

GO Bowl

2007

RULEBOOK



Greater Orlando GK-12 Partnership
College of Optics and Photonics
University of Central Florida
Orlando, Florida
April 13, 2007

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PLANNING INFORMATION

The Greater Orlando GK-12 Partnership is sponsoring the GO Bowl Science Competition for all students who are enrolled in one of the GK-12 sponsored classrooms. Each of these activities is designed to promote the inquiry approach to learning by presenting a goal or question to solve, and students work in cooperative teams to solve the challenge. In each event, teams will compete against each other to achieve the best ranking. Ribbons will be presented to those teams who score 1st through 6th place in each of the 18 events.

Some events do not require that students are present for the competition. For example, in events such as Science Art, Photography, and Videography, the students submit their work before the competition date and they will be scored by a group of judges. When the students arrive at UCF, the results will be displayed. Therefore, if a student is unable to make the trip to UCF, these events will be good alternatives that do not require their attendance.

Schools will receive entries in proportion to the number of students enrolled with each teacher-fellow partnership. For example, some events have a 1 to 20 ratio. If a teacher has 100 students, then 5 teams are permitted to enter. Each mini-team for each event is composed of 2, 3, or 4 students. For some events, there may be up to 20 individual students from your classes competing as 5 teams. You will be receiving a packet of Event Cards. The event cards must be filled out and brought to each of the events on the day of the competition, or they must be sent with the work that is submitted early. Only official GO Bowl registration forms will be accepted. These can be downloaded from the GO GK-12 Website.

Overall teachers should expect that students participate in **three** of the events. You may not have all the events covered. However, this will not reduce your chance of a team winning any single event.

Where shown, it is important that students have safety goggles and follow proper safety protocols. Failure to follow safety protocols will lead to immediate disqualification from the event. Students are also expected to follow all school rules and maintain proper behavior and respect while on the field trip.

Please follow the SPIRIT of the rules. It is not possible to cover every variation of the rules. However, if a judge feels that the student has violated the spirit of the rules, that team may be disqualified.

Many of the events require that student PREBUILD their event. They should create these at home or school and bring it to the competition for testing.

BOTTLE ROCKETS

OBJECTIVE: Teams will design, construct, and launch rockets to stay aloft the greatest amount of time.

Number on Team: 2
Safety: Goggles

Number of Teams Per Students: 1 per 20
THIS IS A PREBUILD EVENT

Impound: YES

Directions:

1. Students will bring one rocket to the tournament that use a standard two-liter plastic carbonated beverage bottle with approximately 2.2 cm internal diameter neck (1/2 inch Schedule 40 PVC pipe should just fit inside the neck opening).
2. The structural integrity of the pressure vessel (2-liter bottle) may not be altered. Examples of altering structural integrity include but are not limited to physical, thermal or chemical damage (e.g., cutting, sanding, using hot glues, or super glues). Adhesive may be used to attach fins and other components but must be limited to glue such as silicone adhesive, polyurethane based adhesives and others that do not damage the structural integrity of the pressure vessel.
3. Rockets may not use extenders that increase the 2L volume. Commercial model rockets or model rocket parts may not be used. Write the names of your team members on the rockets.
4. No metal may be used on any part of the bottle rocket.
5. Rocket components may separate in flight, but must remain somehow stay connected to the main body of the rocket.
6. All propulsive energy imparted to the rocket must originate from the water/air pressure combination provided by the judges. No other form of additional energy is permitted to assist the flight of the rocket. Remote control of the rocket is not permitted.
7. Rockets may use any type of recovery device (including parachutes) that is safe.
8. All rockets will be launched using the launcher provided by the supervisor. Contestants are responsible for ensuring their rocket is capable of launching from the launcher provided. The rocket will be launched on a PITSCO Rocket Launcher.

Competition:

1. All rockets must be impounded before the start of the competition and will be released after the team has finished competing. Once impounded, no physical alterations may be made to the rocket. Appeals by teams will not be processed after they remove their device from impound unless it has been released by the appeals committee.
2. Each team will only six minutes to fill with water, position on launch pad and then launch.
3. All rockets will be launched at a pressure requested by the competitors, not to exceed 60 pounds per square inch. Once the rocket is pressurized, contestant may not touch or approach the rocket.
4. Timing stops when the first part of the rocket hits a stationary object (ground, building, tree, etc.) or when the rocket disappears from the judge's sight. All rocket launch times will be recorded to the nearest hundredth of a second. Any rocket launched before the time expires will be scored.

