Florida SCIENCE OLYMPIAD™

Exploring the World of Science

Elementary Science Olymiad
at
Florida Atlantic University
April 29, 2023

2023 Official Rules Manual

GENERAL INFORMATION

Thank you for registering for a 2023 Elementary Florida Science Olympiad Tournament at Florida Atlantic University. Science Olympiad's goal is to provide students with a quality competition that links collaboration, inquiry, content understanding, and assessment. Science Olympiad has been highlighted in the 2007 National Governors Report as a national model for learning science and mathematics. Each year, we ensure that we select events that correlate well with Florida's current State Standards.

In the tradition of sporting events, Science Olympiad awards medals/ribbons to the top performing students in each event and trophies to the top performing teams. Students take pride not only in their performance but also to their contribution to the team's performance. Often, students depart the competition with a strong sense of accomplishment, looking forward to next year, yet their ranking may indicate a quite different response would have been expected! Science Olympiad builds a love of science and learning that goes beyond all other academic programs.

This rich experience provides students with something that no other competition does: It encourages teamwork, problem solving, and critical thinking.

TEAM SPIRIT:

Although some events in the Science Olympiad are based on individual achievement, all events involve teamwork, group planning and cooperation. That is the real essence of the Science Olympiad. Our emphasis is on advanced learning in science through active, hands-on, group participation. Through the Olympiad, students, teachers, coaches, principals, business leaders, and parents are all bonded together as a team working toward a goal.

We would like to provide an alternative to the "isolated scientist" stereotype and remind students that science can be fun, exciting and challenging all at the same time. In college and beyond, students will find that the team spirit and good sportsmanship they develop during Science Olympiad will be deciding factors in their success.

COACH PREPARATION:

The most important thing to remember is that this competition is for the students. It is strongly encouraged that the coach take a facilitation role and accept the fact that s/he cannot know everything about every event- put the onus on the student to do research and critically read the rules. The events change slightly annually so even long-term coaches will be faced with new challenges every year, which keeps the level of competition high. Many events require students to explain their design choices and/or complete lab work on their own. Teams who have a coach who takes a student-focused approach will have a stronger competitive team.

AREA TOURNAMENTS:

Each elementary level team of **15** will prepare throughout the school year to compete in a Science Olympiad tournament. These inter-scholastic competitions consist of a series of approximately 15 team events that encourage learning in life science, earth science, chemistry and physics, scientific inquiry, technology, and engineering/design.

Events in the Science Olympiad have been designed to recognize the wide variety of skills that students possess. While some events require knowledge of scientific facts and concepts, others rely on science processes, skills or applications. This ensures that everyone can participate, including students from technology classes or advanced science classes.

Teams are welcome to compete in as many tournaments across the state as desired. However, the team must register and pay the $165 ($195) fee for each tournament. After you have registered your team, communication for that event will come from the tournament director. Information such as team number may vary from tournament to tournament. Individual tournaments reserve the right to make rules clarifications or to set their schedule as needed. While most tournaments will run all the events listed in the rules manual, please be sure to see your specific tournament's schedule to confirm.

GENERAL EVENT INFORMATION:

The following apply to all events, even if not noted in the specific rules. Please read carefully:

1. For every event, **it is the responsibility of the competitors to bring their own writing utensils** along with any other items listed in the rules.
2. Pay special attention to events that require eye protection. Teams without eye protection will not be able to compete in any events that require eye protection. Please check the rules for details.
3. **Impound** means that some of your devices or boxes must be put in a holding area before the event begins. These must be turned in to specific places at specific times. Anyone on the team can impound the device; parents and coaches are welcome to help the kids with this piece. The team will be penalized if this is not done on time.
4. In any open events where spectators are allowed, it is up to the discretion of the event supervisor as to the area where spectators are allowed. The event supervisor has the final right to ask spectators to leave and/or to disqualify teams for members (student, parent, coach, etc.) who are disrupting the flow of the competition.

DIFFICULTY OF EVENTS: This is a competition, so expect that there will be questions on tests and tasks on labs that students may be unable to answer- competitors will be ranked and, therefore, we need a wide range of scores. Work with your students to understand that this is not a situation where they will know everything, and they should do their best. Tests/Labs are generally written at a 4th /5th grade level with a few questions below that level and a few questions above that level.

PARENT/CHAPERONE ROLE DURING COMPETITION :

1. Parents and chaperones may feel free to move about common areas as identified by the tournament director, but may not interfere with their activities or enter rooms when doors are closed.
2. Parents/chaperones may not yell out instructions to students during open events. Parents should not argue or discuss scoring with the judges. If a judge believes a parent has behaved in a disruptive manner, **this will be grounds for immediate disqualification of the entire team** . STUDENTS may arbitrate judging concerns using the arbitration process.
3. Parents and chaperones should not interact/argue with event supervisors/judges. There is an arbitration process that the STUDENT and coach should complete when concerns arise.
4. If a judge believes a parent has interfered or helped a student in any way, **this will be ground for immediate disqualification of the entire team**.

COACH ROLE DURING COMPETITION :

Students will be in various rooms around campus. Feel free to move about the common areas as identified by the tournament director, but please do not interfere with their activities or enter rooms when doors are closed. If a judge believes a coach has interfered or helped a student in any way, this will be ground for immediate disqualification of the entire team.

CODE OF CONDUCT :

As part of the paperwork that coaches need to bring to competition, there is a Code of Conduct form to complete by students and the coach. Student participants are expected to compete in tournament events with an honest effort to follow the rules and spirit of the competition. The goal of the competition is to give one's best effort while displaying honesty, integrity, and sportsmanship.

In addition to students, coaches and parents are expected to display courtesy and respect toward Olympiad officials, other teams, and guests of the Olympiad. Please remember all officials are volunteer specialists in their field and should be extended every courtesy.

Failure to show honesty and/or courtesy by a participant, coach, or guest of the team may result in disqualification of the team from that event and/or from the entire competition.

2023 DIVISION A (Elementary) SCHEDULE OF EVENTS--FAU Southeast Regional April 29, 2023

EVENT	*TENTATIVE* LOCATION	OPEN TO PUBLIC ?	9:00 - 9:50	10:00 - 10:50	11:00 -11:50	12:00 -12:50	13:00 -13:50
A is for Anatomy	SC 116	NO	07 - 12	13 - 18	19 - 24	01 - 06	
Backyard Biologist	SC 107	NO	13 - 18	19 - 24	01 - 06	07 - 12	
Balloon Racers	Sanson Breezeway Downstairs	YES	ALL IMPOUND	Self Schedule--Choose Time Slot at Check-In			
Circuit Lab*	PS 150	NO	01 - 06	07 - 12	13 - 18	19 - 24	
Crime Busters	PS 206	NO	07 - 12	13 - 18	19 - 24	01 - 06	
Data Crunchers	BS 105	NO	01 - 06	07 - 12	13 - 18	19 - 24	
Energy Matters*	PS 334	NO	13 - 18	19 - 24	01 - 06	07 - 12	
Experimental Design	PS 359	NO	13 - 18	19 - 24	01 - 06	07 - 12	
Fossil Frenzy	SE 421	NO	07 - 12	13 - 18	19 - 24	01 - 06	
Keyed to Science	SC 115	NO	01 - 06	07 - 12	13 - 18	19 - 24	
Mystery Packaging	GN 101	YES	ALL BUILD	Self Schedule--Choose Time Slot at Check-In			
Precision Ping Pong Propulsion	Sanson Breezeway Upstairs	YES	ALL IMPOUND				ALL TEAMS COMPETE
ProGamers	SE 314	NO	19 - 24	01 - 06	07 - 12	13 - 18	
Roller Coaster	SC 141	YES	ALL IMPOUND	Self Schedule--Choose Time Slot at Check-In			
Starry Starry Night	PS 210	NO	19 - 24	01 - 06	07 - 12	13 - 18	
Professor Jensen's Potions*	SC 108	NO	19 - 24	01 - 06	07 - 12	13 - 18	

* Bold Red = New Event For 2023

7:30 am - 8:30 am	Check-In for Event Supervisors and Volunteers	Sanson Patio
7:30 am - 8:30 am	Team Check-In	Sanson Patio
Approximately 3:00 pm	Awards Ceremony	Sanson Patio

A IS FOR ANATOMY

DESCRIPTION: Teams will demonstrate knowledge of human organs and organ systems.

COMPETITORS BRING:

- Pencil/writing utensil;
- 3-ring binder of any size with any research/reference material. The binder may contain any item, such as a book, computer generated printout, or student created paperwork. No electronic materials are allowed. All materials must be securely bound inside the binder, so that when it is opened vertically (upside down) and given a light shake test no materials will fall out.

NUMBER OF PARTICIPANTS: Maximum of 2 **IMPOUND: NO**

THE COMPETITION:

1. **The competition may be run as timed stations.**
2. Teams will either be asked questions or will be required to complete experiments or make observations as they relate to the topics below.
3. The **topics** that may be tested or in which an experiment may be conducted include:
    a. Identification of the major organs in the human body and description of their functions.
        i. Organs are limited to the skin, brain, heart, lungs, stomach, liver, intestines, pancreas, muscles and skeleton, kidneys, bladder, and sensory organs.
        ii. Skin/Integumentary system:
            1. Students will not be required to identify specific parts of the integumentary system nor describe functions of those parts.
            2. Students do not need to identify layers of the skin.
            3. Students may be asked questions about the role of the skin related to the immune system.
            4. Questions will only focus on the overall function of the skin and identification of the skin on a diagram of the body.
        iii. Muscles/Muscular system:
            1. Students may be asked about the difference in structure and function of cardiac, skeletal, and smooth muscles.
            2. Students may be asked how the skeletal muscles move bone, maintain posture, and produce heat.
            3. Students will not be required to identify specific muscles or explain the function of specific muscles.
        iv. Bones/Skeletal system:
            1. Students may be asked identify structures in a cross section of bones limited to bone marrow, nerves, blood vessels, osteocytes, lamellae
            2. Students may be asked about differences in structure and function of compact and spongy bones.
            3. Students will not be asked to identify specific bones in the body. v. Sensory organs:
            1. Questions are limited to eyes, ears, tongue, skin, and nose.
            2. Questions will focus on general identification and function but not specific parts of those organs.
    b. Explaining how organs and organ systems work together to maintain health.
    c. Comparing and contrasting the function of organs and other physical structures of humans to other organisms such as plants/animals.
    d. Content related to the standards below.

RELATED FLORIDA STANDARDS:

- **SC.5.L.14.1** Identify the organs in the human body and describe their functions, including the skin, brain, heart, lungs, stomach, liver, intestines, pancreas, muscles and skeleton, reproductive organs, kidneys, bladder, and sensory organs.
- **SC.2.L.14.1** Distinguish human body parts (brain, heart, lungs, stomach, muscles, and skeleton) and their basic functions.
- **SC.5.L.14.2** Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support -- some with internal skeletons others with exoskeletons -- while some plants have stems for support.

SCORING:

- **High score wins.**
- Each question or station will be assigned a predetermined set of points, assigned by the event supervisor and communicated to the teams (preferably- points are identified on the test/station paperwork).
- Ties will be broken with predetermined questions.

BACKYARD BIOLOGIST

DESCRIPTION: Teams will be assessed on their knowledge of living organisms that they may encounter in their own backyard. The focus for 2022 will be trees and **insects** .

COMPETITORS BRING/NEED:

- Writing utensil;
- 3-ring binder of any size with any research/reference material. The binder may contain any item, such as a book, computer generated printout, or student created paperwork. No electronic materials are allowed, such as a computer, calculator or smartphone. All materials must be securely bound inside the binder, so that when it is opened vertically (upside down) and given a light shake test no materials will fall out.

