

**North Carolina Science Olympiad**

# **2022 Event Manual**

## **Division A**

North Carolina Science Olympiad ©2022

## Elementary Tournament Big Picture

It can be difficult to describe what an NCSO tournament to someone who has not seen one before. One hint: It looks a lot more like a track meet than a science fair.

During an elementary Science Olympiad tournament in North Carolina, 15 - 19 events are run in three different time periods. A **sample** tournament schedule is given below. *Your tournament may look different this year. If it is a virtual tournament, the events will still occur in these blocks together. Be sure to check your tournament webpage for your exact schedule. Tournament directors will post these schedules as soon as we know what schools will allow in the spring.*

### Proposed 2022 Elementary Tournament Schedule

Times	Events
Period 1 (9:00 - 10:10 am)	3,2,1 Blast Off! DRIVE THRU
	Chew the Fat NEARPOD
	Describe It, Build It Camera on, writer writes, hands off to builder
	Ecology Experts NEARPOD
Impound by 8:30	Marshmallow Catapult DRIVE THRU or CAMERA ON
	Newton's Notions NEARPOD
	Weather Permitting NEARPOD
Period 2 (10:20 am - 11:30 am)	Bridgearoni DRIVE THRU
	Genes R Us NEARPOD
	Landformers NEARPOD
	Science Password CAMERA ON
	STEM Design Challenge DRIVE THRU or CAMERA ON
Impound by 8:30	Super Sleuths PAPER TEST AT SCHOOL or 1 location
Period 3 (11:40 am - 12:50 pm)	Backyard Biologist NEARPOD
	Codebusters PAPER TEST
	Data Crunchers NEARPOD
	Duct Tape Challenge DRIVE THRU or CAMERA ON
	Fossil Frenzy NEARPOD
	Sky Quest NEARPOD
	Closing/Awards Ceremony TBD for each site

**Note:** "Drive Thru" means that the students will go to a school or designated area to participate in these events. Each regional may do this slightly differently based on building availability and health & safety rules in the Spring. "Nearpod" is an online testing platform available to everyone, no accounts needed.

## 2022 NCSO Elementary Event Descriptions

### **3, 2, 1, Blast Off!** (3.P.1, 5.P.1, Science as Inquiry)

Prior to the tournament, teams will construct up to two rockets designed to stay aloft for the greatest amount of time.

### **Backyard Biologist** (1.E.2, 1.L.1, 2.L.1, 3.L.2, 6.L.1)

Teams will be assessed on their knowledge of living organisms that they may encounter in their own backyard. In 2022, the focus will be on plants & insects. Teams will be required to identify organisms from a provided list and know about the habitat and conditions required for growth of the organisms and which ones are North Carolina state symbols.

### **Bridgearoni** (Science as Inquiry)

The objective of this event is to design and build a bridge, constructed only of pasta and glue, with the greatest structural efficiency. This means building a light, but strong bridge capable of supporting a load of up to 10 kg.

### **Chew the Fat** (3.L.1, 4.L.2, 5.L.1)

Teams will demonstrate knowledge of the human digestive tract.

### **Codebusters** (Science as Inquiry)

Teams will decode encrypted messages using cryptanalysis techniques for historical and modern advanced ciphers.

### **Data Crunchers** (Measurement & Data, 5.P.1, NC.4.MD.4, NC.4.NF.2, NC.5.MD.2, NC.6.SP.1-5.)

Teams should be able to create and interpret data tables and graphs and perform simple experiments to collect data, graph their results, and make predictions.

### **Describe It, Build It** (Science as Inquiry)

This event will test a team's ability to effectively communicate by having one team member write a description of how to build a device and having their partner construct the device from raw materials using that description.

### **Duct Tape Challenge** (Science as Inquiry)

Teams will arrive at the competition and be given a set of materials, including Duct Tape, and a task. They will then have a given amount of time to complete whatever task they are assigned, such as building the tallest tower, widest bridge, most buoyant boat, etc. At the end of the build time, teams will test their structures to determine the winner.

### **Ecology Experts** (3.E.2, 4.P.1, 5.L.2, 6.L.2)

Teams will be assessed on their knowledge of Marine, Freshwater, Estuary, and Arctic ecosystems and biomes. Topics include but are not limited to the ecology of the biomes and the roles and interactions of living and nonliving things within them.

### **Genes R Us** (2.L.2, 5.L.3)

Teams will demonstrate an understanding of traits that may or may not be inherited, be able to explain why organisms share similarities and differences and use Punnett squares to predict inheritance patterns of certain characteristics.

**Fossil Frenzy (4.E.2)**

Teams will be assessed on their knowledge of geologic time, fossils and the fossilization process.

**Landformers (3.E.2)**

Teams will identify landforms, describe their characteristics, explain how they were formed, and tell where certain landforms can be found.

**Marshmallow Catapult (Science as Inquiry)**

Teams will build a device constructed out of specified materials in advance to launch a marshmallow at a target placed on the floor. The goal is to land as close to the center of the target as possible.

**Newton's Notions (3.P.1 5.P.1)**

Teams will be assessed on their knowledge of simple machines, forces, and motion.

**Science Password (Science as Inquiry)**

Team members will take turns giving clues and guessing scientific terms or concepts from across all Essential Standards for Elementary Math & Science. Teams of up to 3.

**Sky Quest (1.E.1, 3.E.1, 4.E.1, 6.E.1)**

Teams will be tested on their knowledge of the solar system. Topics include the sun, moon, planets, rotation and revolution, moon phases, seasons, space exploration missions and identification of constellations/stars/asterisms based on a provided list.

**STEM Design Challenge (Science as Inquiry)**

Teams of up to 3 will be given a challenge to complete in advance using only K'nex pieces. They must practice designs in advance but build on site.

**Super Sleuths (3.P.2, 4.P.2, 5.P.2, Science as Inquiry)**

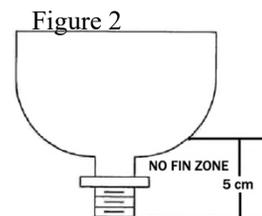
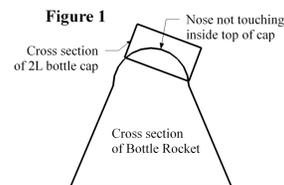
Given a mystery scenario, evidence, and a list of possible suspects, teams will be expected to perform a series of tests to draw specific conclusions about the scenario and suspects. The test results along with other evidence will be used to solve the mystery of the scenario.

**Weather Permitting – (K.E.1, 2.E.1, 5.E.1)**

Teams will be assessed on their knowledge of climate and the factors that affect it around the world.

## 3, 2, 1, Blast Off!

1. **DESCRIPTION:** Prior to the tournament, teams will construct up to two rockets designed to stay aloft for the greatest amount of time. **In 2022, the pressure vessel must be a 2-liter bottle.**
2. **ESSENTIAL STANDARDS ALIGNMENT:** 3.P.1, 5.P.1, Science as Inquiry
3. **TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** 10 min.
5. **TEAMS:** Must bring up to 2 rockets, carbonated beverage bottle labels (if removed), and safety glasses (rated Z87+). Teams may also bring funnels, measuring cups, and/or other tools to help prepare their rockets.
6. **EVENT LEADERS:** Will provide water rocket launcher, water, score sheets, and timers.
7. **SAFETY REQUIREMENTS:** Teams must wear safety glasses rated Z87+ during the loading, launching, and retrieving of their rockets.
8. **IMPOUND:** No
9. **CONSTRUCTION PARAMETERS:**
  - a. **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 plastic carbonated beverage bottle.
    - i. **LABELS** may be removed from the bottle, but labels must be presented at the safety inspection to prove that the bottle is carbonated. *Rockets without labels must not be launched, as this is a safety issue.*
    - ii. **BOTTLE OPENING:** Not all bottles are made the same, and there is no one specific brand that is guaranteed to work. Some bottles 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 resource page for assistance.
    - 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 any glues). 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 or glue of any kind. *Rockets violating this rule must not be launched, as this is a safety issue.*
  - b. **MATERIALS:**
    - i. Metal of any type (including tape with metal fibers) is prohibited everywhere 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.
  - c. **NOSE CONE:** Rockets must use a blunt or round nose. The nose must be designed such that when a standard 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.*
  - d. **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 the rocket fits on the launcher (see Figure 2). Allow teams to fix if possible to allow for launch.
  - e. **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.*



## 3, 2, 1, Blast Off!, page 2

- f. **RECOVERY SYSTEM:** Any free-fall recovery system is allowed, but not required, provided that it does not violate any other rule; however, the recovery system must be judged as safe.