Scoring:

All rocket launch times will be recorded to the nearest hundredth of a second. A team's score will be the flight time of the rocket that gives them the higher rank. The greater flight time wins. Rockets whose parts do not remain linked while aloft will be ranked by their flight time in a second tier after those that remain linked.

BRIDGE BUILDING

OBJECTIVE: The objective of this competition is for a team to design and construct a wooden bracing framework (truss) that will support a load placed at the midline of a 10 inch (25.4 cm) gap between two supports. Bridges will be completed before the competition begins. This is an engineering event. Failure to adhere to measurements as give in the Rules will cause disqualification of the bridge.

Number on Team: 2 Number of Teams Per Students: 1 per 10 Impound: YES
Safety: Goggles, students must provide. THIS IS A PREBUILD EVENT

Directions:

1. Must use any solid wood beams that are 1/4" X 1/4" or less in cross-section. No particle board or commercially laminated wood may be used. Note: Bamboo is not a wood. The wood will be provided by the contestant. Mitering of joints is allowed at any angle.
2. Joints will be formed by wood beams and glue only. Any commonly available glue may be used.
3. Students must provide and wear eye protection for the testing procedure.
4. No alterations to a bridge will be allowed once it has been given to the judges prior to the event.
5. It is not permitted to use the glue in layers or to "paint" it on. If you put your bridge on wax paper while gluing, the bottom of the bridge can become coated with glue and thus it will be disqualified.
6. Be careful with the size of the beams. The beams can not be laminated together.

Construction:

1. The bridge must span a 10 inch gap.
2. There will be a wooden test bed with an abutment for those bridges that will utilize support on the side.
3. The test beds will each be made with two L-shaped 1" X 4" X 12" boards. These test beds will be clamped to each table and the bridge will rest on these boards for testing.
4. Any part of the bridge is permitted to extend below the test bed.
5. There does not need to be a car roadbed, but there must be a place to put the load beam at midline where the solid roadbed could be constructed if desired.
6. Each 1/4 inch beam must be separated by a 1/4 inch spacing. Beams can only touch at joints.
7. Each joint (where two or more beams come together) can not exceed 1 inch in diameter.

Testing:

1. The bridge must accommodate a 5.0 cm long x 5.0 cm wide x 2.0 cm high loading block, a 1/4-inch eyebolt centered on the block, a washer, and a wing nut centered.
2. A chain or rope will be suspended downward THROUGH the bridge and will support an empty 5 galloon bucket.
3. The students will pour sand into the bucket until the bridge deflects 10 or more inches, complete failure occurs, or the bridge supports a maximum of 15 kilograms.

Scoring:

The following formula will be used: **Overall Score = Mass supported (g) / Mass of Bridge (g)** . Those that break before reaching the 15 kilogram limit will be scored below those that are able to support the full 15 kilograms.

BUOYANCY BARGE

OBJECTIVE: Construct an aluminum foil barge, out of materials provided at the site, that can hold the most pennies without sinking.

Number on Team: 2

Number of Teams Per Students: 1 per 20

Impound: YES

BUILT ON SITE

Directions:

1. All barges will be constructed on site and all participants must report before immediately after the start of the day's competitions for construction. There will be a ten minute time limit for construction of all barges.
2. All barges will be constructed during the same ten minute time period. No modifications will be permitted after the construction time has elapsed.
3. After construction, barges will be stored in the shipyard until time for each to be tested.
4. All barges will be constructed from a 9" x 10 ³/₄ " piece of standard aluminum foil provided at the event site. No other material may be used for the construction of the barges. Otherwise there are no design or shape restrictions.
5. Barges will be tested in a container of water by the contestants who slowly place pennies into the barge until they decide that the barge has reached the limit of weight it can hold without sinking. The contestants must choose when to stop adding pennies. If the barge sinks it is disqualified. No second chances.
6. After the contestants stop adding pennies, the barge must remain afloat for at least 30 seconds before it qualifies to be scored.
7. Testing of each barge must be completed within a five minute time period. If the five minutes expires before the contestants have chosen to stop then no additional pennies may be added and they must stop at that time. The 30 seconds will then begin to test if the barge sinks. If the barge remains afloat then it will qualify for being scored.
8. At the end of the 30 second time period for floating, the barge will be removed from the water.