NUMBER OF PARTICIPANTS: Maximum of 2 **IMPOUND: NO**

THE COMPETITION:

1. **The competition may be run as timed stations and/or as timed slides/PowerPoint presentation.**
2. Teams will be asked to identify organisms from the list based on images and/or descriptions.
    a. No more than 50% of the test will be identification.
    b. Identification questions may ask for common names and/or scientific names (*Genus species*).
    c. Identification questions related to TREES may ask about the following specific characteristics:
        - Light range
        - Soil moisture
        - Drought tolerance
        - Soil texture and pH
        - Salt tolerance
        - Related wildlife
        - Growth rate
        - Mature height and/or spread
        - Appropriate areas for planting/growing (Hardiness zones)
    d. **Identification questions related to INSECTS may ask about the following specific characteristics:**
        - **Life history and development (metamorphosis)**
        - **Distribution**
        - **Anatomy and physiology**
        - **Reproductive strategies and behaviors**
        - **Habitat characteristics**
        - **Diet**
        - **Behavior**
3. In addition to identification questions, teams may be asked questions related to the following:
    a. The structure and function of roots, stems, leaves, seeds, and flower parts
    b. The distinct stages of the life cycle of seed plants
    c. Needs of plants, including nutrients received from the soil and air
    d. Classification of flowering and nonflowering plants into major groups such as those that produce seeds or those like ferns and mosses that produce spores, according to their physical characteristics.

e. Compare and/or contrast the function of organs and/or other physical structures of plants and/or animals.
f. **General structure of insects, including classification**
g. **Process of pollination**
h. **Benefits of pollinators for plants and for humans**
i. **Types of metamorphosis and stages of metamorphosis**
j. **Ways humans have impacted the environment and insects/plants**

4. Teams may also be asked to analyze data from experiments related to trees and **insects** or to design an experiment to test a question related to **insects** or plants.

RELATED FLORIDA STANDARDS:

- **SC.3.L.17.2** Recognize that plants use energy from the Sun, air, and water to make their own food.
- **SC.3.L.14.1** Describe structures in plants and their roles in food production, support, water and nutrient transport, and reproduction.
- **SC.3.N.1.1 R** Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
- **SC. N.1.3** Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.
- **SC.4.L.16.4** Compare and contrast the major stages in the life cycles of Florida plants and animals, such as those that undergo incomplete and complete metamorphosis, and flowering and nonflowering seed-bearing plants.
- **SC.4.L.17.4** Recognize ways plants and animals, including humans, can impact the environment
- **SC.5.L.14.2** Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support -- some with internal skeletons others with exoskeletons -- while some plants have stems for support.

SCORING:

- **High score wins.**
- Each question or station will be assigned a predetermined set of points, assigned by the event supervisor **and communicated to the teams.**
- Ties will be broken with pre-determined tie-breaker questions **which are communicated to teams.**

2022 Backyard Biologist organism list

Florida Trees

Cypresses
- Pond Cypress
- Bald Cypress

Elms
- Cedar Elm
- Chinese Elm
- Florida Elm
- Winged Elm

Hollies
- East Palatka Holly
- Dahoon Holly
- Myrtleleaf Holly
- Yaupon Holly

Magnolias
- Southern Magnolia
- Sweet Bay Magnolia

Mangroves
- Black Mangrove
- Red Mangrove
- White Mangrove

Maples
- Florida Maple
- Japanese Maple
- Red Maple
- Sugar Maple

Oaks
- White Oak
- Chapman's Oak
- Southern Red Oak
- Sand Live Oak
- Laurel Oak
- Myrtle Oak
- Live Oak

Pines
- Loblolly Pine
- Longleaf Pine
- Southern Slash Pine

Insects

American Bluet Damselfly
American Bumble Bee
American Rubyspot Damselfly
Antelope Beetle
Aphids
Army Cutworm Moth
Asian Multicolored Lady Beetle
Assassin Bug
Atlantis Fritillary Butterfly
Bed Bug
Bee Fly
Big Dipper Firefly
Black Blow Fly
Black Soldier Fly
Black Swallowtail
Brown Marmorated Stink Bug
Cicada
Click Beetle
Cloudless Sulphur
Darkling Beetle
Dobsonfly
Dung Beetle
Florida Predatory Stink Bug
Giant Mayfly
Goldenrod Soldier Beetle
Great Golden Digger Wasp
Gulf Fritillary
Mangrove Skipper
~~Paper Moth~~
Pipevine Swallowtail
Tachinid Flies
Viceroy Butterfly
Zebra Longwing

Resources: https://floridahikes.com/identifying-florida-species
https://www.insectidentification.org/insects-by-state.php?thisState=Florida

BALLOON RACERS

DESCRIPTION: Teams will build a balloon powered car ("racer") that will move down a track in a straight line during a race against other teams. This is a **PREBUILD EVENT.**

NUMBER OF PARTICIPANTS : **Maximum of 3** **IMPOUND : YES**

COMPETITORS BRING:

- Up to 2 prebuilt balloon racer cars;
- 9" balloons (bring extras);
- Hand held balloon pump;
- Materials needed to make quick repairs to racer;
- Safety goggles

THE COMPETITION:

CONSTRUCTION:

1. Prior to the competition, students will design, construct and test up to two "racers" that are each powered by no more than 2 balloons. The *racer* should be capable of traveling at least 5 meters and should travel straight.
2. *Balloon Racers* must be designed and built by students and cannot be pre-purchased balloon powered cars. Each team may have up to 2 *racers*.
    a. *Racers* must have at least 3 wheels and should roll on the ground as it is propelled forward.
    b. Racers should be built out of materials normally not used for toy cars and may not have sharp edges that could cause injuries. Examples of materials are plastic water bottles, Styrofoam, straws, Popsicle sticks, corrugated board, cardboard, orange sherbet "Push-Ups" circles for wheels, foam, bottle caps, etc.
    c. The wheels (or any part of the vehicle that touches the ground) should not cause damage or leave any marks on floors when moving. **If supervisor determines that the device will damage the venue's floor, teams may not be able to compete and will earn Participation points only.**
    d. *Racers* that are deemed to be hazardous by the Event Supervisor will not be allowed to run- if you think it might be hazardous/dangerous, don't use it. **Cars deemed hazardous will earn the team Participation points only.**
    e. Students will not have time to "put together" components of the car at race time- *racer* should be able to go into race configuration quickly. Consider this when designing the attachment of the balloons. You should be able to blow up and attach the balloons quickly.
    f. **Different teams** from the same school cannot use the same *racer.*
    g. *Racers* MUST have the team number visibly marked. **No team number marked will place the team in Tier 2.**
3. Balloons used may be no larger than 9" in diameter.
    a. You may use the energy from 1 or 2 balloons and these balloons do not need to be the same size.
    b. Teams may place one balloon inside the other to make a 2-layer balloon but this counts as 2 balloons.
    c. Balloons must be able to be blown up quickly upon arrival at the racing site.
    d. Competitors may use a handheld balloon pump to inflate their balloons.
    e. Competitors should bring additional balloons to the event in case of breakage.
4. Design Log
    a. All teams must create a design log and turn it in at impound.
    b. Design logs will be worth 50 points and should include:
    - Labeled diagram of *racer/s* with parts labeled

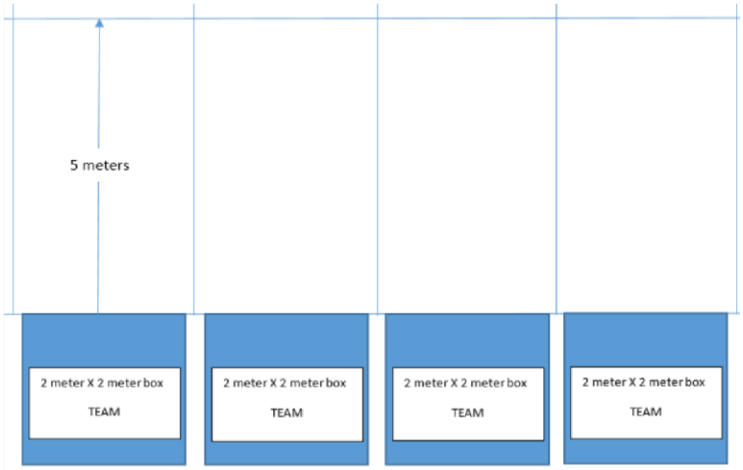
- Data table with 10 trials showing speed (distance/time) data for the following variables:
    + Various diameters of inflated balloon
    + Mass of *racer* (you may add mass to a racer using gram masses, coins, etc. instead of changing the overall design)
- Graph of distance vs. time data

IMPOUND:

1. At least one team member will impound their racer/s and all materials that may be needed to prepare for racing. All additional materials (ex. tape, handheld pump, extra balloons) must be impounded at the same time in a container (cardboard box/baggie) labeled with the team number.
2. Impound must be done at the scheduled time (usually first thing in the morning). **Teams who do not impound on time will be placed in Tier 2 for competition, if the supervisor allows them to compete.**
3. Design logs must be impounded in order to earn points.
4. Supervisors will check for safety and measure the mass of each *racer* during impound time.

RACE:

1. The race track will be set up for **4 teams**.
    a. There will be a starting line and a finish line marked- blue painters tape may work well; check with the venue to ensure that you are not affecting the floors. The starting line and finish line should be 5 meters apart.
    b. Each team should have an area in front of the starting line to release their car from. This area should be 2 meters X 2 meters, if possible.
    c. The team areas should be as far apart as the venue allows.



    d. Each lane should be marked so the track looks similar to the one above.
    e. **Supervisors should do their best to have each race include a similar number of participants. **In small tournaments, supervisors may elect to time the racers and use that for scoring. Ex. fastest wins 100 points, second fastest 50 points, etc. This must be shared with teams at the beginning of the tournament.**
2. Once participants arrive at their race area, they must put their safety goggles on. These goggles must stay on for the entire build period. Supervisors will give one goggle warning**. Additional warnings will place the team in Tier 2 and/or remove them from competition.**
3. No one except competitors and judges are allowed in the competition area. **Outside interference or coaching will cause the team to be placed in Tier 2 and may result in disqualification if the violation is repeated**. Judges have the right to have distracting or disruptive spectators removed from the room.
4. Five teams will be called. Teams will have 5-minutes to get ONE *racer*, blow up their balloon/s, make last minute fixes (using only the materials that were impounded), and place their *racer* at the starting line. Teams who impounded two racers must leave the second at the impound location until the second race. **Teams who do not meet this time will earn only Participation points.**
5. At the end of the 5-minutes (or when everyone is ready, if that is before the 5-minutes), the Supervisor will instruct the teams on releasing their cars to race by saying something like “3, 2, 1…go”.

6. Teams must stay within their 2X2 meter "box" and may release their balloon racer anywhere in the box up to the starting line. **Teams that release past the starting line will forfeit that run.**
7. Teams must not push their racer and may only release it to be fully powered by the balloon/s. Pushing a racer will result in the team earning on Participation points for the event.
8. Supervisors/judges will determine the 1st and 2nd place winners of the race. 1st place winners receive 100 points and 2nd place winners receive 50 points.
9. Supervisors/judges will determine which racers crossed the 5-meter mark. ALL teams who crossed the 5-meter mark earn 100 points. This is in addition to 1st or 2nd place points. So, the first-place team will earn 200 points overall for the run.
10. Any racer that leaves their team's lane will result in a 50-point penalty for that team.
11. Once all information has been collected from the first race, the supervisor will allow teams to collect their racers and prepare for the second race.
12. **The supervisor may elect to restart any race if it is determined that this is necessary for safety or fairness. For example, if a car leaves its lane and hits another racer, causing that racer to potentially not run as effectively, the supervisor may determine that it is fairer to restart that race.**
13. Prior to the second race, any team that wants to change out their racer must notify the Supervisor prior to doing so.
14. The second race will run just like the first.
15. The best run score will be used for the team's score.
16. Scoring will be the sum of the best run score and the design log score.
17. Ties will be broken by the mass of the racer used in the best run score. The highest mass is the winner of the tie.

