

**2017-2018**  
**Chain Reaction Contraption Contest**  
**Official Handbook**



[www.chainreactioncontest.org](http://www.chainreactioncontest.org)

**Friday, December 8, 2017**

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# I. Background

## How to build a Chain Reaction Contraption

You are challenged to build your own Chain Reaction Contraption. A good contraption incorporates everyday devices and objects and connects them in unique ways. It is your mission to construct a contraption that uses multiple steps to complete an assigned task, which varies from year to year.

Your contraption may take some time to put together. Many contraptions undergo a couple months of strategy and planning; others are put together in a few days.

Over the years, the contraptions that have done best seem to be those that arrive at the contest site as nearly intact as possible. The less work needed to assemble your contraption at the site on contest day, the better. Too often, things that work perfectly in the workshop break down during the trip to the contest site. A platform should be constructed for the contraption using a simple and secure way to fasten it together; typical sturdy platforms are made of plywood and two-by-fours. Each team plans its contraption's construction in its own way. Some teams try to plan their whole design before starting to build it; others just start building and see what evolves. Maybe the best way is to use a little of each approach.

Each team may wish to seek the assistance of a mentor along with the help of a teacher. This mentor should be a technical professional or post-secondary student, preferably with an engineering or science background. The mentor should provide technical leadership and assistance whenever it may be needed. The assistance of a mentor is strongly recommended, but no penalty applies for the absence of a mentor.

The materials you use are the most important components of the contraption. See what you have around the house; raid your old toy chest, pick up odds and ends from broken appliances. Most importantly, USE THEM. Anything goes when you are building a Chain Reaction Contraption. Follow the adage "Nothing is impossible if you try." Your imagination is your only limit.

Your contraption should also have a theme. Come up with your own weird and wacky or fun theme when you design your contraption. Try to use objects and steps that conform to your theme. Keep in mind that your theme should be apparent in how you design the steps and in how you make them work together to accomplish the task.

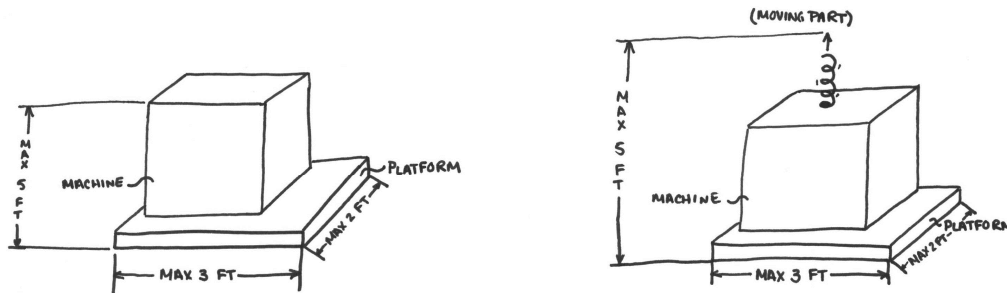
## II. This Year's Challenge

### This year's challenge is to WEIGH IT!

See Score Sheet 2, Contraption Operation Score Sheet, in Appendix B for details on how the task and your contraption will be judged.

### Specifications

The finished contraption should, at maximum, have dimensions of 5 feet by 3 feet by 2 feet. This means that the entire contraption, *while operating*, shall fit and remain completely within an imaginary box whose dimensions are 5 feet by 3 feet by 2 feet. *The platform will be included in the dimensions, along with any moving parts that exceed the dimensions of the contraption at rest.* Build your contraption so you can reach all the crucial parts. Some examples are shown below of how the contraptions will be measured.



Each contraption must take at least 30 seconds to run completely through its steps and should not run longer than two (2) minutes. During the contest, you will be required to run your contraption completely through its steps (in at least 30 seconds and at most 2 minutes), reset your contraption, and then run it through its steps again (in at least 30 seconds and at most 2 minutes). Your reset must be less than four (4) minutes. Any contraption that is determined by the judges to require the delays associated with the use of human interventions in order to meet the 30 second minimum time limit will be penalized 5 points for not meeting the minimum time limit.

