TENNESSEE

SCIENCE OLYMPIAD

Exploring the World of Science

2015 Coaches Manual

Elementary Science Olympiad

Hosted by Chattanooga State and

Sponsored by Tennessee American Water

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Bold items were not in last year.

Introduction

With the current interest and increased awareness of the importance of the STEM (Science, Technology, Engineering, and Mathematics) disciplines it is evident that Tennessee students must improve their performance in science and math. This is especially true at the elementary level where students are just beginning to build their knowledge base for future science and math courses and hopefully their future career choices. The Elementary Science Olympiad program is an opportunity for students to 1) practice cooperation and teamwork; 2) practice toward a clearly identified objective; and 3) improve their knowledge in science, math and technology and demonstrate the skills they have developed through competition. By providing a competitive tournament and rewarding students for their achievement, Tennessee Science Olympiad strives to make learning in the STEM areas both fun and exciting.

It is not the goal of Tennessee Science Olympiad to take away any teaching time from the various science subjects, but rather to enrich and enhance the opportunities in science education for elementary school students. These years are important for influencing young students' perceptions about the STEM disciplines. During these years, students, if taught science in a hands-on, problem-based manner, begin to develop important lifelong science/math literacy skills, such as problem solving, critical thinking, self-regulated and self-evaluated learning, and teamwork. Future career choices are moving more and more rapidly in the direction of science, technology, engineering and mathematics, and therefore it is important that students and educators take advantage of and benefit from every opportunity they are given to further their science education. The Elementary Science Olympiad program will improve the learning of science and math for all students and celebrate their efforts and achievements in the process.

Team Composition

This year's tournament will follow rules similar to those found in high school/middle school competitions. Teams must be made up of 16 students in grades 3 to 5. Teams should strive to have students at all grade levels and no more than seven 5th grade students may be part of a team. **One** team from each school will be accepted on a first-come-first-served basis up until March 31 or until we reach our limit of 36 teams. You may request one additional team. Applications from new schools will not be accepted after

March 31 and additional teams will be awarded to those schools that have requested a 2nd team until a team roster of 36 is filled. Awards of a second team will be made on a first-come-first-served basis determined by the date on which their registration form is received.

Head Coach

Every team must have a head coach who is a teacher at the school. The success of any elementary team depends on the organization and support of an adult that is willing to make decisions and provide leadership. The head coach should strive to involve parents, other teachers, business people, community organizers or other caring adults in preparing their team for competition. The head coach must be aware of all the rules, manage the coaching resources, recruit students and assistant coaches, involve the parents, and provide a clear reason for the team to prepare and compete. If the head coach is too strict, the students will not enjoy the process and may not return for the next year. If the head coach is too lenient, students will not feel prepared when they compete in their events and will quickly become discouraged. Parents may not cooperate if they belive that some students or parents took advantage of the team. While a proper balance is hard to establish and maintain, it is important for success. Above all, the students, parents and assistant coaches must respect the head coach as an individual and as a leader. The head coach is responsible for registering the team and serves as the point of contact for tournament organizers.

Aerodynamics

Description: Each team member will build one paper airplane. Airplanes will be flown a distance of at least five meters, landing on a predetermined target. Airplanes must be of a folded aerodynamic design. Crumpled wads of paper do not qualify.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

1. Two sheets of plain white paper will be supplied for each team along with approximately five centimeters of masking tape or scotch tape and a pair of scissors. Two planes will be constructed.

2. Planes flown in competition must be made on site, during the allotted time using only the materials provided.

3. Planes will be hand launched from behind a line on the floor at a specified target, on the floor, more than five but less than twelve meters distant.

Scoring:

1. After the flight, the distance will be measured from the center of the target to the nose of the airplane where it first landed. The distance from the target will become the launch score for that flight.

2. Each team member will fly one of the two planes once. The two team members can each fly the same plane or they may each fly a different plane. The team score will be determined by adding the two flight launch scores for the team.

3. The lowest score, signifying the closest to the target, will be the winner. In case of a tie, the best single flight will break the tie.

A Is For Anatomy

Description: This event will consist of a written test in which the contestants will view models, slides, and pictures to identify organs from the following human body systems. Both structure and function will be tested in a series of written questions.

1. Skeletal
2. Digestive
3. Respiratory
4. Circulatory
5. Urinary
6. Nervous

Number of Participants: 2

Approximate Time: 30 minutes

The Competition:

Every team will be given an answer sheet. Team members may consult with each other by writing (no talking). Only one answer for each question will be accepted. Team members will move through 12 to 15 stations answering approximately 30 questions. Questions will be at the stations or in a test booklet.

Scoring: At the end of the testing period, the question sheets and the answer sheets will be collected from those teams who have not turned in their responses. Time is not a factor in scoring. Correct spelling will be used as a tiebreaker.