RELATED FLORIDA STANDARDS:

- **SC.3.N.1.3** Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.
- **SC.4.N.1.1** Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations. (**SC.5.N.1.1** ; **SC.3.N.1.1**)
- **SC.5.N.1.3** Recognize and explain the need for repeated experimental trials.
- **SC.5.N.1.5** Recognize and explain that authentic scientific investigation frequently does not parallel the steps of "the scientific method".
- **SC.4.P.10.4** Describe how moving ~~water and~~ air are sources of energy and can be used to move things.
- **SC.4.P.12.1** Recognize that an object in motion always changes its position and may change its direction.
- **SC.4.P.12.2** Investigate and describe that the speed of an object is determined by the distance it travels in a unit of time and that objects can move at different speeds.
- **SC.5.P.13.2** Investigate and describe that the greater the force applied to it, the greater the change in motion of a given object.
- **SC.5.P.13.3** Investigate and describe that the more mass an object has, the less effect a given force will have on the object's motion.

SCORING :

1. **High score wins.**
2. Score = Best run score + Design Log score
3. Design log is scored out of 50 pts.
4. Points earned for the run include:
    a. 1st racer to cross the finish line= 100 pts
    b. 2nd racer to cross the finish line = 50 pts
    c. All racers that cross the 5 meter mark= 100 pts (this is in addition to points for being 1st or 2nd)
5. 50 points will be subtracted for teams whose *racers* veer off into another team's lane.
6. Ties will be broken by the *racer* that had the highest mass on their best run.

Balloon Racers Scoring Sheet

Team #: _____

School: _____

TIER :

IMPOUND		
2. Racer prepurchased/not built by students	**Y= Tier 2**	
2c./2d. Racer/s deemed safe to compete?	**N= Participation points only**	
2g. Device has team number on it?	**N= Tier 2**	
Impounded on time	**N = Tier 2**	
Mass of racer 1 _____ g Mass of racer 2 _____ g	**(TIEBREAKER)**	

RACE:		
1. Outside assistance violation?	**Y= Tier 2; Repeated violations may result in DQ**	
2. Safety goggle violation?	**1st time= Warning; 2nd time = Tier 2; Repeated violations may result in DQ**	
TIER ?		

DESIGN LOG:

i. Labeled diagram of racer/s	**Depending on quality- up to 10 pts**	
ii. 2 data tables with 10 trials each showing speed data for BOTH variables (Balloon diameter/Racer Mass)	**Depending on quality- up to 20 pts**	
iii. Graph of distance vs. time data	**Depending on quality- up to 20 pts**	
Design log impounded?	**N= No points for Design Log**	
DESIGN LOG SCORE =		

RUN 1: (Racer # _____)		POINTS
Racer passed the 5-meter mark?	**Y= 100 pts**	
Racer came in 1st place?	**Y= 100 pts**	
Racer came in 2nd place?	**Y= 50 pts**	
Racer left the assigned lane?	**Y= -50 pts**	
SCORE =		

RUN 2: (Racer # _____)		POINTS
Racer passed the 5 meter mark?	**Y= 100 pts**	
Racer came in 1st place?	**Y= 100 pts**	
Racer came in 2nd place?	**Y= 50 pts**	
Racer left the assigned lane?	**Y= -50 pts**	
SCORE =		

DESIGN LOG SCORE	-	BEST RUN SCORE =	**FINAL SCORE (High score Wins)**
	-		_____

PLEASE NOTE THAT THIS RUBRIC IS A SAMPLE AND GUIDE- IN CASES OF CONFLICT WITH THE RULES, THE RULES TAKE PRECEDENCE OVER THE RUBRIC.

CIRCUIT LAB

DESCRIPTION : The event will challenge student's knowledge of direct current (DC) circuits using low voltage batteries. Wall socket (AC) current will not be used.

COMPETITORS BRING:

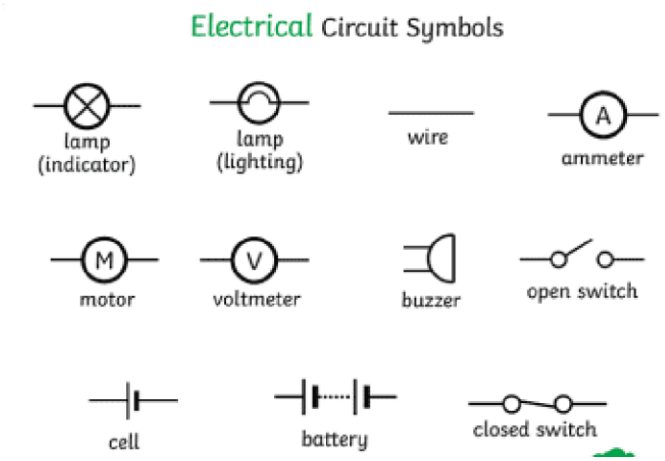
- Pencil/writing utensil;
- 3-ring binder of any size with any research/reference material. The binder may contain any item, such as a book, computer generated printout, or student created paperwork. No electronic materials are allowed. All materials must be securely bound inside the binder, so that when it is opened vertically (upside down) and given a light shake test no materials will fall out.

NUMBER OF PARTICIPANTS: Maximum of 3

IMPOUND : NO

THE COMPETITION:

1. The event may be run as a set of stations or a test that should include at least one hands-on task.
2. Questions and tasks shall **NOT** require students to calculate voltage, amperage, etc. but may ask comparative voltage questions (ex. which setup would include more voltage)
3. Questions may address the following topics:
   a. Energy transfers between electricity and other energy forms
   b. How electricity is generated and how it gets into households (basics of the power grid)
   c. Parallel vs. series-parallel circuits
   d. Circuit drawings including the symbols shown to the right
   e. Conduction and insulation



4. Hands-on activities may include, but are not limited to:
   a. Students will build a continuity tester from the materials provided (battery, lamp, and wires) and use it to complete tasks.
   b. Given five different circuit cards or circuit boxes having contact points labeled A, B, C, etc. that are internally connected to form one or more multi-point circuits, determine which combinations or points on each card are connected together
   c. Given a tray of common household items, classify them as conductors or insulators
   d. Given circuits, draw each circuit using the schematic symbols and answer questions about the circuits.
   e. Construct a circuit based on a series of instructions.

RELATED FLORIDA STANDARDS:

- **SC.3.N.1.3** Keep records as appropriate, such as pictorial, written or simple charts and graphs, of investigations conducted
- **SC.5.P.10.1** Observe and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical.
  SC.4.P.10.1 Observe and describe some basic forms of energy, including light, heat, sound, electrical, and the energy of motion.
  SC.3.P.10.1 Identify some basic forms of energy such as light, heat, sound, electrical, and mechanical.
- **SC.3.P.10.2** Recognize that energy has the ability to cause motion or create change.

- **SC.5.P.10.3** Investigate and explain that an electrically-charged object can attract an uncharged object and can either attract or repel another charged object without any contact between the objects.
- **SC.5.P.10.4** Investigate and explain that electrical energy can be transformed into heat, light, and sound energy, as well as the energy of motion.
- **SC.5.P.11.1** Investigate and illustrate the fact that the flow of electricity requires a closed circuit (a complete loop).
- **SC.5.P.11.2** Identify and classify materials that conduct electricity and materials that do not.

SCORING:

- **High score wins.**
- Each question or station will be assigned a predetermined set of points, assigned by the event supervisor **and communicated to the teams.**
- Ties will be broken with pre-determined tie-breaker questions **which are communicated to teams.** Supervisors may use the time needed to complete a task as a tiebreaker, if that is communicated to teams prior to the event.

CRIME BUSTERS

DESCRIPTION: A team of two contestants will be asked to solve a "crime" by identifying common white household powders, evaluating fingerprints, and performing paper chromatography.

SAFETY PARAMETERS:

Safety precautions MUST be used.

- Participants dress for the event must include close-toed shoes, long pants, and long sleeve shirt.
- Participants should wear safety goggles and a self-brought lab coat or apron.
- Shoulder length hair or longer must be tied back.
- Taste testing is strictly prohibited.
- Students must wash hands prior to leaving the event.

COMPETITORS BRING:

- Pencils/Pens,
- "Powder Properties Chart" (will be turned in to the supervisor),
- One 8.5 x 11" two-sided page of notes, in any form, from any source (will be turned in to supervisor)
- Safety goggles and lab coat or apron
- Gloves (optional)
- NOTE- See appropriate dress requirements listed above.

NUMBER OF PARTICIPANTS: Maximum of 3 **IMPOUND: NO**

THE COMPETITION:

1. Students will be given a scenario and clues to solve a "crime."
2. There will be 4 - 5 suspects with associated evidence to analyze.
    a. The competition has 4 parts and may be run as 3 - 4 stations:
        i. Powder Identification: Teams may be asked to identify the following powders in order to solve a simulated crime. Powders will be limited to granulated sugar, flour, cornstarch, baking soda, calcium carbonate (chalk), powdered Alka-Seltzer ©, plaster of Paris, and sand.
            1. Event Supervisors will provide powder samples from the "crime", popsicle sticks or scoops for stirring and scooping powders, hand lens, paper towels, iodine for a starch test, white vinegar, droppers or transfer pipettes for liquids, distilled water, and container to test powders in (ex. well plate, plastic containers, plastic plate)
            2. Participants will create a Powder Properties chart describing the powders' reactions to the above materials before attending the tournament. This chart should be brought to the tournament. The chart and answer sheet will be collected at the end of the event.
            3. The samples of powder will be one single powder and not a mixture. iv. There will be only 1 powder per suspect to analyze.
            4. Tasting, touching or feeling of the substances, or unsafe handling of the equipment is NOT allowed.
            5. No extra powder is provided, so students should practice with small amounts.
        ii. Fingerprint Identification - Students will be given a set of fingerprints from several suspects and from the crime scene. They will be asked to match the fingerprints found at the scene and identify types of fingerprint patterns such as loops, arches, and whorls.

iii. Paper chromatography – Students will need to perform simple chromatography on markers/pens belonging to suspects in order to match the evidence from the crime scene. There will be no more than 1 sample from each suspect. Students will be provided with water, beakers or plastic cups, chromatography or filter paper strips, and various markers/pens to match the evidence from the crime scene. No calculations will be performed.

iv. Case Report: Students analyze the data collected from the 3 types of evidence and make a conclusion as to who committed the crime and the evidence that supports their conclusion.

b. Students will clean stations and dispose of waste as directed by the event supervisor.

RELATED FLORIDA STANDARDS:

- **SC.5.N.1.1** Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations; experiments requiring the identification of variables; collecting and organizing data; interpreting data in charts, tables, and graphics; analyze information; make predictions; and defend conclusions.
- **SC.4.N.1.6** Keep records that describe observations made, carefully distinguishing actual observations from ideas and inferences about the observations.
- **SC.3.N.1.3** Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.
- **SC.3.N.1.6** Infer based on observation.
- **SC.4.N.1.4** Attempt reasonable answers to scientific questions and cite evidence in support.
- **SC.5.P.8.1** Compare and contrast the basic properties of solids, liquids, and gases, such as mass, volume, color, texture, and temperature.
- **SC.5.P.8.2** Investigate and identify materials that will dissolve in water and those that will not and identify the conditions that will speed up or slow down the dissolving process.