If your contraption should fail during its operation, you may decide whether to continue the run by helping a step along (see Contraption Operation Score Sheet for penalty deduction) or to give up on the run and call a restart. All restarts carry a 5-point deduction. The restart must be called by a team member before the contraption completes its final step and can only be called when the contraption is stalled. The team shall identify the contraption's final step to the judges during the opening presentation to avoid confusion during the contraption operation. Once the final step has been completed, the contraption run is deemed final and no restart may be taken. If the team calls a restart, any interventions that occurred during the initial run will not be penalized because the initial run will be replaced by the restart run. Any interventions that occur after the restart will be penalized. Only one (1) restart will be allowed per run during the contest.

The majority of the steps should apply general laws of physics, relying on kinetic and potential energy, gravity, centripetal or centrifugal forces, etc. to complete the task. The use of live animals and/or plug-in electrical equipment is not permitted. Teams are encouraged to use as many mechanical principles in their design as possible. The use of batteries is allowed; however, teams relying completely on mechanical motion rather than battery-powered motion will receive more points on the Contraption Operation Score Sheet.

## **Judging**

The Chain Reaction Contraption judges will be responsible for scoring the verbal presentations and contraption operation. Oversight will be provided by the Chain Reaction Contraption Judging Committee. The Judging Committee may consult with judging teams to resolve disputes and to clarify rules and specifications of the Chain Reaction Contraption Handbook. The decisions of the Judging Committee are final.

## **Special Awards Judging**

Special Awards judging (e.g., Best Use of Gravity, Best Presentation) will be done on contest day separately from the operations judging for score. Special Awards judging will occur at specified times in the morning. The contraptions should be set up and the team members present for the Special Awards judging. Each team should make sure they have enough supplies for Special Awards judging *in addition to* the supplies needed for operations judging. Note: Costumes, cheers, jokes, music, acting, etc. that goes with the theme of the contraption are encouraged for special awards judging, as long as it does not disrupt the competition (no loud noises allowed), but no additional decorations or additions outside the boundaries of the contraption are allowed during any part of the contest.

### **III. Contest Outline**

#### **1. Conceptual Design Proposal**

The conceptual design proposal contains an illustrative drawing or drawings of your ideas for your contraption. The drawing will not have to match the actual contraption that you create. The proposal should contain high level information on how the contraption will accomplish the task, but does not need detail on each individual step. Each drawing must be no larger than 8.5 inches by 11 inches. The Conceptual Design Form must be postmarked, emailed or faxed along with your actual drawing(s) on or before the due date (see Section V) to receive full credit. Be sure to include your school name on every page you submit. **IF THE DESIGN PROPOSAL FORM (SEE APPENDIX A) IS INCOMPLETE OR DOES NOT ACCOMPANY YOUR DESIGN PROPOSAL, YOU WILL NOT RECEIVE CREDIT.**

*On-time: on or before due date (see Section V)*

*Late: after due date but before Photographic Progress Report 1 due date (see Section V)*

*No credit: on or after Photographic Progress Report 1 due date (see Section V)*

#### **2. Photographic Progress Reports**

Three photographic progress reports are required. Each report should include a picture or two of the contraption's evolution since its design or previous progress report. Each report should include a description of changes since the previous report. Each report should include information on steps that gave the team trouble, ideas that did not work, and improvements to the reliability of the contraption. Any innovative scientific/engineering applications should also be highlighted. Photographic progress reports must be postmarked or emailed or faxed on or before the due dates (see Section V) to receive full credit. Be sure to include the school name on every page submitted. **IF THE APPROPRIATE PHOTOGRAPHIC PROGRESS REPORT FORM (SEE APPENDIX A) IS INCOMPLETE OR DOES NOT ACCOMPANY PHOTOGRAPHIC PROGRESS REPORTS, THE TEAM WILL NOT RECEIVE CREDIT.**

Photographic Progress Report 1:

*On-time: on or before due date (see Section V)*

*Late: after due date but before Photographic Progress Report 2 due date (see Section V)*

*No credit: on or after Photographic Progress Report 2 due date (see Section V)*

Photographic Progress Report 2:

*On-time: on or before due date (see Section V)*

*Late: after due date but before Photographic Progress Report 3 due date (see Section V)*

*No credit: on or after Photographic Progress Report 3 due date (see Section V)*

Photographic Progress Report 3:

*On-time: on or before due date (see Section V)*

*Late: after due date but before Media Release Form due date (see Section V)*

*No credit: after Media Release Form due date (see Section V)*

#### **3. Contest Day Deliverables**

A list of contraption steps, % of recycled/scavenged materials, total value of materials and a printed photograph of the contraption are required to be turned in on Contest Day. This information should match the contraption as it appears on Contest Day. **SEE APPENDIX A FOR THE APPROPRIATE FORM.** Two points will be deducted for failure to submit these items

at the registration table on Contest Day. Be sure to include the school name on every page submitted and on the photograph.

#### **4. Verbal Presentation**

The verbal presentation takes place during the actual contest. Each team of up to four (4) students will have a maximum of five (5) minutes to introduce themselves and explain their Chain Reaction Contraption to a group of judges prior to actually running the contraption. After the verbal presentation, judges will ask questions of the students that will count towards the overall scoring of the verbal presentation. Only the judges may ask questions of the four-member student teams and only the four students presenting the contraption may answer. Scoring for the verbal presentation will be in accordance with the score sheets in Appendix B.

#### **5. Chain Reaction Contraption Operation**

The contraption operation will be judged following the completion of the verbal presentation. In any round, you will be required to operate the contraption twice with a reset between those runs. You may be asked to run your contraption up to eight (8) times by judges on contest day; however, you should plan to have enough materials (anything that must be replaced before running your contraption) on hand to run your contraption more than eight times in case of restarts, test runs, demonstrations for spectators, etc. Scoring for the contraption operation will be in accordance with the score sheets in Appendix B.

#### **6. Rounds**

The contest will consist of a preliminary and a final round. All teams will compete in the preliminary round, with rules as shown in items 1 through 5 above and in Section IV. All teams will be randomly split into groups of schools for preliminary round judging. Each group will be judged by a separate judging team. Scores from all items (1 through 5 above) will be included in the preliminary round judging to tally the total score.

Eight (8) teams will be included in the final round. The top-scoring team from each preliminary round group will advance to the final round and any remaining slots will be filled by the highest remaining total scores from the preliminary round. All finalist teams may be sequestered prior to and after presenting to the finalist judges. Finalists will present their contraption and will operate their contraption, as outlined in items 4 and 5 above. Final scores will be based ONLY on the final round presentations and the final round contraption operation (pre-contest and preliminary round scores will not be taken into account in the final round scores).

#### **7. Awards**

Prizes will be awarded to the four official student team members of the top three teams, based on final round scores. The top three teams will also receive a trophy for the school. All teams competing on contest day will be eligible for numerous Special Awards.

## 8. Scoring

Point Summary		
1.	Design Proposal	5
2.	Photographic Progress Reports	
	Photographic Progress Report 1	2
	Photographic Progress Report 2	2
	Photographic Progress Report 3	6
3.	Verbal Presentation	20
4.	Chain Reaction Contraption Operation	110
<b>Total Points Possible</b>		<b>145</b>

Penalty Deductions	
Human intervention during contraption operation	3-point deduction per intervention except for runs replaced by a restart run
Unintentionally causing a loose or flying object to go outside the set boundaries of the contraption	2-point deduction
Failing to turn in a list of steps, list of materials and a photograph at the registration table on Contest Day	2-point deduction
Failing to turn in a media release form for each team member by due date (see Section V)	10-point deduction
Resetting the contraption in more than 4 minutes	5-point deduction
Restarting the contraption	5-point deduction per restart
Requiring human intervention delays to meet 30-second minimum run time	5-point deduction
Exceeding the dimensional limits	10-point deduction
Coaching by team's teacher, mentor, a parent or a student not in the 4-person team	10-point deduction
Unsportsmanlike conduct by team members or guests	20-point deduction
Unsafe contraption or intentionally causing loose or flying objects to go outside the set boundaries of the contraption	Disqualification
Damaging another team's contraption	Disqualification