All Charged Up

Description: Each team will demonstrate its knowledge of magnets, magnetism, and circuits.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

This event will be run in a station format. Teams will rotate through stations that assess any or all of the following topics:

a) Attraction and repulsion
b) The positive or negative property of particles
c) Magnetic materials
d) Electromagnets
e) Using magnetism to create electricity
f) The nature of static electricity and the conservation of electrical charge including:
    i. Positive and negative charges;
    ii. Opposite charges attract and like charges repel
g) Series and parallel circuits
h) Schematic maps
i) Conductors and nonconductors
j) Parts of a light bulb

Scoring:

Points will be awarded for the accuracy of responses. Ties will be broken by the accuracy or quality of responses to pre-selected questions chosen by the event leader.

Backyard Botany

Description: This event is designed to determine a team's knowledge of plants and life processes that relate to plants.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

Teams may also bring up to 2 field guides for trees and leaves and up to 2 hand lenses. Every team will be provide a hands – on event with all necessary items, objects, materials, questions, writing instruments and response sheets for participants to complete stations. Examples include but are not limited to: drawings, scenarios, questions, challenges, leaves, photographs and plant specimens.

This event will be run in a station format. Teams will rotate through stations that assess any or all of the following topics:
a. Know the structure and function of roots, stems, leaves, and flowers.
b. Describe how environmental conditions determine how well plants survive and grow in a particular environment.
c. Know the distinct stages of the life cycle of seed plants
d. Explain how basic properties (texture and capacity to hold water) and components (sand, clay and humus) of soil determine the ability of soil to support the growth and survival of many plants.
e. Be able to identify the following trees by their leaves. Sassafras (*Sassafras albidum*); Post oak (*Quercus stellata*); Mockernut hickory (*Carya tomentosa*); Sycamore (*Platinus occidentalis*); Flowering dogwood (*Cornus florida*); Red maple (*Acer rubrum*); River birch (*Betula nigra*); Sweet gum (*Liquidambar styraciflua*); Tulip poplar (or yellow poplar) (*Liriodendron tulipifera*); Red bud (*Cercis canadensis*); White oak (*Quercus alba*); Southern magnolia (*Magnolia grandiflora*); Loblolly pine (*Pinus taeda*); Eastern hemlock (*Tsuga canadensis*); Long leaf pine (*Pinus palustrus*)

Scoring: Points will be awarded for the accuracy of responses. Ties will be broken by the accuracy or quality of responses to pre – selected questions chosen by the event leader.

3, 2, 1 Blast Off

Description: This is a build ahead of time event. Teams will design, construct, and launch two 2-liter water rockets to stay aloft for the greatest amount of time.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

1. All rockets must be launched using the launcher and water provided by the supervisor.
2. Only one launch is allowed per rocket. If a team wishes to use both launches, they must have 2 rockets.
3. Teams must arrive at the competition site ready to launch. Teams must bring and wear safety glasses for loading, launching, and retrieving their rockets. Teams must also present labels from the pressure vessel if labels were removed. Following the safety inspection of each rocket, teams will add water to each rocket. When called to launch, the teams will have a total of 10 minutes to launch 1 or 2 rockets brought to the competition (only 1 launch per rocket). Only rocket(s) launched before the time expires will be scored. Teams may not share rockets with other teams (i.e. a varsity team may not loan a rocket to a JV team from the same or different schools).
4. All rockets will be launched at **60 psi**. Once the rocket is pressurized, no contestant may touch or approach the rocket.
5. Time aloft is recorded in tenths of a second. Timing begins when the rocket separates from the launcher and stops when any part of the rocket touches the ground, goes out of sight, or comes to rest on a tree, building, or other obstruction.
6. Event leaders are strongly encouraged to use three independent timers on all launches. The middle value of the three timers should be the officially recorded time.

Scoring:

1. Rockets that violate a safety related rule under Construction Parameters will not be launched and will receive participation points only.
2. Ranking within each tier is determined by the greatest time aloft of a single rocket flight.
   i. Tier 1: Rockets launched without any violations
   ii. Tier 2: Any launch with competition violations, or a non-safety construction violation.
3. Ties in tiers 1 and 2 are broken by the better score of each tied team's second-best rocket launch.

