

2017 - 2018
Division A
Virginia Science Olympiad



Exploring the World of Science

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April 21, 2018 – BASIS Independent McLean
8000 Jones Branch Dr, McLean, VA 22102

April 28, 2018 – Mercer Middle School
42149 Greenstone Dr,
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Indirect Vent Goggles Example



Impact Safety Glasses Examples

2017 - 2018 Competition Rules Overview

Rules Changes

- All teams will choose their own date for competition on a first come basis.
- All schools that pay their fees by February 1 will receive a signup link at the same time and will be able to choose their venue and date.
- Division A does not guarantee teams will be able to sign up for a competition venue or date nearest their school.

Important Dates

- **December 15 - Registration Opens Online at 8:00pm**
- **January 31 - Registration Closes at 8:00pm (possibly extended)**
- **February 1 – Competition Date Signup Genius released at 8:00pm**
- **February 11 - Notification of Event Sponsorship.**
- **February 25 - Payments Due**
- **March 8 - Event tests turned in for review.**
- **March 4 – Student/Parent Registration Opens.**
- **April 1 - School Rosters Due Online.**
- **April 1 – Event Parent Volunteer Names.**
- **April 8 – Student/Parent Registration Closes.**
- **April 21 – BASIS Independent Competition Day.**
- **April 28 – Mercer Middle School Competition Day.**

Team Structure

- A team is defined as a group of students residing within the same school attendance zone and attending the same school.
- **The head coach is the person chosen by the school to be responsible for all the actions of their team and parents.**
- **Teams must have one Head Coach and may have one designated Co-Head Coach that will answer all questions from their team and are the only adults that may talk with Virginia Science Olympiad officials.**
- **All other individuals working with a team are mentors.**
- Students from different schools that attend the same after school or weekend activity may not enter as a team.
- A team may be any number of students up to a total of 45. (Teams may further break this larger team into smaller groups as they like.)
- Homeschooled students may form a team and that would attend different attendance zones are exempt from this rule as long as they reside within 45 minutes driving distance of one another. The standard for driving time will be Google Maps found at <http://maps.google.com>
- Students in grades 3-5 are eligible to participate in Division A. Smaller groups within a team may be mixed with some students from each grade level, or they may be based on grade level with students all coming from the same grade level.
- Students in grade 5 may choose to participate in either Division A or Division B. They may NOT

compete in both divisions in the same school year.

Team Registration

- Teams, regardless of size, will pay a minimum team entry fee minimum of \$300.00 for the first 15 students. On the 16 student fee is \$15.00 per student up to 45 students.
- Schools that are Title 1 or have at least 33.3% have their population receiving free or reduced lunch receive a 25% discount on their registration fees. These teams will pay a minimum team entry fee of \$225.00. On the 16th student fee is \$11.25 per student up to 45 students.

Awards and Scoring

- Division A does not have team awards. So it does not use results from the events to create a combined team score. This is to allow students and teams more flexibility in trying events, without the added pressure of filling all events to get a good team score.
- **The top 10 performing pairs of students in each event earn medals.**
- Scoring varies by event. Each event description includes an explanation of how it will be scored.
- There are also individual impact awards for students that, in the mind of an Event Supervisor, have shown the most Olympic spirit.

Volunteer Requirements

The Division A Tournament cannot be run without teachers, parents, and mentor volunteers.

- **ALL EVENTS will have 2 Adults Supervisors in the room at all times when students are present.**
- **Each school assigned to run an event will provide all the volunteers for that event. Head Coaches do not need to run their event. Where needed, each school will write assessments for their assigned event.**
- **Each school not assigned an event will choose to volunteer for a competition committee. The competition committees are**
 - Setup
 - Cleanup
 - Hospitality
 - Awards
 - Information
- **Each volunteer of an event will help out until all of the examinations are graded and the winners are determined.**
- All volunteers must sign in at the **volunteer room** for their assignment.
- Schools will not receive their medals if they do not meet their volunteer obligations.

Writing an Event

- **If your school is chosen to write the assessment for an event, they must designate an Event Supervisor.**
- **The Event Supervisor must be reachable for the entire competition day in the event of an appeal with the running of the event.**
- **Writing an event involves creating a hands-on activity or written assessment based on the rules set forth in this event manual; running the event the day of the competition; providing materials for the event; and administering the event including setup, cleanup and scoring.**
- **Division A will reimburse expenses, but the Event Supervisor must ask the Budget Chairperson for**

expense approval before buying supplies.

- **Event Supervisors will provide plans/assessments to the tournament organizers by February 29th for review.**

Setting up the Team

- Assignment of team numbers occurs after team registration closes in January.
- The competition schedule will come out in January. There is a sample schedule below based on 25 schools.
- **A team may enter up to 6 students per study event and 2 students per 15 team members for building events. (If a team has 10 members then they may have 2 participate in each building event. If a team has 16 students they may have 4 participate in each building event.)**
- **For most events the students will work in groups of two. Only in Build a Barge, Pentathlon and Picture This will they form a larger group.**
- All students from the same school will take all written assessments at the same time. For example; elementary school team 21 has six students entered in the Edison's Electricity event. All six students will attend the event at the same time and will participate against each other.
- All schools, whether your school is team 1 or team 27, will have event conflicts. Students may not be able to enter their two favorite events if they occur at the same time.
- Teams may have different conflicts depending on the number of teams registered, but all teams with have event conflicts in their schedule.
- In setting up your team schedule, be sure not to schedule one student for two events that meet at the same time.
- Please consult the schedule to determine those conflicts.
- When selecting student pairs, it is advisable that you select students that you know will work well together in a team situation. Both should be equal members of a partnership. If one member dominates the partnership, the two will most likely not work well on the day of the competition.

The Tournament

- **Coaches and families will complete online registration forms before competing. The combined online forms include a pledge signed by students and parents vowing to follow a code of ethics during the competition, a photography release, and a participation and consent form.**
- **Families that have not completed these forms by April 1st may not participate in the tournament.**
- **February 15th is the last day that coaches may change the number of student participating on their team. Each Head Coach will give a count of exact number of students**
- **Each Head Coach will turn in an online roster of the student names and the events they will participate in by February 29th. The roster will include a place for alternates in each event.**
- **April 1st is the deadline to complete all online forms for families.**
- **Division A reserves the right to turn away any schools, students, or parents that do not complete the forms by the published deadlines. Division A will refund registration fees of teams turned away.**
- The tournament can be long for some students, due to "down time" between their events; however, there will be opportunities for fun in addition to competing at different points in the day. Snacks may be offered for sale at the competition. There may also be opportunities for recreation outside with supervision.
- Head Coaches are responsible for their students at the tournament. There should be at least one adult

in the school/team area at all times. Students are not required to stay for the entire tournament. Coaches should communicate their expectations for their students prior to the tournament.

- **Students must make any event appeals in writing to the tournament director or designee using the appeals forms with the help of their Head Coach or Co-Head Coach within 30 minutes of the end of their event.**
- Appeals will be dealt with on a first come, first served basis and will be resolved on competition day.
- **We have a closing awards ceremony where students receive their medals for earning a top 10 placement in each event. Head Coaches will receive participation ribbons for all students the day of the competition.**
- **All schools must have at least one adult available through to the end of the awards ceremony.**
- Participants will leave all building event projects intact and with the Event Supervisor so they can all be graded at the same time and will receive a scheduled time to retrieve their projects.
- All written assessments given the day of competition are the property of Division A.
- Division A will post blank copies of all written assessments with answers within 5 days of the competition.
- Projects left at the end of the day will be recycled.

Preparation for Technology Events

- Division A does not allow teams to bring pre-built devices. Our objective is to ensure a team's performance is their own, and to have them learn and demonstrate skills they will need to compete successfully as they continue on to Division B.
- The students retain control of the process of preparing for a Science Olympiad event. This means that they should have the last word about how something will be done.
- Encourage the students to gather information and ideas from library books, teachers, parents, engineers, scientists and other available resources. The intent is not to reinvent the wheel nor to be given a finished design, but to integrate and build on information gathered. Example: A book on crossbows may contain information on how to make the trigger mechanism for a catapult.
- An important part of any design process is brainstorming. The entire team may be encouraged to participate in the discovery process, not just the two or three that will be involved at the tournament. An adult may act as mentor for the group and ask questions or offer ideas. Don't forget the students should make the final choices.
- Coaches can best prepare their teams for the competition by teaching underlying principles and skills, suggesting ideas, and advice on methods, tools or materials to accomplish the task. Students should practice their events using different materials (suggested materials are included in each event description), and be familiar with the concepts so that they can apply them regardless of the materials provided at the tournament.
- Some events require the collection and interpretation of data; students will be most successful if they have had the opportunity to do this at their practice sessions.
- Keep in mind that the purpose of Science Olympiad is to encourage the exploration and pursuit of science while having fun in the process.