## IV. Rules

- Judging will be based on the rules, specifications and scoring as defined in this handbook.
- The judges will inspect the contraption, deem it safe, and assess any rules infractions. All decisions made by the Judging Committee are final.
- The contraption must complete the challenge assigned by the Judges Committee. This year's specific task and year-specific rules are provided in Section II.
- The finished contraption should, at maximum, have dimensions of 5 feet by 3 feet by 2 feet. This means that the entire contraption while operating shall fit and remain completely within an imaginary box whose dimensions are 5 feet by 3 feet by 2 feet. *The platform will be included in the contraption's dimensions.* See Section II for samples of how the contraptions will be measured.
- The contraption must complete the challenge in 20 steps or more.
- A step is defined as an action that results in another action working towards the final goal of the contraption. For example, the act of tipping over a block of wood with a rolling ball is a step. The actual tipping motion of the block is not a step, unless it causes another action to occur. A series of the same actions repeated (such as dominoes knocking each other over or a ball hitting another ball) are considered to be one step.
- Each step shall be marked (numbered or lettered consecutively) on the contraption and a written summary of each step shall be provided to the officials at the registration table on the day of the contest.
- New materials are those materials that are purchased or donated in new condition. Used materials are those that are being recycled and/or scavenged for use on the contraption. Fair market price should be used when determining the value of donated new materials (i.e., Home Depot prices); actual price should be used to determine the value of purchased materials. A reasonable assessment of the value of recycled/scavenged materials should be used (i.e., Goodwill/yard sale prices).
- The team must be able to run its contraption completely through its steps once, reset it and run it completely through its steps again. A complete run of the contraption through its steps once should take at least 30 seconds and at most two (2) minutes. The reset can take four (4) minutes at most. A team member must tell the judging team when the contraption is done with each run.
- Human intervention will not be allowed once the contraption is in motion unless the contraption is stalled and requires assistance. At most, one human intervention will be assessed for each step of the contraption that requires a team member to intervene to complete the step in a given run. If a restart is called after interventions have occurred, the interventions will not count. Any interventions after the restart will be penalized.
- Any loose or flying objects must remain within the set boundaries of the contraption. If a loose or flying object intentionally exceeds the set boundaries of the contraption, the contraption will be disqualified for safety reasons.
- Live animals and plug-in electrical appliances are not permitted. Combustible fluids, explosives, open flames, or hazardous materials are not permitted.
- The contraption must not imply profane, indecent, or lewd expressions.

- Intentional destructive action against other contraptions is cause for disqualification.
- Contestants are responsible for removing their contraption and debris immediately following the contest.
- The team representing the contraption on contest day must consist of at most four students. More than four students may work on the contraption, but those students will not be eligible for individual prizes. Each school may register one additional team for the contest. An individual student may participate on one contraption team. The number of these additional registered teams that can participate on contest day will be determined based on available space in the contest venue. If necessary, these available spaces will be determined by random selection of registered additional teams. Schools with more teams building contraptions than allocated spaces must select which team(s) will represent their school at the contest. Only one team per school can compete in the final round of the contest. In the case that the additional team meets the qualifications for the finals, the team with the highest preliminary round score will move on.
- Teams from conventional high schools, charter schools, technical schools and home schools may participate. If necessary, the team may be made by combining students across multiple charter and/or home schools. Each participating home or charter school shall provide proof of its certification. Please contact Lisa Kosick (412-237-1534, [kosickl@carnegiesciencecenter.org](mailto:kosickl@carnegiesciencecenter.org)) for further information.
- Each team must complete contraption preparation and set up by their assigned time on the contest day. Note: No tools, extension cords, supplies, clean-up materials, etc. will be provided for the team's use. Set up time is for assembling the pre-constructed contraption parts and any repairs due to transportation. New construction is not permitted at the contest site.
- The contest will not be postponed due to inclement weather.
- Teachers, mentors, and spectators shall not coach or ask questions of the team during the presentation or in the presence of the judges. Anyone asking questions of the team, or interacting with the team after the judges have arrived or before the judges have vacated the area, will be removed.
- Final scores will be based ONLY on the final round presentations and contraption operation. Pre-contest and preliminary round scores will not be taken into account.
- The top-scoring team from each preliminary round group will advance to the final round, along with additional teams (chosen based upon highest total score and as space is available) to fill the eight (8) final round spots.
- A restart is defined as a team member telling the judges that they will be discontinuing the contraption's operation, resetting the contraption and then rerunning it. The restart must be called by a team member before the contraption completes its final step and can only be called while the contraption is stalled. The team shall identify the contraption's final step to the judges during the opening presentation to avoid confusion during the contraption operation. Once the final step has been completed, the contraption run is deemed final and no restart may be taken.