Scoring:

The barge holding the most pennies will receive the most favorable ranking.

CARTOON CONTEST

OBJECTIVE: The objective of this event is to draw a comic strip which conveys a science concept or principle.

Number on Team: 2 Number of Teams Per Students: 1 per 10 Impound: YES

Directions:

1. The comic strip must consist of at least 4 individual panels that include pictures and dialogue.
2. Must fit on one standard 8 x 11” sheet of paper. It can be either black and white or colored. It can be drawn on a computer, but all artwork must be original.
3. The comic strip must describe and explain a science concept and be scientifically accurate.
4. Be sure to include your name and the name of your school.
5. All cartoon strips must be inserted into a clear plastic sheet protector that is three-hole punched, so that they can be displayed in notebooks.

All entries must be sent to :

Mike McKee
University of Central Florida
4000 Central Florida Blvd. Bldg. 53
Orlando, Fl 32816-2700

6. All entries must be received by **5:00 p.m. on Tuesday April 10, 2007.**

Scoring:

The Cartoon Strips will be judged on poetic merit and how well the science concept or principle is conveyed.

Drawing quality:	20 points
Layout and design:	20 points
Story flow and originality:	20 points
Explanation of science concept	40 points
Maximum Total Score	100 points

The entry receiving the highest score will receive the more favorable ranking.

CHEMICAL PROPELLERS

OBJECTIVE: Design and build a device that is propelled on water using only the energy from a combination of baking soda and vinegar. The goal is to use the two chemicals to propel the device as far as possible.

Number on Team: 2
Safety: Goggles

Number of Teams Per Students: 1 per 20
THIS IS A PREBUILD EVENT

Impound: YES

Directions:

1. Teams will build a device that can move as far as possible using only the energy from the chemical reaction of baking soda and household vinegar. The device can be built out of any of the following materials: Clear plastic bottles (1 liter size or smaller) and caps, balloons, straws, popsicle sticks, tissue paper, silicon sealer, thread, rubber or cork stoppers. Any number of the items can be used with the exception of the bottle. Only one bottle can be used.
2. Students must wear goggles at all times during their competition.
3. Baking soda and vinegar will be provided by the judges on the day of the competition.
4. Each device must be impounded prior to competition for a safety inspection and mass determination. After impound, no device can be altered.
5. The device, when completely assembled must fit within a rectangle of dimensions 5" x 25".
6. Students will have 15 minutes to complete their run. They will measure the amount of baking soda and vinegar to their device. They will then place it into the water. The judge will mark the most forward point on the device.
7. When the forward motion of the device has stopped, the judge will determine the distance the device traveled.
8. In the event of ties, mass will be used as a tiebreaker, with the most favorable rank given to the device with the lowest mass.
9. Testing may be conducted in a length of 6" diameter PVC piping or wall paper trays that are approximately 7 inches deep.
10. Any device that leaves the testing trough will be scored below all others that do not leave the trough.

Scoring:

Winner will be the device that travels the greatest distance. Ties broken based on mass, with lowest mass given the more favorable ranking.

CHEMISTRY ART CONTEST

OBJECTIVE: The objective of this event is to create artwork which illustrates a chemistry concept or principle.

Number on Team: 2

Number of Teams Per Students: 1 per 20

Impound: YES

Directions:

1. The artwork may be done in any media desired. May be single media or mixed media.
2. The artwork may be 2-Dimensional or 3-Dimensional.
3. The artwork must fit into a 1 m³ box. The maximum mass of the artwork is 20 kg.
4. No artwork done on poster paper will be accepted.
5. Include a 8½" x 11" sheet of paper with a description of your artwork and the chemistry concept or principle that it is describing. Insert this into a clear plastic sheet protector and attach to artwork. Be sure to include your name and the name of your school on the sheet. The sheet will be displayed with the artwork.
6. Entries must be received before **5:00 p.m. on Tuesday April 10, 2007**. Please e-mail Mike McKee to make arrangements for any evening deliveries.

All artwork must be delivered to :

Mike McKee
University of Central Florida
4000 Central Florida Blvd. Bldg. 53
Orlando, Fl 32816-2700

Artwork will be judged on artistic merit and how well it illustrates the chemistry concept or principle.

