



2026

Division A

Official Rules Manual

North Carolina Science Olympiad ©2026

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Introduction

Science education is crucial for developing critical thinking, problem-solving skills and a deeper understanding of the world, preparing students for future careers and informed decision-making. This is especially true at the elementary level, where students build their knowledge base to serve as a gateway for future science courses and career choices. The purpose of this manual is to support counties, schools, non-profits, home schools, and other interested groups in promoting, offering, and competing in North Carolina Elementary Science Olympiad tournaments for students in grades 3-6.

We must provide elementary students opportunities, like the Olympiad, that encourages students to analyze information, draw conclusions and evaluate evidence. These opportunities provide the framework for understanding the world, including the impact of scientific advancements and their implications. Students learn to approach problems systematically, using the scientific process to test ideas and develop solutions. Throughout the journey, they face unique challenges, such as dealing with failure, and learning to navigate the concept of teamwork. With the added pressure of testing and occupations moving rapidly in the direction of STEM, it is essential that students and teachers benefit from every opportunity they are given to further their STEM knowledge and skills. The North Carolina Elementary Science Olympiad will improve the learning of science for all students and celebrate their efforts.

Elementary Tournament Schedule

During an NC Elementary Science Olympiad tournament, **15 events** are run in **three** different time periods (see the 2026 elementary tournament schedule below). Each team at an elementary tournament is given a team number (e.g., 12). The team with team number 12 would follow the schedule for teams 11-20. If your team had team number 6, it would follow the schedule for teams 1-10 below.

[2026 Division A Regional Tournament Schedule](#)

(Click the link above for more information)

			Period 1	Period 2	Period 3	
Event	7:30 - 8:30	8:30-9:00	9:00 - 10:15	10:30 - 11:45	12:30 - 1:45	3:00
The Adaptables	Coach & Volunteer Registration		1 - 10	11 - 20	21 - 30	Award Ceremony
Bone & Brawn			21 - 30	1 - 10	11 - 20	
Bridgearoni			21 - 30	1 - 10	11 - 20	
Coastal Countdown			1 - 10	11 - 20	21 - 30	
Codebusters			11 - 20	21 - 30	1 - 10	
Dino Nuggets			1 - 10	11 - 20	21 - 30	
Egg-O-Naut			21 - 30	1 - 10	11 - 20	
Genes R Us			1 - 10	11 - 20	21 - 30	
In Metrics We Trust			11 - 20	21 - 30	1 - 10	
Just Plane Awesome			1 - 10	11 - 20	21 - 30	
Movers & Shakers			11 - 20	21 - 30	1 - 10	
Planet Protectors			21 - 30	1 - 10	11 - 20	
Ramp & Roll		Impound	11 - 20	21 - 30	1 - 10	
Super Sleuths			11 - 20	21 - 30	1 - 10	
What's The Matter?			21 - 30	1 - 10	11 - 20	
Lunch:						
Eat lunch between Period 2 and Period 3						
Team Numbers:						
#1-30 on the schedule indicate assigned team numbers. Team numbers are assigned alphabetically by school once registration closes, generally one month in advance of the tournament. Assigned team numbers will be announced to coaches from NCSO once assigned.						

It helps to think of an elementary Science Olympiad tournament like a track meet. During a track meet, team members may compete in hurdles or the 100-meter dash, and they work in practice throughout the year to improve and get better at the events they are competing in. The team member may win a medal individually for each event, but their performance ultimately tallies into the team score. Similarly, in the Olympiad, team members pair up to specialize and become experts in **2 or 3 events** (out of the fifteen) and compete in only these events at the tournament on behalf of their team. For example, team members compete in Backyard Biologist with a partner or Sky Quest with a partner, and work throughout the year to improve and get better at their events. On the day of the tournament, they compete in these events to win individual medals and to do as well as possible to bring home a team win (trophy). In summary, each team member chooses **2 or 3 events** to become “experts” during the year, works with a partner on each event, and then competes in chosen events at the tournament with their partner to medal and post a high rank for the team. **The maximum number of events a team member can compete in is 3.**

Elementary Tournament Scoring



Each event team (of two students) in *each* event will be ranked. For a 15-team tournament, the possible ranks are from 1st to 15th place because there are 15 teams. Teams finishing 1st place in an event receive **1 point** for their team; events finishing in 8th place receive **8 points** for their team; events finishing last place receive **15 points** for their team (not good). If a team decides NOT to compete in a particular event, that event gets an NS (No Show) for the whole team. In this case, the team would get a score of $N + 1$, where N = the number of teams in the tournament. In our example, there are 15 teams, so a team that doesn't compete in a particular event will receive a score of $15 + 1$ for that event, **16 points** (also not good). The ranks for all

fifteen events are added together to get a "team score" which determines 1st, 2nd, and 3rd place overall teams for each tournament. **LOW score wins!** In addition, at least 1st, 2nd, and 3rd place medals are given out for each event (for big tournaments, there may be more than 3 places given out). Each team member is competing for individual medals and an overall team trophy.

Elementary Team Coaching

An elementary team must have a head coach. A head coach registers and manages the school or organization's teams via the [NCSO website](#) and serves as the point of contact for tournament organizers. The head coach may be a parent, teacher, principal, business person, community organizer, or any other caring adult. Successful teams are organized and supported by a head coach who is willing to make decisions and provide leadership. The head coach must be aware of all the rules, manage the coaching resources, recruit students and assistant coaches, involve the parents, and provide a clear reason for the team to prepare and compete.



NCSO follows a ["Never Alone" policy](#) to help ensure the safety of our students and volunteers. This means that volunteers should never be alone with a student who is not related to them. NCSO also requires that

coaches have all people helping with their team register with their school as a volunteer and complete the school district's background check procedure.

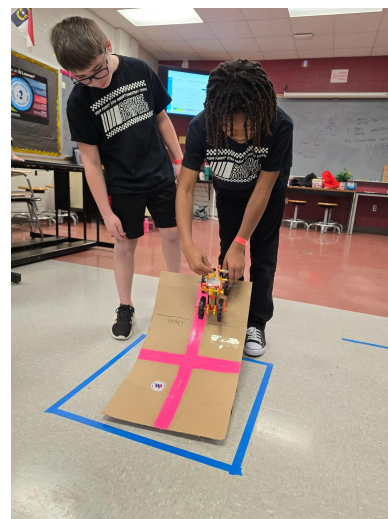
Elementary Team Composition

An elementary team will consist of students in grades 3-6 and of **up to 15 students**. There is no minimum number of students needed to compete, but in order to be competitive across the 15 events, it is best to have at least approximately 10-12 students. **A maximum of five (5) sixth graders** are allowed on any one team. Teams wanting to use students below third grade are allowed to do so. Teams will not be restricted by school affiliation or enrollment. This means that a coach can recruit and organize eligible students regardless of their association with any means of garnering an education (public, private, charter, home school).

Multiple Teams

Schools, organizations, and coaches may have as many teams as they like competing in an elementary tournament. Teams should strive to have a balanced representation of grades, gender, and ethnic background represented by the school/group. In all cases, each team must be registered via NCSO and supervised/coached by a parent/teacher/coach.

The first team from any school or organization is considered the Varsity team, and any additional teams after that are Junior Varsity (JV) teams, simply numbered JV1, JV2, and so on for however many teams the school has. All students compete in the same room at the same time but each team must be distinguished and separated. The Varsity/JV team designation also comes into play with distribution of medals and trophies. Varsity teams compete against the other Varsity teams for one set of medals and trophies, and JV teams compete against all other JV teams for a second set of medals and trophies. Therefore, it is not possible for a school or organization to earn more than 1 Varsity medal. This is to help ensure that one school or organization with a large number of teams cannot “sweep” the competition and earn all the medals. A minimum of 3 JV teams must be registered in an NCSO tournament to receive JV trophies. However, tournaments with less than 3 JV teams will have the JV teams scored with the Varsity teams and receive medals in cases where JV teams place in medal positions. **Varsity and JV teams cannot “mix and match” their students.** The varsity team members must compete with the other varsity team members in an event, JV1 with JV1, JV2 with JV2, etc. Likewise, Varsity and JV **cannot share devices or resources in events**; for example, the Varsity and JV teams from the same school cannot share a guidebook or use the same bottle rocket.



