GRADE 6 REGULATIONS AND MATERIALS

OBJECTIVE

The objective of the project is to successfully drop a package which contains a raw egg from a predetermined height without breaking the egg.

This is an individual project to be constructed at home. The project must be durable enough to protect the egg as it is thrown off the gym roof. Think of the egg as a passenger in a car going through a crash test.

RESEARCH REQUIRED

You may decide the amount and form of research that you do prior to the experiment. You may want to research aspects of this project that you personally find interesting. Learning mathematical formulas to calculate the force of an impact, researching the impact absorbing capability of different materials, identifying the most stable geometric structures, or even studying the basic egg are all research opportunities related to this project.

Kinetic energy is the energy that a body possesses as a result of its motion. Potential energy is the energy that exists in a body as a result of its position or condition rather than of its motion.

In building the container, you 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.

PROJECT DESCRIPTION

You might want to research the latest discoveries on how best to dissipate force. You should then decide on the concept you want to employ, and begin the design process.

Once the prototype egg container has been designed, you should sketch the design, including labels, and create a list of materials required for the construction of your design. This Materials List should be submitted to Mr. Hare prior to construction. If the materials fall within the established criteria (see Design Constraints), you may begin to construct your container.
CONSTRAINTS/RULES/GUIDELINES

Your egg project must fit on a regular size (8 ½ x 11) sheet of paper. (Note that the height of the container is not a factor – it can be “tall” and still fit on the paper)

Only raw, store bought chicken eggs - size large - may be used. Your design must not include changing the egg in any way (no tape on the egg, no nail polish on the egg, no soaking the egg in vinegar, no hollow egg...). You must supply the egg used in the project.

No glass of any kind may be used in the design, for obvious reasons.

The egg container and all materials must remain intact. For example, no parts – inside or out - can fall or break off during flight or impact.

At least ¼ of the egg should be showing at all times – in other words, you may not completely cover the egg with any material. We should be able to clearly see a part of the egg as it is housed in your design.

The container must be able to be opened once we return to the classroom so that we may check on the condition of the egg. The inside materials must be designed to allow raw egg to be easily inserted and removed.

The containers will be dropped from the gym roof to the black top.

Containers must be constructed prior to the school day of testing.

Label your container with your name – you may also assign a name to the project itself.

All eggs must first survive the trip in a box to the top of the building. Any egg that does not survive will be disqualified from the competition.

Once a project is in school it may not be touched by anyone other than its owner or Mr. Hare.

Every student will submit a drawing of their design. This drawing will explain in detail the materials used and how you expect the design to work – what will the materials do to protect the egg? (Hypothesis)

Detailed explanations will be required on the day of the drop – you will need to write a “lab report” detailing the process of constructing your container. It might
be a good idea to keep a “journal” as you go so that writing your report is easier in the end. Include some of the following suggestions in your report:

- What materials did you want to use but couldn’t? Why couldn’t you use these materials? (not available, not feasible, etc.)
- What materials did you feel absolutely had to stay in your design and why?
- If you tested your container, what problems did you find with the outside construction or the materials inside the container?
- Read over the post-experiment analysis questions in this packet and include answers to any of those questions you can in your report. This will make the report very complete and concise.
- Include any research you came across that would support your idea for a successful design. In other words, tell us why you chose the materials/design you used, backing it up with research you found.

THINGS TO CONSIDER

Do keep in mind that your egg-protection device will be dropped from the roof. Mr. Hare will drop from the roof without guidelines. There will be no “hold it this way!” Or “You dropped it from the wrong way that is why it broke!” 😊

CONSTRUCTION AND TESTING

You will construct your impact-absorbing container according to the designs you submitted to Mr. Hare. Should you discover flaws in your design during your construction or test phase, you should go back to the drawing board and resubmit a new design or a design modification.

COMPETITION

The competition determines whose method enables the egg to survive a drop from the gym roof. All packages will be dropped from the same height. In the event there is more than one successful drop, winners will be based on the lightest weight package.
POST-EXPERIMENT ANALYSIS

Think about these questions:

1. What are the forces acting on the egg as it falls?
2. How can you control the forces that cause the egg to break?
3. Was it the material, the amount of it, or its compression factor that was the key?
4. What are the common characteristics of the materials that protected some eggs?
5. Did layering of materials play a role in protection?
6. What about your design made the egg break? Not break?
7. How would you design your container differently next time?

Due Dates:

1. Initial Design: Thursday, March 19th
2. Lab Write up before testing: Wednesday, March 25th
   a. Include: Title, Problem/Objective, Hypothesis, Materials, Procedure in building container (may be in journal form).
3. Final product: March 27th with complete Lab write up. All items from #2 with the addition of results and data table. Data table to include weight and time taken to drop. You must include the post-experiment analysis.

Grading

1. Initial design: ___________/15
2. Lab Write up 1st Draft ___________/15
3. Egg container fitting criteria ___________/10
4. Final Lab Write up ___________/50
5. Participation ___________/10

___________ / 100 (Test Grade)

Some class time will be used for the project, but most will have to be finished at home.