## V. Important Dates

September 27, 2017	Orientation at Carnegie Science Center
October 6, 2017	Registration Deadline
October 16, 2017	Conceptual Design Proposal Deadline
October 30, 2017	Photographic Progress Report #1 Deadline
October 30, 2017	Media Release Form Deadline
November 13, 2017	Photographic Progress Report #2 Deadline
December 1, 2017	Photographic Progress Report #3 Deadline
December 8, 2017	Contraption Demonstration at Carnegie Science Center

# Appendix A: Forms

# Conceptual Design Form

*This form must accompany the team's design to receive credit. Put the school name on any pages accompanying this form to receive credit. Please print or type.*

<b>Contraption Name:</b>			
<b>School Name:</b>			
<b># of Students Involved:</b>			
<b>Teacher's Name:</b>		<b>Email:</b>	
<b>School Address:</b>			
<b>School Phone:</b>		<b>School Fax:</b>	
<b>Student Team Leader(s)(TL):</b>			
<b>Student TL Email(s):</b>			
<b>Mentor (Optional)</b>	<b>Name:</b>	<b>Email:</b>	
<b>Short description of design concept:</b>  (i.e. theme, innovative scientific/engineering applications, key step ideas, expected challenges, risks, etc.)			

# Photographic Progress Report 1 Form

*This form must accompany the photos of your contraption to receive credit. Put your school name on any photos or pages accompanying this form to receive credit. Please print or type.*

<b>Contraption Name:</b>			
<b>School Name:</b>			
<b># of Students Involved:</b>			
<b>Teacher's Name:</b>		<b>Email:</b>	
<b>School Address:</b>			
<b>School Phone:</b>		<b>School Fax:</b>	
<b>Student Team Leader(s)(TL):</b>			
<b>Student TL Email(s):</b>			
<b>Mentor (Optional)</b>	<b>Name:</b>	<b>Email:</b>	
<b>Summary of activity since last report:</b>  (i.e. changes in status, information on steps that gave the team trouble, ideas that did not work, improvements to the reliability, innovative scientific/engineering applications.)			

## Photographic Progress Report 2 Form

***This form must accompany the photos of your contraption to receive credit. Put your school name on any photos or pages accompanying this form to receive credit. Please print or type.***

<b>Contraption Name:</b>			
<b>School Name:</b>			
<b># of Students Involved:</b>			
<b>Teacher's Name:</b>		<b>Email:</b>	
<b>School Address:</b>			
<b>School Phone:</b>		<b>School Fax:</b>	
<b>Student Team Leader(s)(TL):</b>			
<b>Student TL Email(s):</b>			
<b>Mentor (Optional)</b>	<b>Name:</b>	<b>Email:</b>	
<b>Summary of activity since last report:</b>			
<p>(i.e. changes in status, information on steps that gave the team trouble, ideas that did not work, improvements to the reliability, innovative scientific/engineering applications.</p>			