Students' Pledge

I pledge to put forth my best effort in the Science Olympiad tournament and to uphold the principles of honest competition. In my events, I will compete with integrity, respect, and sportsmanship towards my fellow

competitors. I will display courtesy towards Event Supervisors and Tournament Personnel. My actions will exemplify the proud spirit of my school, team, state and myself.

Spirit of Competition

- All teams are expected to participate in the competition in a positive manner.
- Science Olympiad will not tolerate the disrupting of the competition in any way by student competitors.
- Students, who belittle or make fun of the work of other students, as determined by the judges, will be disqualified from their event and/or the competition.
- Any team caught cheating or interfering with the work of another team during an event will be disqualified from that event.

Parent Information and Pledge

- This competition is for your child.
- It is the students' and Head Coaches' responsibility to ask questions and discuss events with Event Supervisors.
- Parents are not to interfere with the judging of any event and may not discuss the administration of an event with the Event Supervisor.
- Division A has the right to ask any parent interfering with an event to leave the competition.

I pledge to be an example for our children by:

- Respecting the rules of Science Olympiad
- Encouraging excellence in preparation and investigation
- Supporting independence in design and production
- Respecting the decisions of Event Supervisors and judges

Tournament Schedule

- The tournament is a one day event. This schedule assumes that there will be 30 schools registering.
- **Schools will receive their team number after they register.**
- **Please note that all teams will have two event conflicts during the morning session and one event conflict in the afternoon session.** Event conflicts may be different for all teams. In setting up your team schedule, be sure not to schedule one student for two events that meet at the same time.
- **Teams will be able to sign-up for a time to compete in Pentathlon and Tech events that are different on the master schedule. A link to an online sign-up will be sent February 29th. When signing up, please make sure not to schedule a student for more than one event at the same time.**
- Use your team number plan your team schedule.
- Assigning events to students before you register your team will cause conflicts to occur in your schedule. We will not modify the schedule to accommodate individual conflicts.
- **All students and coaches will receive wrist bands. Students will need to show these bands at each event.**

Sample 20 Team Regional Competition Schedule

All teams will receive a team number after registration closes. (1-4 means School numbered 1, 2, 3, and 4)

All students from the same school must participate at the same time for these events.

Morning Sessions	9:00-9:30	9:40-10:10	10:20-10:50	11:00-11:30	11:40-12:10
Anatomy	1-4	17-20	13-16	9-12	5-8
Virginia Herpetology	13-16	9-12	5-8	1-4	17-20
Dynamic Planet Tidal Zones	5-8	1-4	17-20	13-16	9-12
Weather or Not	17-20	13-16	9-12	5-8	1-4
Rocks and Minerals	9-12	5-8	1-4	17-20	13-16

Afternoon Sessions	12:20-12:50	1:00-1:30	1:40-2:10	2:20-2:50	3:00-3:30	3:40 Clean Up	5:00 Parade of Schools And Awards
Astronomy - Moons	1-4	17-20	13-16	9-12	5-8		
Matter of Atoms	5-8	1-4	17-20	13-16	9-12		
Shock Value	9-12	5-8	1-4	17-20	13-16		
Choppers	13-16	9-12	5-8	1-4	17-20		
Thermodynamics	17-20	13-16	9-12	5-8	1-4		

Schools will send your assigned students at different times for these events.

Multiple Student Events	Morning Sessions	9:00-9:30	9:40-10:10	10:20-10:50	11:00-11:30	11:40-12:10
	Afternoon Sessions	12:20-12:50	1:00-1:30	1:40-2:10	2:20-2:50	3:00-3:30
Build a Barge (teams of 3) Pentathlon (teams of 5) Picture This (teams of 3) Optics (teams of 3) Orienteering (teams of 2)	Multiple student events are 30 minute events. Each school may send two groups of students. The two groups do not have to compete at the same time. Signup: up to 2 Schools Per ½ Hour.					

1 Hour Tech Events	9:00-10:00	10:20-11:20	11:40-12:40	1:00-2:00	2:20-3:20	3:40 Buil ding Proj ect Pick up	5:00 Parade of Schools And Awards
Engineering Enigma Gunk – Elasticity Wind Power Straw Egg Drop Tower Building Write it, Do it Balloon Cars	Tech Events (1hour) Tech events are hands-on and require the students to create, test and compete with a student built device. Some of these events will not take a full hour. Signup: up to 4 Schools per Hour; 2 groups of 2 students per school.						

Trials	9:00-10:00	10:20-11:20	11:40-12:40	1:00-2:00	2:20-3:20
Science Bowl	Trials are events the rules committee discussed but want to test them to see if we can modify them from the older divisions down to our competition. They are a great filler of time. Students will not earn awards for these events. Some of these events will not take a full hour. Signup: up to 4 Schools per Hour; 2 groups of 2 students per school.				

Science Olympiad Code of Ethics 2018

Student participants are expected to compete in tournament events with honest effort to follow the rules and the spirit of the competition. Team members are expected to be the builders of all the devices used in the events. The goal of competition is to give one's best effort while displaying honesty, integrity, and sportsmanship. Students, coaches, parents, and guests are expected to display courtesy and respect toward Olympiad officials, other teams, and guests of the Olympiad. Failure to show honesty and/or courtesy by a participant, coach, or guest of the team may result in the disqualification of the team from that event, the entire tournament or future tournaments.

STUDENT'S PLEDGE

I pledge to put forth my best effort in the Science Olympiad tournament and to uphold the principles of honest competition. In my events, I will compete with integrity, respect, and sportsmanship towards my fellow competitors. I will display courtesy towards Event Supervisors and Tournament Personnel. My actions will exemplify the proud spirit of my school, team, and state.

PARENT'S PLEDGE

I pledge to be an example for our children by:

- respecting the rules of Science Olympiad,
- encouraging excellence in preparation and investigation,
- supporting independence in design and production of all competition devices, and
- respecting the decisions of Event Supervisors and judges.

Our examples will promote the spirit of cooperation within and among all our participating teams.

I have read the parent participation policy and understand that parents are not allowed to construct any piece of competition devices. All physical work is to be done by students on the team.

My Competition Schedule

Morning Sessions	9:00-9:30	9:40-10:10	10:20-10:50	11:00-11:30	11:40-12:10
Anatomy					
Dynamic Planet Tidal Zones					
Rocks and Minerals					
Virginia Herpetology					
Weather or Not					

Afternoon Sessions	12:20-12:50	1:00-1:30	1:40-2:10	2:20-2:50	3:00-3:30	3:40 Clean Up	5:00 Parade of Schools And Awards
Astronomy - Moons							
Chopper Challenge							
Matter of Atoms							
Shock Value							
Thermodynamics							

Schools may send your assigned students at different times for these events.

30 Minutes Multiple Student Events	Morning Sessions	9:00-9:30	9:40-10:10	10:20-10:50	11:00-11:30	11:40-12:10
	Afternoon Sessions	12:20-12:50	1:00-1:30	1:40-2:10	2:20-2:50	3:00-3:30
Build a Barge (teams of 3)						
Pentathlon (teams of 5)						
Picture This (teams of 3)						
Optics (teams of 3)						
Orienteering (teams of 2)						

1 Hour Tech Events	9:00-10:00	10:20-11:20	11:40-12:40	1:00-2:00	2:20-3:20	3:40 Buildi ng Proje ct Picku p	5:00 Parade of Schools And Awards
Balloon Cars							
Engineering Enigma							
Gunk – Elasticity							
Straw Egg Drop							
Tower Building							
Wind Power							
Write it, Do it							

Trials	9:30	10:30	11:30	1:30	2:30
Science Bowl	This event will take approximately 15 minutes. No awards given, but placements will be announced at the awards ceremony.				

Anatomy – Immune Systems (30 minutes)

For a school to successfully run this event they need:

- 2 Adult Supervisors
- 2-3 Volunteer Scorers

Description: Teams will demonstrate their understanding of immune and lymphatic systems. This event has a written test and may/may not include “hands-on” stations.

Maximum Number of Participants per School:

Six: 3 teams of 2

Teams need to bring: Pencils

Optional Materials: Any notes that fit on one piece of paper - double sided.

