. We will spend the first two weeks of this unit completing a series of labs and activities to help you learn these concepts. During week 3, you will use what you have learned to design a model that can protect an egg from breaking during a free fall.

**Rules for Model Design**

* The model, when completed, must be able to fit inside a rectangular box with the dimensions 25 cm x 25 cm x 50 cm (about 10 in x 10 in x 20 in).
* The following materials will be provided for you:
  + Straws
  + Rubber bands
  + Paper
  + String
  + Wire
  + Glue
  + Cardboard
  + Staples/Paper clips
* Forbidden materials:
  + Balloons, metal (other than paper clips/staples), Styrofoam, and other packing materials
* Other materials (besides the forbidden materials) MAY be used, but you have to buy them yourself.
* NOTE: the less materials you use, the higher your score!

**Rules for Competition:**

* Eggs (Grade “A” large) will be provided by Ms. Rosencrans at the start of competition
* You and your partner will have 30 seconds to secure your egg to your model before each drop, and another 30 seconds to remove the intact egg from the model after each drop.
* The competition will be composed of 5 “rounds”. Your egg must stay intact for each round in order to progress to the next round.
  + Round 1: Drop from 1 meter
  + Round 2: Drop from 2 meters
  + Round 3: Drop from 3 meters
  + Round 4: Drop from 1 story (in the stairwell; approx. 5 meters)
  + Round 5: Drop from 2 stories (outside; approx. 10 meters)
* Scoring:

Maximum height

Number of materials used = Total Score

**PRIZE:** Members of the winning team will receive a KING-SIZED CANDY BAR of their choice!

The competition will be on **Thursday, January 30th.**

**Lab Report requirements:**

The final lab report must be typed and in MLA format (Times New Roman, 12 pt font, double spaced) and include the following:

1. An **Introduction** explaining Newton’s Laws of Motion (all three) and how the project relates to each of Newton’s Laws (one paragraph for each law). The introduction should also clearly state the purpose of the project.
2. A **Materials and Methods** section, with blueprints of your model (you can draw that part by hand), a step-by-step explanation of how you built your model, and an explanation of how (and why) you designed your model the way you did.
3. A **Data and Observations** section, which should state the following (no complete sentences needed)
   1. Mass of your model
   2. The heights for each successful drop
4. A **Calculations** section, where you should calculate the following ***for each fall***:
   1. Potential energy of your model before the fall
   2. The kinetic energy of the model just before impact
   3. The work done on the model at impact
   4. The force exerted on the egg at impact
5. A **Data Analysis** section, where you discuss how potential energy, kinetic energy, work, and force were affected by changing the starting height of the egg drop. You should create a height vs. \_\_\_\_\_ graph for each of the four variables you calculated in section 4.
6. A 1-2 sentence **Conclusion** about what you learned from the lab, and any trends in energy, work, or force that you identified during the lab.

**What you will be graded on:**

**Lab Report: 100 points**

Introduction: 20 points

Materials and Methods: 20 points

Data and Observations: 10 points

Calculations: 20 points

Data Analysis: 20 points

Conclusion: 10 points

**Model Design: 50 points**

Quality (functionality, durability): 30 points

Creativity: 20 points

**Mini-labs: 100 points**

Newton’s Second Law lab: 25 points

Newton’s Third Lab lab: 25 points

Energy of a Tossed Ball lab: 25 points

Momentum, Energy, and Collisions: 25 points

**Agency:** **50 points**

**Collaboration:** **50 points**

**TOTAL: 450 points**