Tournament Registration & Fees



Team registration opens the first Monday of September. Registration information and links can be found on the [NCSO website](#). Teams will register for a tournament based on their school's county or zip code. Teams cannot opt to travel and compete at a different elementary tournament. Extenuating circumstances require approval and can be presented to the NCSO Director for consideration (i.e. a significant date conflict with another large school event). We recommend registering ASAP, as many tournaments do reach capacity.

The registration fee for each elementary team is \$350. If schools have multiple teams (Varsity, JV1, JV2, etc.) this fee is paid for each team. **Payment is due at the time of registration** or should be received by the NCSO **within 30 days of registration**. This fee helps cover the cost of running the local tournament and pays for facility fees, equipment, materials, trophies, and medals. Teams may also incur the cost of transportation to and from the tournament site, lunch and snacks on the tournament day, and purchasing materials used for practicing for events (although most materials needed for events are commonly found at home and in educational settings).

Tournaments must have a minimum of **10** registered teams one month prior to the tournament date in order to host the tournament. Each tournament registration deadline is one month prior to the tournament. This allows sufficient time for preparing for the number of teams that will participate.

New and existing tournaments must be approved by the NC Science Olympiad State Director and should NOT restrict team participation (i.e. only elementary schools from “X” county, only homeschool teams from “Z” county, etc.). The NC Science Olympiad program will be selective with approved tournament sites and want any and all teams in a certain geographic region to be able to participate.

Sample Science Olympiad Timeline

The following is an example schedule to help you think about how you might design your own. The timeline may shift depending on the regional tournament date and school calendar. **If you start later in the year than this, don’t worry! The first year is a learning year, do your best and bring the team to a tournament to celebrate all they learned!**

August/September	● Register team(s) online and pay fees ● Bookmark the Division A Event Manual - check back for updates often ● Recruit students, parents, and coaches ● Get the support of Administration
October	● Coaches attend NCSO Coaches Conference at NC State
October – December	● Hold interest meetings that showcase some of the events ● Students fill out interest form for what events they want to compete in ● Head Coach decides who will participate in each event
January – Competition day	● Prepare for Regional Competition. This looks very different for various teams. Some have 1 set meeting day each week, some meet with their individual event coaches outside of school, and some practice on Saturdays. Do whatever works for you and your team. ● Order or make team t-shirts (not required, but kids love this) ● Organize, study, and build unity with partners and team members ● Check the regional webpage on the NCSO website often for tournament updates, rule clarifications, and frequently asked questions.
After the competition	● Evaluate results from the Regional Competition, have a team celebration, and plan what you will change for next year.

Elementary Event Descriptions

The Adaptables - Teams will be assessed on their knowledge of various animal adaptations and how those adaptations benefit the animals.

Bone & Brawn - Teams will demonstrate knowledge of the human skeletal and muscular systems.

Bridge-A-Roni - The objective of this event is to design and build a bridge, constructed only of pasta and glue, with the greatest structural efficiency. Each team may bring and enter only one pasta bridge.

Coastal Countdown - Students will use science and engineering practices and process skills to complete tasks related to sea level rise, sunny day flooding, and water quality in coastal towns.

Codebusters - Teams will cryptanalyze (decode) encrypted messages using cryptanalysis techniques and show skill with ciphers by decrypting a message.

Dino Nuggets - Teams will be assessed on their knowledge of dinosaurs, fossils and the fossilization process.

Egg-O-Naut - Prior to the tournament, teams will construct up to two rockets designed to stay aloft the greatest amount of time while carrying an Egg-O-Naut (a raw Grade A large chicken egg) that survives (doesn't break) on impact.

Genes R Us - 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.

In Metrics We Trust - Teams will demonstrate their understanding of metric measurement by estimating and measuring length, mass, fluid volume, angles, and temperature and be able to make calculations based on these measurements.

Just Plane Awesome - Prior to the tournament teams will construct up to two rubber-powered monoplanes. Planes will be tested to achieve maximum time aloft.

Movers & Shakers - Teams will be assessed on their knowledge of earthquakes and volcanoes and related land formations.

Planet Protectors - Teams will be assessed on their knowledge of human interaction with the earth, including interacting positively and negatively with the environment, resource use, and consequences of these interactions.

Ramp & Roll - Teams will build a ramp and vehicle to transport an object a certain distance and stop as close to the target point as possible at the tournament.

Super Sleuths - Given a mystery scenario, evidence, and a list of possible suspects, teams will be expected to perform a series of tests to solve the crime.

What's The Matter? - Teams will be assessed on their knowledge of the physical properties of matter and the behavior of solids, liquids, and gases before and after they undergo changes or interactions.

The Adaptables

1. **DESCRIPTION**: Teams will be assessed on their knowledge of various animal adaptations and how those adaptations benefit the animals.
2. **ESSENTIAL STANDARDS ALIGNMENT**: LS.3.2, LS.3.3, LS.4.1, LS.5.2
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 an 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**: One half of this event will be run in a station format. Teams will rotate through stations and respond to questions at each station. The other half of the event will consist of a challenge where the team must either design an animal to match a certain habitat or design a habitat suitable for a certain animal.

During both parts of this event, teams must be able to:

Part 1:

- a. Describe and explain how behaviors and body structures help different animals survive in a particular habitat.
- b. Describe ways that humans and other animals can adapt their behavior to live in changing habitats and explain why the adapted behaviors work.
- c. Observe the adaptations of different animals and describe the habitat that best supports those adaptations including:
 - i. How to get food
 - ii. How to avoid predators
 - iii. How to protect their young
 - iv. How to survive in different physical environments

Part 2:

- d. Design (i.e. draw and label) an animal with certain adaptations that would allow it to survive under certain environmental conditions or design an ideal environment for a given animal.
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**: <https://ncscienceolympiad.ncsu.edu/resources/elementary/>

Bone & Brawn

1. **DESCRIPTION:** Teams will demonstrate knowledge of the human skeletal and muscular systems.
2. **ESSENTIAL STANDARDS ALIGNMENT:** LS.3.1, LS.5.1
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:** 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, pictures, or diagrams.
7. **SAFETY REQUIREMENTS:** None
8. **IMPOUND:** No
9. **THE COMPETITION:** This event will run in a station format. Teams will rotate through stations that assess any or all of the following topics with any combination of questions, models, pictures or diagrams:
 - a. Structure and function of the skeletal system (see Official Bone & Muscle List below)
 - b. Structure and function of the muscular system (see Official Bone & Muscle List below)
 - c. Problems and disorders associated with these systems (bunions, fractures, osteoporosis, rheumatoid arthritis, rickets, sprains, cramps)
 - d. Sample activities:
 - i. Identify the bones in the human leg from a picture, model or x-ray
 - ii. Match each joint type to its description
 - iii. Label if listed actions are caused by a muscle or a tendon
 - iv. Skeletal, Cardiac, or Smooth - which muscle type is shown?
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:** <https://ncscienceolympiad.ncsu.edu/resources/elementary/>

Official Bone & Muscle List

Bones and Joints:

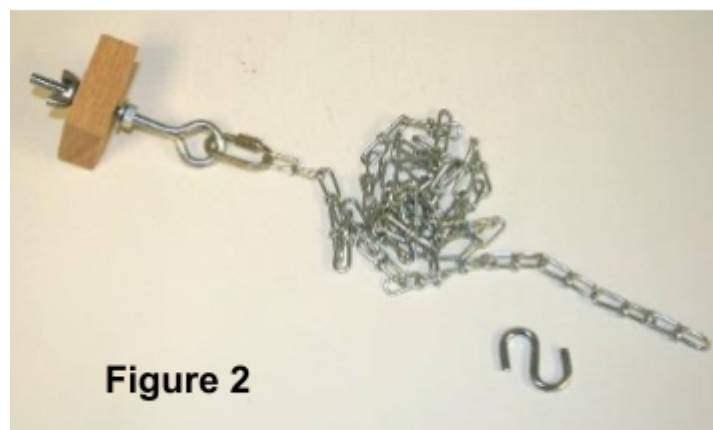
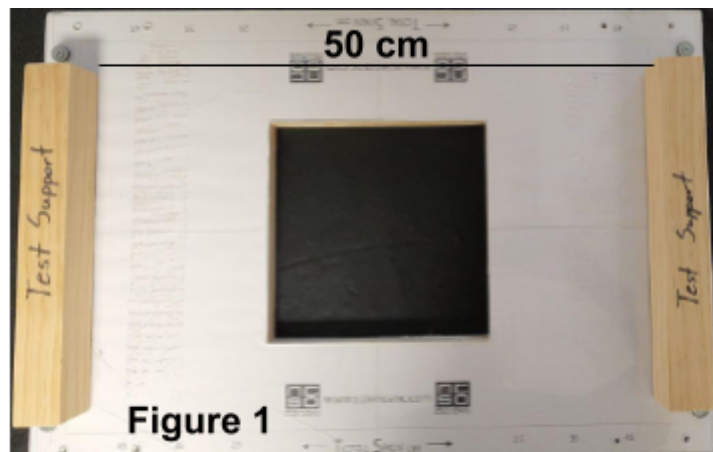
Ankle
 Arm (humerus, radius, ulna)
 Clavicle (collar bone)
 Cranium (frontal, parietal, mandible, teeth)
 Foot (calcaneus, tarsals, metatarsals, phalanges)
 Hand (carpals, metacarpals, phalanges)
 Hip
 Leg (femur, fibula, tibia, patella)
 Pelvis (ilium)
 Rib cage (true ribs, sternum)
 Scapula
 Spine (cervical, thoracic, and lumbar vertebrae, coccyx)
 Wrist

Muscles and Tendons:

Abdominals
 Achilles tendon
 Arm (deltoid, biceps brachii, triceps brachii)
 Back muscles (latissimus dorsi, trapezius)
 Calves (triceps surae)
 Chest muscle (pectoralis major)
 Diaphragm
 Gluteus maximus
 Hamstrings (biceps femoris)
 Heart (cardiac muscle)
 Quadriceps (quads)

Bridge-a-Roni

1. **DESCRIPTION:** The objective of this event is to design and build a bridge, constructed only of pasta and glue, with the greatest structural efficiency. 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 a bridge, constructed prior to the event, 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. Testing Device capable of supporting the Test Base, Test Supports, Bridge, Loading Block, Chain Assembly, and at least 12 kg of sand throughout the testing.
 - b. Test Base consisting of a piece of plywood, or similarly rigid material, with a 20 cm x 20 cm opening in the middle. The Test Base will be at least 55 cm long by 32 cm wide.
 - c. Two Test Supports that must be **at least** 1-½ inches by 1-½ inches by 6 inches (see **Figure 1**). Test Supports are placed on top of a Testing Base. The Span in 9.b will be measured from the face of each Test Support block closest to the opening in the Test Base.
 - d. 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 ~3/16" chain. Additionally, an S-hook and/or carabiner may be used as part of the Chain Assembly (see **Figure 2**).
 - e. 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 .01 g (the "bridge scale"). Bridges exceeding the capacity of the bridge scale will be massed on the sand scale instead.
 - f. Sticks for stabilizing the sand bucket.
 - g. A plastic tarp to protect the floor from sand, if needed. The tarp will be placed beneath the Test Device(s).
 - h. A minimum of 12 kg of clean sand free of large rocks, pieces of pasta/balsa wood.



Bridge-a-Roni - Page 2

7. **SAFETY REQUIREMENTS:** Teams must wear safety glasses throughout the event.
8. **IMPOUND:** None
9. **CONSTRUCTION:**
 - a. The bridge is to be a single structure constructed of **ONLY** pasta and glue. Other materials are not allowed, including paint, rubber bands, twist ties, etc. Homemade pasta is allowed, but additional ingredients, such as metal fibers, cannot be added to the dough.
 - b. The bridge must be free standing and span a **50.0 cm** gap while resting on top of the Test Supports on the platform. The span between the Test Support blocks will be measured per 6.c.
 - c. The bridge shall not exceed **70.0 cm** in length, **10.0 cm** in width, and not extend below the top of the testing platform when unloaded.
 - d. The minimum height of the bridge is **15.0 cm** (measured from the top of the Test Support blocks); the maximum height of the bridge is **40.0 cm**.
 - 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 and above the minimum height per 9.d.
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 are expected to handle their 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 device themselves so that the ends of the bridge rest only on the top surfaces of the Test Supports.
 - 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. The bucket must be suspended above the floor with enough clearance so that the bucket will not touch the floor throughout the duration of testing.
 - f. The team will be given **3 minutes** to load sand into the bucket once the Loading Block and bridge are positioned. One student will control the flow of sand while the other student uses stabilizing sticks to keep the bucket from swinging. Stabilizing sticks must **NOT** be used to “hold up” the bucket in any way.
 - 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 the chain touches the edge of the 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.

Bridge-a-Roni - Page 3

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 3 tiers:
- Tier 1: Bridges with no violations
 - Tier 2: Bridges with construction violations
 - Tier 3: 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. Final rankings are determined by Tier first, then Structural Efficiency score second, then any applicable tie-breakers. Any bridge in Tier 1 will be ranked ahead of all bridges in Tiers 2 & 3 regardless of score.
- e. Ties will be broken in favor of the team with the lighter bridge.

12. **EVENT RESOURCES:** <https://ncscienceolympiad.ncsu.edu/resources/elementary/>

Bridge-a-Roni Score Sheet

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

Student Names: _____

NEVER HANDLE TEAMS' BRIDGES. LET THEM PLACE IT ON THE SCALE, ON THE PLATFORM BLOCKS, AND ALLOW THEM TO PLACE LOADING BLOCK AND CHAIN ASSEMBLY ON THEIR OWN BRIDGES. YOU DON'T WANT IT TO BE YOUR FAULT THAT A BRIDGE BREAKS PRIOR TO TESTING.

Teams must wear proper eye protection at all times during bridge testing.