Scoring:

Explanation of connection to chemistry concept:	20 points.
Correctness in explaining the chemistry concept:	30 points.
Artistic Merit:	50 points
Maximum Total Score:	100 points

The entry receiving the highest score will be given the most favorable rank.

EGG DROP

OBJECTIVE: The objective of this event is to construct a device to protect an egg from a collision with the concrete or linoleum floor from various heights.

Number on Team: 2 Number of Teams Per Students: 1 per 20 Impound: YES
THIS IS A PREBUILD EVENT

Directions:

1. The competitors will construct before hand and bring the package that will be used at the GO Bowl to drop their egg. These packages must be brought to the Egg Drop sign-in location by 10:30 a.m.
2. The package can not be changed or re-engineered once delivered. It must be a container with the minimum dimensions of the egg. There must be a way to insert the egg and take it out without changing the engineering of the container.
3. The mass of the container will be determined at the site.
4. The use of plastic foam, Styrofoam, or other similar product is not allowed. No metal is permitted and parachutes or parachute like devices which have the purpose of using air resistance to reduce the speed of the drop is not permitted.
5. During their assigned drop time, students will be given one large grade A raw egg. They will also be given 10 centimeters of scotch tape.
6. Each competitor will have a maximum of five (5) minutes to insert the egg. No changes in the package will be allowed. Only the 10 cm of tape can be used.
7. The egg will be dropped from various heights onto a concrete sidewalk.
8. The competitor must open the package and show the unbroken egg immediately after the drop. Broken eggs will cause disqualification.

Scoring:

Scores will be determined by the formula: $3 \times \text{Height of Package (meters)} / \text{Mass of Package (grams)}$

EGG SHELL EGSPRESS

OBJECTIVE: Mail a blown out egg shell through the U.S. Postal Service and have it arrive still in one whole piece. The egg shell must be from a Medium Grade A, whole, unaltered egg.

Number on Team: 2 Number of Teams Per Student: 1 per 10 Impound: YES
THIS IS A PREBUILD EVENT

Directions:

1. The package must be rectangular in shape such that its volume can be calculated from the volume of a rectangular box. The Postal Service has a minimum package size requirement: (3.5 inches x 5 inches x .25 inches). Packages under the above minimum dimensions will be disqualified. One dimension must be greater or equal to 5 inches, another dimension greater or equal to 3.5 inches, and a third dimension greater or equal to 0.25 inches.
2. The package material and weight have no restrictions.
3. The postmark date on the package must be on or before the date given below.
4. The package is to be mailed through the United States Postal Service using First Class rates. Do not use Overnight or Special mail services. The UCF post office cannot be used as the mailing site.
5. The person who is labeled as the return addressee shall be the only person allowed to open the package at the competition.
6. The egg shell must be completely removed from the package unbroken.
7. A medium Grade A egg shell should be sent in the package. The inside of the egg must be blown out. (With a pin, put holes in both ends of the egg and blow out the inside.) Do not dip the egg in any material (wax, glue, etc.), or soak it in any material, or put anything inside the empty shell. Doing so will lead to disqualification of your entry. Your egg shell will be studied after opening your package.
8. The package should be addressed to:
Mike McKee
University of Central Florida
4000 Central Florida Blvd. Bldg. 53
Orlando, Fl 32816-2700

The postmark limit date is **Friday, April 6, 2007.**

Scoring:

The score for each entry will be calculated using the following formula:

$$\text{Score} = 1 / (\text{Mass} \times \text{Volume})$$

EGG THE PILOT

OBJECTIVE: Build a hang glider which will carry an egg as far as possible before landing and land safely without breaking the egg.

Number on Team: 4 Number of Teams Per Students: 1 per 20 Impound: NO
THIS IS A PREBUILD EVENT

Directions:

1. The hang glider must hold a Large Grade A egg in a net or self designed harness. No protective material is allowed to cover more than 75% of the egg. This percentage allows the egg to be supported by the hang glider so that it can be attached.
2. Any material can be used to build the glider. No propellers or other devices which help to move the glider forward can be used.
3. The maximum wingspan can not exceed 40 inches.
4. No commercial kits are permitted for the construction of the glider.
5. The launching site will be from a balcony that is at least 2 stories tall, and the gliders will be released with no forward motion supplied from the student. Note that since this event is outside, it will be subject to variations in wind and air currents.
6. The students will be given an egg by the judges. Once the egg has been accepted and the student leaves the egg distribution table, it will not be exchanged. If the student breaks the egg or finds that there is a crack in the egg after leaving the table, the team will be assessed a 10 foot penalty.
7. The displacement will be measured from the point on the ground directly below the point of release in a straight line along the ground to the point where the glider first makes contact with the ground or some other object such as a tree or building.
8. The student will remove the egg from the net or harness for examination. An egg is considered to be cracked if the egg leaves a wet mark on a paper towel that is rolled across it.