SCORING :

1. High score wins .

2. The score will be based on the following formula:

a. Powder Identification- 50 points
b. Fingerprint Analysis- 20 points
c. Chromatography- 20 points
d. Final Analysis- 10 points (will also be used as the second tie-breaker)

3. Tie-breakers will be:

a. First tie-breaker- Quality of "Powder Properties Chart"
b. Second tie-breaker- Quality of final analysis
c. Third tie-breaker- Quality of notes

4. Teams who do not have proper safety equipment cannot compete. They may leave to find someone to lend them the equipment but will not receive any time back to make up for lost time. Supervisor may provide safety equipment, if available, but there will be a penalty of 10% given. This penalty is taken off the overall score that the team gets.

5. A penalty of 10% will be given if the lab station is not cleaned up as instructed by the event supervisor .

“Crime Busters” SAMPLE Answer Sheet (May be adapted by supervisors)

School:_____ Team Number:_____

Team Member 1:_____ Team Member 2:_____

SCORING	
Points for Part 1	_____/50
Points for Part 2	_____/20
Points for Part 3	_____/20
Points for Part 4	_____/10
TOTAL	_____/100
Tie-breaker?	

All additional ***NOTES/ DATA COLLECTION*** *MUST be done on this paper! Separate paper is not allowed.*

INSTRUCTIONS: Complete the analysis using your observations –use these sheets for answers; ***no additional paper is allowed!***

PART 1: POWDER EVIDENCE

	Evidence	Analysis of the Evidence (Answer)	Points Earned/Possible
1a	What is the identity of the powder found on Suspect 1?		__/4
1b	How did you identify it?		__/5
2a	What is the identity of the powder found on Suspect 2?		__/4
2b	How did you identify it?		__/5
3a	What is the identity of the powder found on Suspect 3?		__/4
3b	How did you identify it?		__/5
4a	What is the identity of the powder found on Suspect 4?		__/4
4b	How did you identify it?		__/5
5a	What happened when you tested the evidence powder found at the crime scene?		__/5
5b	What powder was found at the scene?		__/5
5b	Which suspect's "mystery powder" is the same as the powder at the crime scene?		__/4
		TOTAL POINTS FOR THIS SECTION	/50

PART 2: FINGERPRINT ANALYSIS

2a.	Type of fingerprint pattern of Suspect 1		__/3
2b.	Type of fingerprint pattern of Suspect 2		__/3
2c.	Type of fingerprint pattern of Suspect 3		__/3
2d	Type of fingerprint pattern of Suspect 4		__/3
2e	Type of fingerprint pattern found at the scene of the crime.		__/3
2f	Whose fingerprints were like those at the scene?		__/5
		TOTAL POINTS FOR THIS SECTION	/20

Team Number: _____

PART 3: PAPER CHROMATOGRAPHY

Complete a chromatograph according to the directions at the lab station.

3a	Paperclip/staple your chromatography below. Points will be awarded for quality of separation.		__/15
3f	Points awarded for: - Marking the baseline (2.5 points) - Marking the solvent front (2.5 points)		__/5
		TOTAL POINTS FOR THIS SECTION	/20

PART 4: CASE REPORT (*10 POINTS*)

INSTRUCTIONS: Using the evidence you analyzed, draw a conclusion as to what happened about the event. Please consider evidence that supports the guilt of certain suspect/s and evidence that supports the innocence of the other suspects. This section will be used as the second tie-breaker, if needed.

DATA CRUNCHERS

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

COMPETITORS BRING:

- Pencil/writing utensil;
- Non-programmable calculators;
- Ruler

NUMBER OF PARTICIPANTS: Maximum of 2 **IMPOUND: NO**

THE COMPETITION:

1. **The competition may be run as timed stations or as a written test.**
2. Questions and tasks may relate to the following content:
    a. Analyze data from data tables, line graphs, line plots, bar graphs, pie charts, **stem-and-leaf plots** or pictographs
    b. Answer questions and solve problems using data from data tables, line graphs, line plots, bar graphs, pie charts, **stem-and-leaf plots** or pictographs
    c. Answer questions about creating, reading or analyzing graphs
    d. Calculate mean, median, and/or mode from a graph or data set
    e. **Perform an experiment to collect data using appropriate measurements, graph the data, and make predictions.**
    f. **Plot points and analyze problems related to coordinate planes (whole number ordered pairs on the x/y axis only)**

RELATED FLORIDA STANDARDS:

- **MA.3.DP.1** Collect, represent, and interpret numerical and categorical data. (tables, scaled pictographs, circle graphs, scaled bar graphs, line plots; Use appropriate titles, labels, and units
- **MA.4.AR.1** Represent and solve problems involving the four operations with whole numbers and fractions
- **MA.4.DP.1** Collect, represent and interpret data and find the mode, median and range of a data set. Determine the mode, median, or range to interpret numerical data including fractional values, represented with tables, stem-and-leaf plots or line plots.
- **MA.5.GR.4** Plot points and represent problems on the coordinate plane. (whole numbered ordered pairs on the x/y axis only).

SCORING:

- **High score wins.**
- Tiebreakers will be a predetermined and announced set of questions as defined by the event supervisor.

ENERGY MATTERS

DESCRIPTION: Teams will be asked questions and/or will conduct experiments at stations as they relate to the properties of energy. **Safety goggles are required.**

COMPETITORS BRING/NEED :

- Safety goggles;
- Writing utensil;
- 3-ring binder of any size with any research/reference material. The binder may contain any item, such as a book, computer generated printout, or student created paperwork. No electronic materials are allowed, such as a computer, calculator or smartphone. All materials must be securely bound inside the binder, so that when it is opened vertically (upside down) and given a light shake test no materials will fall out.

NUMBER OF PARTICIPANTS : Maximum of 2 **IMPOUND : NO**

THE COMPETITION :

1. **The competition may be run as timed stations and/or a written test.**
2. Teams will either be asked questions or will be required to complete experiments or make observations as they relate to forms of energy such as light, heat, sound, electrical, chemical, and mechanical.
3. Topics are limited to:
    a. Descriptions of light, heat, sound, electrical, **chemical**, and mechanical energy. Topics may include:
        i. **Characteristics of sound waves: Wavelength, amplitude, frequency, time period, velocity**
        ii. **Sound waves begin with vibrating matter**
        iii. **Sound waves need a medium to travel through**
        iv. **Heat can move via conduction, convection, and radiation**
        v. **Friction**
        vi. **The Sun provides heat energy through radiation**
        vii. **Light moves in a straight line unless it strikes matter**
        viii. **Light can be reflected, refracted, or absorbed ix. Law of Conservation of Energy**
        x. **Energy can transfer from one form to another**
        xi. **Kinetic versus potential energy**
    b. **Analysis of data from experiments on light, heat, sound, electrical, or mechanical energy**

RELATED FLORIDA STANDARDS :

- **SC.5.P.10.1** Observe and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical.
    - **SC.4.P.10.1** Observe and describe some basic forms of energy, including light, heat, sound, electrical, and the energy of motion.
    - **SC.3.P.10.1** Identify some basic forms of energy such as light, heat, sound, electrical, and mechanical.
- **SC.3.P.10.2** Recognize that energy has the ability to cause motion or create change.
- **SC.4.P.10.3** Investigate and explain that sound is produced by vibrating objects and that pitch depends on how fast or slow the object vibrates.
    - **SC.3.P.10.3** Demonstrate that light travels in a straight line until it strikes an object or travels from one medium to another.
- **SC.5.P.10.3** Investigate and explain that electrical energy can be transformed into heat, light, and sound energy, as well as the energy of motion.
- **SC.4.P.10.4** Describe how moving water and air are sources of energy and can be used to move things.
    - **SC.3.P.10.4** Demonstrate that light can be reflected, refracted, and absorbed.

- **SC.4.P.11.1** Recognize that heat flows from a hot object to a cold object and that heat flow may cause materials to change temperature.
    - **SC.3.P.11.1** Investigate, observe, and explain that things that give off light often also give off heat.
- **SC.P.11.2** Investigate, observe, and explain that heat is produced when one object rubs against another, such as rubbing one's hands together.
- **SC.3.E.6.1** Demonstrate that radiant energy from the Sun can heat objects and when the Sun is not present, heat may be lost.

- **MA.3.M.1** Measure attributes of objects and solve problems involving measurements (length, mass, volume, temperature
- **MA.4.M.1** Measure the length of objects and solve problems involving measurement; Convert within a single system of measurements using the units: yards, feet, inches; kilometers, meters, centimeters; pounds, ounces; kilograms, grams; gallons, quarts, pints, cups; liter, milliliter; and hours, minutes, seconds.
- **MA.5.M.1** Convert measurement units to solve multi-step problems.

SCORING :

1. **High score wins.**
2. Each question or station will be assigned a predetermined set of points, assigned by the event supervisor **and communicated to the teams (preferably- points are identified on the test/station paperwork).**
3. Ties will be broken with pre-determined tie-breaker questions **which are communicated to teams.**

EXPERIMENTAL DESIGN

DESCRIPTION : Teams will be asked to design, complete, and write up an experiment.

COMPETITORS BRING :

- Pencil/writing utensil;
- 1 sheet of 8.5 X 11" paper with notes on both sides
- Calculator

NUMBER OF PARTICIPANTS : **Maximum of 3** **IMPOUND :** **NO**

THE COMPETITION :

1. Teams will be asked to design, complete, and write up an experiment focused on a topic provided by the supervisor. The lab write up should include the following:
    a. Statement of problem
    b. Hypothesis- predicts the relationship between the dependent and independent variable, gives direction to the prediction, and provides a rationale for the hypothesis
    c. Variables including the independent variable, dependent variable, constants (controlled variables)
    d. Experimental control (when appropriate)
    e. Materials
    f. Procedure and set up diagrams – provided in a list form with labeled diagrams
    g. Qualitative observations
    h. Quantitative data (data table)
    i. Possible experimental errors – at least 2
    j. Conclusion – Hypothesis is restated. A claim made regarding hypothesis being supported or not, data is outlined as evidence of the claim, and a rationale is provided.
2. Students may request additional lined paper from the supervisor.
3. Students must clean their station as per the directions of the supervisor. Failure to do so will include a 75%-point deduction off the score. *So, if students get a score of 75, this would be multiplied by .75 and that value deducted from the original score to give them 18.75 points.*
4. Student experiments that do not focus on the topic provided will earn a penalty of 50% off their score.
5. Students who do not physically complete and experiment and collect data will earn a penalty of 25% off their score.

RELATED FLORIDA STANDARDS :

- **SC.5.N.1.1** Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
- **SC.5.N.1.2** Explain the difference between an experiment and other types of scientific investigation.
- **SC.5.N.1.4** Identify a control group and explain its importance in an experiment.
- **SC.4.N.1.8** Recognize that science involves creativity in designing experiments.
- **SC.3.N.1.4** Recognize the importance of communication among scientists.
- **SC.5.N.2.1** Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence.
- **SC.3.N.1.7** Explain that empirical evidence is information, such as observations or measurements that is used to help validate explanations of natural phenomena.

- **SC.4.N.1.3** Explain that science does not always follow a rigidly defined method ("the scientific method") but that science does involve the use of observations and empirical evidence.
- **SC.4.N.1.7** Recognize and explain that scientists base their explanations on evidence.
- **SC.5.N.1.5** Recognize and explain that authentic scientific investigation frequently does not parallel the steps of "the scientific method."
- **SC.5.N.1.6** Recognize and explain the difference between personal opinion/interpretation and verified observation.

