

A is for ANATOMY

DESCRIPTION: Students will identify anatomical structures of the human nervous and cardiovascular systems. Only the scientific names of the parts of the brain, a spinal cord cross section, a neuron, a spinal reflex, special senses (ear and eye), the parts of the heart, and major blood vessels associated with the heart will be utilized and accepted as correct.

TEAM SIZE: 1 or 2 students

APPROXIMATE TIME: 30 minutes

THE COMPETITION: Twenty-two stations will be set up around the room. Each station will have models or pictures of anatomical structures. Questions will relate to the identity of those structures.

The teams will move around the room, one team per station, answering the questions at each station as they go. This is a timed exercise. A facilitator will direct the students to move to a new station at one-minute intervals. The answers will be recorded on the provided ZipGrade answer sheet with a #2 pencil. Students should bring pencils.

SCORING: There will be twenty-one stations with four multiple choice questions per station. Each question will be worth one or two points. The team with the highest point total will be the winner.

Ties will be broken by the four questions at station #22. These questions will be open-ended (not multiple choice) and will be recorded on the answer sheet. Only the correct spelling of scientific names of the structures will be accepted!

NERVOUS SYSTEM STUDY GUIDE

<u>Parts of the brain</u>	<u>Spinal cord cross section</u>	<u>Simple spinal reflex (reflex arc)</u>
brain stem <ul style="list-style-type: none">- midbrain- pons- medulla oblongata cerebellum cerebrum <ul style="list-style-type: none">- frontal lobe- parietal lobe- occipital lobe- temporal lobe diencephalon <ul style="list-style-type: none">- thalamus- hypothalamus- pineal gland corpus callosum pituitary gland (hypophysis) ventricles <ul style="list-style-type: none">- lateral ventricles- third ventricle- fourth ventricle optic chiasma olfactory bulb *Know primary function for each part.	posterior median sulcus anterior median fissure white matter gray matter ventral roots dorsal roots dorsal root ganglion spinal nerve pia mater arachnoid mater dura mater vertebrae <u>Parts of a neuron:</u> cell body nucleus dendrite axon	receptor afferent or sensory neuron interneuron efferent or motor neuron effector (muscle or gland) *Follow the path of signal transmission.

SPECIAL SENSES STUDY GUIDE

<p><u>Ear</u></p> <p>outer Ear</p> <ul style="list-style-type: none"> - pinna (auricle) - external auditory (acoustic) meatus - auditory canal <p>middle ear</p> <ul style="list-style-type: none"> - tympanic membrane - incus (anvil) - malleus (hammer) - stapes (stirrup) - auditory or Eustachian tube <p>inner ear</p> <ul style="list-style-type: none"> - semicircular canals - vestibule - cochlea - oval window - round window - vestibular nerve - cochlear nerve <p>*Follow the path of sound waves through the ear.</p>	<p><u>Eye</u></p> <p>lacrimal gland</p> <p>sclera</p> <p>cornea</p> <p>pupil</p> <p>iris</p> <p>lens</p> <p>retina</p> <p>choroid</p> <p>optic nerve</p> <p>anterior cavity</p> <p>posterior cavity</p> <p>aqueous humor</p> <p>vitreous humor (body)</p> <p>*Follow the path of light through the eye.</p>
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CARDIOVASCULAR SYSTEM STUDY GUIDE

<p><u>Heart</u></p> <p>right atrium</p> <p>right ventricle</p> <p>left atrium</p> <p>left ventricle</p> <p>aorta (ascending, arch, descending)</p> <p>pulmonary trunk</p> <p>pulmonary arteries (right & left)</p> <p>pulmonary veins (right & left)</p> <p>tricuspid valve</p> <p>bicuspid or mitral valve</p> <p>inferior vena cava</p> <p>superior vena cava</p> <p>aortic semilunar valve</p> <p>pulmonary semilunar valve</p> <p>chordae tendineae</p> <p>papillary muscle</p> <p>coronary arteries</p> <p>cardiac veins</p>	<p><u>Heart tissues and cavity</u></p> <p>parietal pericardium</p> <p>pericardial cavity</p> <p>visceral pericardium (epicardium)</p> <p>endocardium</p> <p>myocardium</p> <p>* Follow the path that blood takes through the heart.</p>
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If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: <https://macombso.org/anatomy>

AMAZING ARTHROPODS

DESCRIPTION: Students will be required to demonstrate an understanding of the major arthropod groups. This knowledge will also be applied to recognize the arthropods in their own neighborhood by assembling a collection of arthropod specimens or specimen photographs and identifying them in advance of the tournament.