Scoring:

1. For those eggs that do survive, the most favorable rank will be given to those that have the greatest displacement from the launch point.
2. For those eggs that do not survive, they will be ranked behind all those that do survive.
3. In the event of a tie, the glider with the lowest wingspan will be given more favorable ranking.

INQUIRY LAB – EARTH SPACE SCIENCE

OBJECTIVE: Students will be given a problem that is related to Earth Space Science and they will design a laboratory investigation to solve the problem.

Number on Team: 3 **Number of Teams Per Students: 1 per 20** **Impound: NO**

Safety: Goggles

Additional supplies: Students must bring a pen or pencil, and may bring a stopwatch, ruler and a non-programmable calculator.

Directions:

1. Teams will be provided with a set of materials and equipment. All of it can be used to complete the event and solve the problem.
2. The teams will be assigned a question/topic area that determines the nature of the experiment. The focus of the question will be on Earth Space Science and this question will be the same for all teams during the day of the competition.
3. The students will use the attached organizer during the experiment. All conclusions must be supported with evidence collected during the investigation.
4. When the teams are finished, all materials will be returned to the event supervisor along with all written materials. The content of the report must be clearly stated and legible.

Scoring: Scoring will be based on the attached rubric.

INQUIRY LAB RUBRIC

Name: _____

School: _____

Name _____

Name _____

A. Problem: (3)	
B. What you already know about the problem: (3)	C. What you don't know about the problem (questions you have about the problem): (3)
D. What are you looking for: (3)	E. What are you going to change to find it: (3)
F. What is your plan to investigate the question? (procedures): (10)	

G. Your results or data (graphs, tables, calculations): (10)

H. What relationship or pattern did you observe based on the evidence and data you collected:
(5)

I. What worked: (3)

J. What didn't: (3)

K. Your conclusions and answers to your initial questions based on the data you collected: (10)

L. What error was there in the experiment? (5)

KITCHEN KEMISTRY

OBJECTIVE: The objective of this event is to make a cake or pie that has the lowest density possible.

Number on Team: 3 Number of Teams Per Students: 1 per 20 Impound: NO
THIS IS A PREBUILD EVENT

Directions:

1. The team will bake a cake or pie out of ingredients that are completely edible and readily available at commercial grocery stores.
2. The cake must be made in a pan with at least a 9" diameter.
3. Students will bring the cake or pie to the testing area where a core sample will be removed from the cake and the mass and volume will be determined. The core sample will be approximately 2" in diameter and will be randomly taken from the cake. The height will be taken along the side of the core sample, from the top of the sample to the bottom. Each measurement will be taken in terms of centimeters. The mass of the sample will be determined in grams.
4. An 8 ½ by 11" sheet of paper will accommodate the cake that will include the list of ingredients, their amount using metric units, a procedure for how you made the cake, and a explanation of trials on your attempts to reduce the cake's density. This must be placed into a clear plastic sheet protector and turned in with your cake. The sheet must include all three participants' names as well as school.

The score will be based on the following:

List of ingredients	5
Amounts listed with metric units	5
Procedure for making the cake	5
Procedure used to lower cake's density	5
Measurements taken at home with calculations of density.	5
Taste test of cake	10
Total:	35

Scoring:

Overall score = Total of criteria / (Density of Cake)

Density = Mass of Cake (g) / Volume of Cake (cm³)

The team with the highest overall score will be given most favorable rank.

LASER LIGHT SHOW

OBJECTIVE: Design, engineer and explain the science of a laser light show set to music.