PRIOR TO TESTING:

What is the mass of the bridge to the nearest 0.01 g? _____ g

Construction Parameters	YES	NO
The bridge is a single structure constructed of ONLY pasta, multi-purpose glue, and/or hot glue.		
The bridge is free standing and spans a 50.0 cm opening while resting on top of the testing platform blocks.		
The bridge is ≤ 70.0 cm in length, ≤ 10.0 cm in width, ≥ 15.0 cm and ≤ 40.0 cm in height <u>and</u> does not extend below the top of the testing platform when unloaded.		
The bridge supports the loading block and chain assembly at the center of its span and allows the chain to hang freely.		
Teams with a "no" checked above will be placed in Tier #2 (Circle One).	TIER 1	TIER 2

Check the reason testing stopped: ___Time Expired ___Bridge Failed ___Load Completely Held

$$\frac{\text{_____ g}}{\text{(mass supported)}} \div \frac{\text{_____ g}}{\text{(mass of bridge)}} = \frac{\text{_____}}{\text{(Structural Efficiency)}}$$

Final Tier: _____ **Final Rank:** _____

(Ties broken by the lowest bridge mass)

Coastal Countdown

1. **DESCRIPTION:** Students will use science and engineering practices and process skills to complete tasks related to sea level rise, sunny day flooding, and water quality in coastal towns.
2. **ESSENTIAL STANDARDS ALIGNMENT:** ESS.3.2, ESS.4.2, ESS.4.3, ESS.5.1
3. **A TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** 60 min.
5. **TEAMS:** Each team may bring one 8.5" x 11" sheet of paper that may contain information on both sides in any form from any source without any annotations or labels affixed. This rule is to prevent teams from affixing annotations or labels that increase the surface area of the 8.5" x 11" sheet of paper.
6. **EVENT LEADERS:** Will provide a hands-on event with all necessary items, objects, materials, questions, and response sheets for participants to complete the event.
7. **SAFETY REQUIREMENTS:** None
8. **IMPOUND:** No
9. **THE COMPETITION:**
 - a. Participants will be given instructions to set up an experiment related to sea level rise and/or sunny day flooding, make a hypothesis in "If, then, because" format, collect data, and write a conclusion based on that data in "Claim, Evidence, Reasoning" format.
 - b. Participants will be presented with questions which may include one or more tasks at a workstation or a timed station to station format.
 - c. The participants will be expected to use science and engineering practices and process skills (e.g., using models, analyzing and interpreting data, using mathematics and computational thinking, constructing explanations, engaging in argument from evidence, etc.) to answer questions on the following topics:
 - i. Causes, effects and solutions/mitigation strategies to global and US regional sea level rise.
 - ii. Causes, effects, and solutions/mitigation strategies to sunny day/high tide flooding.
 - iii. Relationship between sea level rise and sunny day/high tide flooding.
 - iv. Causes and effects of King Tides.
 - v. Effects of stormwater runoff, high tide floods, and king tides on water quality, including physical and biological parameters
10. **SAMPLE QUESTIONS/TASKS:**
 - a. Teams will be asked to analyze graphs, maps, pictures, and data charts related to the above topics. Use the tools in the resource document for practice.
 - b. Teams must understand how to write a hypothesis in "If, then, because" format and draw conclusions from data and communicate those conclusions in "Claim, Evidence, Reasoning" format. See resources.
 - c. What is a sunny day flood and what causes it?
 - d. What are some impacts of sunny day floods on communities and ecosystems?
 - e. What is a king tide and how does it relate to sunny day flooding and sea level rise?
 - f. Explain how sea level rise occurs. Discuss greenhouse gas concentration, melting ice, thermal expansion and land subsidence.
 - g. Describe some impacts of sea level rise.
 - h. Describe some ways to mitigate or adapt to sea level rise now and in the future.

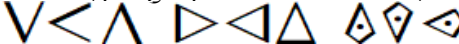
Coastal Countdown - Page 2

11. **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.

12. **EVENT RESOURCES:** <https://ncscienceolympiad.ncsu.edu/resources/elementary/>

Codebusters

1. **DESCRIPTION:** Teams will show their cryptanalysis skills by decoding encrypted messages using various techniques and ciphers.
2. **ESSENTIAL STANDARDS ALIGNMENT:** Science as Inquiry
3. **TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** 50 minutes
5. **TEAMS:** Must bring writing utensils. No other resource materials or tools are allowed.
6. **EVENT LEADERS:** Will provide scratch paper and a resource sheet for each team to use. The resource sheet will include English letter frequencies, Atbash, DancingMen, and Vigenère tables but will NOT provide the PigPen, TapCode, or Knight's Templar Cipher tables
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:
 - i. Mono-alphabetic substitution Aristocrats – messages with spaces included – with or without a hint
 - ii. Atbash Cipher (in English, not Hebrew)
 - iii. 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).
 - iv. The Vigenère Cipher – Decrypting ciphertext given a key.
 - v. The PigPen Cipher, also called the Masonic Cipher – Decrypting ciphertext with no mapping table provided.
 - vi. 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.
 - vii. The DancingMen Cipher – Decrypting ciphertext encoded by DancingMen symbols based on the Sherlock Holmes story "The Adventure of the Dancing Men"
 - viii. The Knight's Templar Cipher - Decrypting ciphertext encoded by the Knight's Templar symbols with no mapping table provided.  decodes to ABC EFG WXY.
 - ix. For the Aristocrat Cipher - no letter can ever decrypt to itself.
10. **SCORING:**
 - a. High score wins.
 - b. Based on difficulty, each question will be worth a clearly indicated number of points.
 - c. 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 50 points.
 - iii. The penalty will not exceed the value of the question. For example, a 200-point question with 4 errors is worth 100 points whereas the same 200-point question with 7 errors would be worth 0 points, not -50 points.
 - d. The scores for each question will be added to determine the exam score.
 - e. 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:** <https://ncscienceolympiad.ncsu.edu/resources/elementary/>

Dino Nuggets

1. **DESCRIPTION**: Teams will be assessed on their knowledge of dinosaurs, fossils and the fossilization process.
2. **ESSENTIAL STANDARDS ALIGNMENT**: ESS.4.2, LS.4.2
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 attached using the available rings. This means 2 guides, or 2 binders, or a guide and a binder. Sheet protectors, lamination, tabs, and labels are permitted in the binder. Field guides may be tabbed or annotated. If the event features a rotation through a series of laboratory stations where the participants interact with samples, specimens, or displays, no material may be removed from the binder throughout the event. Teams may also bring up to 2 hand lenses or magnifying glasses.
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. Identify specimens on the Official Dinosaur and Fossil List from pictures, replicas, actual specimens, descriptions, etc.
 - b. Identify conditions required for a plant or an animal to become fossilized.
 - c. Distinguish between modes of preservation: petrification, mineral replacement, cast/mold, imprint, encasement in amber/copal, mummification, freezing, entrapment in tar/asphalt.
 - d. Make inferences about dinosaurs from footprints, teeth, body structures and coprolites. Examples may include, but are not limited to, determining whether a dinosaur was a carnivore or herbivore based on the type of teeth, spikes present on a tail were likely used for defense, and bones or other distinguishable parts present in a coprolite indicate the diet of the dinosaur.
 - e. 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.
 - f. Identify the geologic time period (Triassic, Jurassic, or Cretaceous) each dinosaur on the Official Dinosaur and Fossil List is from.
 - g. Distinguish between carnivores, herbivores, and omnivores when given evidence based on jaws, teeth, footprints, etc.
 - h. Distinguish the type of environment: marine, terrestrial, fresh water, etc. for all species listed on the Official Fossil List or when given clues from the fossil record.
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 the competition.
11. **EVENT RESOURCES**: <https://ncscienceolympiad.ncsu.edu/resources/elementary/>

Dino Nuggets | Official Dinosaur & Fossil List

Students will have to know common names only!