Event Resources:
http://www.sciencenc.com/event-help/321BlastOff.php
http://www.nerdsinc.com (excellent rocket launchers)
http://exploration.grc.nasa.gov/education/rocket/BottleRocket/about.htm

3, 2, 1 Blast Off

Construction Parameters:

Pressure Vessel: The rocket pressure vessel is the part of the rocket that attaches to the launcher and is filled with water and air. The pressure vessel must be made out of a single 2-liter or smaller plastic **carbonated** beverage bottle.

i. **Labels** may be removed from the bottle but labels must be presented at the safety inspection to prove the bottle is carbonated. Rockets without labels must not be launched, as this is a safety issue.

ii. **Bottle Opening**: Soda manufacturers have recently changed the size of the neck of their bottles. The inner diameter of the bottle neck must be 2.2 cm, not the new reduced size of 2.1 cm. 2.1 cm necks will not fit on the launcher. The easiest way to test this is by sliding a piece of 1/2 inch PVC into the bottle. If it fits loosely, the bottle will go on the launcher. If the PVC sticks and you have to apply any force to slide the PVC in, the bottle will not go on the launcher. See the event help webpage for assistance in checking if yours will fit.

iii. **Structural Integrity**: The structural integrity of the pressure vessel must not be altered. This includes, but is not limited to: physical, thermal, or chemical damage (e.g., cutting, sanding, using hot or super glues). Alteration to the structural integrity of the pressure vessel is a safety violation of the rocket and it must not be launched. Event supervisors must assess the structural integrity by looking through the nozzle and sides of the bottle for discoloration, bubbles, thinning or cuts in the walls. Rockets violating this rule must not be launched, as this is a safety issue.

Materials:

i. Metal of any type is prohibited anywhere on the rocket. Rockets violating this rule must not be launched; this is a safety issue.

ii. Toy or professional rockets or parts of rockets are not allowed.

Nose Cone: Rockets must use a blunt or round nose. The nose must be designed such that when a standard 2 liter bottle cap is placed on top of the nose, no portion of the nose touches the inside top of the bottle cap (see Figure 1). Teams must not use a nose that is sharp, pointed, or consisting of a rigid spike regardless of the material used. Rockets violating this rule must not be launched; this is a safety issue.

Fins and Other Parts: Fins and other parts added to the pressure vessel must be 5 cm or higher above the level of the bottle's opening to ensure rockets fit on the launcher (see Figure 2).

Energy Source: Explosives, gases other than air, chemical reactions, pyrotechnics, electric or electronic devices, elastic powered flight assists, throwing devices, remote controls and tethers are prohibited at any time. All energy imparted to the rocket at launch must originate from the water/air pressure combination. Rockets violating this rule must not be launched, as this is a safety issue.

Recovery System: Any free-fall recovery system is allowed provided it does not violate any other rule; however, the recovery system must be judged as safe. Example: a parachute is allowed, but must be attached by tying or taping it to the rocket.

Can Race

Description: A team of two students will represent the school by racing their can against other teams in a drag race format.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

1. The students will make and bring to the contest one can racer for each school.
2. The racers will be run on a course approximately three meters in length and thirty centimeters in width. The racing surface could be a gym floor, hallway, concrete or close nap carpet. Lane control will be provided by boards or other barriers along the outer edges of each lane.
3. Any can (small or large) may be used. Racer surfaces may not be modified by addition of any substance.
4. Lollipop, Popsicle or other similar sticks may be used as the running arm. Tape and washers may be used.
5. Racers will be released by contestant without any assisting push and must not be touched by anyone until they cross the finish line. Racers stuck against lane barriers will have their "run length" measured at that point. Those jumping off of the course will be ranked after those that stay on the course.

To Make Racer:

1. Drill holes in the precise center of the can bottom and plastic lid(s). The holes must be large enough so the rubber band will thread through them easily, and be sure the edge of the hole in the can lid is smooth so it won't cut the rubber band.
2. Put the lid(s) on the can and thread the large rubber band through the hole so that the loops protrude from both ends of the can. Push the shorter wooden dowel or stick through the loop of rubber band protruding from the can bottom.
3. Push the shorter wooden dowel or stick through the loop of rubber band protruding from the can bottom.
4. Punch two small holes in the can bottom on either side of the stick, and tie the stick securely to the can bottom with twine, wire, or a twist tie.
5. Thread the other loop of the rubber ban through the holes in several washers. (There must be sufficient number of washers to keep the longer stick, which is added in step 6, from rubbing against the edge of the can. Later, if appropriate, you can increase or decrease the number of washers.)
6. Finally, place the longer wooden dowel or stick through the loop with the washers so that one end sticks out beyond the side of the can.
7. Wind up the rubber band and release the racer.

Scoring:

1. Total distance and elapsed running time of each racer will be recorded.
2. Can racers will be ranked by distance. The winner will be chosen on the basis of the greatest distance traveled.
3. In case of a tie, the shortest elapsed time will determine the winner.

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Categories

Description: The game consists of three rounds. Each team begins the round with a blank playcard on which they write their names and school.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

1. The event coordinator will prepare playcards for three separate rounds. Each playcard will contain six subject categories and six letters or wild letters marked by *.