Safety Requirements: None

The Competition:

Students will take a written test to answer topic questions on the immune and lymphatic systems which may include:

- Anatomy and functions of the immune system
- Specific & Non-specific defense mechanism
- Role of lymph in Immunity
- Allergen, Allergic Reaction, Anaphylaxis
- Autoimmune Diseases (Type 1 Diabetes)

Scoring: Points will be awarded for each correct response. The team with the highest accumulated score is the winner.

- Ties will be broken by the accuracy or quality of answers to select questions chosen by the event supervisor prior to the competition.

Or

- The event supervisor will compare tests and the team that incorrectly answers the first question in order will place below the other team.
 - E.g. Team one correctly answers the first three questions and team correctly answers the first two questions but misses the third. Team one will place higher than team two.

Astronomy – Moons of our Solar System (30 Minutes)

For a school to successfully run this event they need:

- 2 Event Supervisor
- 1-3 Volunteer Scorers

Description: Teams will demonstrate knowledge about the satellites that are big enough to be called moons around the non-dwarf planets of our solar system.

Maximum Number of Participants per School: Six: 3 teams of 2

Optional Materials: One double sided 8 ½ x 11 sheet of paper with any notes the students want to bring.

The Competition

Students will take a written test to answer topic questions about stars which may include:

- Comparing
 - relative sizes
 - temperature
 - composition
 - density
- Types of Satellites
- Unique Features of moons

Scoring:

- Points will be awarded for each correct response.
- Ties will be broken by the accuracy or quality of answers to select questions chosen by the event supervisor prior to the competition.

Or

The event supervisor will compare tests and the team that incorrectly answers the first question in order will place below the other team.

- E.g. Team one correctly answers the first three questions and team two correctly answers the first two questions but misses the third. Team one will place higher than team two.

Possible Resources

SciOly Astronomy: <https://scioly.org/wiki/index.php/Astronomy>

NASA: <https://www.nasa.gov/subject/6961/moons/>

Go Astronomy: <http://www.go-astronomy.com/planets/planet-moons.htm>

Matter of Atoms (30 Minutes)

For a school to successfully run this event they need:

- 2 Event Supervisors
- 2-3 Volunteer Scorers

Description: Teams will demonstrate their understanding of atomic structures and the classification and or properties of matter.

Maximum Number of Participants per School: **Six: 3 teams of 2**

Team Needs to Bring: Sharpened Pencils, one double-sided sheet of paper with any content the team wants to use during the competition, hand lenses, a protractor and ruler.

Possible materials provided at event: testing materials, materials for making common compounds

Safety requirements: None

The competition: Teams will answer questions on a written test and build a model of a common compound.

Atomic Bonding

- Ionic
- Covalent
- Metallic

Atomic Structure

- Atoms, Protons, Neutrons, Electrons
- Atomic and Mass Numbers
- Isotopes
- Chemical Symbols

Periodic Table

- Groups
- Periods
- Properties of Periodic Table Groups

Classification of Matter

- Solids, Liquids, Gases, Plasma
- Pure Substances, Mixtures, Elements, Allotropes, Compounds, Colloids

Properties of Matter

- Properties of Solids – Crystalline, Amorphous
- Properties of Liquids – Viscosity, Surface Tension
- Properties of Gases – Effusion, Diffusion
- Properties of Plasma

Common Compounds

- carbon dioxide
- methane
- water
- ammonia
- sodium chloride
- milk

Scoring: Points will be awarded for each correct response. The team with the highest accumulated score is the winner.

- Ties will be broken by the accuracy or quality of answers to select questions chosen by the event supervisor prior to the competition.

Or

- The event supervisor will compare tests and the team that incorrectly answers the first question in order will place below the other team.
 - E.g. Team one correctly answers the first three questions and team two correctly answers the first two questions but misses the third. Team one will place higher than team two.

Possible Resources: <https://www.khanacademy.org/science/organic-chemistry/gen-chem-review/bond-line->

Balloon Car (60 Minutes)

For a school to successfully run this event they need:

- 2 Event Supervisors
- 2-3 Volunteer Scorers

Description: Teams will build a simple air powered car using provided materials to travel a specified distance within a specified area.

Maximum Number of Participants per School: 2 students per 15 registered or portion thereof
Students will work in pairs for this event.

Teams may bring:

- Pencil, pen or marker, a ruler or straight edge, and one pair of scissors for each team pair.

Safety Requirements: During testing and competition all competitors must wear eye protection. Indirect-vent Safety Goggles or Safety glasses labeled ANSI Z87.1+ (impact rated). **Eye Glasses are not Eye Protection.**

Materials Provided at Event:

- Four – ≈3.5 cm plastic wheels
- Two – ≈3 mm by 90 mm axles
- Three – straws
- One – ≈7.5 cm by x ≈30 cm piece of cardboard
- Two – ≈7.5 cm by ≈12.5 cm index cards
- Two – ≈12.5 by ≈20 cm index cards
- One – Latex balloon of undetermined shape (Latex caution!)
- 50 cm of masking tape
- An air balloon pump

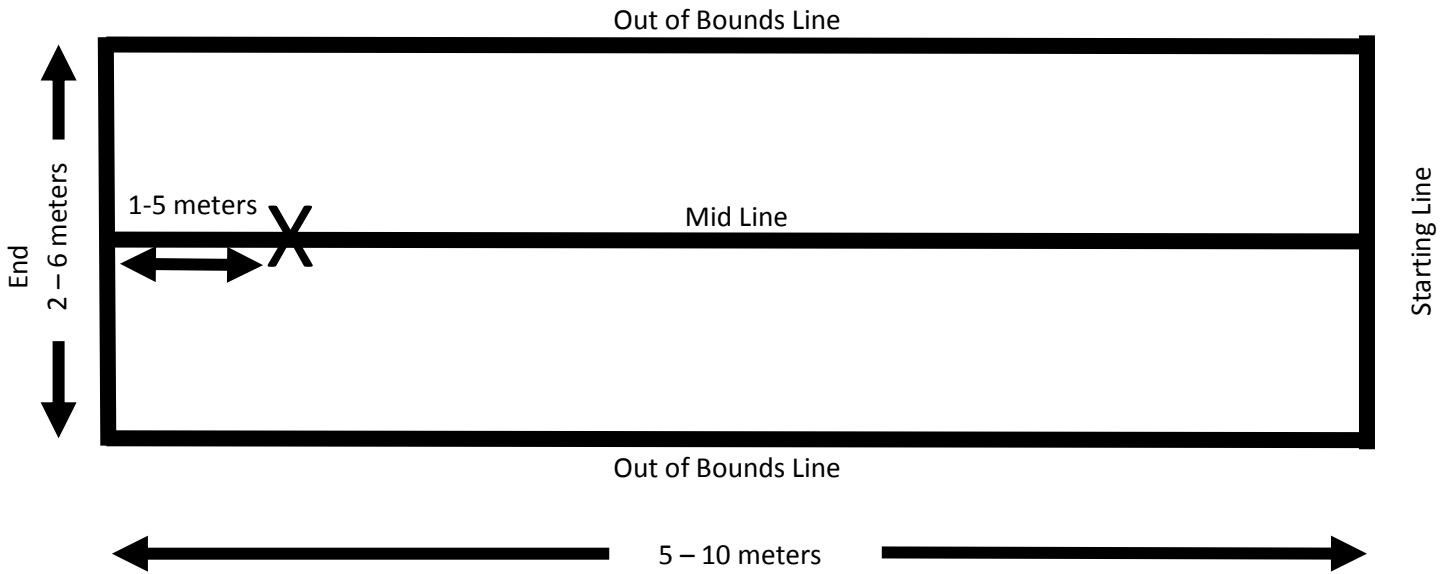
The Competition:

- The Event Supervisor will announce the distance to the marked point on the day of the competition.
- Teams will use their materials to build a car powered by the air flowing out of a balloon
- Each team will have one scored run
- Breaking a balloon or cutting the cardboard is a tier violation. This means that the team may still participate but will be placed below all teams that do not violate this rule
- Modifying the wheels and axles, other than to put them together, is a tier violation
- Teams will have 40 minutes to build and test their car in the competition area. Teams may test their car at any time during this time
- Teams may not release their car down the track without permission of the Event Supervisor during both the testing and scoring phases of the competition
- Teams must state their intent that they are ready to launch and must wait for the Event Supervisor to acknowledge their intent
- Teams may ask for their scored run at any time during the competition

Scoring: During the scoring phase the Event Supervisor will keep two measurements; distance from the closest point of the mailing box to the marked point, and time from start to stop.