Number on Team: 3 Number of Teams Per Students: 1 per 20 Impound: NO
THIS IS A PREBUILD EVENT

Directions:

1. Students must be aware of safe laser practices and follow those practices at all times.
2. Students must use lasers only as provided by or approved by your instructor. A maximum of two lasers are permitted. Only Class II, and IIIA (under 2.5 milliwatts/cm²) lasers are permitted, and no modifications are allowed to the laser or the case. Failure to follow proper laser safety protocols will be automatically disqualified. This includes intentionally shining a laser into a person's eyes.
3. The light show may be constructed of mirrors, motors, speakers, and other devices.
4. The light show may not use voltage above 9 volts.
5. The light show will run in conjunction with a maximum of three minutes of music.
6. The music must not contain vulgarity, profanity, or be of an offensive nature to any group or individual.
7. The light show may be manually or remotely controlled by up to three students.

Competition:

1. The light show will be projected onto a screen from a distance of 15 feet.
2. The room will be as dark as possible.
3. Music will be played through a system provided by the instructor, at a volume level set by the instructor. Bring your music on a cassette tape.
4. All your apparatus must fit on a normal 6 foot folding table, 15 feet from the screen.
5. The judge(s) will evaluate the light show on the following criteria: synchronization with the music, aesthetics, variety of patterns, and construction of the light show itself.
6. Students will present a one page 8 ½" x 11" sheet of paper that explains: Lasers and their operations, how the images are produced from a single point of light, and how lissajous patterns are created.

Scoring:

Synchronization with music	10 points
Construction design	10 points
Variety of patterns	20 points
Oral explanation of optics and lasers	30 points
Written explanation from step 6	30 points.

MOUSETRAP VEHICLE

OBJECTIVE: Design and engineer a vehicle, powered solely by the energy of one standard-sized mousetrap, that will travel the greatest linear distance. Note: By definition, a vehicle is a device with wheels or runners used to carry something (e.g., car, bus, bicycle, or sled). Therefore, launching a ball (e.g., marble) from the mousetrap will be ruled illegal.

Number on Team: 2 Number of Teams Per Student: 1 per 20 Impound: NO
THIS IS A PREBUILD EVENT

Directions:

1. The device must be powered by a single commercially available mousetrap ($1\frac{3}{4}$ " x $3\frac{7}{8}$ ").
2. The mousetrap cannot be physically altered except for the following: 4 holes can be drilled only to mount the mousetrap to the frame, and a mousetrap's spring can be removed only to adjust the length of its lever arm. The spring from the mousetrap cannot be altered or heat treated.
3. The device cannot have any additional potential or kinetic energy at the start other than what can be stored in the mousetrap's spring itself. This also means that the student cannot push start the vehicle. The vehicle must be self-starting and may not receive a push in the forward direction or side direction. The vehicle must steer itself; no outside forces may be used to guide it.
4. All parts of the vehicle must remain with the vehicle as it travels down the track and stops.
5. The spring cannot be wound more than its normal travel distance, or 180 degrees.
6. The judge has the final decision as to the appropriateness of any additional items that might be used in the construction of the vehicle.

Competition:

1. The race track can be any smooth level floor, or concrete area. The track may be limited to a width of 6 feet and if so will be disqualified for that attempt if it hits the wall or runs outside of the track.
2. Distance will be measured from the center of the starting tape to the front of the vehicle after it stops. (Even if the vehicle turns, the front of the vehicle is considered the starting point.)
3. Each contestant will be given three attempts.

Scoring:

The winner will be the vehicle that has obtained the greatest distance on any of the three attempts.

SCIENCE PHOTOGRAPHY CONTEST

OBJECTIVE: Take and submit a photograph which illustrates a science concept or principle or shows an application of a science concept or principal.

Number on Team: 2

Number of Teams Per Students: 1 per 10

Impound: NO

1. The photograph must be digital media, JPG or GIF format, with a 600 dpi resolution or greater. The file size must be no greater than 1 MB.
2. Photograph can be color or black and white. It can be toned and can have special effects added to it.
3. The photograph can be staged, but it must be of a real event. It can not be a trick photo created in darkroom or on the computer. (You can enhance the photo on the computer.)
4. A description of the science concept, principle or application of no more than 500 must accompany the photo in a Microsoft Word Document. It must clearly state the techniques you followed to create the photo and any enhancements that you made to the photo. The photo and word document must be e-mailed through the GO GK-12 website at <http://gogk12.optics.ucf.edu>. It must include the team members' names and school.

