Physics Name:

The Incredible Egg Drop!

Purpose:

To package a *raw* egg so that it does not break when dropped from a predetermined height. The length (m) of the vehicle, weight (N) of the vehicle, and time for the fall will all factor into the score of your egg vehicle. The object of the lab is to construct your egg vehicle such that when using the following formula the result is the largest number.

Egg Formula:

$$score = \frac{1}{t_{fall}\ (weight)(length)}$$

Materials:

Your creative ideas are the limit…
Your egg must drop, not float to the ground.
Baggie (all eggs must be in a baggie to reduce possible cleanup)

Restrictions:

You may not use liquids, glass, or any materials that will potentially make a mess on the floor
No parachute type devices are allowed.
Egg can not be treated in any way (hard boiling, painting, taping, etc.).

Procedure:

1.) Design and build an egg carrier that will allow the egg to survive a two story drop. Keep in mind the Impulse-Momentum Theorem and it's applications (rolling with the *punches). Also, keep in mind what you learned about momentum changes when things bounce*!

2.) On the day of the egg drop we will mass the container <u>without the egg in it</u>. Record this in your data table (in grams). Mass the4 egg separately. Record the result. You can then calculate the *weight* of the vehicle (to determine score) and the total weight to determine impact speed etc… (use W = mg).

3.) Measure the <u>longest dimension</u> (in m) of your carrier. Record in your data table.

4.) We will make one drop for each person and have 3 timers for each drop. Record the height of the drop. Record all times and calculate the average time. If there is a outlier in the time data, ignore it. Record the average time in your data table.

5.) Calculate your score and place it in your table (show calculation below).

Data for carrier:

Mass (g)	Weight (N)	Length (m)	Ave Time (s)	Score	Break?

Mass of egg (g): _____ Height of drop (m): _____

Analysis/Conclusions:

1.) Using the data in your data, calculate the *following* (be sure to show all calculations).
Ave. Speed (**v** = d/t): Theor. Time ($d = 1/2at^2$): Actual Time (ave):

Accel. ($d = 1/2at^2$): (use actual time) Impact Velocity ($v = v_0+at$): (use actual time) Momentum (**p** = mv):

Impulse (**I**=F·t): "Score":

Questions: Answer on a separate sheet.

1.) Make a diagram of your egg carrier.

2.) Describe the fall of the egg and the rationale for the design you chose <u>using the following laws of physics</u>:

- -The Law of Inertia
- -The Law of Force-Counterforce
- -The Impulse-Momentum Theorem
- -"Momentum and bouncing"
- -The Work-Energy Theorem

3.) How did the theoretical time compare to the average time measured? Account for any differences.

4.) What was your calculated impact velocity in mph? Does this surprise you?

5.) If you had a second chance at the drop what type of changes might you make to improve your score. Be sure to explain why you would make the changes.

6.) From a physics point of view, why don't you want your egg carrier to *bounce*?

7.) What does this activity have to do with automobile air bags and running shoes?

Conclusions
What did you do? What did you find? What generalizations can you make?