- The team whose car comes the closest to the marked end point measured to the nearest millimeter will be the winner
- In the event of a tie the team with the fast time from start to stop will place higher

Example of the Balloon Car Course



Build-a-Barge (30 minutes)

For a school to successfully run this event they need:

- 2 Event Supervisors
- 2-5 Volunteer Judges

Description: Teams will build a barge on-site to hold the greatest amount of cargo before sinking.

Maximum Number of Participants per School: 2 groups of 3 students per school

Team needs to bring:

- Pen or pencil and scissors. Teams may also bring rulers, protractors, tape-measures and a non-programmable calculator.

Materials provided at event:

- Each team will receive a set of materials to build a barge. Materials may include items such as aluminum foil, small plastic sheets, clay, cardboard, water-proof tape, straws, Styrofoam, etc. The exact set of materials will not be announced prior to the tournament, but all teams will receive the same materials in the same amounts.
- Cargo items such as coins, washers, marbles, small bags of rice, or similar items will be provided for loading the barges. The mass of each type of cargo will be provided to the teams.
- A container at least 30cm long by 30cm wide and filled to a depth of at least 20 cm with water.
- Equipment to measure the mass of building materials MAY be provided.

Safety Requirements: Indirect-vent Safety Goggles

The Competition:

Teams will be given a set of materials with which to build their barge, and will have 10 minutes to complete a barge meeting the following criteria:

- **Teams will give the Event Supervisors an estimate of the amount of mass their barge will hold before sinking before their barge is set in the water.**
- The barge may have only one, continuous area for cargo (i.e., no separate cargo compartments), and must be open at the top for loading.
- The barge may include components that help it stay afloat, remain stable or otherwise improve its cargo-carrying capacity. (If equipment to measure mass and volume of the materials is available, teams will have the option of taking these measurements. If equipment is not available, mass and volume or density of materials will be provided.)
- Completed barge must fit completely within a box measuring 10cm x 15cm x 10cm.
- The event supervisor will measure the barge and note on the score sheet whether it meets all criteria (Tier 1), or does not (Tier 2). Teams in Tier 2 may test their barge, but will be ranked below all teams in Tier 1.
- The team will then have 1 minute to place their barge in the test container and load it with cargo.
- Cargo is loaded one piece at a time, until the barge sinks, or is holding all the available cargo.
- Mass held will be the total mass held before the barge sinks (i.e., the mass of the last piece of cargo added, that causes the barge to sink, will not be included in the total).
- A barge is considered to have "sunk" when 50% of the top of the cargo area is completely below the

water surface. It is not necessary for the barge to settle to the bottom of the container. If a barge takes on water but the top of the cargo area remains above the water surface, the team may continue to add cargo, however the mass of any water in the barge will not count toward the total mass held. (Teams may not attempt to remove water that enters their barge during testing.)

- There may be multiple types of cargo. Teams can load cargo in any order, but may not remove a piece of cargo once it has been placed in the barge.

Scoring:

- The winner of this event will be the team that builds a barge that holds the highest total mass.
- Teams in Tier 1 will be ranked from most mass held to least, followed by teams in Tier 2 ranked from most mass held to least.
- In the case of a tie, the team whose estimation of how much mass their barge would hold is closer to the actual amount held will be ranked higher. (If a team involved in a tie did not provide a prediction, it will be ranked below a team that did.)

Additional Information:

- In preparing for this event, teams may want to learn about density and how objects float.
- They may want to practice by building vessels of various materials and shapes to see how these things affect the ability of the barge to hold cargo.
- They may also want to practice loading cargo.

Chopper Challenge (30 minutes)

For a school to successfully run this event they need:

- 2 Event Supervisors
- 2-3 Volunteer Scorers

Description: Contestants will build and test one chopper (rotary flying device) using only the materials provided at the competition. No other equipment or supplies allowed.

Maximum Number of Participants per School: 2 students per 15 registered or portion thereof

Team Needs to Bring:

- Pencils, a ruler/straight edge, scissors, and a team chart showing testing results for dropping a chopper from various heights and with various weights (Minimum requirement: 6 drops-3 heights, 2 different weights)

Materials Provided at Event:

- Each team will receive one sheet of 8 ½ x 11 inch 60-90 pound card stock and one large paper clip. Supervisors will also provide weights (non-lead slip shot fishing weights)

Safety Requirements: None

The Competition:

Construction Phase: Timed 15 Minutes

- The chopper must be made using the single sheet of paper and the large paper clip. The team does not need to use all of the paper they are given, but must use the paper clip. The chopper must have at least two rotor blades.
- The paper clip must stay in its original shape and may not be bent into another other shape.
- The known weight is 3 grams. The unknown weight will be between 0 and 5 grams.
- Rotation of the chopper (clockwise, counter-clockwise, horizontal, or vertical) is a team choice.
- The drop distance and mystery weight will be announced during the building phase.
- Contestants may test their devices in the building area without weights attached but will not be allowed to test them from the official drop location.
- Teams must write their team designator on their chopper.
- During the construction phase the team will give the event director their estimate for the time that their chopper will stay airborne based on the known weight.
- When the team has finished construction of their chopper the event director will attach the known weight anywhere on the chopper that the team requests.
- Teams may not test once the weight is attached.
- Teams will also be shown the unknown weight at this time and will give the event director their estimate for the choppers flight time.
- Teams will not hold the unknown weight.
- Coaches and spectators are not allowed in the building area.

Flight Phase:

- Each team will have two drops of their chopper. The first drop will be without a weight. The second drop will be with the unknown weight.
- Maximum drop height will be the top of a 2-story school stairway. Minimum drop will be from the top of an elementary school bleachers.
- When it is their turn all teams will release their chopper from the same height specified by the event director.
- Participants will wait for the Event Supervisor to give the okay to drop their chopper. They will then announce their intention to drop their chopper by saying "3, 2, 1, Drop."
- Time will start when judges see the chopper leave the hand of the student.
- The event director and at least one judge will measure and record the time required for a team's chopper to reach the ground/floor. Time will continue if the chopper bounces off an object, but will stop when the chopper gets stuck or stops. The chopper must rotate more than five times before stopping for the flight to be scored.
- Students may not artificially spin the chopper. It must be a natural spin based on the two or more wings.
- Timing will stop when the chopper comes to a complete stop.
- The event director will record the flight times for both the known weight and the unknown weight.
- The event director will then add or remove the same amount of weight from the chopper of each competitor for the second drop.
- The event director will add the collected times for each flight and divide by two to get the choppers flight time. Times will be recorded in seconds to the nearest 1/100.
- Spectators will be allowed to watch the chopper drops from a safe distance designated by the event director and based on space constraints.

Scoring:

- Teams will be ranked based on the longest combined flight times with the known and unknown weights measured to the nearest 1/10 of a second.
- Teams will further be ranked based on the differences between the combined computed flight times with the known and unknown weights and the estimated combined flight times to the nearest 1/100 of a second.

Tiebreakers:

- Tiebreaker No. 1: The closest estimate to the actual flight time for the unknown weight to the nearest 1/100 of a second.
- Tiebreaker No. 2: Completeness of the team chart showing testing. Teams showing more testing details will be ranked above others. (Minimum requirement: 6 drops - 3 heights, 2 different weights.)

Dynamic Planet – Tidal Zones (30 minutes)

For a school to successfully run this event they need:

- 2 Event Supervisors
- 2-3 Volunteer Scorers

Description: Teams will demonstrate their understanding of tides, tidal action and the adaptations of animals living in the intertidal zone. This event has a written test and may/may not include “hands-on” stations.

Maximum Number of Participants per School: Six: 3 teams of 2

Team Needs to Bring: Sharpened Pencils, One-four function calculator (nonprogrammable), one double-sided sheet of paper with any content the team wants to use during the competition.

Safety Requirements: None

The Competition:

Teams will answer questions either on a written test or at a series of team stations or a combination of both.

- If this is a station event the participants will move from station to station, with the length of time at each station predetermined and announced by the Event Supervisor.
- No participant may return to unfinished stations, but may change or add information to their original responses while at other stations.
- Topics may include but not limited to:
 - Tides, Spring & Neap tides
 - Predicting the tides
 - Animals and their adaptations
 - Wave Induced Erosion
 - Methods of Controlling Erosion

Scoring: Points will be awarded for each correct response. The team with the highest accumulated score is the winner.

- Ties will be broken by the accuracy or quality of answers to select questions chosen by the event supervisor prior to the competition.

