# EggXpress - Packaged Eggdrop

**LEVEL:** Grade 6 - 8

**TYPE OF CONTEST:** Individual / Team

**COMPOSITION OF TEAM:** 1 – 2 students per team

**NUMBER OF TEAMS:** 3 teams per Center

**SPONSOR:** Carlos Gonzalez, Director, UC Riverside MSP Center

**OVERVIEW**: Students will **design and construct** a container of restricted size, which will keep as many eggs as possible from breaking after a fall from a height to be determined by the Host Center. The package should be designed in a way to maximize <u>BOTH</u> the number of total eggs in the package and the percentage of eggs which survive the impact of the collision with the ground. Commercial containers are allowed. **Project must be the original work of the student(s). Judges may ask questions for verification**.

**MATERIALS:** **LEGAL:**
- **Large**, fresh, raw, **white,** chicken eggs
- **Only paper tape or masking tape (non-reinforced of any width) can be used**

**ILLEGAL:**
- "Treated" or hard-boiled eggs; rotten eggs
- Small or medium eggs
- Duct tape, "Scotch-type" tape (Including on the package and on the individual eggs)
- Staples
- Aerodynamic devices or parachutes

The container may not contain any substance that will splatter including peanut butter, jell-o, liquids, fruits or vegetables (popcorn is okay), powdered soap, flammable substances of any kind or glass.

**RULES:**

1) Students must design and construct a package. **Commercially constructed containers are allowed.**

2) Eggs may not be "**treated**" in any manner (e.g. hard-boiled as stated above, or by applying tape or any other material that adheres directly to the shell of the egg).

3) No more than one entry per team/person is permitted.

4) **The container with pass freely through a 14-inch diameter "rigid", circular hoop when the hoop is turned at all angles, including diagonally. "Freely" is defined as no change to the circular shape of the hoop. The "official" hoop will be the one used at MESA Day.**

5) All entries must be clearly and correctly labeled with entrant's name, school, grade, MESA Center, and **number of eggs** within container. Entries without proper labeling will be assessed a 10% point deduction. Any special instructions regarding, for example, how to drop the container must be clearly marked. Droppers will try to follow special dropping instructions. Failure to follow drop instructions is not grounds for complaint or appeal. Disqualified entries may be dropped at the discretion of the Host Center, time permitting.

6) Each entry should include a **computer-generated** lab report. Hand written reports will not be accepted. The first page of the lab report must identify the students' name, school and **grade level** and the students' MESA Center or a 10% point deduction will be assessed at the end of scoring. PLEASE REFER TO THE LAB REPORT INSTRUCTIONS.

7) The container must land in the drop zone to be considered a legal drop.

8) Packages determined to be hazardous will not be dropped.

9) Please remember that the purpose of this contest is to use creativity to build the best packaged egg drop container within the framework of the rules. The purpose is not to break the rules and see if you can get away with it.

**JUDGING:**
1) Specification Check:
   a) Immediately upon submission for competition, the package receives a specification check to determine conformity to dimensions, materials, and construction rules. Any container that fails the specification check will be disqualified.
   b) Package may not be modified for competition during or after specification check. Judges **may disqualify** any entry if, in their opinion, the dropping of the package might create a safety hazard for spectators or property.
   c) The package is weighed and its weight recorded.

2) Following the Specification Check, judges will review the Lab Report of each container that has passed the Specification Check.

3) A total of 60 points may be awarded for the Lab Report.  Points received for the lab report will be added to Drop Score to determine a final competition score (See Lab Report Instructions).

4) Packages will be dropped from a **recommended** height of 6 stories. An impartial party will release the package.

5) The drop zone must be cleared after the dropping of each package.

6) Packages will be opened after the drop and inspected to determine the number of survivors. Each region or Host Center will determine who (competitors or judges) will open the containers.

7) Any egg broken, chipped, or cracked during extraction is considered a non-survivor.

8) Surviving eggs will be broken to ensure they are fresh and **not** hard-boiled or treated in any way.

9) When the number of surviving eggs has been determined, **a 0.25 deduction will be given for each egg in the container, the deduction will be taken from the number of surviving eggs and a score will be determined.**  Thus if the TOTAL EGGS IN THE PACKAGE equals TE and SURVIVING EGGS equals SE, then the DROP SCORE (DP) is determined by the following equation:
> **DP = SE minus (0.25 X TE)**
> **Example:**  The package contains 12 eggs;  10 eggs survive;  Then TE = 12 and SE = 10
> Therefore, DP = 10 – (0.25 X 12); DP = 10 – 3; DP = 7

10) **IMPORTANT NOTE!!:**  This competition is not based solely on the highest ratio of surviving eggs to total eggs, nor is it based solely on total surviving eggs.  Why?  If SE/TE defines the ratio of surviving eggs to total eggs, then packages with a 10:10 and 1:1 ration of surviving eggs total eggs would have the same performance despite the fact that one package has 9 more surviving and total eggs.  **Teams should come up with package designs that maximize BOTH the number of total eggs and the percentage of eggs that survive the final impact with the ground.**

11) **The highest Final Score** will determine winners.
> (a) <u>Lab Report Score:</u>  The maximum possible Lab Report Score is 6; there are 3 sections to the lab report that award points.  A total of 60 points can be awarded; the total points will be divided by 10 to get the Lab Report Score (See Lab Report Instructions).
> (b) <u>Final Score:</u>  The Lab Report Score will be added to the Drop Score.  The 10% point deduction for improperly labeling will then be assessed (if necessary) to determine the Final Score
> (c) <u>Tie Breaker:</u>  If there is a tie among packages having the highest Final Score, the lightest package will be the winner.