### 10. **THE COMPETITION:**

- a. All rockets must be launched using the launcher and water provided by the supervisor.
- b. Only one launch is allowed per rocket. If a team wishes to use both launches, they must have 2 rockets.
- c. Teams must arrive at the competition site ready to launch. Teams must bring and wear safety glasses for loading, launching, and retrieving their rockets. Allow teams to get eye protection if at all possible. 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). **Pieces from 1 rocket cannot be recycled for use on the second rocket.**
- d. All rockets will be launched at **60 psi**. Once the rocket is pressurized, no contestant may touch or approach the rocket.
- e. Time aloft is recorded in tenths of a second. Timing begins when the rocket separates from the launcher and stops when any piece of the rocket touches the ground, the rocket goes out of sight or comes to rest on a tree, building, or other obstruction.
- f. 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.

### 11. **SCORING:**

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

### 12. **EVENT RESOURCES:**

See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

## 3,2,1 Blast Off! 2022 Score Sheet *(revised 7/27/21)*

School Name: \_\_\_\_\_ Team (Circle One): Varsity JV1 JV2 JV3

Student Names: \_\_\_\_\_

ROCKET 1	ROCKET 2
<b>Safety Criteria</b>	<b>Safety Criteria</b>
<p>_____ 9.a. Used 2-liter plastic carbonated beverage bottle.</p> <p>_____ 9.a.i. Teams presented labels if removed from pressure vessel or label was still on bottle.</p> <p>_____ 9.a.iii. Structural integrity of pressure vessel unaltered (no cutting, sanding, using any glues on <i>pressure vessel</i>).</p> <p>_____ 9.b. No metal parts anywhere on rocket.</p> <p>_____ 9.b. No commercial rockets or parts.</p> <p>_____ 9.c. Rocket has a blunt or rounded nose.</p> <p>_____ 9.e. Only water/air used at launch.</p> <p>_____ 9.f. Recovery system is safe (if used).</p> <p>_____ 7. Wearing Z87+ impact rated safety glasses or impact rated goggles at all times (one warning ok).</p>	<p>_____ 9.a. Used 2-liter plastic carbonated beverage bottle.</p> <p>_____ 9.a.i. Teams presented labels if removed from pressure vessel or label was still on bottle.</p> <p>_____ 9.a.iii. Structural integrity of pressure vessel unaltered. (no cutting, sanding, using any glues on <i>pressure vessel</i>).</p> <p>_____ 9.b. No metal parts anywhere on rocket.</p> <p>_____ 9.b. No commercial rockets or parts.</p> <p>_____ 9.c. Rocket has a blunt or rounded nose.</p> <p>_____ 9.e. Only water/air used at launch.</p> <p>_____ 9.f. Recovery system is safe (if used).</p> <p>_____ 7. Wearing Z87+ impact rated safety glasses or impact rated goggles at all times (one warning ok).</p>
If any safety criteria above are not met, do not launch.	If any safety criteria above are not met, do not launch.
<b>Construction Criteria</b>	<b>Construction Criteria</b>
_____ 9.d. All parts of rocket are 5 cm or further from opening of bottle. If not, allow team to step out of line and attempt to fix.	_____ 9.d. All parts of rocket are 5 cm or further from opening of bottle. If not, allow team to step out of line and attempt to fix.
Rocket 1 Time Aloft (sec) <b>Record all times.</b> <i>(Time until any piece of the rocket lands)</i>	Rocket 2 Time Aloft (sec) <b>Record all times</b> <i>(Time until any piece of the rocket lands)</i>
(Use time from middle of 3 timers): _____	(Use time from middle of 3 timers): _____

Tier (Circle one): 1 2 Greatest Time Aloft for best rocket: \_\_\_\_\_ Final Rank: \_\_\_\_\_  
*Tiebreaker: Greatest combined time aloft.*

## Backyard Biologist

1. **DESCRIPTION**: Teams will be assessed on their knowledge of living organisms that they may encounter in their own backyard. **In 2022, the focus will be on plants & insects.** Teams will be required to identify organisms from a provided list and know about the habitat and conditions required for growth of the organisms.
2. **ESSENTIAL STANDARDS ALIGNMENT**: 2.L.1, 3.L.2, 6.L.1, 6.L.2
3. **TEAM OF UP TO**: 2
4. **MAXIMUM TIME**: 60 min.
5. **TEAMS**: Must bring writing instruments. Teams may also bring up to 2 commercially produced field guides and/or 2 1-inch, 3-ring binders with pages in any form, from any source, contained in the rings. (This means 2 guides, or 2 binders, or a guide and a binder). Actual plant & leaf samples are allowed in the binders as long as they are in plastic sheet protectors. No insect parts are allowed in the binder. Teams may also bring up to two hand lenses.
6. **EVENT LEADERS**: Will provide an event with all necessary items, objects, materials, questions, and response sheets for participants to complete exams. Examples include but are not limited to: drawings, scenarios, questions, leaves, bark, seeds, photographs, and specimens.
7. **SAFETY REQUIREMENTS**: None
8. **IMPOUND**: No
9. **THE COMPETITION**: The competition will consist of an exam that covers any or all of the following topics.
  - a. Identification of specimens, by common name, from the Official Specimen List, including which are NC official state symbols. No more than 50% of the test will be identification of specimens.
  - b. Plants and trees
    - i. The structure and function of roots, stems, leaves, seeds, and flower parts.
    - ii. The life cycle of plants and how they make energy (e.g. basic photosynthesis, no chemical equations).
    - iii. The concepts of gravitropism, phototropism, thigmotropism, & hydrotropism.
  - c. Horticulture
    - i. What is needed to grow a successful garden and harvest food to eat, including how plants react in different conditions (no light, too much/too little water, addition of fertilizer, competition with other plants, etc).
  - d. Insects
    - i. Basic characteristics and description of habitat.
    - ii. Eating habits and life cycles.
    - iii. Diseases they may transmit and economic importance (good or bad), if any.
10. **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.
11. **EVENT RESOURCES**:  
See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

## Backyard Biologist – 2022 Official Specimen List

For identification, students only need to know the common name and if it is an official NC State Symbol. Scientific names are given for reference purposes only.

<p><b>Trees</b> (Identify by leaves, bark, and seeds):</p> <p>American elm (<i>Ulmus Americana</i>)          Bitternut hickory (<i>Carya cordiformis</i>)          Black cherry (<i>Prunus serotina</i>)          Black oak (<i>Quercus velutina</i>)          Eastern white pine (<i>Pinus strobus</i>)          Flowering dogwood (<i>Cornus florida</i>)          *NC State Flower          Southern live oak (<i>Quercus virginiana</i>)          Loblolly pine (<i>Pinus taeda</i>)**          Longleaf pine (<i>Pinus palustris</i>)**          Red maple (<i>Acer rubrum</i>)          Shortleaf pine (<i>Pinus echinata</i>)**          Southern red oak (<i>Quercus falcate</i>)          Sweet gum (<i>Liquidambar styraciflua</i>)          Tulip/yellow poplar (<i>Liriodendron tulipifera</i>)          White oak (<i>Quercus alba</i>)</p> <p><b>Bushes, Vines, and Flowers</b></p> <p>English ivy (<i>Hedera helix</i>)          Carolina lily (<i>Lilium michauxii</i>)          *NC State Wildflower          Eastern poison ivy (<i>Toxicodendron radicans</i>)          Carolina rose (<i>Rosa carolina</i>)          Kudzu (<i>Pueraria lobata</i>)          Pink lady’s slipper (<i>Cypripedium acaule</i>)          Scuppernong grape (<i>Vitis rotundifolia</i>)          *NC State Fruit          Sunflower (<i>Helianthus annuus</i>)          Venus flytrap (<i>Dionaea muscipula</i>)          *NC State Carnivorous Plant          Butterfly weed (<i>Asclepias tuberosa</i>)          Trumpet creeper (<i>Campsis radicans</i>)</p> <p>* State Symbol          ** Pine trees (generic) are the NC state tree</p>	<p><b><u>Insects:</u></b></p> <p><b>American Cockroach</b> (<i>Periplaneta americana</i>)</p> <p><b>Antlion</b> (<i>Glenurus gratus</i>)</p> <p><b>Big Dipper Firefly</b> (<i>Photinis pyralis</i>)</p> <p><b>Black &amp; Yellow Mud Dauber</b>          (<i>Sceliphron caementarium</i>)</p> <p><b>Brown Marmorated Stink Bug</b>          (<i>Halyomorpha halys</i>)</p> <p><b>Carolina Locust</b> (<i>Dissosteira carolina</i>)</p> <p><b>Carolina Mantis</b> (<i>Stagmomantis carolina</i>)</p> <p><b>Carpenter Ant</b> (<i>Camponotus spp.</i>)</p> <p><b>Common Pillbug</b> (<i>Armadillidium vulgare</i>)</p> <p><b>European Earwig</b> (<i>Forficula auricularia</i>)</p> <p><b>European Honeybee</b> (<i>Apis mellifera</i>)          *NC State Insect</p> <p><b>Fire Ant</b> (<i>Solenopsis sp.</i>)</p> <p><b>Giant Water Bug</b> (<i>Lethocerus americanus</i>)</p> <p><b>Gray Silverfish</b> (<i>Ctenolepisma longicaudata</i>)</p> <p><b>Green June Beetle</b> (<i>Cotinus nitida</i>)</p> <p><b>House Cricket</b> (<i>Acheta domestica</i>)</p> <p><b>Japanese Beetle</b> (<i>Popillia japonica</i>)</p> <p><b>Katydid</b> (<i>Microcentrum rhombifolium</i>)</p> <p><b>Red Pavement Ant</b> (<i>Tetramorium caespitum</i>)</p> <p><b>Spotted Camel Cricket</b> (<i>Ceuthophilus maculatus</i>)</p> <p><b>Tick</b> (<i>Dermacentor sp.</i>)</p>
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## Bridge-a-Roni