INVERTEBRATES

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

VERTEBRATES

Bony Fish (*Osteichthyes*)
Ichthyosaurs
Plesiosaurs
Pterosaurs
Sharks (Shark Teeth) and Rays

Dinosaurs

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

TRACE FOSSILS

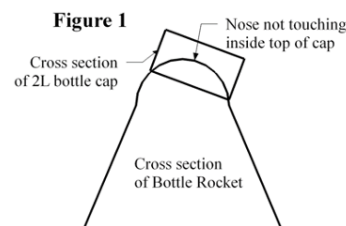
Burrows, Tubes
Coprolites
Tracks, Trackways
Trails, Borings

OTHER

Amber
Petrified Wood

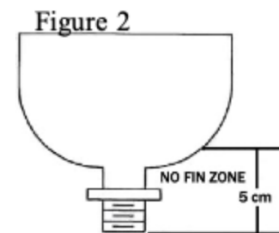
Egg-O-Naut

1. **DESCRIPTION:** Prior to the tournament, teams will construct up to two rockets designed to stay aloft the greatest amount of time while carrying an Egg-O-Naut (a raw Grade A large chicken egg) that survives (doesn't break) on impact.
2. **ESSENTIAL STANDARDS ALIGNMENT:** PS.3.1, PS.5.1, Science as Inquiry
3. **TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** 10 min.
5. **TEAMS:** Teams must bring up to two rockets, constructed prior to the event, carbonated beverage bottle labels (if removed) and safety glasses. Teams may also bring funnels, measuring cups, and/or other tools to help prepare their rockets.
6. **EVENT LEADERS:** Event leaders will provide raw, Grade A large chicken eggs, water rocket launcher and water, scoresheets and timers. The event leader will place an identifying mark (using a Sharpie or ink stamp) on the eggs to ensure that teams are using provided eggs. They may also provide funnels and measuring devices.
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 or smaller plastic carbonated** beverage bottle.
 - i. **LABELS** may be removed from the bottle but labels must be presented at the safety inspection to prove the bottle is carbonated. Rockets without labels must not be launched, as this is a safety issue.
 - ii. **BOTTLE OPENING:** Must have an internal diameter of approximately 2.2 cm. 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.
 - iii. **STRUCTURAL INTEGRITY:** The structural integrity of the pressure vessel must not be altered. This includes, but is not limited to: physical, thermal, or chemical damage (e.g., cutting, sanding, using hot or super glues). Alteration to the structural integrity of the pressure vessel is a safety violation of the rocket and it must not be launched. Event supervisors must assess the structural integrity by looking through the nozzle and sides of the bottle for discoloration, bubbles, thinning or cuts in the walls. Rockets violating this rule must not be launched, as this is a safety issue.
 - b. **MATERIALS:**
 - i. Metal of any type (including tape with metal fibers) is prohibited anywhere on the rocket. Rockets violating this rule must not be launched; this is a safety issue.
 - ii. Toy or professional rockets or parts of rockets are not allowed.
 - c. **NOSE CONE:** Rockets and separated components 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.



Egg-O-Naut - Page 2

- d. **FINS and OTHER PARTS:** Only tape must be used to attach fins and other components to the pressure vessel. No glues of any type may be used on the pressure vessel. Fins and other parts added to the pressure vessel must be 5 cm or higher above the level of the bottle's opening to ensure rockets fit on the launcher (see Figure 2).



- 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.
- f. **RECOVERY SYSTEM:** Any free-fall recovery system (such as a parachute) is allowed, but not required, as long as it does not violate any other rule and is deemed safe. Potential or kinetic sources of energy may be used in the recovery system; however, objects (such as plastic springs, rubber bands, etc.) must be in their lowest energy state at launch.
- g. **EGG:** The rocket(s) must be built so that the egg provided by the event leader is easily removed. Nothing (e.g., glue or tape) may be adhered to the egg. The part of the rocket containing the Egg must be differently colored if it is supposed to detach from the rocket.

10. **THE COMPETITION:**

- a. Teams must arrive at the competition site ready to launch with proper eye protection on. Teams without proper eye protection must be immediately informed and given a chance to obtain eye protection if time allows, otherwise they will not be allowed to compete and receive participation points only.
- b. All rockets must be launched using the launcher and water provided by the event leader.
- c. **Only one launch is allowed per rocket. If a team wishes to use both launches, they must have 2 rockets. The second rocket may be launched prior to retrieval of the Egg from the first rocket.**
- d. Following the safety inspection of each rocket, teams will add any amount of 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.**
- e. All rockets will be launched at **60 psi**. Once the rocket is pressurized, no contestant may touch or approach the rocket.
- f. Time aloft is recorded in hundredths of a second. Timing begins when the rocket separates from the launcher and stops **when the portion of the rocket containing the egg** touches the ground, goes out of sight, or comes to rest on a tree, building, or other obstruction (i.e. a tree or building).
- g. The teams will retrieve their rockets and immediately show the rocket or capsule with the Egg to an event leader. Any Egg capsule or wrapping must be opened in the presence of an event official.
- h. 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.

10. **SCORING:**

- a. Rockets that violate a safety-related rule under Construction Parameters will not be launched and will receive participation points only.
- b. Any launch with competition violations, or non-safety construction violations will receive a **-5.00 second penalty**. (negative scores are possible)
- c. Any Egg-O-Naut (or portion of the rocket containing the egg) that completely detaches from the pressure vessel will receive a **10 second bonus**. Rockets whose parts (e.g. fins) do not remain linked while aloft will not be disqualified or penalized.
- d. Eggs that can be retrieved and survive will receive a **5 second bonus**. An egg's survival is defined as not cracking the egg enough to leave a wet spot on a paper towel. An Egg that cannot be retrieved will not receive this 5 second bonus.

Egg-O-Naut - Page 3

- e. The score for each rocket launch will be equal to its time aloft plus bonus seconds for Egg-O-Naut capsule separation (+10.00 second bonus) plus bonus seconds for Egg-O-Naut survival (+5.00 second bonus) minus penalty seconds for competition or non-safety violations.
 - f. Ranking is determined by the greatest time aloft for **one rocket** flight. Rockets that cannot be tested for any reason (e.g. safety issue, does not fit on launcher, etc) will be given participation points only.
 - g. Tiebreakers: First tiebreaker is the better score of each tied team's other rocket launch. If you have two tied teams and one launched a second rocket, and the other did not then the team that launched a second rocket wins the tie breaker. Second tiebreaker is team with the most bonus points. Third tiebreaker is averaging the times of the three timers for the launch and the lowest average time score wins.
12. **EVENT RESOURCES:** <https://ncscienceolympiad.ncsu.edu/resources/elementary/>

Egg-O-Naut Score Sheet

School Name: _____ Team (Circle One): V JV1 JV2 JV3

Student Names: _____

ROCKET 1 / LAUNCH 1	ROCKET 2 / LAUNCH 2
Safety Criteria _____ 2-liter or less carbonated beverage bottle _____ Bottle label present _____ Only tape used on pressure vessel _____ Pressure vessel unaltered _____ No metal parts anywhere on rocket _____ Rocket has a blunt or rounded nose _____ Recovery system is safe (if used) _____ Only water/air used to launch _____ Team wearing Z87+ safety glasses	Safety Criteria _____ 2-liter or less carbonated beverage bottle _____ Bottle label present _____ Only tape used on pressure vessel _____ Pressure vessel unaltered _____ No metal parts anywhere on rocket _____ Rocket has a blunt or rounded nose _____ Recovery system is safe (if used) _____ Only water/air used to launch _____ Team wearing Z87+ safety glasses
If any safety criteria above are not met, DO NOT LAUNCH.	If any safety criteria above are not met, DO NOT LAUNCH.
Non-Safety Criteria _____ ½ inch PVC fits in bottle opening _____ All parts 5 cm or higher above bottle opening _____ No commercial rockets or toy parts _____ Egg is easy to remove and nothing adhered to it	Non-Safety Criteria _____ ½ inch PVC fits in bottle opening _____ All parts 5 cm or higher above bottle opening _____ No commercial rockets or toy parts _____ Egg is easy to remove and nothing adhered to it
Timer 1 = _____ Timer 2 = _____ Timer 3 = _____ Circle Middle Time Above Any Non-Safety Violations? Y or N (-5 sec if Y) Did Egg Capsule Separate? Y or N (+10 sec if Y) Did Egg Survive (circle)? Y or N (+5 sec if Y) Final Time Launch 1 = _____	Timer 1 = _____ Timer 2 = _____ Timer 3 = _____ Circle Middle Time Above Any Non-Safety Violations? Y or N (-5 sec if Y) Did Egg Capsule Separate? Y or N (+10 sec if Y) Did Egg Survive (circle)? Y or N (+5 sec if Y) Final Time Launch 2 = _____
FINAL RANK = _____	