2. Making entries: After the timer is set, each team of 2 players attempts to enter a word or phrase in each of the 36 blanks on their playcard. Each entry must agree with or fit the category at the top of that column and its "Key Word" must begin with the letter at the left of the row in which it is written. A specific entry may be written only one on the playcard even though it may be valid in another blank. Teams may converse quietly. Loud discussions will give away good answers to competitors!

3. Key Words: Generally, the "Key Word" in an entry is the first word. However, if the first word or title prefix of an entry is part of the category, the next main word is to be regarded as the Key Word (e.g., River Seine would be under S, Sir Walton would be under W, and giant Panda would be under P). A person's last or surname must always be regarded as the Key Word. The articles "a", "an", and "the" are never Key Words. Common surnames given only will be disallowed as guesses unless accompanied by appropriate first names.

   Key Words in a row with a wild initial letter (*) may begin with any letter of the alphabet but need not begin with the same letter (see example below). When time is up, each player must stop writing immediately and pass his/her playcard to the judge. The judge will validate responses at a later time.

4. This process is repeated three times with different categories. The initial letters, however, may be the same.

5. Categories should be chosen by the coordinator to reflect subjects discussed during the school year at third, fourth, or fifth grade level.

6. An example chart is shown below.

Categories:	Mammals	Trees	U.S. Rivers	Insects	Units of Measure	Scientists
A	Apes	Aspen	Allegheny	Ant	Amperes	
M	Man	Mangrove	Missouri	Moth	Meter	Mendel
F	Fox	Fir		Fish fly		Fermi
*	Cat	Oak	Mississippi	Beetle	Liter	Einstein
D	Dog	Dogwood	Detroit	Dragon fly	Decigram	David Smith**
*	Horse		Snake	Spider**		Watt

*= Free letter
** = Incorrect answer

<u>Scoring</u>:

One point will be given for each correct answer.

Note: In the example the student will not get credit for blank spaces and a spider is not an insect and David Smith violates rule, direction or first name beginning with a D is incorrect. We need a scientist whose last name begins with a D such as Dirac or Humphrey Davey.

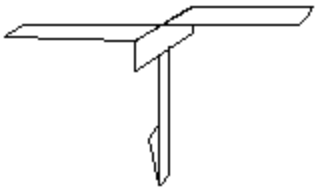
Chopper Challenge

Description: Contestants will build and test 3 choppers (rotary flying devices) using only the materials provided at the competition. They may bring pencils, a ruler/straight edge and scissors. No other equipment/supplies are allowed.

Number of Participants: 2 **Approximate Time:** 30 minutes

Construction:

1. Each team will be given one sheet of 8 ½ x 11 inch 60-90 lb card stock and 3 standard paper clips to construct 3 choppers that use rotation to slow their descent.



2. Each chopper must be made using a single piece cut from the sheet of cardstock provided and one paper clip. The pieces for the 3 choppers need not be the same size and shape.

3. Each chopper must rotate in a different direction, as shown below, and they must be labeled with the direction they are intended to rotate. The drawings only illustrate the direction of rotation. The choppers may be any design.

4. Contestants may test their devices in the building area but will not be allowed to test them from the official drop location.

The Competition:

1. When it is their turn, contestants will release their choppers, one at a time, from the height specified by the judges. All teams will release their choppers from the same height.

2. The judges will measure and record the time required for each chopper to reach the ground/floor. Time will continue if the chopper bounces off an object, but will stop if the chopper gets stuck and stops.

3. A chopper's flight time will be divided by 2 if it does not rotate in the direction labeled.

Scoring: The team's score will be the sum of the flight times for all three choppers. Longest total time wins. Ties will be broken by comparing each team's single longest flight time.

Density

Description: This event is designed to examine the students' basic understanding of the nature of density using samples of various materials.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

This activity will consist of 4- 10 stations that will be used to determine the competitors understanding of density. Each station will test different aspects of the problem Students may also be asked to find the mass of an object in grams (g) using an elementary or digital balance. They may also be asked to measure length, width, and height in centimeters (cm) and calculate the volume in cubic centimeters (cm^3). Students may be asked to calculate density using a simple formula (e.g., if a 20-gram block is 10 cubic centimeters, what is the density (2 g/cm^3)?

Scoring: Highest score wins. One point is given for measurements, two points for density questions. Tiebreakers will be previously determined questions.

Sample Stations/Questions:

Station 1: Given a set of 3 blocks, rank order them from most to least dense.
Station 2: Given two blocks, which would float in water?
Station 3: Given two objects of the same size, which is more dense?