1. **DESCRIPTION:** The objective of this event is to design and build the lightest bridge, constructed only of pasta and glue, with the greatest structural efficiency, capable of supporting a load of up to 10 kg. Each team may bring and enter only one pasta bridge.
2. **ESSENTIAL STANDARDS ALIGNMENT:** Science as Inquiry
3. **TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** 10 min.
5. **TEAMS:** Teams must bring bridge and safety glasses.
6. **EVENT LEADERS:** Will provide all equipment, except for eye protection, needed for testing and scoring. The equipment needed is as follows:
  - a. A testing platform with two elevated flat support surfaces (e.g. blocks of wood) 40.0 cm apart from each other, at least 15 cm wide.
  - b. A square loading block, 5.0 cm long x 5.0 cm wide x 2.0 cm tall (+/- 1 mm) with a hole drilled in the center of the square face. Connected through this hole will be a ¼" eyebolt (with wing nut and washer) connected to a chain. The loading block and chain assembly is placed on the bridge by the team during testing and used to suspend the bucket and sand beneath the bridge.
  - c. An electronic balance or scale that can mass up to 12 kg (the "sand scale") and one that can mass a bridge up to 400 g to the nearest 1 g (the "bridge scale"). Bridges exceeding the capacity of the bridge scale will be massed on the sand scale instead.
  - d. A plastic tarp to protect floor from sand, if needed.
7. **SAFETY REQUIREMENTS:** Teams must wear safety glasses throughout event.
8. **IMPOUND:** None
9. **CONSTRUCTION:**
  - a. The bridge is to be a single structure constructed of ONLY pasta, multi-purpose glue, and/or hot glue. Multi-purpose glue must be labeled safe and non-toxic (e.g. Elmer's). Other materials are not allowed, including paint, rubber bands, twist ties, other types of glue, etc.
  - b. The bridge must be free standing and span a **40.0 cm** distance while resting on top of the testing platform.
  - c. The bridge shall not exceed **55.0 cm** in length, **15.0 cm** in width, and not extend below the top of the testing platform when unloaded.
  - d. **The minimum height of the bridge is 10.0 cm;** there is no maximum height on the bridge.
  - e. The bridge must support, at the center of its span, the loading block and chain assembly described in 6.b. The bridge must have an adequately sized opening at its center that allows the bolt and chain to pass through the bridge and hang below the bridge. The loading block assembly must rest freely on the bridge and cannot be rigidly attached to the bridge.
  - f. If the bridge has multiple levels, the team may decide which level to place the loading block on, as long as it remains at the center of the span.



10. **THE COMPETITION:**

- a. Once teams enter the event area to compete, they may not leave the area or receive outside assistance, materials, or communication until they are finished competing. Only contestants and judges will be allowed in the event area while teams are competing. Teams violating this rule will be disqualified.
- b. All bridges must be measured and weighed prior to testing.
- c. Teams must strive to handle the bridge themselves throughout the process of measuring and loading. Event leaders should only handle bridges as a last resort.
- d. Teams must place the bridge on the testing platform themselves so that the ends of the bridge rest on the top surfaces of the testing platform.
- e. Teams will place the loading block on the bridge at the center of its span so the chain hangs freely without touching the testing platform, and connect a 5 gallon bucket to the chain below the testing platform.
- f. The team will be given **3 minutes** to load sand into the bucket once the loading block and bridge are positioned.
- g. Loading must stop when failure of the bridge occurs, when the maximum load of 10 kg is supported, or when the time expires. Failure is defined as the inability of the bridge to support additional load, or something other than the bridge is supporting the load (i.e., the bridge leans and chain touches edge of platform, or sags enough that the bucket touches ground, or part of the bridge sags below the top of the testing platform).
- h. Event leaders will remove sand added after failure occurs. Event leaders will also remove any pasta bits that fall into the sand. The Load Supported at that time will be used to calculate the Structural Efficiency.
- i. The mass of the loading block assembly, bucket, and sand are included in the Load Supported.

11. **SCORING:**

- a. The best structural efficiency (highest number) wins, determined by the following equation:  
$$\text{Structural Efficiency} = \text{Load Supported (grams)} \div \text{Mass of Bridge (grams)}$$
- b. Bridges that hold more than 10 kg will be scored using 10 kg (10,000 g) as the maximum Load Supported.
- c. Bridges will be scored in 2 tiers:  
Tier 1: Bridges with no violations  
Tier 2: Bridges with construction violations  
Bridges that cannot be tested for any reason (e.g. cannot accommodate the loading block or team does not have proper eye protection) will be given participation points only.
- d. Ties will be broken in favor of the team with the lighter bridge.

12. **RESOURCES:**

See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.



## Chew the Fat

1. **DESCRIPTION:** Teams will demonstrate knowledge of the human digestive system and proper nutrition.
2. **ESSENTIAL STANDARDS ALIGNMENT:** 3.L.1, 4.L.2, 5.L.1
3. **TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** 60 min.
5. **TEAMS:** Must bring a writing instrument.
6. **EVENT LEADERS:** Will provide a hands-on event with all necessary items, objects, materials, questions, and response sheets for participants to complete stations. Examples include but are not limited to: models, slides, and pictures.
7. **SAFETY REQUIREMENTS:** None
8. **IMPOUND:** No
9. **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. Identify the major organs and body parts involved in the digestive process and understand the important job each body part has:
    - i. salivary glands
    - ii. taste buds
    - iii. teeth: incisors, premolars, molars, and canines
    - iv. esophagus, stomach, liver, small intestine, large intestine
    - v. kidney, urine, bladder
  - b. Compare and contrast chemical and physical digestion.
  - c. Understand food and the benefits of vitamins & minerals.
    - i. Vitamin List: A, B, C, D, E, K
    - ii. Minerals List: Calcium, Iron, Magnesium, Potassium, Sodium
  - d. Be able to distinguish healthy foods from unhealthy foods by comparing food labels as well as understanding what a serving size is.
  - e. Know common foods in the major food groups: fruits, vegetables, grains, protein, dairy and where they fit in the food pyramid and in the USDA My Food Plate.
  - f. Understand the relationship among the amount of food energy (calories) consumed, weight, and metabolism.
10. **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.
11. **EVENT RESOURCES:** See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

## Codebusters

1. **DESCRIPTION:** Teams will cryptanalyze (decode) encrypted messages using cryptanalysis techniques and show skill with ciphers by decrypting a message.
2. **ESSENTIAL STANDARDS ALIGNMENT:**
3. **TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** 50 minutes
5. **TEAMS:** must bring writing utensils. No other resource materials are allowed.
6. **EVENT LEADERS:** Will provide scratch paper for each team to use.
7. **SAFETY REQUIREMENTS:** None
8. **IMPOUND:** No
9. **THE COMPETITION:** This event consists of participants using cryptanalysis techniques to decrypt messages on a written exam.
  - a. Teams must not open the exam packet nor write anything prior to the “start” signal, nor may they write anything after the “stop” signal.
  - b. Participants are free to answer the questions in any order, working individually or in pairs, attempting whichever of the questions seem right for them.
  - c. **The code types that may be used on the exam at competitions are as follows:**
  - d. Atbash Cipher (in English, not Hebrew)
  - e. The Caesar Cipher, also called a shift cipher, with a shift of no more than 3 characters in either direction. (e.g. ‘a’ can map to x,y,z,b,c,or d).
  - f. Mono-alphabetic substitution
    - i. Aristocrats with a hint - messages with spaces included, and with a hint
    - ii. Aristocrats - messages with spaces included, but without a hint
  - g. The Vigenère Cipher – Decrypting ciphertext given a key.
  - h. The PigPen Cipher, also called the Masonic Cipher – Decrypting ciphertext with no mapping table provided.
  - i. The Tap Code Cipher – Decrypting ciphertext encoded by a pair of numbers indicating a coordinate in a standard 5x5 table (not provided with the test) with c and k sharing the same cell.
  - j. Aristocrats Cipher - no letter can ever decrypt to itself.
  - k. The exam packet will include a resource sheet with English letter frequencies, AtBash and Vigenère tables but will NOT provide the PigPen or TapCode Cipher tables.
10. **SCORING:**
  - a. High score wins.
  - b. Based on difficulty, each question will be worth a clearly indicated number of points.
  - c. **The general point distribution by question type is:**
    - i. An “easy question” = 400-500 pts
    - ii. A “medium question” = 600-700 pts
    - iii. A “hard question” = 800-900 pts
    - iv. A “very hard question” = 1000 pts
  - d. For all questions, **the final points will be determined based on the number of errors found**
    - i. **Two or fewer errors will result in full credit**
    - ii. Each additional error results in a penalty of 100 points
    - iii. The penalty will not exceed the value of the question. For example, a 400-point question with 5 errors is worth 100 points whereas the same 400-point question with 7 errors **would be** worth 0 points, not -100 points.
  - e. The scores for each question will be added to determine the exam score.
  - f. Tie Breakers: For teams that are tied, select questions predetermined by the event supervisor, will be used to break the tie using the following criteria in this order: score, degree of correctness and attempted.
11. **EVENT RESOURCES:**

See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos, and more.