- **MA.3.M.1** Measure attributes of objects and solve problems involving measurements (length, mass, volume, temperature)
- **MA.4.M.1** Measure the length of objects and solve problems involving measurement; Convert within a single system of measurements using the units: yards, feet, inches; kilometers, meters, centimeters; pounds, ounces; kilograms, grams; gallons, quarts, pints, cups; liter, milliliter; and hours, minutes, seconds.
- **MA.5.M.1** Convert measurement units to solve multi-step problems.

SCORING:

- **High score wins.**
- **Possible penalties include:**
  - **Not cleaning up : 75% point deduction off the Part 1 score**
  - **Experiment off topic : 75% point deduction off the Part 1 score**
  - **Not completing experiment : 25% point deduction off the Part 1 score.**
- Ties will be broken with predetermined tie-breaker questions

EXPERIMENTAL DESIGN STUDENT ANSWER SHEET

TEAM #: _____ SCHOOL : _____

TEAM MEMBERS : _____

Supervisor Only
Score Part 1: _____
Score Part 2: _____
Rank: _____

Student Section	**Supervisor Only** Points earned/notes
[2 pts] Statement of Problem:	
[6 pts- Tiebreaker 1] Hypothesis:	
[3 pts] Independent Variable:	
[3 pts] Dependent Variable:	
[4 pts] Constants:	
[4 pts- Tiebreaker 2] Experimental Control/Control Group:	
[4 pts] Materials:	

TEAM # _____	
[15 pts- Tiebreaker 3] Procedures	

TEAM # _____	
[8 pts] Qualitative Observations:	
[14 pts] Quantitative Data (Data Table):	
[4 pts] Possible Experimental Errors:	

TEAM # _____	
[8 pts] Conclusion:	

Supervisor ONLY:

Total Points: _____/75

Deduction Multipliers (if penalties applied):

- Non-clean up of station: _____ X 0.75 = _____
- Off topic: _____ X 0.5 = _____
- No experiment: _____ X 0.25 = _____
    - Total penalty to be subtracted from Part I: _____

Score: _____

FOSSIL FRENZY

DESCRIPTION: This event focused on **their knowledge of geologic time, dinosaur fossils and the process of fossilization.**

COMPETITORS BRING/NEED:

- Writing utensil;
- ONE sheet of 8.5 X 11" paper with notes (handwritten or printed) on both sides; This may be in a page protector, but there cannot be additional notes or post-its on the page protector that would add the amount of notes

NUMBER OF PARTICIPANTS : **Maximum of** 2 **IMPOUND : NO**

THE COMPETITION :

1. The competition may be run as timed stations, a slideshow and/or a written test.
2. Identification of fossils is limited to 50% of the total score. Students will be able to identify fossils of the Clade Dinosauria from pictures, replicas, actual specimens, etc. and answer questions on the following:
    a. If the dinosaur was a carnivore, omnivore, and herbivore
    b. The specific environment that the dinosaur lived in- marine, terrestrial, freshwater, etc.
    c. The geologic time period the dinosaur is from (Triassic, Jurassic, or Cretaceous)
    d. Specific physical adaptations
3. Fossil identification is limited to the following:
    a. Order Saurischia (lizard-hipped dinosaurs) to include Allosaurus, Coelophysis, **Dilophosaurus**, Spinosaurus, Tyrannosaurus, Velociraptor, Brachiosaurus, Diplodocus, Patagotitan, Plateosaurus
    b. Order Ornithischia (bird-hipped dinosaurs) to include Ankylosaurus, Triceratops, Iguanodon, Parasaurolophus, Dracorex, Stegosaurus
4. Teams may also be assessed in any of the following topics:
    a. The conditions required for a plant or animal to become fossilized.
    b. Distinguish between modes of preservation: petrification, mineral replacement, cast/mold, imprint, encasement in amber/copal, mummification, freezing, entrapment in tar/asphalt.
    c. 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 dinosaurs and humans fit on that time scale.
    e. Describe possible causes of extinction

RELATED FLORIDA STANDARDS :

- **SC.3.N.1.7** Explain that empirical evidence is information, such as observations or measurements, that is used to help validate explanations of natural phenomena.
    - **SC.4.N.1.7** Recognize and explain that scientists base their explanations on evidence.
- **SC.4.N.1.6** Keep records that describe observations made, carefully distinguishing actual observations from ideas and inferences about the observations.
- **SC.3.L.15.1** Classify animals into major groups (mammals, birds, reptiles, amphibians, fish, arthropods, vertebrates and invertebrates…) according to their physical characteristics and behaviors.
- **SC.5.L.15.1** Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.
- **SC.5.L.17.1** Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycle variations, animal behaviors and physical characteristics.

- **SC.4.E.6.1** Identify the three categories of rocks: igneous, (formed from molten rock); sedimentary (pieces of other rocks and fossilized organisms); and metamorphic (formed from heat and pressure).

SCORING :

- **High score wins.**
- Each question or station will be assigned a predetermined set of points, assigned by the event supervisor **and communicated to the teams (preferably- points are identified on the test/station paperwork).**
- Ties will be broken with pre-determined tie-breaker questions **which are communicated to teams.**

KEYED TO SCIENCE

DESCRIPTION : This event focused on **classification and using tools for classification** .

COMPETITORS BRING/NEED :

- Writing utensil;
- ONE sheet of 8.5 X 11" paper with notes (handwritten or printed) on both sides; This may be in a page protector, but there cannot be additional notes or post-its on the page protector that would add the amount of notes

NUMBER OF PARTICIPANTS : Maximum of 2 **IMPOUND : NO**

THE COMPETITION :

1. The competition may be run as timed stations and/or a written test.
2. Teams will be tested on their ability to classify, sort, and categorize using Dichotomous keys, field guides, or other tools.
3. **Specific knowledge students might need to know to complete tasks:**
    a. **General classification of arthropods- what makes something an insect vs. an arachnid; These tasks may require specific organism identification only with the use of a dichotomous key or field guide as students are not expected to know specific organisms by sight.**
    b. **Classification of two-dimensional figures based on defining attributes. Figures are limited to: triangles including scalene, isosceles, equilateral, acute, obtuse, and rights; quadrilaterals include parallelograms, rhombi, rectangles, squares and trapezoids.**
    c. **Types of metamorphosis and classification of insects that go through metamorphosis.**
    d. **Classification of flowering vs. non flowering plants.**
4. Students are not expected to know scientific names of organisms.
5. Students may be asked about the concept of binomial nomenclature and how an organism is identified by a scientific name.
6. All other classification tasks will not require specific prior content knowledge and students will be able to complete those tasks using basic scientific processing.
7. Sample activities may include, **but are not limited to**:
    a. Given a Dichotomous Key, identify animal tracks (footprints).
    b. Given images of leaves, create a Dichotomous Key to classify them.
    c. Use a field guide to identify an unknown bird from images provided.
    d. Given three categories, sort random objects into the most appropriate category.
    e. Answer questions using a field guide, Dichotomous key, or other tools such as tables and charts.
    f. Given images of organisms, identify which are arachnids and explain what makes something an arachnid.
    g. Given images of 2-dimensional objects, classify them by shape.

RELATED FLORIDA STANDARDS :

- **SC.4.L.16.4** Compare and contrast the major stages in the life cycles of Florida plants and animals, such as those that undergo incomplete and complete metamorphosis, and flowering and nonflowering seed-bearing plants.
- **SC.1.L.14.3** Differentiate between living and nonliving things.
- **SC.3.L.15.2** Classify flowering and nonflowering plants into major groups such as those that produce seeds, or those like ferns and mosses that produce spores, according to their physical characteristics.
- **SC.3.L.15.1** Classify animals into major groups (mammals, birds, reptiles, amphibians, fish, arthropods, vertebrates and invertebrates, those having live births and those which lay eggs) according to their physical characteristics and behaviors.
- **MA.3.M.1** Measure attributes of objects and solve problems involving measurements (length, mass, volume, temperature)

- **MA.4.M.1** Measure the length of objects and solve problems involving measurement; Convert within a single system of measurements using the units: yards, feet, inches; kilometers, meters, centimeters; pounds, ounces; kilograms, grams; gallons, quarts, pints, cups; liter, milliliter; and hours, minutes, seconds.
- **MA.5.M.1** Convert measurement units to solve multi-step problems.

- **MA.5.GR.1** Classify two-dimensional figures and three-dimensional figures based on defining attributes. (2-D: Triangles including scalene, isosceles, equilateral, acute, obtuse, and rights; quadrilaterals include parallelograms, rhombi, rectangles, squares and trapezoids. 3-D: Attributes include number and shape of faces, number and shape of bases, apex, curved or straight edges, curved or flat faces. Figures are limited to right pyramids, right prisms, right circular cylinders, right circular cones and spheres.)

SCORING :

- **High score wins.**
- Each question or station will be assigned a predetermined set of points, assigned by the event supervisor **and communicated to the teams (preferably- points are identified on the test/station paperwork).**
- Ties will be broken with pre-determined tie-breaker questions **which are communicated to teams.**

MYSTERY PACKAGING

DESCRIPTION: At the beginning of the event, teams will be given a bag of building materials and instructions for designing and building a package that will protect a given material from a drop. This is an **ON-SITE BUILD EVENT.**

NUMBER OF PARTICIPANTS: **Maximum of 3** **IMPOUND:** NO but all teams will build at the same time.

COMPETITORS BRING:

- Writing utensil;
- Scissors;
- Ruler;
- Safety goggles

THE COMPETITION :

BUILD:

1. All teams will build at the same time. Teams will have 25-minutes to build. Once teams enter the area to build, they may not leave the area or receive outside assistance, materials, or communication until after they are finished building. **Violation of this rule places a team in Tier 2.**
2. Once participants arrive at their build area, they must put their safety goggles on. These goggles must stay on for the entire build period. Supervisors will give one goggle warning**. Additional warnings will place the team in Tier 2 and/or remove them from competition.**
3. Each team will be given a bag containing the same materials and a working area.
    a. Examples of materials are: paper cups, drinking straws, paper clips, string, tape, paper, Play Doh ©, and Popsicle sticks. Materials are not limited to this list but will not include anything potentially hazardous.
    b. Teams may not use any outside materials, other than what is provided to them by the event supervisor or their scissors and ruler.
    c. The bag that the materials come in cannot be part of the package and should be used to hold all waste at the end of the build.
    d. The materials provided may be altered as needed, using the allowable tools.
    e. The allowable materials (scissors, pencil, ruler) may NOT be part of the package.
4. The material that will be loaded into the device will be announced at the start of construction.
    a. This could be either a solid or a liquid and either homogeneous or heterogeneous in composition.
    b. After the teams have constructed the package, the material will be loaded into the device.
    c. Teams will be allowed to examine a separate "inspection" load material of the same size and weight as used for testing but this cannot be loaded into the device during construction. This inspection area will be separate from the building area and may be accessed by any team, however, teams may not take the sample material back to their building area.
5. The team will create a package using the given materials that will hold the load when it is dropped from a height between 0.5 and 1 meter, depending on the team's choice.
    a. The device must be built to allow for the loading of the material after construction has been completed.
    b. The loading of the material should be able to be completed and device ready to drop within 1-minute.
    c. The package must have the team number on it. **Packages without team numbers will be placed in Tier 2.**
6. At the end of the build time, teams must clean up their build area by placing all trash and extra materials in the bag.

a. The remaining supplies will be massed and this will be used as a tie-breaker (those with more supplies left over will place higher in the tie).
b. Prior to leaving the build area, teams must ensure that their area is clean and all instructions have been followed. **Failure to follow this rule will place teams in Tier 2.**
c. Teams should store their packages in a location noted by the event supervisor. It is suggested that the event supervisor/judges do not touch student packages and instead have them place them in a location that will be monitored throughout the day.