## Photographic Progress Report 3 Form

*This form must accompany the photos of your contraption to receive credit. Put your school name on any photos or pages accompanying this form to receive credit. Please print or type.*

<b>Contraption Name:</b>			
<b>School Name:</b>			
<b># of Students Involved:</b>			
<b>Teacher's Name:</b>		<b>Email:</b>	
<b>School Address:</b>			
<b>School Phone:</b>		<b>School Fax:</b>	
<b>Student Team Leader(s)(TL):</b>			
<b>Student TL Email(s):</b>			
<b>Mentor (Optional)</b>	<b>Name:</b>	<b>Email:</b>	
<b>Summary of activity since last report:</b>  (i.e. changes in status, information on steps that gave the team trouble, ideas that did not work, improvements to the reliability, innovative scientific/engineering applications.			



## Media Release Form

I grant permission to Carnegie Science Center (CSC) and Westinghouse Electric Company LLC (WEC) to use, reproduce and/or publish photographs, film footage and/or reports submitted during my participation in the 2017-18 Chain Reaction Contraption Contest (CRCC) activities. This will include, but is not limited to: orientation, contest day, and National Engineers Week events.

The items above, and the information below, will solely be used for the following purposes: 1) the promotion of CSC and WEC and its programs (e.g., catalogs, magazine, websites, video, text panels, etc.), 2) to study the impact of the program on interest and careers in science and engineering (which may include contacting you in the future), and 3) to engage past participants in future contests. The use of these materials and information is strictly limited to the CSC and WEC. The materials and information will not be sold, reproduced for sale in any form, or provided to any 3<sup>rd</sup> party.

<b>Activity:</b>	<b>2017-18 Chain Reaction Contraption Contest</b>			
<b>School Name:</b>				
<b>Team Member Information</b>				
<b>Name:</b>			<b>Age:</b>	
<b>Address:</b>				
<b>City/State/Zip:</b>				
<b>Phone:</b>		<b>Email:</b>		
<b>If 18 or older,</b>	<b>Signature:</b>			
<b>If under 18,</b>	<b>Parent/Guardian Name:</b>			
	<b>Parent/Guardian Signature:</b>			
<b>Demographic Information</b>				
<b>Note: All information in this section is optional and is used solely to understand the impact and reach of the CRCC. The responses will in no way have any impact on decisions related to judging.</b>				
<b>Gender:</b>	<b>Male</b>	<b>Female</b>	<b>Other</b>	<b>Prefer not to answer</b>
<b>Ethnicity:</b>	<b>Asian/Pacific Islander</b>		<b>Black or African American</b>	
	<b>Hispanic or Latino</b>		<b>Native American/American Indian</b>	
	<b>White</b>			
	<b>Other: _____</b>		<b>Prefer not to answer</b>	
<b>How many years have you participated in this contest?</b>			<b>1</b>	<b>2</b>
			<b>3</b>	<b>4</b>
<b>Are you considering a career in STEM?</b>	<b>No</b>	<b>Possibly</b>	<b>Probably</b>	<b>Absolutely</b>

# Contest Day Submittals

<b>Contraption Name:</b>		
<b>School Name:</b>		
<b><i>Final Contraption Steps</i></b>		
<b>Step 1.</b>		
<b>Step 2.</b>		
<b>Step 3.</b>		
<b>Step 4.</b>		
<b>Step 5.</b>		
<b>Step 6.</b>		
<b>Step 7.</b>		
<b>Step 8.</b>		
<b>Step 9.</b>		
<b>Step 10.</b>		
<b>Step 11.</b>		
<b>Step 12.</b>		
<b>Step 13.</b>		
<b>Step 14.</b>		
<b>Step 15.</b>		
<b>Step 16.</b>		
<b>Step 17.</b>		
<b>Step 18.</b>		
<b>Step 19.</b>		
<b>Step 20.</b>		
<b>Step 21.</b>		
<b>Step 22.</b>		
<b>Step 23.</b>		
<b>To list more steps, please attach additional sheet(s).</b>		
<b><i>Final Contraption Materials</i></b>		
<b>% of materials in contraption that are recycled or scavenged:</b>		
<b>Total assessed cost of contraption materials:</b>		
<b><i>Final Contraption Photograph</i></b>		
<b>Please attach a photograph of the contraption to this sheet.</b>		