## Data Crunchers

1. **DESCRIPTION**: Teams should be able to create and interpret data tables and graphs and perform simple experiments to collect data, graph their results, and make predictions.
2. **ESSENTIAL STANDARDS ALIGNMENT**: Measurement & Data is a unifying concept for all grade levels across the Common Core Standards. It also aligns with 5.P.1 and Science as Inquiry in the Essential Standards for all grades and with these standards in the mathematics curriculum: NC.4.MD.4, NC.4.NF.2, NC.5.MD.2, NC.6.SP.1-5.
3. **TEAM OF UP TO**: 2
4. **MAXIMUM TIME**: 60 min.
5. **TEAMS**: Must bring writing utensils.
6. **EVENT LEADERS**: Must provide tests and student response sheets for each team. Event leaders may also provide items such as: rulers, calculators, meter tapes, meter sticks, objects to measure and various types of graphs and data sets to be analyzed.
7. **SAFETY REQUIREMENTS**: None
8. **IMPOUND**: No
9. **THE COMPETITION**: Teams will demonstrate understanding of this content in any or all of the following ways:
  - a. Collect data with metric measuring devices (length, mass, or volume) and represent that data in a correctly labeled graph or data table.
  - b. Plot data points, make and interpret data tables, draw and interpret graphs, including what trends can be predicted from the data shown.
  - c. Make estimates of data between or beyond the data points given.
  - d. Calculate fractions or percentages based on charts, tables or data.
  - e. Calculate the mean, median, and mode for a set of data.
  - f. Distinguish between accuracy and precision and identify outliers in a set of data.
  - g. Identify types of questions (numerical, categorical, data that changes over time) when collecting data.
10. **SCORING**: Points will be awarded for the accuracy of responses. Ties will be broken by the accuracy or quality of answers to selected questions chosen by the event leader prior to competition.
11. **EVENT RESOURCES**:  
See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

## Describe It, Build It

1. **DESCRIPTION**: Technical writing skills are an important part of an engineer or scientist's abilities to communicate precisely and clearly. This event will test a team's ability to effectively communicate by having one team member write a description of how to build a device and having his or her partner construct the device from raw materials using their partner's description.
2. **ESSENTIAL STANDARDS ALIGNMENT**: Science as Inquiry
3. **TEAM OF UP TO**: 2
4. **MAXIMUM TIME**: 60 min.
5. **TEAMS**: Teams must bring a writing instrument. No other resources are allowed.
6. **EVENT LEADERS**: Will provide paper and all necessary materials.
7. **SAFETY REQUIREMENTS**: None.
8. **IMPOUND**: No
9. **THE COMPETITION**: This event should occur in two rooms so that the builders are not in the same room as the describers while they are writing.
  - a. One team member (the describer) is shown an object (which may be abstract) built from, but not limited to, office & craft materials (e.g., straws, push pins, Styrofoam balls, paper cups, Popsicle sticks, paper, stickers, etc.) or commercial sets (e.g., K'nex, Tinker Toys, Legos, Lincoln Logs, etc.). The describer has 25 minutes to write a description of the object and how to build it. There will be no advantage to finishing early. The event leader will notify teams if the color of the pieces does not matter.
  - b. Only words and numbers may be used. Symbols, drawings and diagrams are not allowed, with the exception of common punctuation and editing symbols. Printable punctuation marks and/or editing symbols that can be produced on a standard QWERTY keyboard by pressing a single key or a single key in combination with the shift key may be used. These must be used in their normal context and not as symbols to form a key or code.
  - c. All abbreviations (not symbols) must be defined either at the beginning or when the abbreviation is first used. (e.g. rt = right)
  - d. The event leader will pass the description to the other team member (the builder) who will use the description to create the original object in 20 minutes. Time will be recorded if teams finish early and used as a tiebreaker.
10. **SCORING**:
  - a. The team that builds the object most like the original object wins.
  - b. Any improper use of symbols, codes or pictures of any kind (including use of words or letters as pictures or codes) will result in the team being placed in a second tier below devices without any writing violations.
  - c. Points will be given for each piece of material placed in the proper connection and location compared to the model according to a scoring rubric.
  - d. Pieces that are connected correctly beyond an incorrect connection will be counted in the score. No penalty will be assessed for parts that were not used.
  - e. Shortest time for the construction phase will be used as a tiebreaker, there is no benefit to finishing the writing portion early.
11. **EVENT RESOURCES**:

See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

## Duct Tape Challenge

1. **DESCRIPTION:** Teams will arrive at the competition and be given a set of materials, including Duct Tape, and a mystery task. They will then have a given amount of time to complete whatever task they are assigned, such as building the tallest tower, widest bridge, most buoyant boat, etc. The task parameters will be clearly outlined for the teams. At the end of the build time, teams will test their structures to determine the winner.
2. **ESSENTIAL STANDARDS ALIGNMENT:** Science as Inquiry
3. **TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** 50 min.
5. **TEAMS:** Teams must bring something to write with and may also bring a ruler, scissors, and a stopwatch.
6. **EVENT LEADERS:** Will provide challenge instructions and all materials needed for the event.
7. **SAFETY REQUIREMENTS:** None.
8. **IMPOUND:** No
9. **THE COMPETITION:**
  - a. **LOCATION:** This event should occur in a large room or in multiple rooms at the same time. As much as possible, teams should be given the same type of area to build (e.g. space on the floor, flat desktop). Students may not stand on tables or chairs or each other to construct their devices.
  - b. **MATERIALS:** Each team will be given the exact same type and quantity of materials, including a roll of duct tape. Examples of supplemental materials may be: Styrofoam bowls, drinking straws, paper clips, cups, string, paper, and popsicle sticks. Materials are not limited to this list. The actual materials provided may be entirely different. Only those materials given to the competitors may be used to build the structure.
  - c. **TASK:** The event leader will provide task instructions that identify the task to complete. The instructions will not be released until the beginning of the competition. Example tasks are: a parachute that descends the slowest, longest bridge span to support a tennis ball without sagging, lightest boat that holds the most weight, tallest sail that stands up to a fan, longest/highest/slowest ramp to deliver a ball to a destination, plane that flies the furthest/longest, etc. Tasks are not limited to this list.
  - d. **TIME:** The team of students will have a maximum of 35 minutes to complete the specified task. The remainder of the time will be used for judging.
  - e. **ATTACHMENT:** Unless specifically stated in the task instructions, devices must be freestanding and may not be attached to a tabletop, floor, ceiling or other support.
10. **SCORING:**
  - a. Devices will be judged according to the guidelines set forth by the event leader. The dimensions specified in the task instructions will be measured and recorded as accurately as possible by the event leader.
  - b. At the event leader's discretion, devices that are required to accomplish a task (e.g. support a load for so many seconds) may either be given an assigned number of points for completing the task, or be tiered so that all devices completing the task rank above those that do not. This must be specified in the task instruction sheet.
11. **EVENT RESOURCES:**