Possible Resource Sites: Sets of ten 1" density cubes (Aluminum, steel, copper, brass, nylon, acrylic, pine, poplar, oak, and PVC) are available from several sources:

- Carolina Biological, Inc. https://www3.carolina.com/
- Fisher Scientific https://www1.fishersci.com/
- NASCO Science, Ft. Atkinson, WI http://www.enasco.com

Note: If blocks are used they should be numbered for easier identification.

Don't Bug Me

Description: The contestants are to distinguish insects from non-insects, identify various body parts, characteristics, habitats, ecological significance, life cycles, and major classes and orders of arthropods.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

1. Participants will be asked two part questions at each of 10 – 20 stations. Depending upon availability, pictures, preserved or living specimens may be used.
2. Questions will include the major classes of arthropods and orders of insects. Classes: ARACHNIDA, CHILOPODA, CRUSTACEA, DIPLODA, INSECTA (HEXAPODA). Orders: Thysanura, Orthoptera, Isoptera, Neuroptera, Ephemrida, Odanata, Mallophaga, Anoplura, Hemiptera, Homoptera, Dermaptera, Coleoptera, Trichoptera, Lepidoptera, Diptera, Siphonaptera, Hynmenoptera. The second part will test student's knowledge about other items mentioned in the description. Questions will be multiple choices.
3. Participants may develop and bring to the competition a key to aid them in answering these questions. This key must fit on an 8.5 x 11 inch sheet of paper.

Scoring:

One point will be given for each correct answer. The last five questions may be more difficult to avoid ties and they may be tiebreaker questions.

SAMPLE QUESTIONS:

Grasshopper

1. To which order does this insect belongi
   a. Dipteral b. Odonata c. Orthoptera
2. What is the purpose of the log on the last thoracic segment?
   a. Walking b. Food gathering c. Jumping d. Mating

Picture of a feathery antenna of a moth

1. What class of insects has this kind of antenna?
   a. Coleopteran b. Lepidoptera c. Diptera
2. What do we call this type of antenna?
   a. Laminate b. Club c. Plumes

Egg Drop

Description: The objective is to have a two-person team construct a package to protect an egg (from breaking) that will be dropped free fall from a high spot selected by the event coordinator.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

1. The students will construct a package for holding and dropping the egg and bring it with them to the tournament. The package must have dimensions of no more than 20 cm on a side and have a mass of no more than 1 kg (without the egg). The name of the school and of the team (if there is more than one team from the school) must be marked on the package. The package may not contain anything that would aid in the package adhering to the target.

2. The event-coordinator will provide large, inspected Grade A eggs which the students will load into their package at the event site. Students are responsible for the egg during loading, dropping, and unloading. The student must hand the egg to the supervisor once the drop is complete.

3. The package will be dropped free fall by one student from a height determined by the event coordinator and announced when teams arrive at the event site. There will be only one drop with a time limit of three minutes to prepare for the drop from the time the judge says to begin. A plumb line may be used. Packages may be dropped through an aperture (provided by the event coordinator).

4. The drop area will be approximately 60 cm x 60 cm and made of solid material (e.g. ½" plywood) with a target in the center of the area.

Scoring: Eggs that do not break or show cracks will be ranked first. Those that break or crack will be ranked after those that do not. The farthest distance of any part of the package to the center of the target will determine the score. The package with the shortest distance wins. Ties will be broken by the lighter package (without egg).

Estimania

Description: Students will be asked to estimate the answers to approximately 10 to 15 questions requiring an estimate between ten and one million.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

1. The questions will follow the following format:
   a. How many pennies in the jar?
   b. How many two-centimeter paper clips could be laid end to end across a standard football playing field?
2. Calculators **will** be allowed.
3. Students should bring a variety of equipment to help them with the estimations (rulers, cups of various sizes, spoons, etc.)

Scoring:

Points will be awarded on the following scale:

0 – 10% away from answer = 5 points
11 – 20% away from answer = 4 points
22 – 30% away from answer = 3 points
31 – 40% away from answer = 2 points
41 – 50% away from answer = 1 point
>50% away from answer = 0 points

The team with the most points wins. In case of ties, the least amount of time needed to estimate the problems will determine the winner.

Grasp a Graph

Description: This even requires students to analyze different graphs and to organize data into a graph.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

1. Each team will be required to analyze and answer questions about pictographs, pie graphs, bar graphs, line graphs, or other representations of data.

2. The team will also be asked to prepare graphs of a given set of data. Graph paper will be provided. A simple non-programmable calculator may be used.

Scoring: 70% of the points will be awarded for interpretation of the graphs. 30% of the points will be awarded for preparation of the graphs.