## Appendix B: Score Sheets

# Score Sheet 1 - Presentation

The verbal presentation takes place during the actual contest. Each team will have a maximum of five (5) minutes to introduce themselves and explain their Chain Reaction Contraption to a group of judges prior to actually running the contraption. Students will then be asked several questions by the judges.

### Sample Questions

- 1) What did this project teach you about science and engineering?
- 2) How would you make your contraption more reliable and efficient?
- 3) Did all members contribute to the overall completion of the contraption?
- 4) What steps gave you the most trouble?
- 5) Were there any ideas you tried that did not work?
- 6) How did you decide upon your theme?

<b>Presentation Score Sheet</b>		
1.	<p><b>Knowledge</b> How well did the students describe the principles used in, and answer questions about, their contraption?</p> <p>(Judges enter a score anywhere between 0 and 5 points. Guidelines: Excellent is 5 points; Good is 3 points; Poor is 0 points.)</p>	
2.	<p><b>Cooperation</b> How well did the students work as a team?</p> <p>(Judges enter a score anywhere between 0 and 5 points. Guidelines: Excellent is 5 points; Good is 3 points; Poor is 0 points.)</p>	
3.	<p><b>Overall Presentation</b> How well did the students present their contraption to the judges?</p> <p>(Judges enter a score anywhere between 0 and 10 points. Guidelines: Excellent is 10 points; Very Good is 7 points; Good is 4 points; Poor is 0 points.)</p>	
<b>Total Presentation Score (0-20 points)</b>		

## Score Sheet 2 – Contraption Operation (Page 1/3)

<b>Contraption steps:</b>			
4.	How many steps does the contraption have? (Lead Judge enters number of steps. Each step equals 1 point up to a maximum of 20 points.)		
5.	Are the steps labeled on the contraption? (Lead Judge circles Y (yes) or N (no). Y = 2 points; N = 0 points.)	Y	N
<b>First Run Time:</b>			
6.	Minimum Run Time – Did the contraption operation complete in 30 seconds or more? (Lead Judge enters Y (yes) or N (no). Y = 5 points; N = 0 points.)	Y	N
7.	Maximum Run Time – Did the contraption operation complete in less than 2 minutes? (Lead Judge enters Y (yes) or N (no). Y = 5 points; N = 0 points.)	Y	N
<b>Second Run Time:</b>			
8.	Minimum Run Time – Did the contraption operation complete in 30 seconds or more? (Lead Judge enters Y (yes) or N (no). Y = 5 points; N = 0 points.)	Y	N
9.	Maximum Run Time – Did the contraption operation complete in less than 2 minutes? (Lead Judge enters Y (yes) or N (no). Y = 5 points; N = 0 points.)	Y	N
<b>Deductions:</b>		<b>1<sup>st</sup> run</b>	<b>2<sup>nd</sup> run</b>
10.	How many human interventions occurred? (Lead Judge enters number of interventions. 3-point deduction per intervention.)		
11.	How many restarts occurred? (Lead Judge enters number of restarts. 5-point deduction per restart.)		
12.	Did the reset take more than 4 minutes? (Lead Judge enters Y (yes) or N (no). Y = 5-point deduction; N = no deduction.)	Y	N
13.	Did a loose or flying object unintentionally leave the set boundary of the contraption? (Lead Judge enters Y (yes) or N (no). Y = 2-point deduction; N = no deduction.)	Y	N
14.	Did the contraption require human intervention delays to meet the 30-second minimum run time? (Lead Judge enters Y (yes) or N (no). Y = 5-point deduction; N = no deduction.)	Y	N
15.	Did a teacher, mentor, parent or student outside the 4-person team provide coaching during the run or presentation? (Lead Judge enters Y (yes) or N (no). Y = 10-point deduction; N = no deduction.)	Y	N
<b>Sub-Total 1 Contraption Operation (0-42 points)</b>			