See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

## Ecology Expert

1. **DESCRIPTION:** Teams will be assessed on their knowledge of Marine, Freshwater, Estuary and Arctic ecosystems and biomes. Topics include but are not limited to the ecology of the biomes and the roles and interactions of living and nonliving things within them.
2. **ESSENTIAL STANDARDS ALIGNMENT:** 1.L.1, 1.L.2, 1.E.2, 3.E.2, 4.L.1, 5.L.2, 6.L.2
3. **TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** 60 min.
5. **TEAMS:** Must bring writing instruments. No other resources are allowed.
6. **EVENT LEADERS:** Will provide a hands-on event with all necessary items, objects, materials, questions, and response sheets for participants to complete stations.
7. **SAFETY REQUIREMENTS:** None.
8. **IMPOUND:** No
9. **THE COMPETITION:** This event will be run in a station format. Teams will rotate through stations with questions, models, pictures, diagrams, and maps that assess any or all of the following topics:
  - a. The following ecosystems and biomes:
    - i. Marine: oceans, coral reefs, and estuaries
    - ii. Freshwater: ponds, lakes, streams, rivers, and swamps
    - iii. Arctic: ocean/ice and arctic tundra
  - c. Components of marine, freshwater, and arctic ecosystems and biomes.
    - i. Location on earth
    - ii. Biotic and abiotic components
    - iii. Adaptations of organisms that live in the biome
  - d. The functions of organisms within each ecosystem and biome.
    - i. Producers
    - ii. Consumers
    - iii. Decomposers
  - e. The physical characteristics of each biome.
    - i. Salinity
    - ii. Temperature
    - iii. Soil Nutrients
    - iv. Amount of sunlight
  - f. The interaction of organisms within an ecosystem.
    - i. Food chains & webs
    - ii. Trophic levels
    - iii. Predator/prey interaction
    - iv. Symbiotic relationships: mutualism, commensalism, parasitism
10. **SCORING:** Points will be awarded for the accuracy of responses. Ties will be broken by the accuracy or quality of answers to pre-selected questions chosen by the event leader.
11. **EVENT RESOURCES:**  
See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

## Fossil Frenzy

1. **DESCRIPTION:** Teams will be assessed on their knowledge of geologic time, fossils and the fossilization process.
2. **ESSENTIAL STANDARD ALIGNMENT:** 4.E.2
3. **TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** 60 min.
5. **TEAMS:** Must bring writing instruments. Teams may bring one 8.5” x 11” two-sided page of notes containing information in any form from any source.
6. **EVENT LEADERS:** Will provide a hands-on event with all necessary items, objects, materials, questions, and response sheets for participants to complete stations.
7. **SAFETY REQUIREMENTS:** None.
8. **IMPOUND:** No
9. **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. Be able to identify conditions required for a plant or an animal to become fossilized.
  - b. Be able to distinguish between modes of preservation: petrification, mineral replacement, cast/mold, imprint, encasement in amber/copal, mummification, freezing, entrapment in tar/asphalt.
  - c. Be able to make inferences about dinosaurs from footprints, teeth, and body structures.
  - d. Understand the Geologic Time Scale and be able to distinguish between era, period, and epoch and know where the dinosaurs and humans fit in on that time scale.
  - e. Identification of fossils on the Official Fossil List from pictures, replicas, actual specimens, descriptions, etc.
  - f. Dinosaurs: Distinguish between carnivore, herbivore, and omnivore. Identify the geologic time period (Triassic, Jurassic, or Cretaceous) the dinosaur is from.
  - g. Identify the environments: marine, terrestrial, fresh water, etc. for all species listed on the Official Fossil List.
10. **SCORING:** Points will be awarded for the accuracy of responses. Ties will be broken by the accuracy or quality of answers to pre-selected questions chosen by the event leader.
11. **EVENT RESOURCES:**  
See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

**2022 Official Fossil List**  
**Students will have to know common names only!**

**INVERTEBRATES**

Corals  
Trilobites  
Crustaceans (shrimp, lobster, crabs, barnacles)  
Brachiopods  
Bivalves (Clams, mussels, oysters)  
Cephalopods (nautiloids, ammonoids, belemnoids)  
Echinoids (sea urchins, sand dollars)  
Asteroids (sea stars, brittle stars)

**VERTEBRATES**

Fish  
Sharks (\*Shark Teeth) and rays  
Bony Fish \*Osteichthyans  
Ichthyosaurs  
Plesiosaurs  
Pterosaurs

**Dinosaurs**

*Acrocanthosaurus*  
*Allosaurus*  
*Ankylosaurus*  
*Apatosaurus*  
*Archaeopteryx*  
*Coelophysis*  
*Deinonychus*  
*Diplodocus*  
*Parasaurolophus*  
*Plateosaurus*  
*Velociraptor*  
*Tyrannosaurus rex*  
*Iguanodon*  
*Stegosaurus*  
*Triceratops*

**TRACE FOSSILS**

Trails, Borings  
Tracks, Trackways  
Burrows, Tubes  
Coprolites

## Genes R Us

1. **DESCRIPTION**: Teams will demonstrate an understanding of traits that may or may not be inherited, be able to explain why organisms share similarities and differences and use Punnett squares to predict inheritance patterns of certain characteristics.
2. **ESSENTIAL STANDARDS ALIGNMENT**: 2.L.2, 5.L.3
3. **TEAM OF UP TO**: 2
4. **MAXIMUM TIME**: 60 min.
5. **TEAMS**: Teams must bring writing instruments. **Teams may not bring resources to this event.**
6. **EVENT LEADERS**: Event leaders will provide an event with all necessary objects, materials, questions, and response sheets for participants to complete each exam.
7. **SAFETY REQUIREMENTS**: None
8. **IMPOUND**: No
9. **THE COMPETITION**: The competition will consist of an exam that covers any or all of the following topics.
  - a. Define/use the following words: genes, alleles, genotype, phenotype, chromosomes, DNA, homozygous, heterozygous, dominant, and recessive.
  - b. Identify life processes or species characteristics that members of a population share and if they are likely inherited (including instinctive behavior) or learned (example: cheetah spots are inherited, but their hunting skills are learned).
  - c. Understand why certain organisms are present in certain habitats, including a basic understanding of adaptation based on inheritance (example: walrus have thick blubber to protect them from hypothermia in arctic habitats).
  - d. Identify the following common human inheritable traits and the pattern of inheritance: earlobe attachment, tongue rolling, cleft chin, dimples, ACHOO syndrome and colorblindness.
  - e. Make/analyze a Punnett square to determine genotype and phenotype of offspring with known parental genotypes and/or phenotypes (only Mendelian monohybrid crosses).
  - f. Understand that dominant alleles mask recessive alleles.
10. **SCORING**: Points will be awarded for the accuracy of responses. Ties will be broken by the accuracy or quality of responses to preselected questions by the event leader.
11. **EVENT RESOURCES**:  
See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

## Landformers

1. **DESCRIPTION:** Teams will identify landforms, describe their characteristics, explain how they were formed, and tell where certain landforms can be found.
2. **ESSENTIAL STANDARDS ALIGNMENT:** 3.E.2
3. **TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** 60 min.
5. **TEAMS:** Must bring a writing instrument. No other resources are allowed.
6. **EVENT LEADERS:** Event leaders will provide an event with all necessary objects, materials, questions, and response sheets for participants to complete each exam. Examples include but are not limited to models, slides, maps, topographic maps, charts, aerial photographs, satellite images, and pictures.
7. **SAFETY REQUIREMENTS:** None
8. **IMPOUND:** No
9. **THE COMPETITION:** The competition will consist of an exam that covers any or all of the following topics.
  - a. Identify and analyze forces that cause changes in landforms over time.
  - b. Identify landforms and describe how they have changed over time.
  - c. Investigate and describe the role of water and the water cycle in shaping landforms.
  - d. Explain how weathering, erosion, transport, and deposition occur and how they shape landforms.
  - e. Locate and describe the landforms in a specific area or region.
  - f. Choose the most likely places to find certain landforms and explain why they formed where they did.
  - g. Explain why certain landforms do not form in some areas.
  - h. Interpret photos, images, etc. to describe the geologic history of an area and predict how it will change over time.
  - i. Examine evidence of geologic change and predict its impact on human activities.

### Example Challenges:

- a. Observe the landform shown in each picture. Name the type of landform and describe how it was formed.
- b. Compare the two photographs of the same area at different times. Describe how the area has changed and what caused the changes. How might these changes affect human activities in the area in the future?
- c. Look at this world map with numbered locations. Match each landform on the given list with the number where it would most likely be found on Earth.

10. **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.