TEST:

1. Teams will return to test at some point later in the day- this may be via self-scheduling or based on a set schedule.
2. Once participants arrive at their test area, supervisors will have them collect their device and give them the loading material (this is the same for all participants).
3. Teams have 1-minute to load the material and place their package on the balance to measure the mass. **Teams who do not meet this time will earn only Participation points.**
4. **Teams whose package cannot hold the load will earn Participation points.**
5. Teams will then take their full package and proceed to the testing site.
6. One member of the team will hold a meter stick and the other will hold the package at the drop height of their choice. This drop height should be between 0.5 meters and 1 meter. The height is measured from the bottom of the package to the floor. The supervisor will confirm the height.
7. Once given the signal by the supervisor, teams drop their full package. Teams have one chance to drop their package. There are no trial runs or do-overs.
8. Teams will then pick up their package and carry it to the balance to measure the ending mass to account for any lost load. Any material that falls out prior to massing will not count in the final mass.
9. Teams will remove the load according to the supervisor's instructions and return their package to the location where they are being stored. Teams may pick up packages at the end of the day, if desired.

RELATED FLORIDA STANDARDS:

- **SC.5.N.1.5** Recognize and explain that authentic scientific investigation frequently does not parallel the steps of "the scientific method".
- **SC.5.P.13.1** Identify familiar forces that cause objects to move, such as pushes or pulls, including gravity acting on falling objects.
- **MA.3.M.1** Measure attributes of objects and solve problems involving measurements (length, mass, volume, temperature)
- **MA.4.M.1** Measure the length of objects and solve problems involving measurement; Convert within a single system of measurements using the units: yards, feet, inches; kilometers, meters, centimeters; pounds, ounces; kilograms, grams; gallons, quarts, pints, cups; liter, milliliter; and hours, minutes, seconds.

SCORING :

1. **High score wins.**
2. The following formula will be used to get the test score:

   Score= [Drop Height – (Initial Loaded Package Mass-Final Package Mass)] x100

   - Drop height will be measured in centimeters
   - Mass will be measured in grams
   - Negative point values are allowed

3. Devices that cannot support the load will earn Participation points only.

Mystery Packaging Scoring Sheet

Team #: _____

School: _____

BUILD:

		TIER
1. Outside assistance violation?	**Y= Tier 2; Repeated violations may result in DQ**	
2. Safety goggle violation?	**1 st time= Warning; 2 nd time = Tier 2; Repeated violations may result in DQ**	
3. Package made only of allowable materials?	**N= Participation points only**	
5c. Device has team number on it?	**N= Tier 2**	
6c. Building area cleaned up as instructed?	**N = Tier 2**	
Team did not show up at build time?	**Y= Participation points only**	
	TIER?	

TEST SCORE :

		POINTS
Mass of bag with "waste"	_____ g (TIE-BREAKER)	
3. Loaded within 1-minute?	**N= Participation points only**	
4. Package held the load?	**N= Participation points only**	
Mass of fully loaded package BEFORE drop		_____ g
Height of drop		_____ cm
Mass of package and remaining load AFTER drop		_____ g
	CHANGE IN MASS=	

Drop Height (cm)	-	Change in Mass (g)	X	100 =	**FINAL SCORE (High score Wins)**
	-		X	100	_____

PLEASE NOTE THAT THIS RUBRIC IS A SAMPLE AND GUIDE- IN CASES OF CONFLICT WITH THE RULES, THE RULES TAKE PRECEDENCE OVER THE RUBRIC.

PRECISION PING PONG PROPULSION

DESCRIPTION: Students will build and calibrate their own free-standing (not hand held) launching device to propel ping pong balls at a target that is placed within a given range. **This is a PREBUILD event.**

COMPETITORS BRING:

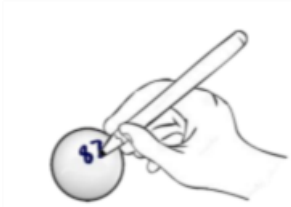
- Student built launching device;
- 15 regulation ping pong balls (see details below for specifics);
- Prepared graph/chart;
- Safety goggles

NUMBER OF PARTICIPANTS: **Maximum of 2** **IMPOUND: YES**

CONSTRUCTION/IMPOUND :

LAUNCHING DEVICE:

1. Prior to the competition, students will design, construct and test a launching device. The device should be capable of accurately and consistently shooting a ping pong ball a range of distances.
2. The balls must be launched using energy stored in the device. Gravitational potential energy, elastic energy, and compressed air are appropriate (e.g. stretching or compressing a component). Students may pull back on the launcher to launch. No electricity, batteries, or flammable gas allowed.
3. Balls may be loaded individually or all together, but not before approaching the launch line.
4. There are minimal material and size restrictions for the launcher. But, consider the following when designing:
    a. Devices that are deemed to be hazardous by the Event Supervisor will not be allowed to launch- if you think it might be hazardous/dangerous, don't use it. **Devices deemed hazardous will earn the team Participation points only.**
    b. ALL devices MUST sit upon rubber or soft material "feet" to prevent floor damage when moving. **If supervisor determines that the device will damage the venue's floor, teams may not be able to launch and will earn Participation points only**
    c. Devices will have to be moved and placed by the student at launch time- consider this when building.
    d. Students will not have time to "put together" components of the launcher at launch time- devices should be able to go into launch configuration quickly.
    e. Teams from the same school cannot use the same launcher and a new launcher must be designed and built by members of the current year's team (teams cannot use previously used launchers).
    f. Device MUST have the team number visibly marked. **No team number marked will incur a 20-point penalty.**
5. PING PONG BALLS:
    a. Teams must bring 15 regulation 40mm ping pong balls
    b. 10 balls should be white
    c. 4 balls should be orange
    d. One ball should be orange marked with a black band around the circumference using a permanent marker.
    e. Each ball must be clearly marked with the team number in two places on opposite sides using a black permanent marker.
    f. Team numbers MUST be underlined to aid in identification.
    g. No other alterations to the ping pong balls are allowed.
    h. Teams without ping pong balls may be unable to compete. **In instances where Supervisors are willing and able to provide ping pong balls, teams will be placed in Tier 2.**



PRACTICE LOG:

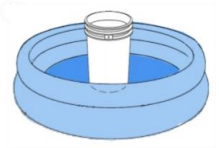
1. At impound, the team should submit 2 identical copies of a practice log.
    a. Each copy should be labeled with the school name and team number.
    b. One copy will remain with the device during launching and the 2nd copy will be held for scoring purposes.
    c. The second log will not be returned.
2. **Teams without practice logs at impound will be placed in Tier 2.**
3. The practice log should include a minimum of three variables and 20 launches related to launch performance. Examples of appropriate variables might include:
    a. Score
    b. Distance to the target
    c. Elevation or angle of shooting
    d. Stretched elastomeric membrane length
    e. Type of Elastomeric membrane
    f. Size of Elastomeric membrane
4. Practice logs will be judged in terms of data completeness, clarity, and depth, as part of the tie-breaking process.

IMPOUND:

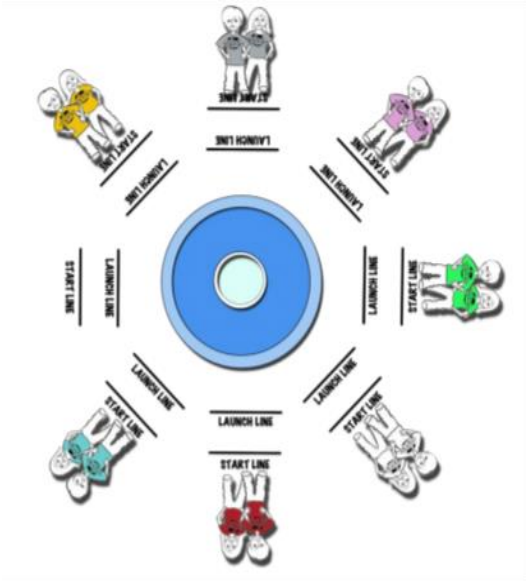
1. At impound, the team should impound:
    a. Launching device and any tools/supplies that might be needed to adjust prior to launch
    b. Ping pong balls, colored and labeled as outlined in the rules, in a clear, Ziploc type baggie.
    c. 2 copies of the Practice log
2. **Teams who do not impound during the impound time may earn Participation points OR be placed in Tier 2** .

THE COMPETITION:

TARGET/LAUNCHING AREA:



1. The target is a 5-gallon plastic bucket with the handle removed placed in the center of an inflatable wading pool.
2. The target and launch area will be on a hard surface such as a tiled floor or hardwood gymnasium floor.
3. Launch line will be marked on the floor 4 to 8 meters from the center of the target at half meter intervals (see diagram below right). A starting line will be marked approximately 2 meters back from each launch line.
4. Competitors will be notified of the distance to the target at the time of their individual shooting round.
5. The target is surrounded by several launch lines. The chaos of multiple simultaneous launches is part of this event. Expect to see mid-air collisions, unfortunate bounces, and unbelievable lucky bounces.
6. **Supervisors are encouraged to balance the number of teams shooting at one time so that this is similar throughout the day.**
7. **Supervisors may choose to do ONE or TWO rounds of shooting depending on the number of teams participating. If TWO rounds are used, the score will be the BEST of the two rounds.**



LAUNCHING:

1. Safety goggles must be worn in the competition area at ALL times.
   Teams who are warned about not wearing goggles once testing begins will be placed in Tier 2.
2. No one except competitors and judges are allowed in the competition area.
3. The teams will wait with their launcher behind their assigned starting line. When they hear the Event Supervisor's signal, all teams may advance to the launch line, set up their launcher, and begin launching.
   a. Once in launch position, no part of the launcher may cross the launch line. **Teams whose launchers cross the line will earn a 50 point penalty and may be disqualified for repeated infractions.**
   b. No participant may manually weigh down or manually support the front edge of the device during active shooting.
   c. Students must stay behind the launching line.
   d. Students may adjust their launchers during the launching time as needed unless the adjustment causes a safety concern. Launchers must be in a position that makes them unable to launch at that time.
   e. Misfired balls that do not pass the launch line may be picked up and relaunched. Balls that go outside the launch line may not be relaunched.
4. A total of 4 minutes are allowed to set up and launch all 15 balls. The team decides what order to launch their different colored balls.
5. The supervisor will announce when there is one minute remaining and signal at the end of the 4 minutes. At that time, all launching must cease.
6. Penalty points or disqualification may be caused if the Supervisor has to intervene during the testing. The Event Supervisor will immediately intervene if:
   a. A team's device or behavior appears unsafe for any reason. This will likely cause immediate disqualification.
   b. If any part of the device crossed the launch line. This will cause a penalty of 50 points the first time and may cause disqualification for additional instances.
   c. **If there is any interference or coaching from outside the competition area. This will cause a penalty of 50 points the first time and disqualification for other instances.**
7. When the final whistle sounds, the Event Supervisor/judges will count the balls, by color contained inside the target. Any ball that is outside the target at the final whistle will have no value, even if it was in earlier and was somehow ejected.