Or

- The event supervisor will compare tests and the team that incorrectly answers the first question in order will place below the other team.
 - E.g. Team one correctly answers the first three questions and team two correctly answers the first two questions but misses the third. Team one will place higher than team two.

Enigma Engineering (1 Hour)

For a school to successfully run this event they need:

- 2 Event Supervisors
- 2-3 Volunteer Scorers

Description: This event will test a team's ability to design and build a mystery device using mystery materials.

Maximum Number of Participants per School: 2 students per 15 registered or portion thereof

Team Needs to Bring: Nothing

Materials Provided at Event:

- Building materials (see competition description).
- Classroom tools such as scissors and rulers MAY be provided.

Safety Requirements: Indirect-vent Safety Goggles or Safety glasses labeled ANSI Z87.1+ (impact rated). All competitors must wear their eye protection at all times during the competition. **Eye Glasses are not Eye Protection.**

The Competition:

- Each team will be given a bag containing the exact same type and number of building materials. Examples of materials are: paper cups, drinking straws, paper clips, and string, tape, paper, thumbtacks, and Popsicle sticks. Materials are not limited to this list. The actual materials provided may be entirely different, but materials will be items that are readily available household items.
- Only those materials contained in the bag may be used to build the device. The bag may not be used.
- All teams will be given the same building objective(s).
- The instructions will identify a device to build. Examples of devices are: the tallest tower to hold a baseball at the top; the longest bridge to hold a small milk carton full of sand in the center; the longest cantilever to hold a chalkboard eraser at the end; or a catapult to fire a marshmallow the furthest distance. Devices are not limited to these examples.
- The students will not know the assignment until they begin the competition.
- If the device is tested using any separate item(s) (e.g., support a load, launch a projectile, or roll a ball) item(s) of the specified characteristics (dimensions, mass, shape) will be available for each team to use in constructing/testing their device.
- When finished building, students must remove the item from their device until immediately prior to the testing by the judges.
- The judges will use a separate, but identical item for testing.
- The team of students will have a maximum of 40 minutes to construct the specified device.
- Unless specifically stated in the instructions, devices must be freestanding and may not be attached to a tabletop, floor, ceiling or other support.

Scoring:

- Specific scoring will be provided to the teams at the event. Teams will be given the scoring information, including how ties will be broken, before they begin building.
- The dimensions specified in the building instructions will be measured and recorded as accurately as possible by the event leader.

- Devices that are required to accomplish a task (e.g. support a load for so many seconds) will be placed in one of two groups depending on whether or not they accomplish the task.
- Devices that accomplish the task will be ranked higher than all devices that do not.

Gunk – Elasticity (60 Minutes)

For a school to successfully run this event they need:

- 2 Event Supervisors
- 2-5 Volunteer Judges

Description: Teams will make a material called “Gunk” from three specific materials in order to meet criteria announced at the event.

Maximum Number of Participants per School: 2 students per 15 registered or portion thereof

Approximate Time:

- 50 minutes (5 minutes for setup, 30 minutes for creating, 5 minutes for measuring and shaping, and 10 minutes for scoring)

Team Needs to Bring:

- Indirect-vent Goggles.
- Optional items:
 - Gloves
 - One page of note sheet describing their experimentation results
 - Mixing bowls and/or measuring equipment

Materials Provided at Event:

- Event supervisors will provide a measured quantity, ranging from 25 – 250ml:
 - Elmer’s Washable School Glue
 - Liquid starch
 - Non-iodized salt.
- Event supervisors will also provide the material containers, graduated cylinders, scales or balances, stir sticks, mixing bowls etc., needed to create Gunk.

Safety Requirements:

- All teams must wear eye protection at all times.
- If a team does not have the required eye protection, they will be given the opportunity to obtain it, time allowing.
- If a team is unable to obtain eye protection, the team will not be allowed to compete and will be scored as a no show.

The Competition:

Creation:

- Each team will be given three materials – Elmer’s glue, liquid starch, and non-iodized salt. The amount of each of the materials will not be announced until the day of the event. Each team will receive the same quantity of each material.
- The amount of materials given at the start of the event is all that will be given to each team, so students should work carefully.

- Each team will act as a chemist or engineer, and create their own version of Gunk that optimizes 1 or 2 specified characteristics: the ability to bounce and/or stretch without breaking.
- The characteristic(s) that will be scored will not be announced until the day of the event. The judges will also announce the maximum amount of Gunk that may be used in testing.
- Teams will be allowed to bring a one page note sheet describing their experimentation results.
- Teams will be allowed to bring their own mixing bowls and/or measuring equipment, if they desire. Mixing bowls and measuring equipment will still be provided, if necessary.
- Teams may be allowed by the event supervisor to use the full amount of gunk produced in the competition, in lieu of providing a maximum amount.

Testing:

- Each team will measure out an amount of Gunk for testing. Teams may use any amount up to the maximum allowed.
- Teams may shape their Gunk in any way they wish, unless the judges specify a shape for all teams.
- Teams will have a maximum of 5 minutes to measure and shape their Gunk for testing. Gunk may be re-shaped for the 2nd test, if both characteristics are tested.
- Teams will then test their Gunk as described in Scoring, below.

Scoring:

- The team that makes Gunk that best demonstrates the criteria announced for the event will be declared the winner.
- If bounce-ability is the criteria, it will be the team whose Gunk bounces the highest after a 1.5-meter drop.
- If stretch-ability is the criteria, it will be the team whose gunk stretches the farthest before breaking.
- Walking Definition: the student's heel cannot leave the ground until the toes of the opposite foot has touched the ground.
- The two students holding the Gunk must walk apart, there is absolutely no running, and the event supervisor may use his discretion to call for a re-stretch or drop to Tier 2 if students do not follow the rules.
- When the gunk hits the floor, the scientists stop and lower their hands directly to the floor for measurement.
- In the event of a tie, the tying team that made and entered more Gunk by weight will be the winner.
- The judge's decision is final.

Optics – (30 minutes)

For a school to successfully run this event they need:

- 2 Event Supervisors
- 1-3 Volunteer Scorers

Description: Optics (30 minutes; 3 students) - Description: Teams will participate in an activity involving the positioning of mirrors to direct a laser beam towards a target and will also test their knowledge of geometric and physical optics.

Maximum Number of Participants per School: 6 students - Students will work in teams of three.

Teams may bring:

- Sharpened pencils (2-3), Protractor, Ruler, and Calculator

Materials provided at event:

- Event supervisors will provide mirrors, a class 2 laser, 1 stationary and 4 movable mirrors.
- Event supervisors will provide an exam on some of the topics listed below.
- Target size 2 cm diameter
- Mirror size \approx 6.5 cm by 7.5 cm

Safety Requirements:

- No AC power will be used.
- **Class 2:** A Class 2 laser is safe because the blink reflex will limit the exposure to no more than 0.25 seconds. It only applies to visible-light lasers (400-700 nm). Class-2 lasers are limited to 1 mW continuous wave, or more if the emission time is less than 0.25 seconds or if the light is not spatially coherent. Intentional suppression of the blink reflex could lead to eye injury. Many laser pointers are class 2.

The Competition:

- This event will be run in two parts.

Practical application:

- Teams will hold up to 4 mirrors to direct a beam of light from a stationary laser pointer mounted 1 meter above the floor to one mirror one and one or more targets set 1 meter above the floor on a wall
 - The event supervisor will operate the laser
 - The laser pointer, targets and one mirror will be stationary
 - Teams receive bonuses for using 4 mirrors and reaching multiple targets
 - Teams will have 3 minutes to direct the beam of light to as many targets as possible
 - The teams will only have one turn with the laser so they must be exacting in their measurements
 - Teams may move and adjust their mirrors but may not exceed the three minute total time limit
 - Teams must use a minimum of three mirrors to hit the target, one of them being the stationary mirror
 - A 1 meter protractor will be placed on the floor under the stationary mirror and this marks the boundary of the closest the teams may approach the mirror
 - The Event Supervisor or designee will time the teams

Knowledge:

- Teams will demonstrate their understanding of basic optics, and light properties. Vocabulary is limited to the provided list.