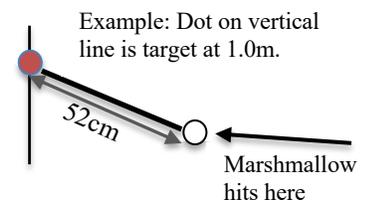
### 11. **EVENT RESOURCES:**

See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

# Marshmallow Catapult

- DESCRIPTION:** Teams will build in advance a device constructed out of specified materials to launch a marshmallow at a target placed on the floor. The goal is to land as close to the center of the target as possible.
- ESSENTIAL STANDARDS ALIGNMENT:** 3.P.1, 4.P.2, 5.P.1, Science as Inquiry
- TEAM OF UP TO:** 2
- MAXIMUM TIME:** 5 min.
- TEAMS:** Teams must bring their catapult and safety glasses.
- EVENT LEADERS:** Must provide full-sized Kraft Jet-Puffed marshmallows, score sheets, tape measures, and targets.
- SAFETY REQUIREMENTS:** Teams must wear safety glasses throughout the event.
- IMPOUND:** Yes, all devices will be impounded prior to any launches.
- THE CATAPULT:**
  - Energy may be provided by one mousetrap (no rat traps) and any number or kind of rubber bands. These must supply all the energy for launching the marshmallow.
  - The lever arm and base must be non-metallic. No energy from these should be provided to the launch.
  - The device must have a trigger or switch that can be activated by a team member using a pencil or string to start the launch. Students cannot hold the base steady while they are launching.
  - No part of the catapult is allowed to be higher than 60 cm from the floor when the launch is triggered.
  - The entire catapult must be behind the launch line before, during, and after all launches.
  - Other construction materials may be used, but no sharp objects, liquids, flames, flammable substances, or projectiles will be allowed. Violations will disqualify a catapult.
  - No part of the device will be allowed to leave the catapult during a launch except the marshmallow. (Violation = Tier 2)
  - The catapult must be designed and operated in such a way as to not damage the floor. This can be accomplished with fabric or felt pads on the bottom of the device.
- COMPETITION:** This event should occur in a large room with a high ceiling.
  - Only team members and event leaders will be allowed in the event area while teams are competing. Teams cannot receive outside assistance of any kind from anyone once they enter the competition area. Teams violating this rule will be disqualified.
  - Teams will have a total of 5 minutes to make one launch at each of two targets.
  - Targets will be placed on the floor between 1.0 m and 5.0 meters from the launch line at 0.5 m increments.
  - All catapults will be impounded before the target distances are announced.
  - Team may have 1 practice launch for each distance but must tell judge that it is a practice before launching.
  - Target Distances will be measured from the center of the target to where the marshmallow first lands (in cm) NOT where it rolls or finally stops. This is a straight-line distance from marshmallow to target.
  - If a launch fails, the target distance used will be the entire distance to the target.
- SCORING:**
  - Devices will first be ranked in tiers.
    - Tier 1= No violations for building or competition
    - Tier 2= Violations of rules 9a-h.
  - Target distances of both launches will be added to determine the total score.
    - Lowest total score wins. Within each tier, catapults will be ranked according to the lowest total score.
  - Ties will be broken by the closest single shot.
- EVENT RESOURCES:**

See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.



**Marshmallow Catapult Score Sheet – 2022 (revised 7/27/21)**

School Name: \_\_\_\_\_ Team (Circle One): Varsity    JV1    JV2    JV3

Student Names: \_\_\_\_\_

**Safety Criteria:** Teams must wear proper eye protection at all times during launches. No dangerous objects or substances are used. The team does not need to hold the base of the catapult in order to launch.

**Are all safety criteria met by the team and device? \_\_\_\_\_ If yes, continue. If no, then the team will not be allowed to compete for safety reasons.**

	YES	NO
1. The catapult device was properly impounded.	_____	_____
2. All energy for launches is provided by only one mousetrap and rubberbands.	_____	_____
3. The team uses a pencil or string to trigger the launches.	_____	_____
4. No part of device is higher than 60 cm from floor when in the ready-to-launch state.	_____	_____
5. Entire device is behind start line before, during, and after launch.	_____	_____
6. No part(s) leave device during the launch.*	_____	_____

\*If it is determined that the device is dangerous to operate, it will be disqualified and not tested. If this is the case, indicate below.

**Teams with a “no” checked above will be placed in Tier #2. Tier = \_\_\_\_\_**

**Teams with no eye protection or who continue to remove eye protection after warnings will receive participation points only. Participation only? \_\_\_\_\_**

**Place an “X” in the blank if safety rules are violated. Disqualified? \_\_\_\_\_**

	<b>Target Dist.</b>	<b>Distance from Target (measured from where marshmallow first hits ground)</b>
<b><u>Launch #1</u></b>	_____ m	_____ cm
<b><u>Launch #2</u></b>	_____ m	_____ cm

TOTAL for BOTH Launches = \_\_\_\_\_ (Lowest score wins.)

**Tier (Circle one):    1    2    P    DQ**  
*Ties are broken by the single closest shot.*

**Final Rank:** \_\_\_\_\_

## Newton's Notions

1. **DESCRIPTION**: Teams will be assessed on their knowledge of forces and motion.
2. **ESSENTIAL STANDARDS ALIGNMENT**: 3.P.1, 5.P.1
3. **TEAM OF UP TO**: 2
4. **MAXIMUM TIME**: 60 min.
5. **TEAMS**: Teams must bring a writing instrument. No other resources are allowed.
6. **EVENT LEADERS**: Will provide paper and all necessary materials.
7. **SAFETY REQUIREMENTS**: None.
8. **IMPOUND**: No
9. **THE COMPETITION**: This event may be run in a station or lab format. Teams will use the materials provided to:
  - a. Identify the following types of simple machines: inclined plane, lever, pulley, screw, wedge, & wheel and axle, in pictures or everyday objects.
  - b. Explain how factors such as gravity, friction, and mass affect the motion of objects.
  - c. Illustrate the motion of an object using a graph to show a change in position or speed over a period of time.
  - d. Evaluate the relative speeds of objects given the time and distance traveled.
  - e. Determine whether forces are balanced or unbalanced in a situation and describe the resulting motion of objects.
  - f. Set up and operate simple machines to perform a task and then describe the advantages and disadvantages of the simple machine.
10. **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.
11. **EVENT RESOURCES**: See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

## Science Password

1. **DESCRIPTION**: Team members will take turns guessing verbal clues for scientific terms or concepts from across all Essential Standards for Elementary Science.
2. **ESSENTIAL STANDARDS ALIGNMENT**: Vocabulary found throughout K-6 Science & Math Essential Standards
3. **TEAM OF UP TO**: 3
4. **MAXIMUM TIME**: 4 minutes per team.
5. **TEAMS**: Teams must be in groups of 2 or 3 in order to compete in this event. Teams must not bring anything with them to the competition.
6. **EVENT LEADERS**: Will provide stopwatch, 40 words printed on index cards, and score sheets.
7. **SAFETY REQUIREMENTS**: None.
8. **IMPOUND**: No
9. **THE COMPETITION**:
  - a. Teams will have 4 minutes to complete up to 40 terms.
  - b. All teams will receive the same terms in the same order. The terms will consist of one or two words coming ONLY from the list provided in these rules.
  - c. Team members will alternate giving and receiving clues. All team members must rotate turns on being the clue giver and guesser. Teams may pick the initial order of rotation. This event requires a minimum of 2 team members to participate.
  - d. The team member giving clues first will be shown one term by the judges. Timing begins when the judge shows the first team member the first term and ends when the team has correctly identified or passed the last term or when the 4-minute time period has expired. No other team member may see the term.
  - e. Clues may consist of one or two words only and may not contain any part or form of the term. Proper nouns and proper names may be used as clues however: letters, acronyms, etc. (e.g. DNA) may not be used. A hyphenated word is considered one word. Participants may not give visual clues with their hands or bodies.
  - f. Another clue may not be given until one of the responders has given a response. The responders may give multiple responses to a clue.
  - g. The event leader will indicate when the correct term is given. Different forms of the term will not be accepted with the exception of plurals and singulars, which will be accepted interchangeably (e.g. calories or calorie would be accepted).
  - h. If a team violates any of the rules regarding the use of verbal or visual communication, the term in play at the time of the violation will be counted as a pass.
  - i. Any team member (person giving or receiving clues) may choose to pass on a term. Once the team passes on a term they may not return to it.
  - j. When the team has correctly identified or passed on the term, or if a violation occurs, the next team member will be given a new term until the team has gone through their set of terms or the time expires.
10. **SCORING**:
  - a. One point will be awarded for each term correctly identified within the allotted 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 team with the longest string of consecutively correct words. Second tiebreaker will be the team who identifies the first word in the list passed by the other team. Third tiebreaker would be the team with the fewest words passed. The final tiebreaker is the shortest period of time to complete the list. If teams are unable to guess any of the words in 4 minutes, participation points only will be given.
11. **EVENT RESOURCES**: See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

