Egg Drop Project

Project Overview

In this project, you will build a container which can house a medium egg as it is in a state of free fall. In building the container, you and your partner should think about how the energy is converted from potential energy to kinetic energy, and the work done on the container and the work done on the eggs. In your design, you should choose one or two variables and test the results of this variable on your crate. Your design must not include changing the egg in any way (no tape on the egg, no nail polish on the egg, no hollow eggs.). Some materials you may choose are poster board, cardboard, cotton, Styrofoam, diapers, tape, glue, socks, toilet paper, and straws. You will write a lab report with all the standard sections and produce a final product to describe your work. In this project, you should be trying to apply some of the knowledge about motion that you have learned so far in this course. This will require some thinking on your part about how each of the units fits with the one before and those that came after. Then, these topics should be applied to an unrelated task, in this case, building and testing an egg crate.Your thinking process and the ways you find to apply the physics to the design task should be readily apparent to anyone who reads your final report, or who experiences your final product. Your goal should be the synthesis and application of this unit.

Proposal

Students will write a proposal Purpose, Hypothesis, Diagram, question to answer, variables to test, and diagram of crate(s)

Procedure

Students will list step by step instructions define materials and methods needed to study the relationship between their variables, data collection and analysis techniques.

Theory

Students will write a detailed background Theory section which includes information from a literature search, and explanations of all relevant physics concepts used in their project.

Data

Students will record their data in neat and organized data table that includes space for results from their calculations. Data table should contains all necessary data to analyze variables identified.

Construction

Students will build an egg crate or a series of egg crates which allow them to test the variable(s) they decide on. These egg crates will be dropped from the height approximately 10 m. Height will be calculated by students.

Conclusion and Analysis

Students will write a conclusion which relates to their purpose using example data and graphical analysis to support their conclusion.

Final Report

Students will write a formal lab report which will contain the purpose, materials and methods, background, data, a diagram of the egg crate(s), graph(s), and the conclusion sections. It should be typed using a word processor, and include imported graphs and diagrams.

Things to do

1. Find at least three resources from the literature (books, articles, websites) which you can use to help in writing your proposal and your procedure also your design and protection of the eggs.

2. Make a list of materials you would like to use in your container. You must have this approved by the teacher.

3. Make a detailed diagram (sketch) of what your container will look like.

4. Write a purpose for your investigation. This should be very specific. You may wish to frame this as a question. For example, What is the effect of adding extra cardboard to the design of our egg crate? or How much cotton is best?

5. Write your procedure for how to build your container(s), test your variable(s), and collect your data. Your data should include at least some information about distance, time, velocity (average and initial and final), acceleration, Potential Energy, Kinetic Energy &Work.

6. Think about how the literature sources you found, your physics knowledge, and this project are related. Organize your thoughts in an outline, then in a detailed essay. Call this essay the theory section of your lab report.

7. Build the container(s).

8. Drop it/them from the top of the building (your teacher will do this). You should try a few smaller heights as trials before you drop from the building.

9. Collect your data. This should include at least some information about distance, time, velocity (average and initial and final), acceleration, Potential Energy, Kinetic Energy &Work.

10. Represent your data in a meaningful way using a graph. Produce this graph using graphical analysis. Your graph may be a bar chart, a scatterplot, or a line with an equation.

11. Write a lab report which includes all the standard sections: Name, Date, Title, Hypothesis, Apparatus, Procedure, Observation, Conclusion (Data table, and description of data), and Bibliography. This lab report should tell about all your work. It should include any attempts you tried, and the reasons you stayed with them, or the reasons you decided to try something else. It should explain the physics that you used to collect and analyze your data. It should show the data and demonstrate how the data helped you reach your conclusion.

Due Dates

Proposal including procedure, purpose, diagrams and bibliography: Sept 18
Background section including the physics behind it: Sept 25
Egg crate(s) built and dropped (do this early if possible): Oct 3
Final Lab Report: Oct 9

Egg Drop Project

Situation: You are in your physics class minding your own business, or sleeping as some people would say, and the teacher suddenly says, "I am assigning you an egg drop project. You may construct the egg drop apparatus with whatever materials you want but the apparatus may not exceed four inches on any side."

Objective:

To build an egg drop apparatus to protect a raw egg that is dropped from the top of the football stadium (approximately 40 ft. tall) onto concrete.

Restrictions:

The container may be no longer than 10 centimeters on any side. For each millimeter that the container is off a point will be deducted from the final grade. This includes the use of parachutes, etc.

Grading Criteria:

Please refer to the rubrics This project is equal to one test grades for this quarter.