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**: LS.5.3
3. **TEAM OF UP TO**: 2
4. **MAXIMUM TIME**: 60 min.
5. **TEAMS**: Must bring writing utensils. No other resource materials are allowed.
6. **EVENT LEADERS**: Will provide 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 cover 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 answers to pre-selected questions chosen by the event leader.
11. **EVENT RESOURCES**: <https://ncscienceolympiad.ncsu.edu/resources/elementary/>

In Metrics We Trust

1. **DESCRIPTION**: Teams will demonstrate their understanding of metric measurement by estimating and measuring length, mass, fluid volume, angles, and temperature and be able to make calculations based on these measurements.
2. **ESSENTIAL STANDARDS ALIGNMENT**: Measurement & Data and Geometry are unifying concepts for all grade levels
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 all necessary items, objects, materials, questions, and response sheets for participants to complete stations. Event leaders may also provide items such as rulers, calculators, protractors, meter sticks, electronic and/or triple beam balances, beakers, graduated cylinders, thermometers, calipers, etc. and objects to measure.
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. Estimation or measurement of the angle degree, mass, volume, length, area, or temperature of various objects in metric units to the precision requested.
 - b. Understanding the relative scale of metric units and which is appropriate for measurement (mg, g, kg, mm, cm, m, km, mL, L, kL, °C, K, cm², cm³) in different scenarios.
 - c. Identification of lines and angles and classification of shapes by the properties of their lines and angles.
 - d. Understanding of how to measure and calculate the volume of a rectangular prism, a liquid in a container, or an irregularly shaped object given water and a graduated cylinder.
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 the competition.
11. **EVENT RESOURCES**: <https://ncscienceolympiad.ncsu.edu/resources/elementary/>

Just Plane Awesome

1. **DESCRIPTION:** Prior to the tournament teams will construct up to two rubber-powered monoplanes. Planes will be tested to achieve maximum time aloft.
2. **ESSENTIAL STANDARDS ALIGNMENT:** Science as Inquiry
3. **TEAM OF UP TO:** 2 students
4. **APPROXIMATE TIME:** 15 minutes
5. **TEAMS:** Must bring up to two assembled airplanes and associated rubber motors. A tool kit containing a winder, glue, tape, clay and other similar items to adjust or repair the airplane are permitted. Tool kit may not contain extra rubber for motors.
6. **EVENT LEADERS:** Will provide all measurement tools and timing devices for scoring purposes.
7. **SAFETY REQUIREMENTS:** Safety glasses must be worn at all times.
8. **IMPOUND:** No
9. **CONSTRUCTION PARAMETERS:**
 - a. Airplanes may be constructed from published plans, competitor's own design or kits. Pre-Assembled ready-to-fly airplanes may not be used.
 - b. Airplanes must be constructed primarily from wood, glue and tissue paper. Wings may be solid wood or wood frame with tissue covering. Foam wings are not allowed. Plastic, wire, rubber bands and tape are allowed for propeller, propeller holder, propeller shaft, motor hook and wing attachment as appropriate. Minor prefabricated components such as propeller with holder assembly and preinstalled rear motor hook are allowed.
 - c. In ready to fly condition, the projected wing span must not exceed **41.0 cm**.
 - d. Total mass of the airplane, without the rubber motor, must be **7.5 grams or more**.
 - e. The propeller must be one piece molded plastic. Diameter must not exceed **15.5 cm**.
 - f. Up to **4 motors** may be checked in. O-rings may be used to enable attachment to the propeller shaft and motor hook. Motors may be lubricated before or after check in.
 - g. The mass of a rubber motor, including any O-rings if used, must not exceed **2.0 grams**.
 - h. It is recommended that a winder be used to wind motors. Electricity may not be available for electric winders.
 - i. Airplanes must be labeled with a team or school name to allow identification by Event Officials.
10. **THE COMPETITION:** The event must be held indoors. Tournament Officials are encouraged to announce the room dimensions (approximate length, width and ceiling height) in advance of the competition. Tournament Officials and Event Leaders are urged to minimize the effects of environmental factors such as air currents. Rooms with minimal ceiling obstructions are preferred over very high ceilings.
 - a. At check in, participants will present their airplanes and motors for weight and measurement verification.
 - b. Once participants enter the designated competition area to check in and compete they must not receive outside assistance, materials or communications. Teams violating this rule will be ranked below all other teams.
 - c. At the Event Supervisor's discretion multiple flights may occur simultaneously.

- d. At the Event Supervisor's discretion practice flights may be allowed during non-competition time. Test flights must yield to official flights.

Just Plane Awesome - Page 2

- e. Teams will be given a **6 minute flight period** to make up to **two official flights** using up to two airplanes. Test flights may be taken and aircraft adjustments or repairs may be made. The 6 minute flight period is all inclusive, no additional time is allocated for test flights, aircraft repairs or aircraft retrieval.
- f. Competitors must indicate to the Official Timer if a flight is a test flight or an official flight. A flight is considered official if a team fails to notify the Timer of the flight's status.
- g. Flight begins when the aircraft leaves the competitor's hand and stops when any part of the airplane touches the floor or the wing no longer supports the weight of the aircraft (such as landing on a light fixture, roof girder or basketball goal).
- h. Any flight beginning within the 6 minute flight period will be allowed to fly to completion.
- i. Event Leaders are strongly encouraged to utilize 3 timers on all flights. The median flight time is the official time.
- j. In an unlikely event of a collision with another airplane, a team may elect to re-flight. The decision to re-fly may be made after the airplane lands. If a re-flight is taken, the "collision" flight time is void. Timers are allowed to delay a launch to avoid a possible collision. The 6 minute flight period does not apply to such a flight.

11. SCORING:

- a. Highest official flight time wins.
- b. A team's score is the highest of their official flight times.
- c. Ties will be broken by the higher second official flight time.
- d. Teams that violate rule(s) under CONSTRUCTION PARAMETERS or THE COMPETITION will be ranked in Tier 2 after all teams that do not violate those rules.

12. EVENT RESOURCES: <https://ncscienceolympiad.ncsu.edu/resources/elementary/>

Just Plane Awesome Score Sheet

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

Student Names: _____

EVENT LEADERS NEVER HANDLE PLANES - ONLY STUDENTS ARE TO TOUCH THEIR PLANES

CONSTRUCTION:

Model #1

Model #2

- | | | | | |
|---|---|---|-------------|---|
| a. Airplane(s) constructed primarily from wood and tissue.
Wings may be tissue covered or solid wood but not plastic foam. | Y | N | Y | N |
| b. Airplane(s) labeled with team name or other identifier | Y | N | Y | N |
| c. Wing span does not exceed 41.0 cm | Y | N | Y | N |
| d. Mass of airplane(s), without rubber motor, is 7.5 grams or more. | Y | N | Y | N |
| e. Propeller is one piece molded plastic not exceeding 15.5 cm diameter. | Y | N | Y | N |
| f. Mass of each rubber motor (up to 4), including O-rings if used, does not exceed 2.0 grams | Y | N | | |
| g. Tool Kit (optional) if presented contains only permitted materials | Y | N | No Tool Kit | |

COMPETITION:

- a. **Did not** received assistance during competition (Y = **did not**) Y N

Teams with any "N" (no) checked above will be placed in Tier #2

SCORE:

Flight 1

Flight 2

Flight Time: Timer #1

____ : ____ . ____
Minutes Seconds

____ : ____ . ____
Minutes Seconds

Timer #2

____ : ____ . ____
Minutes Seconds

____ : ____ . ____
Minutes Seconds

Timer #3

____ : ____ . ____
Minutes Seconds

____ : ____ . ____
Minutes Seconds

Highest Flight Time Score: _____

Ties are broken by the second longest official Flight Score.