Metric Mastery

Description: Students will demonstrate an intuitive feeling for estimating and later for measuring different events/objects using S.I. metric units. Both parts may include mass, volume, distance, time and temperature.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

1. 6 to 8 objects will be designated for contestants to estimate and later to measure. Each team will be given a form to record the estimations. After turning in the estimation form, a second answer sheet will be provided to record the actual measurements. Contestants will move from station to station as directed by the monitors of the event. The recommended time at each estimation station will be about 60 seconds. The time for the measurement stations will be about 90 seconds. Desired units will be identified by the supervisor (e.g., kg, g, or mg.)

2. No standardized or marked measuring devices, including fingers, pencils, pieces of paper, etc., will be allowed for the estimation portion. Supervisors will furnish pencils. Calculators are not permitted in the estimation portion of the competition. Each of the objects will have been precisely measured, in advance, by the supervisors of the event.

3. The ideal system would allow students to move from station to station making their estimations. Then they would return to the same stations to make their measurements. Measuring devices will be kept out of reach, hidden in a drawer or covered in some way during the estimation portion of the competition.

Scoring: Scores for both portions of the event will be rated according to the precision of the estimates for each object/event – highest score wins. For the estimation competition, scores that are within 10% of the measured value will be awarded 5 points; within 20% will be awarded 3 points; within 30% will be awarded 1 point. In the measurement portion of the competition measurements within the instrument's range of precision will receive 5 points. All others receive zero. Ties will be broken with pre-selected tiebreaker question(s).

Note: supervisors should determine the acceptable measurement with the same equipment that is available to the students.

Name That Number

Description: This event will require students to use a sequence of digits and arithmetic operations to calculate a set of numbers.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

1. Each team will be given a list of 5 to 9 digits and a set of arithmetic operations. They will also be given a list of integers to be created using only the digits and operations provided. Each digit may be used only once without penalty, however, each operation may be used as many times as desired.

2. Students must provide a way to calculate a specified integer using the given digits and operations.

Scoring: Each correct calculation will earn points in the following manner. 1 point will be awarded for each digit and operation used. 2 points will be subtracted for each duplicate digit.

For example, given the digits 1, 2, 3, 4, and 5 and the operations +, -, x, ÷, and ^ provide a way to calculate the value 7. One possible answer would be 5 + 4 - 2 = 7. This answer would score 5 points, one for each different digit used (2, 4 and 5) and one for each operation (+ and -). A second possible answer would be 5 + 3 + 1 - 4 ÷ 2 = 7. This answer would score 9 points, one for each different digit used (1, 2, 3, 4, and 5) and one for each operation used (+, +, -, and ÷). A third possible answer would be 5 + 4 – 4 ÷ 2 = 7. This answer would score 4 points, one for each different digit used (2, 4, and 5), one for each operation used (+, -, and ÷), and minus 2 for the duplicate digit 4.

Name the Scientist

Description: Students will be required to identify prominent scientists and/or inventors and their contributions to their field(s).

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

The competition will be in two parts. Part I. Students will play a concentration game in a group of three to five that consists of matching the scientist/inventor to their invention, discovery, or contribution. Each student on the team will play separately and the points will be combined. Part II. Students, as a team of two, will take a quiz on some of the scientists' contributions to science. For example: Name the French chemist who discovered a method of processing milk to reduce the bacteria content.

_____

Scoring:

In the concentration game each student will receive one point for each successful match. A 6 x 6 matrix is used for the concentration game (18 scientists/inventors cards + 18 contribution cards). In the quiz each correct answer will be one point. High score wins.

Sample List of Scientists and/or Inventors:

Benjamin Franklin
Galileo
Wilbur Wright
Thomas Edison
Alexander Graham Bell
Edwin Powell Hubble
Carolus Linnaeus
George Washington Carver
Anton Van Leeuwenhoek
John James Audubon
Sally Ride
Sir Henry Cavendish
Robert Fulton
Joseph Priestly
Linus Pauling
Albert Einstein
Johann Kepler
Michael Faraday
Edward Jenner
Madame Curie
William Harvey
Andre Ampere
Sir Isaac Newton
Eli Whitney
Edward Teller
Robert Goddard
Wilhelm Rontgen
Louis Pasteur
James Watt
Sir Humphrey Davy
Gregor Mendel
Charles Darwin
Jonas Salk
Neil Armstrong
Antoine Lavoisier
John Dalton
Samuel F. B. Morse
Rachel Carson
Robert Koch
Robert Bunsen

No Bones About It

Description: A team of two students will identify bones and pictures of bones at stations throughout the room. They will also be required to answer questions found on cards at the stations pertaining to bones. Only the SCIENTIFIC NAMES of the bones will be accepted as correct.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

Stations will be set up in the room with provided bones and pictures of bones (HUMAN AND ANIMAL). The two participants will move from station to station with all the other teams only on the direct command of the event coordinator. (There will be 30 – 60 seconds for each station.) The team will be asked to record answers to the questions found at various stations on the provided answer sheet. Questions will relate to the identity of the bones or picture of the bones and also MAY include questions on orientation, articulation, number of this type in the human body, function, type of joint, range of motion, etc.