Absorb	amplitude	concave	convex
crest	electromagnetic	electromagnetic spectrum	energy
frequency	infrared	lens	mirror
opaque	radiation	rainbow	reflect
reflection	refract	refraction	solar radiation
spectrum	translucent	transmit	transparent
trough	ultraviolet	visible light	visible spectrum
wave	wave speed	wavelength	white light

Scoring:

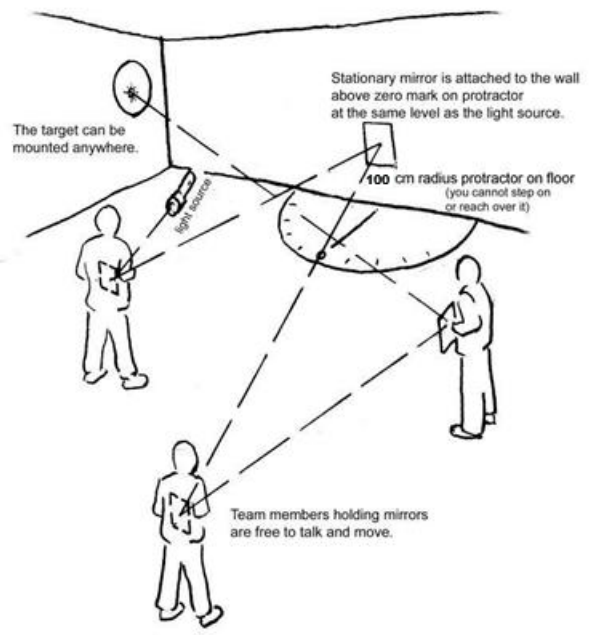
- Teams receive
 - 1 point for each whole second under three minutes (time is rounded to the nearest second)
 - 5 points for each target touched (maximum 15 points)
 - 1 point for each correct response on the written test

Tiebreakers:

- 1st Tiebreaker – time
- 2nd Tiebreaker – target hit
- 3rd Tiebreaker - the accuracy or quality of answers to selected questions chosen by the event supervisor prior to competition.

Additional Information:

- Science Olympiad – Division B – Optics: <https://www.soinc.org/optics-b>



Orienteering (30 minutes)

For a school to successfully run this event they need:

- 2 Event Supervisor
- 1-3 Volunteer Scorers

Description: This is an orienteering event. Teams will follow a set of directions using map, pacing and compass skills to find locations within the Science Olympiad competition. This event may be held outdoors in good weather.

Maximum Number of Participants per School: Six: 3 teams of 2

Team Needs to Bring: A liquid-filled orienteering compass; labeled with the team, school or owner's name, pencils, and a centimeter ruler. **A 4 function calculator is the only allowed electronic device. No other electronics allowed including range finders and electronic compasses.**

- **Optional:** protractor, and other measuring devices, 4-function calculator, and a magnifying glass.

Materials Provided at Event: A written test, maps and instructions for each team.

Safety Requirements: None

The Competition:

- Teams will have to answer questions about the parts of an orienteering compass and Topographic Maps.
- Topics may include map symbols and features, scale, distances between locations/features, compass rose, borders and boundaries, walking/driving directions, map coordinates.
- Teams will have to walk a predetermined route using a compass, map, and their pacing to collect clues.
- Teams will receive a set of directions that, if completed correctly, will bring them back to the starting point.
- At each stopping point in the directions, teams will write down the clues they find. Pacing is important; there will be "dummy" points with incorrect clues.
- An international orienteering symbol will mark all stopping points.
- No team from the same school will have the same directions.
- No team starting at the same time will have the same directions.
- All teams may visit the same points at different times.
- The Event Supervisor and one judge will time each team to the nearest 1/100th second.
- Teams will estimate the time it takes for them to find all their clues.
- If the event is indoors, teams caught running during the event will receive a 5 second penalty.

Scoring:

Teams will receive a ranking on each of three scoring components. The rankings will then average into a total to the nearest 1/100th of a point.

- Time to complete the course
- Correctness of the data collected
- Correct number of answers on the written questions
- Example: Team #24 ranks 3rd in time, 7th in data collection, and 5th on the written questions. Their average is 5th place.

Tiebreakers

1. Time to complete the course

2. Team with the first incorrect answer on the written questions will rank lower.

Pentathlon (30 minutes)

For a school to successfully run this event they need:

- 2 Event Supervisor
- 2-5 Volunteer Judges

Description: Five physical skills are interspersed with science questions in an obstacle course that will be run in a relay race style where each student passes the baton or tags the next student. A sixth physical skill and science question may be performed by the group.

Maximum Number of Participants per School: Ten: 2 teams of 5

Materials provided at event: All materials are provided.

Safety Requirements: Appropriate athletic attire including closed-toe shoes.

The Competition:

- Students will work as a team to complete a 5-person relay.
- Each member of the relay must complete 1 physical activity followed by completing an academic science challenge.
- The relay continues until all 5 team members have finished.
- A sixth activity may have to be completed by the team followed by a question for the team to answer.
- The physical activities will include events such as: a dash, crossing a balance beam, dribbling a basketball around a row of safety cones, running through 6 tires on the ground, a Frisbee throw for accuracy, etc.
- One student in the relay will complete each stretch of the relay.
- Each leg of the relay will feature questions from any of the following categories: Forces, Motion and Energy; Life Processes and Living Systems; Interrelationships in Earth Space Systems; Earth Patterns, Cycles and Changes; Resources; Matter; all content is derived from the grade 3-5 Virginia state standards for science.
- Each team will be timed from the start of the first leg until the team completes the final challenge. For the academic challenges team members will have a maximum of 2 minutes to answer the questions otherwise they will be forced to pass the baton on to the next team member.
- Students who may not be able to complete the physical challenge due to some physical limitation may designate another team member to complete the physical challenge for them, but they must complete the academic challenge on their own.
- Each physical and academic challenge must be completed before proceeding to the next station. The only exception is if students do not answer the academic challenge in 2 minutes they must pass the baton onto the next teammate.

Scoring:

The Event Supervisor or Judge will record the total time for a team to complete the Pentathlon to the nearest 1/10th of a second. The overall lowest time wins.

Tiebreaker:

The tiebreaker will be the number of correct answers.

Picture This (30 minutes)

For a school to successfully run this event they need:

- 2 Event Supervisor
- 1-3 Volunteer Scorers

Description: Team members will take turns drawing representations of scientific terms or concepts using vocabulary from the 2018 events while the other team members guess the term being drawn.

Maximum Number of Participants per School: Six (2 teams of 3)

Team Needs to Bring: 2 black dry erase markers

Materials Provided at Event: 8 ½ x 11inch white boards.

Safety Requirements: None

The Competition:

- Each team will have 10 minutes to complete up to 25 terms. All teams will use the same terms in the same order.
- Teams must follow a definite order of rotation of team members. All team members will take turns drawing.
- The team may choose to pass, however, they cannot return to that term.
- The sketcher may not speak unless he/she chooses to pass the term. If the sketcher passes on a term they will continue to sketch until the team gets a term correct.
- Timing begins when Event Supervisor gives the 1st sketcher the 1st term. No other team member may see the term. The sketcher will begin by drawing pictures and visual clues.
- Letters of any alphabet, or numbers of any kind, are not allowed (it is the intent of this rule to prevent teams from inventing alphabets, codes, etc.).
- The following are acceptable symbols: arrows, a minus sign “-” to shorten a word, a plus “+” to lengthen a word (e.g., in response to “refract” from a team member, a “+” can be used to elicit the word “refraction”). All other symbols are not permitted unless they represent the word(s) given, (e.g., a circle for the word sun in a solar eclipse).
- If the science term consists of one, two or more words, the sketcher may write down any word (**never** parts of a word) that has been correctly identified but, only when the supervisors directs them to do so. The number of words not letters may be represented with underlines “___”.
- Any drawing that is correctly guessed but does not make sense to the supervisor will result in a time out while the team explains the drawing to the supervisor. If the supervisor is satisfied with the explanation the point will be awarded, however if the judge is not satisfied the point will not be awarded.

- Sketchers may not give visual clues with their hands or bodies except for supervisor demonstrated clues that will be accepted for such things as nodding yes or no, or to acknowledge a desired response from team members.
- If a team violates any of the rules regarding the use of alphabets, numbers, verbal communication, etc., the term in play at the time of the violation will be counted as a pass.
- Forms of the word will not be accepted with the exception of plurals and singulars, which will be accepted interchangeably.
- The event judge will indicate when the correct term is given. Then the next team member will receive a new term until the team has gone through their set of terms or the time expires.

Scoring:

- a. One point will be awarded for each term correctly identified in the allocated time. The team correctly identifying the most terms will be declared the winner.
- b. In the event of a tie, the first tiebreaker is the fewest terms passed. Second tiebreaker is the shortest period of time to complete the entire list. Third tiebreaker will be the team with the longest string of consecutively correct words. The final tiebreaker would be those teams who identify the first word in the list not correctly identified by the other team.