## Science Password – Official Vocabulary List

absorb	coral reef	galaxy	moon	ruler
acid rain	crater	gas	motion	salinity
adapt	current	geologist	muscle	saliva
air pressure	data	global warming	nutrients	sand
angle	decay	grains	ocean	scale
asteroid	decomposer	graph	omnivore	season
astronomer	degree	grassland	orbit	sedimentary rock
atmosphere	desert	gravity	organ	seed
atom	digestion	greenhouse effect	organism	shadow
axle	digestive system	heat	ornithologist	skin
bacteria	dissolve	herbivore	ozone layer	soil
behavior	DNA	horticulture	paleontologist	solid
biologist	doctor	hurricane	parasite	solution
biomass	eardrum	ice	pattern	sound wave
biome	earthquake	iceberg	pendulum	space
bird	eclipse	igneous rock	photosynthesis	star
boiling point	ecologist	insect	physicist	stem
botanist	electricity	joint	planet	stomach
calorie	elevation	kidney	pollution	sugar
carnivore	energy	kinetic energy	population	sun
catapult	engineer	lake	potential energy	swamp
cell	environment	leaf	precipitation	symbiosis
charge	equator	lever	predator	taste buds
chemist	erosion	lift	prey	teeth
chew	estimate	light	producer	telescope
chromosome	estuary	lightning	properties	temperature
circuit	evaporation	liquid	protein	thermometer
clay	expand	magnet	pulley	thunder
climate	experiment	mammal	push	tornado
cloud	fiber	map	quadrilateral	tundra
cold front	flight	mass	quantity	velocity
comet	float	matter	recycle	vibration
compass	flower	measure	repel	viscosity
compound	food web	melt	repulsion	vitamin
compression	force	metamorphic rock	resistance	volume
condensation	forest	meteor	revolve	water cycle
conductor	fossil	meter	river	weather
constellation	fraction	migrate	rocket	weathering
consumer	friction	mineral	root	wedge
contract	fungus	molecule	rotate	wheel

## Sky Quest

1. **DESCRIPTION:** Teams will be tested on their knowledge of the solar system. Topics include the sun, moon, planets, rotation and revolution, moon phases, seasons, space exploration missions and identification of constellations/stars/asterisms based on a provided list.
2. **ESSENTIAL STANDARDS ALIGNMENT:** 1.E.1, 3.E.1, 4.E.1, 6.E.1
3. **TEAM OF UP TO:** 2                      4. **MAXIMUM TIME:** 60 min.
5. **TEAMS:** Must bring writing instruments. No other resources are allowed.
6. **EVENT LEADERS:** Will provide an event with all necessary items, objects, materials, questions, and response sheets for participants to complete exam. Examples include but are not limited to reference charts, posters, and models for the event.
7. **SAFETY REQUIREMENTS:** None                      8. **IMPOUND:** No
9. **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. The Earth/Sun relationship including: rotation and revolution, day/night, shadows, and seasons
  - b. The Earth/Sun/Moon relationship including: phases and relative positions of all three bodies, tides, and both lunar and solar eclipses
  - c. Identification and understanding of the planets in our solar system, how they relate to each other in size, order from the sun, physical properties, and what is unique about each one.
  - d. Space Exploration, including:
    - i. Robots and Probes
      - Rovers on Mars (Sojourner, Spirit, Opportunity, Curiosity, Perseverance)
      - Voyager 1 & 2
      - Juno
      - New Horizons
    - ii. Human Spaceflight
      - Vostok 1
      - Freedom 7 & Friendship 7
      - Apollo 11
      - Space Shuttle program
  - a. Identification of *Major Constellations (Western Starlore)*, their *Alpha stars* and common Northern Hemisphere *asterisms* from the lists below:

**Major Constellations and their Alpha star in parentheses, if noted:**

Aquila (Altair)	Canis Major (Sirius)	Cygnus (Deneb)	Lyra (Vega)	Scorpius (Antares)
Aquarius	Canis Minor (Procyon)	Gemini (Castor and Pollux)	Orion (Betelgeuse)	Taurus (Aldebaran)
Aries	Cassiopeia	Hercules	Pegasus	Ursa Major
Bootes (Arcturus)	Corona Borealis	Leo (Regulus)	Perseus	Ursa Minor (Polaris)

**Northern Hemisphere Asterisms:**

Big & Little Dippers	Great Square of Pegasus	Orion's Belt	Summer Triangle	Winter Triangle
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10. **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.
11. **EVENT RESOURCES:**  
See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

## STEM Design Challenge

1. **DESCRIPTION**: Teams must build a structure on site to solve a creative engineering task using only the materials and tools that they have brought in their challenge box. Teams must prepare their challenge box before the competition and practice solving engineering tasks using the allowed materials.
2. **ESSENTIAL STANDARDS ALIGNMENT**: 4.P.2, 5.P.1, Science as Inquiry
3. **TEAM OF UP TO**: 3
4. **MAXIMUM TIME**: **40 minutes to build**, up to 5 minutes present and test
5. **TEAMS**: Teams **MUST** bring writing instruments, their box full of K'nex materials, a blueprint design and journal.
6. **EVENT LEADERS**: Event leaders will provide the specific task instructions, score sheets, specific ball, and any measuring devices needed.
7. **SAFETY REQUIREMENTS**: None
8. **IMPOUND**: Yes. Teams must drop the challenge box off at the time and place specified by the tournament director. The box must be clearly labeled with the school/team name and team designation (Varsity, JV, etc.).
9. **THE CHALLENGE BOX**:
  - a. All materials and tools must be brought in a box with a lid; the outside dimensions of the box with lid in place can be no greater than 30.0 cm x 35.0 cm x 50.0 cm (example: a common 10 ream copy paper box with the lid on meets this requirement). With all materials and tools in the box, the lid must fit all the way on the box and close completely.
  - b. Teams may construct their own box or repurpose a box that is within the specified dimensions, made from any material. The box must not be used as a part of the device.
  - c. The box must be impounded and measured before the event begins.
  - d. The box must be clearly labeled with the school name and which team it belongs to (Varsity or JV). Each team must have its own box. Varsity and JV teams from the same or different schools may not share the same challenge box nor materials and tools in the challenge box.
  - e. **BUILDING MATERIALS**: Teams may only bring the following building materials:
    - i. K'nex pieces. No K'nex motors or other electronic components may be used. No other brands or kinds of building materials may be used. Pieces must not be preassembled in the box.
    - ii. Rubber bands – any size, brand, or quantity.
    - iii. String – any size, brand, or quantity.
    - iv. 1 page (front & back can be used) blueprint for their designs. This can take any form, including photographs, hand or computer drawings. This is to show the judges that the team has worked on the design in advance and has a plan for how to build their device. A 1 second penalty will be assessed to any team without a blueprint design.
    - v. Teams should make a reasonable effort to organize the supplies within the box neatly for efficient check-in and ease of inspection by the event leader. Teams may organize box supplies in clear plastic bags or other clear containers. The bags and containers must not be used as building materials.
  - f. **TOOLS**: Tools must not be used as part of the device. All tools must also fit within the closed box. Teams may include the following tools in the box:  
Scissors, Ruler, Stopwatch, Tape Measure, Writing instruments
  - g. Any items that are not allowed will be removed by the event leader at impound and can be picked up after the competition.

## STEM Design Challenge, page 2

### 10. THE CHALLENGE:

- a. Once teams enter the event area to compete, they may not leave the area or receive outside assistance, materials or communication until they are finished competing. Only participants and event leaders will be allowed in the event area while teams are competing. ***Teams violating this rule will be disqualified.***
- b. At the start of the event, the event leader will announce what ball will be used for the challenge: a racquet ball (57mm in diameter), a golf ball (43mm), or a marble ‘shooter’ (larger marbles; approx. 18mm) and give any special instructions immediately prior to the build phase, preferably in writing.
- c. Teams will be challenged to design and build: A “roller coaster-type” device that moves a ball from a marked starting point to a marked endpoint. A team member will release the ball (it cannot be pushed) upon a signal from the judges. The ball will roll through the device on its own until it stops at a point that is lower in the device. Students cannot push the ball through the device. If it gets stuck, a nudge can be given, but this will put the device in Tier 2. The ball cannot roll out of the device at the end of the coaster.
- d. The maximum height of the device must not exceed 1.5 meters. The device must fit in a 1m<sup>2</sup> square on the floor.
- e. Team members will not be allowed to stand on chairs, tables, each other or anything else to construct the device or release the ball.
- f. The device must be freestanding – it cannot be attached to the floor or any other piece of furniture.
- g. The goal is for the roller coaster to take the longest time in moving the ball from start to finish without stopping.
- h. If the ball leaves the device, it can be placed back at the point it left the device, but 3 seconds will be deducted from the time for each time this happens.
- i. The event leader will signal when teams should start building and give time countdowns to “hands off.” Students who touch their device after time has been called will be placed in Tier 2.
- j. Students cannot use any supplies not impounded in their challenge box for building.

### 11. SCORING:

- a. Teams will be ranked into tiers based on adherence to the challenge instructions. Within each tier, teams will be ranked based on the scoring criteria for the challenge.
  - Tier 1: Teams with no violations
  - Tier 2: Teams whose device violates a specific challenge instruction. Some examples are:
    - i. If the device to move the ball is higher than 1.5 meters.
    - ii. If the ball does not continue through the entire device and stop.
    - iii. If the team helps move the ball through the device.
  - Tier 3: Teams that violate a requirement in section 9a-g of the rules.
- b. If the team builds a device that cannot move the ball at all, but an attempt at building is made, participation points only will be given.
- c. Any team that impounds a box but fails to attempt the build will be considered a “No Show.”
- d. Ties will be broken by the shortest vertical height of a device.