Scoring: There will be 20 to 25 stations with 2 questions per station. Each question will be worth 2 points. The team with the highest point total will be the winner. In case of a tie the team with the answers spelled correctly will place ABOVE the team with an incorrect spelling.

Number Patterns

Description: This event will require students to recognize number patterns to determine missing values in a number sequence.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

1. Each team will be given a list of at least 20 number sequences.

2. To determine whether they recognize the pattern in the number sequences they may be asked to provide the next two or three numbers in the sequence. For example, provide the next three numbers in the sequence 1, 3, 5, 7, …

3. Or they may be asked to provide missing numbers in the sequence. For example, provide the missing numbers in the sequence 1, 4, 7, …, …, 16, 19.

Scoring: Students will get points for each sequence they identify correctly. The event coordinator will designate the number of points possible for each sequence. In the event of a tie, the team completing the event in the shortest time will be the winner.

Save Our Earth

Description: This event is designed to determine a contestant's knowledge and awareness of the major problems that are causing harm to our environment. Topics included are extinction of species, future energy shortage and cost, acid rain, greenhouse effect, ozone depletion, air, water and soil pollution, waste treatment and disposal.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

The contestants will move to different stations and perform various environmental activities and studies such as:

1. Identification of extinct and endangered species.
2. Use of indicators to test the pH of water, rain, and soil samples.
3. Recognition of aquitards and aquifers.
4. Given appropriate data, draw a contamination plume.
5. Estimation of the time required for a contamination source to reach the drinking water supply.
6. Identification of four methods of waste treatment: landfill, incineration, reuse or recycling, or source reduction.
7. Comparison of volume and weight factors when discarding waste in a landfill.
8. Comparison of the unregulated dump with the sanitary landfill.
9. Methods used to fix heavy metal waste.
10. Successive dilution of a toxic solution.
11. Investigation of recycling techniques: hydrologic cycle, compost, and plastics.
12. Study of use of recycling and reuse on various materials to reduce waste and produce energy.
13. Study of global warming and ozone depletion.

Scoring: Points will be awarded for each question correctly answered. The highest score wins.

Science Detectives

Description: Teams will 1) list the properties of given items, and 2) locate items fitting a specified list of properties.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

Part I: Teams will receive a list of items and list three (3) appropriate properties for each listed item.

Part II:

1. Each team will receive a worksheet with an assortment of physical and chemical properties and/or characteristics listed. Teams will circulate throughout the classroom in an attempt to locate items within the room that match the given descriptions. Teams will identify an item and its general location in the classroom as their response.
2. Teams must select items that were within the classroom prior to their entrance. Thus, no materials brought in by participants are eligible as answers. No items shall be physically moved by students in an effort to find other materials that may be answers.
3. In addition to items physically in the classroom, students may also select items shown in photographs and diagrams in the room or in books.
4. There may be several items that match each given set of properties. Students should only list the number of answers asked for on the worksheet. No extra credit will be given for additional answers. In the event that teams list more than the required number of answers, only the appropriate number of responses will be scored. Therefore, if two answers are needed and four are listed by participant, only the first two in the list will be scored, correct or incorrect, not the first two correct answers.

Scoring: Teams will receive one point for each correct response in Part I. In Part II, each correct response will be worth two points. The team with the most points will be declared the winner. Ties will be broken with pre-determined tiebreaker questions.

Properties	Item	Location
1. Metallic 2. Flat 3. Round 4. Approximately 2 grams	Penny	3rd desk in row near the door
1. White 2. Floats in water 3. Cylindrical 4. Light weight	Styrofoam cup	Countertop near windows

Sky Quest

Description: This event will test a team's knowledge of the solar system.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

This event will be run in a station format. Teams will rotate through stations that assess any or all of the following topics:

a. Identification of: Sun, planets, major constellations*, stars±, and star clusters±.
b. Understanding of satellites, asteroids, meteors (meteoroids, meteorites), and comets.
c. Earth's seasons, tides, lunar and solar eclipses.
d. Phases of the moon.

Scoring: Points will be awarded for the accuracy of responses. Ties will be broken by the accuracy or quality of responses to pre-selected questions chosen by the event leader.