## Score Sheet 2 – Contraption Operation (Page 2/3)

<b>Engineering</b>		<b>Question 16 is worth a maximum of 15 points.</b>
16.	<p>How much of the contraption relies on mechanical (not battery-operated) power?            (Judges enter a score anywhere between 0 and 15 points.            Guidelines: 0 points for all battery-powered steps; 8 points if batteries power half the steps; 15 points if no batteries are used.)</p>	
<b>Variety of building materials</b>		<b>Question 17 is worth a maximum of 10 points.</b>
17.	<p>How much of the contraption consists of used/recycled rather than new donated or purchased materials?            (Judges enter a score anywhere between 0 and 10 points.            Guidelines: 0 points if no items are used/recycled; 5 points if half the items are used/recycled; 10 points if all of the items are used/recycled.)</p>	
<b>Theme of contraption</b>		<b>Question 18 is worth a maximum of 4 points.</b>
18.	<p>How well is a centralized theme incorporated within the contraption?            (Judges enter a score anywhere between 0 and 4 points.            Guidelines: 0 points for no centralized theme; 4 points for a well-developed and well-executed centralized theme.)</p>	
<b>Contraption reset</b>		<b>Question 19 is worth a maximum of 4 points.</b>
19.	<p>How efficiently is the contraption reset and how well does the team work together to reset the contraption?            (Judges enter a score anywhere between 0 and 4 points.            Guidelines: 0 points is for an inefficient reset with no teamwork; 4 points is for a very efficient reset with coordinated teamwork.)</p>	
<b>Successful completion of task</b>		<b>Questions 20 and 21 are worth a maximum of 20 points.</b>
20.	<p>How well does the contraption complete the requirements of the task?            (Judges enter a score between 0 and 10 points.            Guidelines: 0 points if the task was completed poorly or unsuccessfully; 10 points if the task was completed extraordinarily well.)</p>	
21.	<p>How unique and creative is the approach to achieving the task?            (Judges enter a score anywhere between 0 and 10 points.            Guidelines: 0 points if approach to achieving the task is not unique or creative at all; 10 points if the approach to achieving the task is very unique and creative.</p>	
<b>Engineering creativity</b>		<b>Question 22 is worth a maximum of 15 points.</b>
22.	<p>How creative is the engineering design of the contraption?            (Judges enter a score anywhere between 0 and 15 points.            Guidelines: 0 points if the contraption had no engineering creativity; 15 points if sophisticated engineering creativity was used.)</p>	
<b>Sub-Total 2 Contraption Operation (0-68 points)</b>		

## Score Sheet 2 – Judges' Comments (Page 3/3)

What did this team do well?

In what areas could this team improve its performance?

General Comments:

## Score Sheet 3 - Score Sheet Summary

*(This score sheet will be filled out by the Judging Committee.)*

1.	Design of Chain Reaction Contraption (0-5 points)	
2.	Failing to turn in media release forms for each team member by due date: 10-point deduction	
3.	Photographic Progress Report 1 (on time: 2 points, late: 1 point, none: 0 points)	
4.	Photographic Progress Report 2 (on time: 2 points, late: 1 point, none: 0 points)	
5.	Photographic Progress Report 3 (on time: 6 points, late: 3 points, none: 0 points)	
6.	Failing to turn in Contest Day submittals (step, materials and a photograph) at the registration table on Contest Day: 2-point deduction	
7.	Exceeding the dimensional limits: 10-point deduction	
8.	Unsportsmanlike conduct by team members: 20-point deduction	
9.	Damaging another team's contraption or safety infraction: Disqualification	
10.	Unsafe contraption or intentionally causing loose or flying objects to go outside the set boundaries of the contraption: Disqualification	
11.	Presentation (0-20 points)	
12.	Contraption Operation (0-110 points)	