RELATED FLORIDA STANDARDS:

- **SC.5.N.1.3** Recognize the need for repeated experimental trials.
  - **SC.3.N.1.3** Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.
- **SC.5.N.1.5** Recognize and explain that authentic scientific investigation frequently does not parallel the steps of "the scientific method"
- **SC.4.N.1.6** Keep records that describe observations made, carefully distinguishing actual observations from ideas and inferences about the observations.
- **SC.5.P.11.1** Identify familiar forces that case objects to move, such as pushes or pulls, including gravity acting on falling objects.
- **SC.5.P.13.2** Investigate and describe that the greater the force applied to it, the greater the change in motion of a given object.
- **SC.4.P.12.2** Investigate and describe that the speed of an object is determined by the distance it travels in a unit of time and that objects can move at different speeds.
- **SC.5.P.13.3** Investigate and describe that the more mass an object has, the less effect a given force will have on the object's motion.
- **SC.5.P.13.4** Investigate and explain that when a force is applied to an object but it does not move, it is because another opposing force is being applied by something in the environment so that the forces are balanced.

Scoring:

1. **High score wins.**
2. Score is calculated based on the balls that are contained inside the target and the quality of the practice log.
   a. Each ball that is in the pail at the target center is worth 25 points.

    b. Each ball that is inside the pool but outside the pail is worth 9 points.
    c. Practice logs are worth up to 50 points.
3. A point multiplier will be applied for the orange colored balls.
    a. Orange balls count 3 times the normal value.
    b. Orange ball with the black band counts 5 times the normal value.
4. Penalties may be assessed according to the rules, including:
    a. Outside interference causes a penalty of 50 points.
    b. If any part of the launching device crosses the launch line, a penalty of 50 points is incurred.
5. Ties will be broken by:
    a. Total points in bucket
    b. Total points scored by colored balls
    c. Quality of Practice log

Precision Ping Pong Propulsion
Scoring Rubric

Team #: _____

School: _____

IMPOUND :

		Does the Catapult meet the requirements? (Y/N)
a. Catapult determined to be safe?	**N= Cannot compete; Participation only**	
b. Catapult sits upon rubber or soft material as to not damage floor?	**N = Participation only (supervisor discretion)**	
c. Catapult labeled with team #?	**N= -20 points**	
d. Ping pong balls impounded and labeled	**N= Participation only OR Tier 2**	
e. 2 copies of Practice log provided?	**N = Tier 2**	
f. Impound on time?	**N = Participation only OR Tier 2**	
	TIER?	

LAUNCH SCORE :

		Points
a. Number of WHITE balls in bucket-	_____ X 25 **points =**	
b. Number of WHITE balls in pool-	_____ X 9 **points =**	
b. Number of ORANGE balls in bucket-	_____ X 75 **points =**	
b. Number of ORANGE balls in pool-	_____ X 27 **points =**	
b. Points for ORANGE ball with BLACK BAND (5X multiplier)	**In bucket? = 125 points; In pool? = 45 points**	
	TOTAL=	

LAUNCH PENALTIES :

		Penalty
a. Catapult labeled with team #? (see above)	**N= -20 points**	
b. Student or device crosses launch line?	**Y = -50 points**	
c. Outside interference?	**Y= -50 points**	
	TOTAL=	

Launch score	-	Penalty Points	+	Practice Log =	**FINAL SCORE (High score Wins)**
	+		-		_____

PLEASE NOTE THAT THIS RUBRIC IS A SAMPLE AND GUIDE- IN CASES OF CONFLICT WITH THE RULES, THE RULES TAKE PRECEDENCE OVER THE RUBRIC.

ProGAMERS

DESCRIPTION : Teams of students will use the Scratch 3.0 programming language to recreate a game being shown to them on a screen in the room.

COMPETITORS BRING /NEED :

- Writing utensil;
- One sheet of 8.5" X 11" sheet of paper, which may include hand written information on both sides from any source.

NUMBER OF PARTICIPANTS : Maximum of 2 **IMPOUND : NO**

THE COMPETITION:

1. Each team will have their own computer with access to the Scratch website.
2. Students will login using accounts created specifically for the tournament.
3. A pre-programmed game, supplied by the Event Supervisor, will play on a continuous loop on a screen in the room.
4. Students will have 45 – 50 minutes (all teams have the same amount of time for one tournament) to program the game exactly as it is shown.
5. Students will make their game public by sharing them with the Event Supervisor.
6. **Supervisor may provide scoring rubric at the beginning of the event but this is at supervisor discretion. Supervisors must provide the same directions and tools to all teams equally throughout the day.**
7. **Schools with multiple teams must compete in this event at the same time.**
8. **Teams will be notified if any of the following will be used for scoring. At supervisor discretion,**
   a. **Students may be asked to code part of the game using a specific technique (e.g. …use a loop).**
   b. **Students may be asked to code a specific part of the game and notify the supervisor when complete (time of this may be used for additional points)**

RELATED FLORIDA STANDARDS :

- **SC.35.CS-CP.2.2** Create, test, and modify a program in a graphical environment (e.g. block-based visual programming language), individually and collaboratively.
- **SC.35.CS-CP.2.5** Detect and correct program errors, including those involving arithmetic operators, conditionals, and repetition, using interactive debugging.
- **SC.35.CS-CP.3.1** Write, communicate, and publish activities using technology tools.
- **SC.35.CS-CP.3.2** Present digitally created products, either individually or collaboratively, where a topic, concept, or skill is carefully analyzed or thoughtfully explored.

SCORING :

- **High score wins.**
- Points will be awarded for each part of the game that students are successfully able to program- see sample rubric.
- Ties will be broken with predetermined pieces of code or by the team that successfully programs a piece of code in the least amount of time **. Event supervisor will determine and communicate the tiebreaker to teams.**

PROGAMERS SAMPLE RUBRIC

**PLEASE NOTE THAT THIS IS JUST A SAMPLE- SCORING WILL ALIGN WITH RULES

____/20 BASIC GAME MECHANICS

____/2 Title is displayed

____/2 Backdrop for "welcome" screen

____/4 Instructions

____/2 Start "button" works

____/2 Game backdrop is correct

____/4 Scoring

- Scoring shows on screen
- Scoring functions properly

____/2 End of game options

- Scoring linked to end of game
- Game play stops when done
- Items remaining on screen at end of game are correct

____/2 Sounds

____/12 PLAYER CONTROLLED SPRITE

____/2 Sprite selection

____/2 Sprite orientation

____/4 Sprite motion

- User controls sprite movement using keyboard
- Sprite moves correctly
- Sprite moves smoothly

____/4 Sprite interactions

- Sprite interacts with background appropriately
- Sprite interacts with autonomous sprite appropriately
- Interactions affecting scoring appropriately

_____/ 12 NON-PLAYER CONTROLLED SPRITE

____/2 Sprite selection

____/2 Sprite orientation

____/4 Sprite motion

- User cannot control sprite
- Sprite moves correctly
- Sprite moves smoothly

____/4 Sprite interactions

- Sprite interacts with background appropriately
- Sprite interacts with autonomous sprite appropriately

_____/ 15 SPECIFIC CODING (Example only) ____/2

"When GREEN FLAG clicked"

____/2 "forever"

____/2 "If *score = 20* then"

____/2 "Switch backdrop to *you win*"

____/2 "Stop *all*"

____/5 In a loop

TIEBREAKER: _____

NOTES: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

ROLLER COASTER

DESCRIPTION : Prior to the competition, teams design, build, and test a roller coaster track to guide a all or sphere that uses gravitational potential energy as its sole means of propulsion to travel as close as possible to a target time. . Students MUST bring and wear impact resistant **safety goggles**. **This is a PRE-BUILT EVENT.**

COMPETITORS BRING:

- Roller Coaster device;
- Tools needed to adjust the device, if necessary;
- Design log including technical diagrams and data;
- Safety goggles
- Clear glass marbles

NUMBER OF PARTICIPANTS: Maximum of 3 **IMPOUND: YES**

THE COMPETITION:

CONSTRUCTION:

DEVICE CONSTRUCTION

1. Teams will design and build a roller coaster that allows a ball to travel from a starting point to an ending point in 60 seconds.
2. The device should be designed and built by the students (adult construction assistance is OK). Each device should be designed to operate safely at all times. No points will be awarded for design.
3. Students may not use metal or any sharp material in their build. The device must be safe to move and use. Suggested materials for building include foam pipes, pool noodles, pvc pipe, cardboard, manila folders, paper, etc.
4. Students may not use any pre-fabricated roller coaster kits such as K'nect. **Teams may use paper templates that they have to cut and assemble themselves as part of the design. The supervisor should be able to ask questions to the students to determine that they designed the roller coaster for the challenge.**
5. The entire device must fit in a 1 m^2 taped area on the floor of the testing area and must be no taller than 1.5 meters.
6. The device must be freestanding and able to move from impound to the testing site with ease.
7. Team members may not stand on chairs, tables or anything else to release the ball.
8. Print the team number prominently on the roller coaster. **Teams without their team number on the device will be given an initial warning prior to penalty.**
9. Teams from the same school may **NOT** use the same device for a tournament.
10. The marble must run through the track using only gravitational energy. (i.e. no rubber bands or motors)
11. Teams will earn 20-points for each of the following elements that are incorporated into their coaster. In order for these to count toward the score, the marble must successfully pass through the element on the way to the end. **Each of these can only count toward the score once but may be used as many times as desired to reach the target time.**
    a. DROP- this is a downward portion of track that forms at least a 45-degree angle
    b. INVERSION- portion of the track that turns the marble upside down
    c. HELIX- portion of track that turns at least 360 degrees in an upward or downward spiral
    d. JUMP- track breaks and marble passes over open portion to the other "side"
12. The marble must stay in the device at the end of the run. This will earn the team 20-points.
13. The total run score will be out of 100 points.

DESIGN LOG

14. The design log should include technical diagrams and a graph/chart showing the speed of the marble.
15. Students must create labeled, technical diagrams of the device. These should include:
    a. At least 2 diagrams showing different views and details of the track
    b. Accurate metric measurements
    c. Labels of any scorable elements (helix, jump, etc.)
16. Prior to the competition, teams should prepare a graph or data chart, with data on the **speed** of the marble using various track adjustments.
17. Teams without a graph or data chart will be placed in Tier 3 and scored below all other teams.

IMPOUND

18. Teams will impound their Roller Coaster, marbles, any tools that may be needed for adjustments before testing (this includes things like tape and rubber bands), and a completed design log. Teams may pick up their design log after testing, as long as there are no arbitrations.
19. During impound, Event Supervisors will evaluate all devices for safety and determine if the device is suitable for testing.
20. Supervisors should note to students possible violations prior to testing so students may arbitrate, if necessary.

TESTING :

1. At testing time, supervisors may request teams move their device to a location other than impound. Students should be able to do this without adult supervision.
2. Once the team is called to set up for testing, no coaching or support from outside is allowed.
3. Any adjustments to the device can only be made with impounded materials. Any adjustments must take less than 5-minutes.
4. Impact-resistant safety goggles (or glasses) are required during launch time. If team members do not wear safety goggles while they are setting up and running their device, they will be given an initial warning and allowed to correct. If a second warning is given, the team will not be allowed to compete **and will receive participation points only**.
5. Teams should show the supervisor where the start and end points are.
6. Teams must give ample warning to the supervisors/timers prior to launch. Warning may be "3,2,1 launching…" etc.
7. Using their marble, the students will release it at the "beginning point". The ball must be released and not pushed. The event supervisor may have the team redo a launch if pushing is determined.
8. The timers will time the entire run of the device until the marble stops at the "end".
9. If the ball falls off the track or stops during the run, the students may touch or put the ball back to continue the motion. Each touch earns a **penalty** .
10. If possible, the supervisor will announce their run time to the students.