Entries must be received by **5:00 p.m. on Tuesday April 10, 2007.**

Scoring:

Explanation of connection to science concept:	20 points.
Correctness in explaining the science concept:	30 points.
Artistic Merit:	50 points
Total points:	100 points

Those with the highest score will be given the most favorable ranking.

SCIENCE PROBLEM SOLVING: WATER FILTRATION

OBJECTIVE: Each team will create a device capable of filtering dirty water.

Number on Team: 4

Number of Teams Per Students: 1 per 20

Impound: NO

Safety: Goggles

THIS IS A PREBUILD EVENT

Directions:

1. The team must construct a device which is capable of removing contaminants from water.
2. The device must be made in such a way that they do not involve elements that are directly taken from commercially available filtration systems. For example, the team is not allowed to use a filter that is used in commercially available filtration systems, but they are allowed to use chemicals found in the commercially available filters as long as they can be purchased separately. For example, you can use activated charcoal because it is commercially available for other uses.
3. The device must fit into a box that has the following dimensions: 60 cm x 30 cm x 30 cm.
4. A removable clear collection container must be included to collect the water after it has gone through the filtration. It must be large enough to collect 500 mL of water.
5. There must be an opening that will accommodate pouring 500 mL of water into the device.
6. The water will be contaminated with any combination of the following ingredients: Coffee grinds (after they have been used once), flour, potting soil, sand, vinegar, crushed shells.
7. The water will be poured into the device and the judge will start the stopwatch. The time will proceed for 20 minutes.
8. At the end of the 20 minutes the clear container will be removed and the following tests will be performed: **Transmittance of light as measured in lumens**, which answers how clear the water is, **volume of water as measured in mL**, which answers how efficiently your device removed contaminants from water, and **pH of water**, to return the water back to a 7.0 pH level.

Scoring:

Score = Transmission (lumens) x (Volume of Water after filtration mL) / [(pH-7)+7]

SCIENCE VIDEOGRAPHY CONTEST

OBJECTIVE: Shoot and submit a digital video which illustrates a science concept or principle or shows an application of a science concept or principal.

Number on Team: 4

Number of Teams Per Students: 1 per 20

Impound: NO

1. The video must be in digital form, with resolution size of 320 x 240. The video must be no more than 5 minutes long and no larger than 100 MB. Must also use a standard format that is limited to AVI, MPEG, or WMV. Only these types supported by Windows Media Player are allowed. Do not submit file types that can only be played on Real Player or Quicktime.
2. The video must show, demonstrate, explain, or highlight a science concept or principle. Be creative in the way that you create the video.
3. At the beginning of the video, a maximum 30 second introduction must be given with a team member explaining the science content that the video will show, describing the science correctly.
4. The video must be uploaded to the GK-12 website by **5:00 p.m. on Tuesday April 10, 2007.**

Scoring:

Explanation of connection to science concept:	20 points.
Correctness in explaining the science concept:	30 points.
Artistic Merit and Creativity:	50 points
Total points:	100 points

Those with the highest score will be given the most favorable ranking.

SOLAR WATER HEATER

OBJECTIVE: Produce the most effective solar water heater. To determine efficiency, all entries will have the same collecting surface to volume of water ration and be exposed to the sun at the same time. The winner will be the unit producing the required temperature rise of the given volume of water in the least time, or failing that, the unit producing the greatest temperature rise in the maximum time allowed. In case of bad weather the judging will be done on technical merit. Entrants will be questioned about basic operating principles and design strategies.

Number on Team: 3 Number of Teams Per Students: 1 per 20 Impound: YES
THIS IS A PREBUILD EVENT

Directions:

1. Each apparatus will have a collecting area to be exposed to the sun of not less than 100 cm^2 and not more than 1000 cm^2 . The surface area of each collector will be measured and calculated to three significant figures.
2. Each apparatus must be provided with:
 - a. A white border, in white poster board, extending at least 10 cm from the collecting area around the perimeter and preventing direct sunlight from falling on the sides or the back of the apparatus.
 - b. A cover of white poster board which will cover the entire collecting area. This will be removed to start the competition and replaced at the end of the timed part of the competition.
3. No device shall be allowed any type of additional energy input including solar voltaic cells.
4. All entries will be placed indoors or in the shade for a period of at least one hour to allow the entire device to come to room temperature.
5. Each entry will have a separate water reservoir covered with aluminum foil to accommodate water in the amount of one cubic centimeter per square centimeter of collector area. For example if the collecting area is 500 cm^2 then the water reservoir must be designed to accommodate 500 ml of water, plus room for expansion of the water. A second post heating reservoir must be included that will have the same size and specifications.
6. Each water reservoir must be empty at the start of the competition and provide a convenient opening for filling with a funnel. A port for the insertion of a standard laboratory thermometer or PASCO temperature probe into the main body of the water within the reservoir must be provided and the extension and the extension of the thermometer outside of the reservoir must remain shaded. This shading apparatus must be included and can either be attached or a separate piece added to the thermometer.
7. The water reservoirs must be insulated and shaded from direct solar input.
8. Each entry shall be filled with water by the judges from a container of water that has reached room temperature. All filling will be completed before the devices are removed from the shade.
9. Any device that leaks or is not free standing will be disqualified. No patching is allowed after water has been added to the device.
10. A standard laboratory thermometer or PASCO temperature probe will be used in each device during testing.
11. All devices will begin at approximately the same initial temperature and at approximately the same time.

Competition:

1. Devices will be placed along a line with the order of placement randomly determined by a drawing.
2. To start the competition, sequentially along the line of devices, the covers will be removed from the collectors and the initial temperature will be measured and recorded along with the starting time, individually for each device.
3. The competition will continue until each device raises the measured temperature of its water by 20.0 degrees Celsius or the time limit expires. When a particular device passes the 20.0 degree Celsius temperature rise, its cover will be replaced and its temperature measured. The highest reading achieved in the one minute following the covering of the collectors is the official ending temperature.
4. When the competition is declared closed, the covers will be replaced on the collectors, sequentially, in the same order that they were removed and the ending time and temperature recorded.
5. The event has a 1.5 hour time limit to collect solar energy and store it in the water. This will end the competition, whether or not any device has reached a 20.0 temperature change.
6. The temperature will be additionally checked and recorded for each device every 15 minutes during the competition.
7. When any entry has increased the water's temperature by 15 degrees or more, the measurement of temperature will increase in frequency until the water reaches a 20 degree temperature change.
8. The total temperature rise for any device will be its official ending temperature minus its initial temperature.
9. The total elapsed time for any device will be the time from when the cover was removed from the collectors to the time when the cover is replaced over the collectors.
10. The score for any device will be according to the following formula:

Scoring:

$$\text{Score} = \text{Change in Temperature (deg. C)} \times \text{Volume of Water (mL)} / [\text{Time of Exposure (min.)}]$$

Those devices that achieve a temperature change of 20 degrees within 90 minutes will be ranked ahead of those that do not reach a 20 degree temperature increase.

SPAGHETTI TOWER

OBJECTIVE: Build a tower made from dry spaghetti pasta and small marshmallows that is capable of supporting a bag of sand at the greatest height.

Number on Team: 3
BUILT ON SITE

Number of Teams Per Students: 1 per 20

Impound: YES

Directions:

1. On the day of the competition, students must immediately report to the testing station for construction. They will be allowed 20 minutes for construction. They are allotted a budget to build the tower. They are only allowed to use marshmallows and regular spaghetti (not linguini or other types of pasta.)
2. A single piece of pasta is not allowed to come into contact with any other piece of pasta, other than where they cross. They are not allowed to be parallel and touching each other as reinforcement to make the structure stronger.
3. Each team will be able to purchase their supplies, via a point system. Once the item has been purchased, it cannot be returned. They will have a budget of \$5000. GO Bucks are available on the GO GK-12 website (<http://gogk12.optics.ucf.edu>) that must be used for purchase. The cost for each item is as follows:
 - Marshmallow = 5.00 each
 - Spaghetti pasta = 20.00 each
 - Scotch tape = 50.00 per cm
4. The top of the tower must accommodate a sandwich sized zip lock bag of sand that has a mass of 100 +/- 5 grams. The students will place the bag of sand on the top of the tower. The tower must be able to support the bag for at least one minute. If the tower fails, it will be ranked behind all those that do not fail. Failure occurs if the bag falls off the tower, if any member (spaghetti) shifts more than 10 centimeters in any direction, or if there is a complete collapse.

Scoring:

The score will be determined by the following formula:

Overall score = 2 x (Height of Tower) (cm) / Cost (Dollars)

Towers in which a collapse occurs will be ranked behind those that do not fail. The tower with the highest overall score will be given the most favorable ranking.