Event Resources:

http://www.sciencenc.com/event-help/SkyQuest.php
Astronomy for Every Kid: 101 Easy Experiments that Really Work. By Janice Van Cleaves
http://www.exploratorium.edu/exploring/space/activity.html
http://www.wnit.org/outdoorelements/pdf/510filmcanisters.pdf
http://www.windows2universe.org/

*__Major Constellations:__ Aquila, Bootes, Canis Major, Canis Minor, Cassiopeia, Cepheus, Cygnus, Draco, Gemini, Leo, Lyra, Orion, Pegasus, Scorpio, Taurus, Ursa Major, Ursa Minor, Virgo
±__Major Stars and Star Clusters:__ Altair, Arcturus, Sirius, Procyon, Denebelo, Castor, Pollux, Regulus, Vega, Betelgeuse, Rigel, Antares, Aldebaran, Pleiades, Hyades, Merak, Dubhe, Polaris, Spica.

What Shape Are You In

Description: This event will consist of a series of stations testing the students understanding of geometry.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

Each team will be given an answer sheet. Stations will be provided involving working with plane and solid geometric figures. Stations will typically incorporate 3 to 5 questions. Questions may include identifying types of geometric figures, recognizing cross-sectional figures, calculating the area or volume of the figures, etc.

Scoring: At the end of the event the team with the most correct answers will be declared the winner. The test may include a set of questions that will be used as a tie-breaker if necessary.

What's the Matter

Description: Teams will be assessed on their knowledge of the physical properties of matter and the behavior of solids, liquids, and gases before and after they undergo changes or interactions.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

This event will be run in a station format. Teams will rotate through stations that assess any or all of the following topics:
a. Understand that atoms are the building blocks of all matter and that atoms are small, too small to be seen directly with a powerful microscope.
b. Understand that the behavior of atoms in different states of matter (solid, liquid, gas) regarding shape and volume.
c. Know how to measure and/or calculate volume of a rectangular prism or a liquid.
d. Be able to measure mass and weight.
e. Understand the concept of relative density and how it can be changed in solids, liquids, and gases.
f. Differentiate between a solution and a mixture and how they can be separated.
g. Know examples of physical changes and signs that a physical change has taken place (e.g. tearing a piece of paper)
h. Understand dissolving and concentration of substances such as food dye, salt, and sugar in water, and the factors that affect solubility such as stirring and heat.
i. Observe or test for other properties of matter to include: magnetism, flexibility, hardness, opacity, strength, viscosity (runniness), and buoyancy.

Scoring: Points will be awarded for the accuracy of responses. Ties will be broken by the accuracy or quality of responses to pre-selected questions chosen by the event leader.

Possible Resource Sites:
http://www.sciencenc.com/event-help/whatsthematter.php
http://www.science-class.net/Chemistry/properties.htm
http://www.sciencekids.co.nz/gamesactivities/materialproperties.html
Several simulations at http://phet.colorado.edu/ including states-of-matter, concentration, balloons, soluble-salts, states-of-matter-basics

Write It/Do It

Description: This event tests competitor's ability to clearly communicate in writing and follow directions.

Number of Participants: 2 **Approximate Time:** 30 minutes

The Competition:

1. One student is shown a contraption built from blocks, science equipment, tinker toys, Lego's, Construx, Lincoln Logs, or other inexpensive materials. The student has 12 minutes to prepare written directions for how to build the contraption. No diagrams allowed as part of the directions.

2. His/her partner (in another room) takes the directions and attempts to recreate (build) the original object in 10 minutes.

3. No verbal or other communication is allowed as students pass their directions to their partner.

Scoring: The student who builds the contraption closest to the original is declared the winner. A point will be given for each piece of material placed in the proper location. No penalty will be assessed for parts that were not assembled. The decision of the judges is final. Time may be used as a tiebreaker.

Tournament Schedule – May 8, 2015

8:30 – 9:40	9:40 – 10:10	10:20 – 10:50	11:00 – 11:30	11:30 – 12:00	12:00 – 1:00
Arrival and Site Registration Omniplex Lobby	Group I Teams Set A Events	Group II Teams Set A Events	Group III Teams Set A Events	Lunch Gym	Awards Program Gym
	Group II Teams Set B Events	Group III Teams Set B Events	Group I Teams Set B Events		
	Group III Teams Set C Events	Group I Teams Set C Events	Group II Teams Set C Events		

Set A Events:

1. Estimania
2. Can Race
3. A Is For Anatomy
4. Density
5. Science Detectives
6. What Shape Are You In
7. Name That Number
8. Don't Bug Me

Set B Events:

1. Categories
2. Name the Scientist
3. Save Our Earth
4. Chopper Challenge
5. All Charged Up
6. Number Patterns
7. What's the Matter?
8. Bottle Rocket

Set C Events:

1. No Bones About It
2. Backyard Botany
3. Aerodynamics
4. Write It/Do It
5. Grasp a Graph
6. Metric Mastery
7. Egg Drop
8. Sky Quest