RELATED FLORIDA STANDARDS :

- **SC.3.N.1.3** Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.
- **SC.4.P.10.2** Investigate and describe that energy has the ability to cause motion or create change.
- **SC.4.P.12.1** Recognize that an object in motion always changes its position and may change its direction.
- **SC.4.P.12.2** Investigate and describe that the speed of an object is determined by the distance it travels in a unit of time and that objects can move at different speeds.
- **SC.5.P.13.1** Identify familiar forces that cause objects to move, such as pushes or pulls, including gravity acting on falling objects.
- **SC.5.P.13.3** Investigate and describe that the more mass an object has, the less effect a given force will have on the object's motion.
- **SC.5.P.13.4** Investigate and explain that when a force is applied to an object but it does not move, it is because another opposing force is being applied by something in the environment so that the forces are balanced.

SCORING:

1. **High score wins.**
2. Score is the sum of the RUN SCORE, the LOG SCORE, and the TIME SCORE.
3. Penalties may be assessed as listed in the rules.
4. **Ties will be broken by the lowest vertical height of the Roller Coaster.**

Roller Coaster Scoring Rubric

Team Number: A_____

Team Name: _____

Student Names: _____

TIER- DID STUDENTS FOLLOW ALL DIRECTIONS AND SAFETY REQUIREMENTS ?

Were the device and design log impounded before the deadline?	**N= Tier 3**	Y N
Dimensions of the device are no larger than 1 meter X 1 meter X 1.5 meters Vertical height: _____ (used as tiebreaker)	**N=Tier 3**	Y N
Dimensions of the device are no larger than 1 meter X 1 meter X 1.5 meters **Vertical height: _____ (used as tiebreaker)**	**N=Tier 3**	Y N
Device is safe but has other construction violations.	**Y=Tier 2**	
Device was inspected and determined to be safe	**N= CANNOT RUN (Tier 3 and earn participation points only)**	Y N
Teams received outside assistance during set up or run.	**Y=DQ**	Y N

SCORING

RUN SCORE		**POINTS EARNED**
SCORABLE ELEMENTS (Check each element included and successfully completed) _____ DROP- a downward portion of the track that forms at least a 45 degree angle _____ INVERSION- portion of the track that turns the marble upside down _____ HELIX- portion of track that turns at least 360 degrees in an upward or downward spiral _____ JUMP- track breaks and marble passes over open portion to the other "side"	_____ **X 20 =**	_____
At the end of the coaster, did the marble stay in the device?	**Y= 20 pts; N= 0 points**	_____
Number of times device had to be restarted (MAX penalty of -15 points)	_____ **X -5 =**	_____
TOTAL RUN SCORE		_____
TIME SCORE		**POINTS**
What was the run time? AVG TIME: _____ + **1 point for each second up to 60 seconds; -1 point for each second longer than 60 seconds and up to 2 min.** TIMER 1: _____ TIMER 2: _____ TIMER 3: _____		_____ (MAY BE NEGATIVE)
LOG SCORE		**POINTS**
____ Quality of Diagram 1 including measurements and labels of any scorable elements (helix, jump, etc.)	**(up to 20 pts)**	
____ Quality of Diagram 2 including measurements and labels of any scorable elements (helix, jump, etc.)	**(up to 20 pts)**	
____ Graph or data chart, with data on the **speed** of the marble using various track adjustments	**(up to 20 pts)**	_____

FINAL SCORE= RUN SCORE (_____) + TIME SCORE (_____) + LOG SCORE (_____) = _____

PLEASE NOTE THAT THIS RUBRIC IS A SAMPLE AND GUIDE- IN CASES OF CONFLICT WITH THE RULES, THE RULES TAKE PRECEDENCE.

STARRY, STARRY NIGHT

DESCRIPTION: Teams will demonstrate knowledge of astronomical concepts relating to stars and planets.

COMPETITORS BRING:

- Pencil/writing utensil;
- 3-ring binder of any size with any research/reference material. The binder may contain any item, such as a book, computer generated printout, or student created paperwork. No electronic materials are allowed, such as a computer, calculator or smartphone. All materials must be securely bound inside the binder, so that when it is opened vertically (upside down) and given a light shake test no materials will fall out.

NUMBER OF PARTICIPANTS: **Maximum of 2** **IMPOUND: NO**

THE COMPETITION:

1. The event may be run as stations, may include a slideshow of images, or may be a "pencil and paper" test.
2. Teams will identify stars and planets from images. Planet identification are limited to those in our solar system and stars are limited to the following:
    - Altair
    - Procyon
    - Castor
    - Sirius
    - Deneb
    - Pollux
    - Regulus
    - Rigel
    - Polaris
    - Vega
    - Antares
    - Spica
    - Betelgeuse
    - Pleiades
    - Sun
3. No more than half of the questions on the exam will be identification questions.
4. Additional questions may be from any of the following topics:
    a. Characteristics of the Sun including:
        i. Atmosphere
        ii. Temperature
        iii. Composition
        iv. Solar winds
        v. Flares
        vi. Sunspots
    b. Characteristics of stars including brightness, color, surface temperature, size, and mass. Students are not expected to know the specific characteristics of individual stars but instead be able to generalize comparisons between the characteristics listed above.
    c. Characteristics of the planets in our solar system- Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune. Characteristics may include:
        i. Atmosphere
        ii. Relative sizes
        iii. Temperature
        iv. Rotation periods
        v. Distance from the Sun
        vi. Orbital periods
        vii. Number of moons
    d. Distinguish between the motions of rotation and revolution and explain the effects produced by rotation and revolution on Earth.
    e. Describe how understanding of the solar system was changed by the invention of the telescope.

RELATED FLORIDA STANDARDS:

- **SC.4.E.5.1** Observe that the patterns of stars in the sky stay the same although they appear to shift across the sky nightly, and different stars can be seen in different seasons.
    - **SC.3.E.5.1** Explain that stars can be different; some are smaller, some are larger, and some appear brighter than others; all except the Sun are so far away that they look like points of light.
    - **SC.1.E.5.1** Observe and discuss that here are more stars in the sky than anyone can easily count and that they are not scattered evenly in the sky.
- **SC.5.E.5.2** Recognize the major common characteristics of all planets and compare/contrast the properties of inner and outer planets.
- **SC.4.E.5.3** Recognize that the Earth revolves around the Sun in a year and rotates on its axis in a 24-hour day.
    - **SC.3.E.5.3** Recognize that the Sun appears large and bright because it is the closest star to Earth.
- **SC.4.E.5.4** Relate that the rotation of Earth (day and night) and apparent movement of the Sun, Moon, and stars are connected
- **SC.3.E.5.5** Investigate that the number of stars that can be seen through telescopes is dramatically greater than those seen by the unaided eye.

SCORING:

- **High score wins.**
- Each question or station will be assigned a predetermined set of points, assigned by the event supervisor **and communicated to the teams (preferably- points are identified on the test/station paperwork).**
- Ties will be broken with pre-determined tie-breaker questions **which are communicated to teams.**

SPECIAL EVENT: PROFESSOR JENSEN'S POTIONS

DESCRIPTION: This event is in memory of Mrs. Samantha Jensen, a supporter of Florida Science Olympiad and a coach from Orlando Science Schools. Ms. Jensen's passing was a huge loss to the Florida Science Olympiad community. Teams will be asked questions and/or will conduct experiments at stations as they relate to **science laboratory equipment, chemical reactions, toxins and antidotes. Safety goggles are required.**

COMPETITORS BRING/NEED:

- Safety goggles
- Writing utensil;
- 3-ring binder of any size with any research/reference material. The binder may contain any item, such as a book, computer generated printout, or student created paperwork. No electronic materials are allowed, such as a computer, calculator or smartphone. All materials must be securely bound inside the binder, so that when it is opened vertically (upside down) and given a light shake test no materials will fall out.

NUMBER OF PARTICIPANTS: Maximum of 2 **IMPOUND: NO**

THE COMPETITION:

1. This event leans heavily on elements from the Harry Potter series, a favorite of Ms. Jensen.
2. Each team will move from one station to another. There will be 5 stations that can be completed in any order even though they have numbers. Each station should take approximately the same amount of time.

Station 1: First Year Potions Class

a. This station focuses on activities related to lab safety and laboratory equipment such as:
   i. What is the importance of PPE in the laboratory?
   ii. What are standard safety expectations in a laboratory?
   iii. What are the uses of common laboratory equipment, including graduated cylinders, beakers, flasks, hot water baths, bunsen burners, mortar and pestle, pipettes, pH paper, microscopes, test tubes, well plates, gloves, goggles, aprons, eye wash stations, etc..

Station 2: Second Year Potions Class

a. At Hogwarts, second-year students focused on a specific element of potions and brewed simple potions.
b. This station focuses on simple chemical reactions that include Sodium Bicarbonate (baking soda), Acetic Acid (vinegar), Calcium Carbonate (egg shells), Calcium Chloride, water, and/or Ascorbic Acid (Vitamin C). Sample tasks may include:
   - Describing the physical and chemical properties of the compounds listed above.
   - Performing simple experiments and collecting data using the compounds above
   - Identifying the characteristics of a chemical change
   - Writing simple chemical equations using the compounds listed above.

Station 3: Third Year Potions Class

a. At Hogwarts, third-year students focused on "Undetectable Poisons".
b. This station focuses on toxic plants. Students will need to be able to identify these plants from images, explain the symptoms of poisoning from these plants, and describe possible remedies/antidotes. The plants that students may be tested on are:
   i. Wolfsbane (*aconitum sp.*)
   ii. Jack-in-the-pulpit (*Arum maculatum*)
   iii. Lily of the Valley (*Convallaria majalis*)

iv. Poison sumac (*Toxicodendron vernix*)
v. Poison Ivy (*Toxicodendron radicans*)
vi. Water Hemlock (*Cicuta maculata*)
vii. Tobacco (*Nicotiana tabacum)*
viii. Mistletoe (*Viscum album*)

Station 4: Fourth Year Potions Class

a. At Hogwarts, fourth-year students focused on "Poison Antidotes".
b. This station focuses on toxic animals. Students will need to be able to identify these animals from images, explain the symptoms of poisoning/envenomation from these animals, and describe possible remedies/antidotes. The animals that students may be tested on are:
    i. Poison dart frogs (*Dendrobates sp*)
    ii. Portuguese man o'war (*Physalia physalis*)
    iii. Fattail scorpion (*Androctonus australis*)
    iv. Cone snails (*Class Conoidea*)
    v. Cane toad (*Rhinella marina*)
    vi. Box jellyfish (*Carukia barnesi*)
    vii. Fire salamander (*Salamandra salamandra*)
    viii. Olive Sea Snake (*Aipysurus laevis*)

Station 5: Fifth Year Potions Class

a. At Hogwarts, fifth-year students focused on properly brewing potions using directions.
b. Students will be asked to complete a lab activity following directions from the supervisor which may include:
    i. Mixing reagents and measuring: reaction rate, production of gas, color change, development of a precipitate
    ii. Separating mixtures
    iii. Determination of pH

RELATED FLORIDA STANDARDS:

- **SC.5.P.8.1** Compare and contrast the basic properties of solids, liquids, and gases, such as mass, volume, color, texture, and temperature
- **SC.3.P.8.1** Measure and compare temperatures of various samples of solids and liquids.
- **SC.3.P.8.2** Measure and compare the mass and volume of solids and liquids.
- **SC.5.P.8.3** Demonstrate and explain that mixtures of solids can be separated based on observable properties of their parts such as particle size, shape, color, and magnetic attraction.
- **SC.5.P.8.2** Investigate and identify materials that will dissolve in water and those that will not and identify the conditions that will speed up or slow down the dissolving process.
- **SC.5.P.9.1** Investigate and describe that many physical and chemical changes are affected by temperature.

SCORING:

1. **High score wins.**
2. Each question or station will be assigned a predetermined set of points, assigned by the event supervisor **and communicated to the teams (preferably- points are identified on the test/station paperwork).**
3. Ties will be broken