### 11. RESOURCES:

See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

# STEM Design Challenge – Roller Coaster Scoresheet rev. 7/30/21

School Name \_\_\_\_\_ Circle One: V JV1 JV2 JV3 JV4

Student Names: \_\_\_\_\_

Rule	Inspection Criteria	(✓/✗)
8. & 9.d.	Team impounded Challenge Box on time. If not, then Tier 3. Each team must have its own Challenge Box, blueprint design, and journal. No sharing between Varsity and JV.	
9.a-b.	Challenge Box measures 30 x 35 x 50 cm or smaller (common copy paper box) including the lid. (Plastic storage containers or self-constructed boxes are acceptable.) If not, then Tier 3.	
9.d.	Challenge Box is clearly labeled with school and team names.	
9.e.i..	Materials are not preassembled or prepared ahead of time in any way. If yes, then Tier 3.	
9.e.	Challenge Box contains only the following materials and tools (no penalty if some items are missing). (Set aside materials that are not allowed. No affect on Tier if items are removed from box.) i. Only K'nex pieces that are not pre-assembled; no motors or electronic components. ii. Rubber bands- any size, brand, or quantity iii. String - any size, brand, or quantity iv. Blueprints for team's designs v. Box should be organized for checking. NO storage materials may be used to build.	
9.f.	Tools are <b>not</b> used as part of the device (If so, then Tier 3.) and all fit within Challenge Box. Tools are limited to scissors, ruler, stopwatch and writing instruments.	
9.g.	Challenge Box and plastic bags used for organization of materials were not used as building materials. (If so, then Tier 3.)	
10.a.	Once in the event area, team members do not leave or receive outside assistance. (If so, then DQ.)	
10.c.	Teams have a marked "beginning" and "end" point for timing. If no, then Tier 2.	
10.c.	The ball cannot roll out at the end of the coaster. If it does, then Tier 2.	
10.d.	The structure fits inside a 1m <sup>2</sup> square and is no taller than 1.5m. If no, then Tier 2.	
10.e.	Team members do not stand on anything or anyone to build. If they do, then Tier 2.	
10.f.	Structure is free standing and not attached to a table, floor, or any other support. (If not, then Tier 2)	
10.f.	Teams built device on site only out of the materials in the Challenge Box. (If not, then Tier 2.)	
10.j.	The team does not modify their device after the construction period has ended. (If so, then Tier 2.)	

- Does team have a blueprint? (any type of drawings, pictures, or CAD design) \_\_\_\_\_  
If no, subtract 1 second from time.
- Did team have to touch the ball to get it through the device? \_\_\_\_\_ Touches: \_\_\_\_\_  
If yes, subtract 3 sec for each touch (to put ball back on track or move it over a point where it gets stuck).
- Time ball is moving in the device to the tenth of a second. \_\_\_\_\_ sec  
If Ball falls out or gets stuck, time stops until it is reloaded.

$$\frac{\text{Time (sec)}}{\text{Time (sec)}} - \frac{\text{violations}}{\text{violations}} = \frac{\text{Final Time}}{\text{Final Time}}$$

**Tier: 1    2    3**

**Final Rank: \_\_\_\_\_**

Tiebreaker – Shortest overall vertical height of the device = \_\_\_\_\_ cm

## Super Sleuths

1. **DESCRIPTION:** Given a mystery scenario, evidence, and a list of possible suspects, teams will be expected to perform a series of tests to draw specific conclusions about the scenario and suspects. The test results along with other evidence will be used to solve the mystery of the scenario.
2. **ESSENTIAL STANDARDS ALIGNMENT:** 3.P.2, 4.P.2, Science as Inquiry
3. **TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** 60 min.
5. **TEAMS:** Teams may bring only specified items and goggles. No other items are allowed. The event supervisors will check the kits, and confiscate non-allowed items. **Students not bringing these items will be at a disadvantage.**
  - a. Spot plates, cups, or any containers in which teams can perform the tests
  - b. Droppers, popsicle sticks, spatulas, plastic spoons, tongs, and/or forceps for handling materials
  - c. pH test strips or pH paper
  - d. A ruler
  - e. A wash bottle or dropper bottle of distilled water (don't use tap water for this)
  - f. Hand lens (aka magnifying glass)
  - g. Paper towels
  - h. A disposable cup for solid waste
  - i. Writing instruments
  - j. Safety gear – see rule #7.
  - k. Teams may bring one 8.5" x 11" two-sided page of notes containing information in any form from any source.
6. **EVENT LEADERS:** Event leaders will provide evidence at a central location or pre-organized bags of evidence for each team along with the following:
  - a. Iodine reagent (KI solution) Note: ***Be sure to check with parents about Iodine allergies before assigning students to this event.***
  - b. Vinegar
  - c. Isopropyl (rubbing) alcohol
  - d. A waste container

The event leader may provide additional equipment such as microscopes or special demos as the test calls for; instructions on additional equipment will be given if deemed necessary. Flame tests are not permitted.

7. **SAFETY REQUIREMENTS:**

Students must wear the following or they cannot participate:

  - a. Closed-toed shoes
  - b. Safety goggles (indirect vent goggles)
  - c. Long hair must be tied back
  - d. Optional: aprons, gloves, and lab coats

Students who unsafely remove their safety goggles or are observed handling any of the material or equipment in a hazardous/unsafe manner (e.g., tasting chemicals or flushing solids down a drain) will be disqualified from the event.

8. **IMPOUND:** No

## Super Sleuths, page 2

9. **THE COMPETITION:** Teams will be given a scenario that introduces a crime, suspects, and sources of evidence. Teams will perform tests on the evidence to identify the perpetrator of the crime and write up their analysis of the crime.
- a. **Crime Scene Chemical Evidence:**
- i. Powders: Teams will be asked to identify up to 5 of the following powders. There will be no mixtures of powders.

Alka Seltzer (powdered)	crystal sugar	sodium acetate
baking soda	flour	sodium carbonate
calcium carbonate	gypsum (calcium sulfate)	vitamin C (ascorbic acid)
citric acid	non-iodized table salt	yeast
cornstarch	powdered milk	

- ii. General Knowledge: Teams will be expected to answer questions about the tests they perform, chemical and physical properties of the powders, and proper lab procedure. Example questions:
1. If the pH of a substance is 3.5, is it acidic or basic?
  2. What does it mean if a powder turns black in the presence of iodine?
  3. What is the chemical name and chemical formula of table salt?
  4. What is the proper method to smell a chemical?
- b. **Crime Scene Physical Evidence:**
- i. Fingerprints: Participants may be asked to identify different patterns on fingerprint evidence such as the difference between whorls, loops, and arches and compare fingerprints from the crime scene to suspect's fingerprints.
- ii. Spatters: Analyze spatter patterns for speed and direction of impact. No calculations are expected to be performed.
- c. **Analysis of the Crime:**  
Students will answer questions about which pieces of evidence implicate which suspect and why the suspect was chosen as the culprit, and also why the other suspects were not chosen. They will also answer any other crime scene analysis questions posed by the event supervisor.
10. **SCORING:** The team with the highest score wins. Time will not be used for scoring. The score will be composed of the following elements (percentages given are approximate):
- a. Analysis of chemical evidence 50%, analysis of physical evidence 30%, and analysis of the crime 20%.
  - b. Tiebreaker: The highest score on the chemical evidence analysis will break ties.
  - c. A 10% penalty may be given if the area is not cleaned up as designated.
11. **EVENT RESOURCES:**  
See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.

## Weather Permitting



1. **DESCRIPTION**: This event will test the team’s knowledge of conducting investigations and using appropriate technology to build an understanding of **Climate**.
2. **ESSENTIAL STANDARDS ALIGNMENT**: 2.E.1, 5.E.1
3. **TEAM OF UP TO**: 2
4. **MAXIMUM TIME**: 60 min.
5. **TEAMS**: Must bring writing instruments. No other resources are allowed.
6. **EVENT LEADERS**: Will provide a hands-on event with all necessary items, maps, charts data sets, materials, questions, and response sheets for participants to complete stations.
7. **SAFETY REQUIREMENTS**: None
8. **IMPOUND**: No
9. **THE COMPETITION**: This event can be run as sit-down test or a station format. Teams will rotate through stations that assess any or all of the following topics:
  - a. Locating climate zones around Earth and describing the conditions in each.
  - b. Explaining why climate zones are located where they are.
  - c. Observing and interpreting data to determine the climate of certain areas.
  - d. Examining historical data to describe and explain shifts in climate.
  - e. Explaining the factors that can cause the climate to be different than expected in a certain location.
  - f. Comparing climates in different areas and explaining why they are different.
  - g. Matching areas with the appropriate climate data.
  - h. Describing the climate in a given area.
10. **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.
11. **EVENT RESOURCES**:  
See the Event Resources tab on our website ([ncscienceolympiad.ncsu.edu](http://ncscienceolympiad.ncsu.edu)) for instructions, videos and more.