Circle One: Tier 1 (no violations) Tier 2 (construction or competition violation)

Movers & Shakers

1. **DESCRIPTION:** Teams will be assessed on their knowledge of earthquakes and volcanoes and related land formations.
2. **ESSENTIAL STANDARDS ALIGNMENT:** ESS.3.2, ESS.4.2
3. **TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** 60 min.
5. **TEAMS:** Each team must bring writing instruments. No other resources are allowed.
6. **EVENT LEADERS:** Will provide 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 using pictures, models, and diagrams. Teams rotate through stations that assess any or all of the following:
 - a. Features of earthquakes, including what they are, where they can occur, why they occur (the underlying mechanism), and how they are measured.
 - b. Know how the following terms apply to earthquakes: tectonic plates, epicenter, fault, focus, foreshock, aftershock, seismograph and seismogram, P waves, S waves.
 - c. Features of volcanoes including what they are, parts of the world that have volcanoes, why they erupt (the underlying mechanism), and the impact of eruptions on both humans and the environment.
 - d. Know how the following terms apply to volcanoes: geysers, hot spots, hot springs, magma, lava, ash, mudslides, upper mantle, pyroclastic flow, pumice.
 - e. The different stages and types of volcanoes.
 - f. Locations of volcanic activity on earth, especially Hawaii, Yellowstone, and the Pacific Ring of Fire
 - g. How volcanoes and earthquakes are related.
 - h. What type of landmasses and rocks are formed from earthquakes and volcanic eruptions.
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:** <https://ncscienceolympiad.ncsu.edu/resources/elementary/>

Planet Protectors

1. **DESCRIPTION:** Teams will be assessed on their knowledge of human interaction with the earth, including interacting positively and negatively with the environment, resource use, and consequences of these interactions.
2. **ESSENTIAL STANDARDS ALIGNMENT:** ESS.4.3, LS.5.2
3. **TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** 60 min.
5. **TEAMS:** Each team must bring writing instruments. No other resources are allowed.
6. **EVENT LEADERS:** Will provide 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 using pictures, models, and diagrams. Teams rotate through stations that assess any or all of the following:
 - a. Helpful interactions with the earth such as reducing, reusing, repurposing, recycling or composting
 - b. Harmful interactions with the earth such as strip mining, deforestation, overconsumption, overpopulation, and bycatching
 - c. Renewable vs. non-renewable resources
 - d. Energy sources: coal, petroleum, nuclear, solar, wind, wave, geothermal, biomass and hydroelectric
 - e. Point and non-point pollution, including air, water, ground water and light
 - f. Best practices for conservation and pollution prevention
 - g. Consequences of not using best practices, especially the Great Pacific Garbage Patch, ozone layer depletion, ocean acidification, loss of biodiversity and climate change
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:** <https://ncscienceolympiad.ncsu.edu/resources/elementary/>

Ramp and Roll

1. **DESCRIPTION:** Teams will build a ramp and vehicle to transport an object a certain distance and stop as close to the target point as possible at the tournament.
2. **ESSENTIAL STANDARDS ALIGNMENT:** PS.3.1, PS.5.1, Science as Inquiry
3. **TEAM OF UP TO:** 2
4. **MAXIMUM TIME:** up to 30 minutes to build and test before the official scoring.
5. **TEAMS:** Teams MUST bring something to write with, their box full of K'nex materials, and a ramp. **Teams may bring only 1 picture no larger than 8.5" x 11" of their device. This must be 1 picture, not a collage.** No other resources are allowed.
6. **EVENT LEADERS:** Event leaders will provide the item for transport, score sheets and any measuring devices needed.
7. **SAFETY REQUIREMENTS:** None
8. **IMPOUND:** Yes. Teams must drop off the challenge box and the ramp at the time and place specified by the tournament director. The box and ramp must be clearly labeled with the school/team name and team designation (Varsity, JV, etc.). The ramp must have a soft protective covering on the bottom, or it cannot be impounded.
9. **THE CHALLENGE BOX:**
 - a. All materials and tools for the vehicle must be brought in a box with a lid; the volume of the box with lid in place can be no greater than 33,000 cm³ (for 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. The box must not be used as a part of the device.
 - c. Varsity and JV teams from the same or different schools must not share the same challenge box nor materials or tools in the challenge box.
 - d. **BUILDING MATERIALS:** Teams may only bring the following building materials:
 1. 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 can't be preassembled in the box. Event leaders will disassemble or remove any pieces not allowed by these rules.
 2. String – any size, brand, or quantity.
 3. Copy paper, any size.
 4. Tape, any size or kind.
 - e. Teams may organize the box supplies in labeled 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 (any quantity) scissors, rulers, tape measures, and a stopwatch in the box.
 - g. Any items that are not allowed will be removed by the event leader at impound and can be picked up after the competition.
 - h. Team members must build the device on-site using only the materials impounded in their box.
 - i. **Teams should NOT bring a marble or tennis ball in their box. The item for transport will be provided by the event leader.**
10. **THE CHALLENGE:**

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.

Ramp and Roll - Page 2

- a. **The Vehicle:** Teams will build on-site a wheeled vehicle powered by gravity (a ramp) to travel either 4.0, 4.5, 5.0, 5.5, or 6.0 meters (distance announced after impound) **and stop nearest to the target point.**
- i. The vehicle must be powered solely by the gravitational energy of rolling down a ramp. No additional sources of energy are allowed.
 - ii. Mechanical braking systems that automatically engage are the only type of braking system allowed, if a braking system is used (i.e. no remote controls or tethered stopping system).
 - iii. Non-electronic sighting devices are allowed on the vehicle and/or ramp for alignment purposes.
 - iv. The vehicle must have a fixed point (e.g. a K'nex piece) extending from the front edge of the vehicle, close to the track surface, where all measurements will be made.
 - v. The vehicle **must transport either a standard medium marble (1.5-2.0cm diameter, ~2g) OR standard tennis ball (~6.7cm diameter, ~57.5g)** (provided by the event leader before the competition begins). The **marble OR tennis ball** must be safely secured with K'nex pieces ONLY. No tape, string, or paper may be attached to the **marble or tennis ball**.
- b. **The Ramp:** Teams will build, **in advance**, a ramp for their vehicle to **roll down and onto the track**. The ramp, with the vehicle in the ready-to-roll position, must fit within a 60.0 cm x 60.0 cm starting square. There is no height restriction. The ramp **MUST** have a protective covering on the bottom that will protect the floor from any protruding nails, screws, or other rough edges. Teams without protective material on their ramp will **NOT** be allowed to compete. The ramp can be built from any materials, not just K'nex.
- i. The ramp must be freestanding and cannot be attached to the floor or walls or held by the students.
 - ii. **There must be exactly one clearly labeled Start Line on the ramp (at least ½ inch width, but not more than 1 inch in width), and the front wheels must touch the start line on the ramp at launch.** The Start Line may not be adjusted after impound and the vehicle must be released from the designated Start Line for all official runs.
 - iii. **All wheels of the vehicle must make contact with the ramp surface in the ready-to-run configuration.**
 - iv. The ramp cannot be adjusted in shape, slope, size, etc, during the build and test time.
- c. **The Track:** The track must be a relatively smooth, hard surface. The starting box must be marked with tape **by the event leader and the center line marked at the front edge of the starting box..** A target line will be marked and announced by the event leader after the impound is completed at either 4.0, 4.5, 5.0, 5.5, or 6.0 meters. **The target point will be offset, right or left of the center line, by 30cm.**
- d. Structures must be free-standing and cannot be attached to a table, floor, or any other support.
- e. Teams will have a **maximum of 30 minutes** to construct the specified device. Teams must not modify their device after the construction period has ended. Teams that complete construction early may be judged early.
- f. The team can practice with their vehicle in their allotted space during the build time.
- g. **Official Runs:** Teams will be given a 5-minute time period to make 2 official runs.
- i. When the team is ready for official testing, they will carry their vehicle and ramp to the area designated by the event leaders. The students will set up their ramp within the 60cm x 60cm starting square. The team may position the vehicle and ramp in any way as long as the entire structure remains within the square.
 - ii. Teams may opt to calibrate and/or adjust their vehicle to achieve the intended distance during the 5-min testing period. **Pieces can be added or removed from the vehicle during the testing period as long as those pieces were impounded.**
 - iii. Teams are not allowed to roll the vehicle down the track in advance of the run.
 - iv. Teams will do a simple release of the vehicle to start the run, they cannot push the vehicle.
 - v. Teams may not chase their vehicle down the track, they must wait until they are called by the event leader to retrieve the vehicle.
 - vi. Timing will stop while event leaders make official measurements.
- h. Event leaders will measure from the intended stopping point to the fixed point on the front of the vehicle. If there is no fixed point, judges will measure to the center of the front edge of the vehicle.