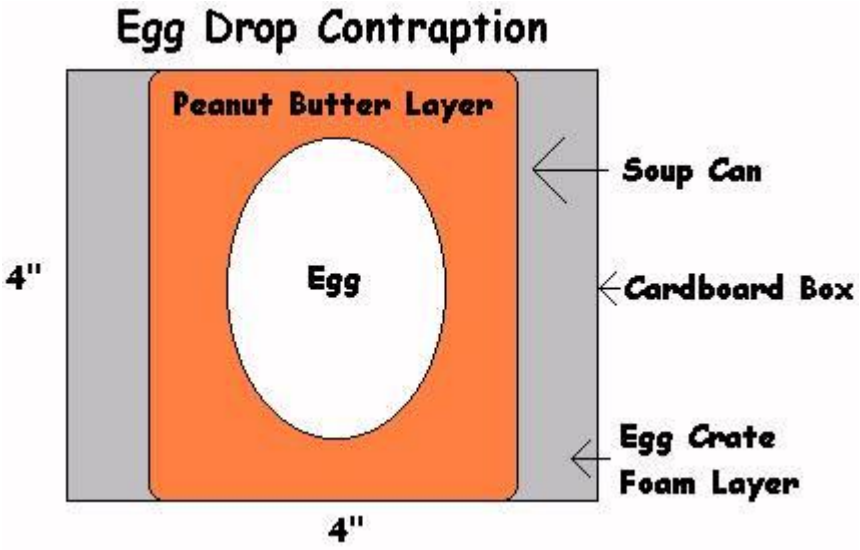
Construction of an Egg Drop Apparatus

Phase 1: *The Design*

When you are designing this apparatus, there are a few things that you need to keep in mind. First of all, this device must be protective. The raw egg inside must not even crack at the first drop. This is much harder to accomplish than one would think. Second of all, it has to be strong enough to withstand the weight of the physics teacher.

Example: I designed my apparatus as something that I felt would be protective as well as strong. I took a soup can and hammered the bottom down about a half an inch so it would fit into the 4"x4" box. Then, I wrapped the can with egg crate foam and put it in the box. Finally, I put peanut butter in the can and put the egg inside, covered in saran wrap so I could take the egg out to inspect in between drops.

See "Designing Tips"



Phase Two: *Testing*

Request practice runs at the drop site before the actual project due date to make sure that your apparatus will withstand these tests. Also, test standing on the object with your own weight to determine if it might withstand the heavy weight of your physics teacher. The project takes much trial and error and it is highly doubtful that you will succeed in your design on the first trial. You will most likely have to modify your current design or start completely over and design a new apparatus.

Phase Three: *Actual Drop*

Eggs should be provided by the teacher at the drop site so there is no way that a student could modify an egg before the drop. The student should bring a small repair kit for their apparatus, i.e. tape, scissors, rubber gloves (if semi-solids were used), etc. Be fully prepared and bring all items to the drop site.

Designing Tips

What worked, what didn't

Heavily constructed objects did not work. Some used metal boxes to withstand the weight of the teacher, but the egg hit the metal on the initial drop and cracked. Normal packing materials do not work every time. Even though one would imagine bubble wrap protecting the egg, it does not seem to work every time. On some apparatuses it did, others it didn't. The overall outcome of the project was that most student's projects failed. There was about a 5% complete success rate. This was mainly due to a failure to test the project before the due date.

The lightest strongest materials worked. One student used popped popcorn to surround an egg and it withstood all three tests. Another used high impact foam used in computer shipment. They cut out the outline of an egg and it withstood all three trials. Similarly, another used the green foam used in flower arrangements. Peanut butter works very well in protecting the egg. It is a very good material to incorporate into the apparatus. The only downside of peanut butter is that it is very messy and requires the use of rubber gloves.

The apparatus which I built only withstood the first trial. The use of the peanut butter is what saved the egg. The second trial cracked the egg because it was thrown at too fast of a speed onto the concrete and the device was much too heavy and had little space inside of the can for the egg to shift.

Dos:

Use light and strong materials
Use simplified apparatuses
Test the device many times before the actual project due date
Bring a repair kit to the drop site
Ask if you can help with the drops for extra credit

Don'ts:

Don't overcomplicate the design
Don't use heavy materials if at all possible
Don't restrict your planning time till the last day of the project.

Links

The Great Egg Drop
Egg Drop
Yankee Ridge Egg Drop

Rules!

- Of course the egg and its contraption must hit the ground! I will be doing the throwing, and I'll throw them anyway I want!
- No balloons or parachutes are allowed.
- The egg and the project must weigh less than 200 grams. (the average egg weighs 50 grams)
- Only raw, store bought chicken eggs; size medium or larger may be used. You may NOT soak the egg in vinegar.
- Your egg project must fit on a regular size sheet of paper. (note that it may be 3 ft high and still fit on the paper)
- Your egg project must have an opening the size of my pinky finger where i can see a portion of the egg.
- You may not use nerf balls, pillows, or stuffed animals to protect your egg.
- You may bring in your project early to weigh it - if your project is overweight you may take it home and make any necessary alterations. If you wait until the last minute and your project is overweight, it will be disqualified.
- Once a project is in school it may not be touched by anyone other than its owner. Please have your name and class period written on it.
- Once a project has hit the ground it will your responsibility to retrieve your egg and show it to the score keeper for scoring.