Rocks and Minerals – (30 minutes)

For a school to successfully run this event they need:

- 2 Event Supervisor
- 1-3 Volunteer Scorers

Description: Students will demonstrate their knowledge about the geology of Virginia and how rocks and minerals are formed and reformed.

Maximum Number of Participants per School: Six: 3 teams of 2

Team Needs to Bring: Sharpened Pencils, One-four function calculator (nonprogrammable), one double-sided sheet of paper with any content the team wants to use during the competition.

Safety Requirements: None

The Competition:

Teams will answer questions either on a written test or at a series of team stations.

- If this is a station event the participants will move from station to station, with the length of time at each station predetermined and announced by the Event Supervisor.
- No participant may return to unfinished stations, but may change or add information to their original responses while at other stations.
- Topics may include but are not limited to:

acidity	andesitic	calcite	chemical weathering
cleavage	coarse-grained	composition	contact metamorphism
crystal	density	double refraction	effervescence
extrusive	felsic	fine-grained	fluorescence
foliated	fracture	hardness	hydrolysis
igneous rock	intrusive	lava	limestone
luster	mafic	magma	metallic
metamorphic rock	mineral	nonfoliated	nonmetallic
physical weathering	sedimentary rock	specific gravity	streak
texture	vesicular		

Scoring:

Points will be awarded for each correct response. The team with the highest accumulated score is the winner.

- Ties will be broken by the accuracy or quality of answers to select questions chosen by the event supervisor prior to the competition.

Or

- The event supervisor will compare tests and the team that incorrectly answers the first question in order will place below the other team.
 - E.g. Team one correctly answers the first three questions and team correctly answers the first two questions but misses the third. Team one will place higher than team two.

Shock Value (30 minutes)

For a school to successfully run this event they need:

- 2 Event Supervisor
- 1-3 Volunteer Scorers

Description: Teams will answer questions and may do hands-on activities involving direct current circuits, basic electricity, and magnetism.

Maximum Number of Participants per School: Six: 3 teams of 2

Team needs to bring:

- Sharpened pencils (2-3)

Optional materials: Teams may bring any notes that fit on a single sheet of double sided paper.

Materials provided at event:

- Event supervisors will provide answer sheets and may provide batteries (AA, C or D), wire, lamps, switches or similar components; any necessary tools; circuit sets (such as Snap Circuits®), samples of conducting and non-conducting materials, magnets and similar hands-on materials.
- This event will not use lithium batteries.

Safety Requirements:

- No AC power will be used.

The Competition:

- This event may or may not include a student rotation through stations assessing knowledge in areas including dc circuits, batteries (commercial and/or homemade), household electrical safety (questions only - no hands-on activities related to AC power), and conducting and non-conducting materials and their uses.
- This event will include written questions.
- Stations may include questions or hands-on activities to assess students' knowledge of these subjects.
- Students should understand basic electricity concepts, series and parallel circuits, simple Ohm's Law calculations, electron flow in circuits, etc.
- How did we get here? Major early historical moments and scientists in electricity.

Scoring: Points will be awarded for each correct response. The team with the highest accumulated score is the winner.

- Ties will be broken by the accuracy or quality of answers to select questions chosen by the event supervisor prior to the competition.

Or

- The event supervisor will compare tests and the team that incorrectly answers the first question in order will place below the other team.
 - E.g. Team one correctly answers the first three questions and team correctly answers the first two questions but misses the third. Team one will place higher than team two.

Additional Information:

- Science Olympiad - Shock Value: http://www.soinc.org/shock_val_b
- SciOly: <http://scioly.org/phpBB3/viewtopic.php?f=166&t=4951>

Straw Egg Drop (60 minutes)

For a school to successfully run this event they need:

- 2 Event Supervisors
- 1-3 Volunteer Scorers

Description: Each pair of students will make a device out of straws and masking tape, supplied on-site by the Event Supervisor, to hold a large raw egg. The device containing the egg will be dropped from a fixed height to a target.

Maximum Number of Participants per School: 2 students per 15 registered or portion thereof

Safety Requirements - Eye Protection Safety glasses labeled ANSI Z87.1+ (impact rated). All competitors must wear their eye protection at all times during the competition. **Eye Glasses are not Eye Protection.**

Teams need to bring: Must bring and wear safety goggles, teams may bring plumb lines.

Materials provided at the event:

- 20 paper - non-flexible straws
- One meter of one-inch masking tape
- Scissors
- One raw egg wrapped in plastic wrap or inside a snack/sandwich size plastic bag

The Competition:

- Team members will have 20 minutes to construct a device to cushion the egg and prevent it from cracking or breaking.
- No tape may be attached to the egg.
- No tape may be attached to the snack/sandwich size plastic bag.
- The snack/sandwich bag may not be opened, nor may air be added to the bag.
- Each team will have 5 minutes to drop the device from a height of 2-3 meters to a target.
- There will be ONE drop per team from the prescribed height. Plumb lines will be allowed.
- Maximum drop height will be the top of a 2-story school stairway. Minimum drop will be from the top of an elementary school bleachers.
- A team whose egg is broken before their drop may request a second egg, but will be penalized 100% of the distance from the target (e.g., a measurement of 20cm from the target will be scored as 40cm.)
- The distance measured for each team is the distance from the center of the target to the FARTHEST point on the container (or the farthest point of any piece of the container, if it breaks during the fall) where it comes to rest in the target area. (There is no penalty for the container bouncing, rolling or breaking on impact, other than the broken egg penalty, if applicable.)
- At the end of their drop the competitors will open their device so the supervisor may check the egg.
- A broken egg is one that when rolled upon a paper towel will leave a damp spot.

Scoring:

Teams will be tiered in three separate groups.

- Tier 1: Teams whose egg does not break during the drop will be ranked by distance from the target (including the "second egg" penalty, if appropriate) to the farthest point of their container or farthest piece of their container.

- Tier 2: Teams whose egg breaks during the drop will be ranked behind Tier 1, in order of distance from the target, again taking any "second egg" penalty into account.

Tier 3: Teams that drop empty containers will be ranked behind Tier 2, in order of distance from the target.

Thermodynamics (30 minutes)

For a school to successfully run this event they need:

- 2 Event Supervisors
- 2-3 Volunteer Scorers

Description: Teams will demonstrate their understanding of the basics of thermodynamics.

Maximum Number of Participants per School: Six: 3 teams of 2

Team Needs to Bring: Sharpened Pencils, One-four function calculator (nonprogrammable), one double-sided sheet of paper with any content the team wants to use during the competition.

Safety Requirements: None

The Competition:

Teams will answer questions on a written test.

- Topics may include but are not limited to:
 - Thermodynamic laws
 - Temperature scales and conversions
 - Definitions of heat units
 - Thermal conductivity
 - Specific heat
 - Latent heat

Scoring:

Points will be awarded for each correct response. The team with the highest accumulated score is the winner.

- Ties will be broken by the accuracy or quality of answers to select questions chosen by the event supervisor prior to the competition.

Or

- The event supervisor will compare tests and the team that incorrectly answers the first question in order will place below the other team.
 - E.g. Team one correctly answers the first three questions and team correctly answers the first two questions but misses the third. Team one will place higher than team two.

Tower Building (1 hour)

For a school to successfully run this event they need:

- 2 Event Supervisor
- 2-5 Volunteer Judges

Description: Teams will build a strong, stable tower from popsicle/craft sticks and masking tape. The team that builds the highest tower with the fewest sticks while holding a mass no less than 100 grams and no more than 750 grams will be the winner.

Maximum Number of Participants per School: 2 students per 15 registered or portion thereof

Teams need to bring:

- Pencil, pen or marker, a ruler/straight edge and protractor.

Safety Requirements:

- Indirect-vent Safety Goggles or Safety glasses labeled ANSI Z87.1+ (impact rated). All competitors must wear their eye protection at all times during the competition. **Eye Glasses are not Eye Protection.**

Materials Provided at Event:

- Popsicle/Craft sticks, masking tape, a 5cm x 5cm square of plywood and an object with a mass no less than 100 grams and no more than 750 grams.

The Competition:

Construction Phase: Timed 35 Minutes

- **For student safety, the craft sticks may not be broken or cut.**
- Teams will construct a tower that rises the greatest possible distance and be able to support the object when **placed on the highest point** by the team.
- The amount, length and width of the craft sticks and the type of tape for this competition will remain secret until the day of the competition.
- The Event Supervisor will announce on the day of the competition the object and the mass of the object each tower will have to hold.
- The mass of the object will be no less than 100 grams and no more than 750 grams.
- The tower must support the object for ten seconds.
- Teams may cut the tape into any shape or size.
- The Event Supervisor will record the amount of craft sticks left for each team.
- Any team using any tools or materials other than those listed above will be ranked below all other teams.

