

Name \_\_\_\_\_  
Physics \_\_\_\_\_  
Period \_\_\_\_\_

Date \_\_\_\_\_  
Lab #21 (75 pts)  
Mrs. Nadworny

Due Date \_\_\_\_\_

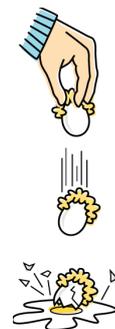
**NO Lab Write-Up Required**  
attach diagram

## Egg Drop

### • The Challenge

- Your task is to design, build and describe the performance of an egg safety container that will allow an egg to survive a fall from the ceiling. In the spirit of all three of Newton's laws & momentum, design a container to **HOLD** a plastic egg such that the container can be dropped from the ceiling onto the hard, unforgiving floor without the egg being broken (popping open).

(15 pts)



### • Rules

- You may use **only** the supplies provided. If the container is non-compliant with specifications it will result in a penalty (loss of points).
- You will be creating a detailed diagram of your container. Create a quick sketch for reference.
- **Materials** –
  - 1 meter of scotch tape
  - 20 straws
  - 2 pieces of paper
  - You will **NOT** be given extras of any materials. Plan before you build.
  - You must take **ALL** supplies at the start of your construction.
- You may not tape the egg shut.
- You will only have the time allowed and no more. If you do not present your container when requested, it will result in a penalty.
- You must be able to prove your egg is intact. **Make sure that you can extract your egg from your device without destroying your container.**

**Decision of the judge  
is final!**

### • The Point System

- Your egg must survive a fall from the ceiling. If your egg survives you will earn full credit for this portion of the lab. (5pts)
- Bonus points are possible for a successful drop from an increased height. All containers that are successful at the ceiling drop will be brought to the Commons. All eggs that survive a fall from the balcony of the Commons will be awarded 10 lab bonus points.
  - Distances for bonus points may be adjusted at anytime by the judge (Mrs. Nadworny)
- Additional points may be earned in the following categories:
  - Best Aesthetic Design
  - Most Spectacular Crash

To be completed by teacher only:	
<input type="checkbox"/>	Egg Cracked Open (0 pts)
<input type="checkbox"/>	Egg Survived (5 pts)
<input type="checkbox"/>	Egg Survived Commons (+10 pts)

• **Analysis**

- Using a **pencil** and **ruler** create a detailed diagram of your container on a piece of blank paper. Your diagram must be neat with all components labeled. A minimum of two views of your container (side, aerial, interior, or exterior) should also be included. Attach the diagram to this lab sheet. (10 pts)
- Describe any of the reasoning that led to your design. (5 pts)

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- Comment on the success or failure of any particular piece of your design as well as the fate of your egg. (4 pts)

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**Directions** - Answer the following question using physics concepts learned in class and complete sentences. Stay away from using the words “**absorbed**” or “**cushioned**” when answering the questions.

1. Using Newton’s 1<sup>st</sup> Law explain why the egg continued through the container to the floor even after the container hit the floor. (3 pts)

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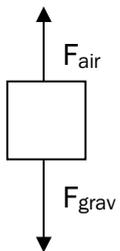
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2. How did the design of your container have an effect on the vertical net force while falling? [Do NOT neglect air resistance.] (7 pts)



- Compared to my classmates, my egg container's (plus egg)  $F_{grav}$  was (lower, same, higher) because: \_\_\_\_\_  
\_\_\_\_\_
- and it was (light, medium, heavy) because: \_\_\_\_\_  
\_\_\_\_\_
- and compared to my classmates  $F_{air}$  was (small, medium, large) because: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- As a result, my vertical net force was (small, medium, large).

3. Using Newton's 2<sup>nd</sup> Law explain how a decrease in net force would affect the acceleration of the container as it fell towards the ground. [Do NOT neglect air resistance.] (2 pts)

- My  $F_{air}$  was (did, did not) significantly reduce my  $F_{net}$  and acceleration. Compared to  $g = 9.81 \text{ m/s}^2$ , my acceleration was (equal, slightly smaller, smaller, much smaller).

4. Using Newton's 3<sup>rd</sup> Law compare the force of the container on the floor to the force the floor exerted on the container. (2 pts)

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\_\_\_\_\_

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\_\_\_\_\_

5. How did the design of your container have an effect on its momentum while falling? [Using  $p=m \cdot v$ ] (7 pts)

- Compared to my classmates, the mass of the container (plus egg) was (lower, same, higher) because: \_\_\_\_\_  
\_\_\_\_\_
- and it was (light, medium, heavy) because: \_\_\_\_\_  
\_\_\_\_\_
- and the velocity was (slow, medium, fast) because: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- As a result, my momentum while falling was (small, medium, large).

6. How did your container's momentum while falling affect the amount of impulse experienced when contact was created with the floor? [Using  $J = \Delta p$ ] (2 pts)
- Because my momentum while falling was (small, medium, large), the impulse experienced when hitting the floor was (small, medium, large).
7. How did the design of your container have an effect on the components of impulse on the egg while stopping/crashing into the ground? [Using  $J = F_{net} \cdot t$ ] (4 pts)
- The impulse experienced when hitting the floor was (small, medium, large) and
  - the contact time with the ground (stopping time) was (quick, medium, slow) because:  


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  - As a result, the force necessary to stop my container was (small, medium, large).
8. How do the concepts you applied when designing your container relate to devices used in the real world? Explain. (3 pts)
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9. What physics concepts that we have studied so far this year do you now understand better as a result of completing this lab? Explain at least one. (3 pts)
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10. If given another chance to create a new container, explain how you would design the components of your container differently as well as an explanation of why or why not. (3 pts)
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