Ramp and Roll - Page 3**11. SCORING:**

- a. Teams will be ranked based on the single run where the straight-line distance from the fixed point on the vehicle to the center mark of the finish point is the closest, measured to the nearest tenth of a cm.
- b. Teams will be placed in 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 any part of sections 9 or 10.

- c. Ties will be broken by the best combined score of both runs. Any team that impounds a box but fails to attempt the build will be considered a “No Show.”

12. EVENT RESOURCES: <https://ncscienceolympiad.ncsu.edu/resources/elementary/>

Ramp and Roll Score Sheet

School Name: _____ **Team (Circle One):** V JV1 JV2 JV3
Student Names: _____

NOTE: Any materials or tools that are not on the approved list will be removed before the competition and given back to the team at a later time. Any pre-assembled materials will be taken apart by the event leaders before the event. No penalty will be assessed for this.

Impound Checklist

Event Leader Choice (Circle one)

Marble

Tennis Ball

The ramp has a protective covering on the bottom to avoid scratching the floor. <i>If no, students may not impound, send them back to their home base to try and fix the problem</i>	Y / N
The box and ramp were impounded on time and are clearly labeled with the school/team name and designation.	Y / N
All materials for vehicle and tools fit in a box that is no greater than 33,000 cm ³ including the lid, which fits all the way on the box and closes completely.	Y / N
There is a clearly labeled Start Line on the ramp. ($\frac{1}{2}$ inch < width < 1 inch) 10.b.ii <i>If no, allow students to designate one during impound and compete in Tier 1.</i>	Y / N

Competition Checklist

Run 1

Run 2

10.a.i	All energy to propel the vehicle comes from gravitational energy.	Y / N	Y / N
10.a.ii.	Only a mechanical braking system is allowed (no remote control or tether).	Y / N	Y / N
10.a.iii.	Only non-electronic sighting devices used.	Y / N	Y / N
10.a.iv.	Vehicle has a fixed point extending from the front edge.	Y / N	Y / N
10.a.v	Marble or Tennis Ball attached to vehicle only using K'nex pieces	Y / N	Y / N
10.b.	Ramp/vehicle in ready-to-launch position fits within a 60cm x 60cm square.	Y / N	Y / N
10.b.i.	The ramp is freestanding and not held by the competitors.	Y / N	Y / N
10.b.ii.	Students released vehicle with front wheels touching the start line.	Y / N	Y / N
10.b.iii	All wheels of the vehicle touch the ramp surface in ready-to-launch position.	Y / N	Y / N
10.b.iv.	Team did not adjust the ramp after impound.	Y / N	Y / N
10.g.iii.	Team did not roll the vehicle to calibrate on the track.	Y / N	Y / N
10.g.iv.	Team released the vehicle without pushing it during release.	Y / N	Y / N
10.g.v.	Team did not chase the vehicle down the track.	Y / N	Y / N
10.b.v.	Vehicle successfully transported marble or tennis ball for the entire run.	Y / N	Y / N

Straight-line Distance (distance in cm from fixed point to Target point to nearest 0.10 cm)

Circle best run – low score is best.

Tier and Penalties:

Tier 1: Run with no violations – all boxes above are a “Yes” for at least 1 run

Tier 2: Run with any competition violations – both runs or impound have a “No”

DQ: Students continued to work after 30 min time was called or received outside assistance

1
2
DQ

Final Rank

Low Score wins. The Final Score of a vehicle with one Failed Run must be the other Run Score.

Circle lower of 2 Run Scores above. Ties are broken by the lowest combined run score.

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**: PS.3.1, PS.5.1, 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 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 (magnifying glass)
 - g. Paper towels
 - h. A disposable cup for solid waste
 - i. Writing instruments
 - j. Safety gear – see rule #7.
 - k. Each team may bring one 8.5" x 11" sheet of paper that may contain information on both sides in any form from any source without any annotations or labels affixed. This rule is to prevent teams from affixing annotations or labels that increase the surface area of the 8.5" x 11" sheet of paper.
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
 - e. 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:

baking powder	crystal sugar	sodium acetate
baking soda	powdered sugar	sodium carbonate
borax	flour	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? (Students would need to know the proper capitalization and subscripts, but not the why.)
 4. What is the proper method to smell a chemical?

b. **Crime Scene Physical Evidence (at least one of the following topics will be tested):**

- Soil:** Participants may be given the composition of soil found at the scene or on the suspects and asked to determine if this implicates any of the suspects.
- Footprints, Shoeprints and/or Tire Treads:** Participants may be asked to compare prints and make conclusions such as direction and relative speed of travel. 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):
- Analysis of chemical evidence 50%, analysis of physical evidence 30%, and analysis of the crime 20%.
 - Tiebreaker: The highest score on the chemical evidence analysis will break ties.
 - A 10% penalty may be given if the area is not cleaned up as designated.

11. **EVENT RESOURCES:** <https://ncscienceolympiad.ncsu.edu/resources/elementary/>

What's The Matter?

1. **DESCRIPTION**: Teams will be assessed on their knowledge of the physical properties of matter and the behavior of solids, liquids, and gases before and after they undergo changes or interactions.
2. **ESSENTIAL STANDARDS ALIGNMENT**: PS.3.1, PS.5.1
3. **TEAM OF UP TO**: 2
4. **MAXIMUM TIME**: 60 min.
5. **TEAMS**: Must bring writing instruments and safety goggles (safety glasses are not permitted for this event). 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 the exam.
7. **SAFETY REQUIREMENTS**: Safety goggles are required.
8. **IMPOUND**: No
9. **THE COMPETITION**: The competition will consist of an exam that covers any or all of the following topics:
 - a. Understand the size, parts (and their charges) of an atom.
 - b. Understand the behavior of atoms in different states of matter (solid, liquid, gas) regarding shape and volume and relative speed.
 - c. Know how to measure and/or calculate volume of a rectangular prism or a liquid in a container.
 - d. Be able to measure mass and calculate density.
 - e. Understand the concept of relative density and how it can be changed in solids, liquids, and gases.
 - f. Differentiate between a solution and a mixture and understand how they can be separated.
 - g. Understand the difference between physical and chemical changes and signs that each has taken place.
 - h. Understand dissolving and concentration of substances such as food dye, salt, and sugar in water, and the factors that affect solubility such as stirring and heat.
 - i. Observe or test for other properties of matter: magnetism, flexibility, hardness, opacity, strength, viscosity (runniness), and buoyancy.
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**: <https://ncscienceolympiad.ncsu.edu/resources/elementary/>