Testing Phase:

- Teams will place the tower on a flat surface.
- All support parts of the tower must rest on top of the flat surface.
- No sticky part of the tape may touch the top or sides of the flat surface
- The Event Supervisor will measure the height of the tower to the nearest millimeter (1mm) before testing begins.
- To begin testing the teams will place the 5cm x 5cm wood block on top of their structure. (The supervisor

will not add the height of block to the height of the tower measurement).

- Timing begins when teams place the mass on top of the wood block and remove their hand.
- Testing will end when the tower fails to hold the object or the end of the 10 second time
- The Event Supervisor or appointed judge will be the official time keeper.

Event Supervisor Records:

- Height of tower
- Time to structural failure
- Amount of unused craft sticks by each team

Scoring:

- Teams with the highest tower will rank ahead of all others measured to the nearest millimeter (1mm) by the Event Supervisor or appointed judge.

Tiebreakers:

- Least amount of craft sticks.
- Time to structural failure.

Virginia Herpetology (30 minutes)

For a school to successfully run this event they need:

- 2 Event Supervisors
- 2-3 Volunteer Scorers

Description: Teams will demonstrate their knowledge of Virginia’s reptiles and amphibians. This event has a written test and may/may not include “hands-on” stations.

Maximum Number of Participants per School: Six: 3 teams of 2

Team Needs to Bring: Sharpened Pencils, one double-sided sheet of paper with any content the team wants to use during the competition, hand lenses, and rulers.

Possible materials provided at event: Pictures, drawings, or other items relating to Virginia herpetological life, and assessment materials provided by the event supervisor.

Safety requirements: None

The competition:

Teams may

- Rotate through stations to identify Virginia reptiles and amphibians.

And/or

- Teams may answer questions about the following topics:
 1. Life cycles of Virginia amphibians, or reptiles.
 2. How habitat and environmental conditions impact herpetological life.
 3. How herpetological species use adaptation to survive.
 4. Watershed management to support herpetological species.

Scoring: Points will be awarded for each correct response. The team with the highest accumulated score is the winner.

- Ties will be broken by the accuracy or quality of answers to select questions chosen by the event supervisor prior to the competition.

Or

- The event supervisor will compare tests and the team that incorrectly answers the first question in order will place below the other team.
 - E.g. Team one correctly answers the first three questions and team correctly answers the first two questions but misses the third. Team one will place higher than team two.

Possible Resources:

- Virginia Herpetological Society: <http://www.virginiaherpetologicalsociety.com/>

Weather or Not (30 minutes)

For a school to successfully run this event they need:

- 1 Event Supervisor
- 2-3 Volunteer Scorers

Description: This competition will test the students' knowledge of weather topics to possibly include meteorological terms, techniques, events and instruments.

Maximum Number of Participants per School: Six: 3 teams of 2

Optional Materials: One double sided 8 ½ x 11 sheet of paper with any notes the students want to bring.

Safety Requirements: None

The Competition:

Students will take a written test to answer questions about weather topics. These may include:

- basic weather terms
- cloud charts
- simple weather instruments
- weather patterns
- severe weather photos
- major weather events/disasters in the past year
- weather charts, graphs, tables, photographs, drawings, or diagrams
- states of water
- water cycle
- weather terminology,
- weather instruments and their function,
- atmosphere, seasonal changes in weather
- weather safety
- types of severe weather watches/warnings

Scoring:

- Points will be awarded for each correct response.
- Ties will be broken by the accuracy or quality of answers to select questions chosen by the event supervisor prior to the competition.

Wind Power – (60 minutes)

For a school to successfully run this event they need:

2 Event Supervisors
1-3 Volunteer Scorers

Description: Teams will build and test a blade assembly for a wind turbine. This event will have a written test component.

Maximum Number of Participants per School: 2 students per 15 registered or portion thereof

Teams may bring:

Sharpened pencils (2-3), Protractor, Ruler, and Scissors

Safety Requirements:

Indirect-vent Safety Goggles or Safety glasses labeled ANSI Z87.1+ (impact rated). All competitors must wear their eye protection at all times during the competition. **Eye Glasses are not Eye Protection**

Materials provided at event:

- Paper plates
- 1 meter of masking tape
- Wind power stand to attach blade assembly
- Box fan
- Voltmeter

The Competition: This event will be run in two parts.

Practical application:

- Teams will use their materials to create a blade assembly to produce the most electricity
- Teams will not be able to test their assembly before measuring the electrical output

Knowledge:

- Teams will demonstrate their understanding of basics using wind forces to produce energy

Scoring:

- Part One: The Event Supervisor will rank all teams in order of the voltage generated by their blade assembly to the nearest 1/10.
- Part Two: The Event Supervisor will rank all teams in order of the points scored on the written test

Tiebreakers:

- Ties will be broken by the accuracy or quality of answers to select questions chosen by the event supervisor prior to the competition.

Or

- The event supervisor will compare tests and the team that incorrectly answers the first question in order will place below the other team.
 - E.g. Team one correctly answers the first three questions and team two correctly answers the first two questions but misses the third. Team one will place higher than team two.

Additional Information:

Scioly – Division B – Wind Power, Physical Science Lab or Physical Science-

https://scioly.org/wiki/index.php/Wind_Power

Write it. Do it. (60 Minutes)

For a school to successfully run this event they need:

- 2 Event Supervisors
- 2-3 Volunteer Scorers

Description: One student will write a description of an object and how to build it, and their partner will try to build the object from this description.

Maximum Number of Participants per School: 2 students per 15 registered or portion thereof

Team needs to bring: Pen or pencil. (Pencil with eraser highly recommended)

Materials provided at event:

For the Writer:

- An object made of small items such as arts & craft supplies, or commercial building sets (e.g., Legos, K'Nex, etc.) or a combination of these items.
- One object may be shared by several teams. The object will be identical for all teams.
- Lined notebook paper.
- Picture of a standard keyboard, for reference (to remind students of characters they may use in writing the description)

For the Builder:

- Complete set of materials needed to build the object. (Note that extra materials, not used in building the object, may be included in the set.)

Safety Requirements: None

The Competition:

- One team member (the Writer) is shown an object (which may be abstract and is the same for all teams) built from arts & craft supplies, construction toy parts or similar items.
- The Writer has 25 minutes to write a description of the object and how to build it.
- Writers may only use words, numbers and punctuation and editing symbols in their descriptions. (Only characters and symbols that can be produced by pressing a single key, or SHIFT+ a single key on a standard 101-key keyboard are allowed.)
- Letters/numbers/symbols must be used in their normal context and not as symbols for a code.
- All abbreviations must be defined at the beginning of the description or when the abbreviation is first used, and must be hand-written on the description (i.e., students may not bring a previously prepared list of abbreviations to attach to the description).
- At the end of the 25 minutes, the Event Supervisor will collect the descriptions to pass to the other student (the Doer) waiting in another room.
- The Doer will receive a set of building materials along with their partner's written description, and will have 20 minutes to construct the object.

- If the Doer finishes before the 20 minutes are up, s/he should raise his/her hand to notify the Event Supervisor, who will note the time of completion on the description for use in breaking ties.

Scoring:

- Event Supervisors will score the completed objects based on a point system that awards points for each materials placed in the proper location and with the correct connection as on the original model.
- Pieces connected correctly to an incorrectly located or connected piece will receive full credit (i.e., no penalty for "error carried forward").

Scoring Penalties:

- If a team's description includes any drawings or diagrams, that team will be placed in Tier 2, and will score below all teams with no drawings or diagrams (Tier 1).
- If a team's description includes any codes or undefined abbreviations, that team will be penalized 5% for each individual infraction. (For example, if a team used S to mean star and a T to mean triangle without defining those terms in the description, they would receive a 10% deduction from their score.)
- If a team's description includes any illegal characters, such as the degree symbol, even if in the proper context, that team will be penalized 1% for each infraction. (For example, use of the degree symbol 5 times will result in a deduction of 5% from their final score.)
- Teams will be ranked by total score in their tiers, after any penalties have been assessed.

Additional Information:

- A sample object and score sheet from the B division for this event is available on the Virginia Science Olympiad website (www.virginiaso.com), under the Events tab.