**AWARDS:**    Awards will be given for 1st, 2nd and 3rd place based on the highest Final Score.

# OFFICIAL SCORING SHEET
# EGGS X PRESS 2014-2015
# GRADE 6 - 8

**NAME(S)** _____

_____

**SCHOOL** _____

**CENTER** _____

| For Judges Use Only |
|---|

1) Weight: _____

2) Is package correctly labeled?     Yes          No

2) Is package legal?          Yes          No

3) Are package contents legal?     Yes          No

4) Was a lab report submitted?     Yes          No

5) Total Number of Eggs (TE)          _____

6) Number of survivors (SE)          _____

7) Deduction (0.25 X TE)          _____

8) Drop Score  SE – (0.25 X TE)          _____

9) Lab Report Score:          _____

11) Sub Total          _____

10) 10% deduction for improper labeling          _____

**10) FINAL SCORE:** Drop Score + Lab Report – 10% deduction (if necessary)          _____

# EGGXPRESS LAB REPORT INSTRUCTIONS

1. **Identify the Goal and Define the Problem (note: there are no points for this step, but it is essential to the design process).**
   **(a) Identify the goal.** An engineer must use knowledge of math, science and economics to achieve a specific goal. Goals are identified by saying "there must be a better way of doing this", then finding the way, given limited resources. Your team's goal is to build the package that performs the best given the performance standards for the competition and limited resources.

   As a team, define the purpose of your egg package and what you want it to achieve; this is your goal.

   **(b) Define the problem:** The problem is revealed by asking, "How do we accomplish this goal?" Or, "What must be done to accomplish this goal given the parameters of the competition?"

   As a team, define the problem in your own words.

2. **Create an Initial Package Design (15 points). Include the following:**
   - Detailed drawing of the internal structure of the package (Drawing may be done by hand).
   - A list of materials under consideration for the internal and external parts of the package
   - Completed calculations for the surface area and volume of the package using appropriate formulas

3. **Construct Initial Package Design**
   - Construct an initial package consistent with the package design

4. **Test and Evaluate Initial Package (25 points)**
   - Address why the package did or didn't perform according to plans
   - Explain how the package design can be improved
   - Evaluate the process used to build the package, i.e. the "procedures". Explain how the process can be improved.

5. **Refine Design and Build Final Competition-ready Package (20 points)**
   - Provide a detailed drawing of the final design highlighting the internal structure of the package
   - Provide a final materials list for the final package
   - Calculate the surface area and volume of the final package
   - List 3 science concepts; explain how they are involved in the packaged egg drop competition and reference sources.

   **NOTE:** the final design and initial design must be different, as well as the final and preliminary materials list and corresponding calculations for surface area and volume.

**IMPORTANT: The rubric on the next page will be used to determine a TOTAL LAB REPORT SCORE. The TOTAL LAB REPORT POINTS will be divided by 10 to determine a FINAL LAB REPORT SCORE The maximum possible score is 6 (60 points divided by 10). The FINAL LAB REPORT SCORE will be added to the DROP SCORE.**

# LAB REPORT RUBRIC

| | NEEDS TO IMPROVE | PROFICIENT | ABOVE PROFICIENT | ADVANCED |
|---|---|---|---|---|
| **STEP 2:** Initial package design | Inadequate information or incomplete tasks<br><br><br><br>0 – 8 points | Provide a detailed drawing of the internal structure of the package, this is the initial design<br><br><br>9 – 11 points | In addition to the things listed under "proficient", provide a list of the materials under consideration for the external parts of the package. Explain why the materials are being considered<br><br>12 – 13 points | In addition to the things listed under "Above proficient", calculate the surface area and volume of the package using appropriate formulas and accompanying calculations<br><br><br>14 – 15 Points |
| **STEP 4:** | Very limited testing or evaluative information generated<br><br><br>0 - 5 | Adequately address why the package did or didn't perform according to plans. What data was generated:<br><br>6 - 12 | In addition to what is listed under "proficient", explain how the package design can be improved<br><br>13 - 18 | In addition to the things listed under "above proficient", evaluate the actual process of building the project. Explain how the process or procedure used in building the package can be improved<br>19 - 25 |
| **STEP 5:** Refine design and build final competition-ready project | Inadequate information or incomplete tasks<br><br><br><br>0 – 6 points | Based on observations, research, discussion, conclusions, or recommendations from findings, come up with a final design. Provide a final detailed drawing of the internal structure of the package; this is the final design<br>7 – 11 points | In addition to those things listed under "proficient", provide the following: (1) a final materials list for the final design, (20 calculations for surface area and volume using appropriate formulas<br>12 – 15 points | In addition to things listed under "above proficient", list 3 critical science concepts and explain how the concepts are involved in the egg drop competition. Reference all sources of information<br>15 – 20 points |
| | | | | |

# EGGXPRESS SPECIFICATION CHECKLIST
## GRADE 6 - 8

- ❑ 2014-2015 rules were followed

- ❑ Only paper tape or masking tape (non-reinforced) was used

- ❑ Entry passes freely through a 14-inch diameter hoop at all angles

- ❑ Entry contains no harmful substances

- ❑ Entry is clearly labeled with number of eggs and entrant's name, school and center

- ❑ A computer generated lab report is included with entry and is clearly labeled with entrant's name, school, grade level and center

- ❑ I understand my entry may **not** be modified during or after the specification check

- ❑ The eggs in the container have not been treated in any way

- ❑ Eggs are large, fresh, raw, white, chicken eggs (same as rules)