TEAM SIZE: 1 or 2 students

APPROXIMATE TIME: 30 minutes

WHAT TO BRING: A pencil, and the team's arthropod collection. (*Note: the arthropod collection is not needed for any practice events*). Each team may also bring one, 8 ½" x 11", two-sided page of notes.

THE COMPETITION:

Part 1: A test consisting of multiple choice and true or false questions presented in a station-based format. Teams will rotate among approximately 20 stations with about 1 minute at each station. Each station may include 3 to 6 questions. Students will record their answers on a ZipGrade form. One station will be designated as tie-breaker questions, and will have a fill-in-the-blank format. The scope of subjects listed below will be the basis for questions on the test.

For the groups listed in more detail in Table 1 and Table 2, students should be able to:

Arthropod Classes and Insect Orders (Table 1)	Know the key characteristics of each listed arthropod Class and insect Order, visually recognize specimens that belong to each, and describe basic biology & anatomy.
Arthropod Species (Table 2)	Visually recognize each species, describe the species' unique physical and behavioral characteristics, describe the habitat in which it lives, describe the niche which this species holds in our ecosystem, and its conservation status.

Studying these general topics will help the student be more successful:

- Linnaean classification
- Basic arthropod anatomy
- How to use dichotomous keys
- Various methods and tools of collecting arthropods
- Arthropod life cycle (metamorphosis)
- Arthropod defenses
- Arthropod respiration
- Economic impacts
- Pest control tactics

Many of these topics are covered in the associated study guide and other resources posted on the event website.

Table 1:

Arthropod Classes	Insect Orders	
Arachnida	Blattodea	Mantodea
Branchiopoda	Coleoptera	Megaloptera
Chilopoda	Diptera	Neuroptera
Diplopoda	Ephemeroptera	Orthoptera
Insecta	Hemiptera	Odonata
Malacostraca	Hymenoptera	Trichoptera
	Lepidoptera	

Table 2. Arthropod Species

Class & Order	Common Name	Scientific Name
Class: Insecta		
Order: Blattodea	American cockroach	<i>Periplaneta americana</i>
	German cockroach	<i>Blattella germanica</i>
Order: Ephemeroptera	Giant mayfly*	<i>Hexagenia limbat</i>
	Light cahill*	<i>Stenacron interpunctatum</i>
Order: Mantodea	Chinese mantis	<i>Tenodera sinensis</i>
	European mantis	<i>Mantis religiosa</i>
Order: Megaloptera	Eastern dobsonfly*	<i>Corydalis cornutus</i>
	Spring fishfly	<i>Chauliodes rastricornis</i>
Order: Neuroptera	Spotless antlion*	<i>Myrmeleon immaculatus</i>
	Red-lipped green lacewing	<i>Chrysoperla rufilabris</i>
	Brown wasp mantidfly	<i>Climaciella brunnea</i>
Order: Trichoptera	Shrunken giant caddisfly*	<i>Agrypnia deflata</i>
	Diamond northern caddisfly*	<i>Limnephilus rhombicus</i>
	Silver-striped sedge*	<i>Hesperophylax designatus</i>
Class: Arachnida	European red mite	<i>Panonychus ulmi</i>
	Lonestar tick	<i>Amblyomma americanum</i>
	Goldenrod crab spider	<i>Misumena vatia</i>
	Long-bodied Cellar Spider	<i>Pholcus phalangioides</i>
	Eastern Harvestman	<i>Leiobunum vittatum</i>
	Black and Yellow Garden Spider	<i>Argiope aurantia</i>
	Cross Orb Weaver	<i>Araneus diadematus</i>
Class: Branchiopoda	Spiny water flea	<i>Bythotrephes longimanus</i>
	Knobbedlip fairy shrimp	<i>Eubbranchipus bundyi</i>
	Longtail tadpole shrimp	<i>Triops longicaudatus</i>

* = be able to distinguish the larvae/naiads of these species as well

Part 2: An arthropod collection that is brought to the **regional** tournament (not the practice tournament). The collection may either be pinned or presented as photographs of the actual specimen that the student found, but not a mix.

General requirements

- Specimens that can be found in the Great Lakes region (*not limited to species in Table 2*)
- **No specimens kept as pets or available from pet stores/supply houses**
- The team number and students' names should be clearly identifiable on the collection.
- An immature specimen (not adult) of a species which undergoes gradual (**paurometabolous**) metamorphosis will be accepted. However, an immature specimen of a species which would undergo either complete (**holometabolous**) or incomplete (**hemimetabolous**) metamorphosis will not be accepted. (**Refer to the Amazing Arthropods Study Guide for more details on the distinctions among the types of metamorphosis**)
- All specimens were collected or photographed within the prior year of the competition, and by members who are actively studying the Arthropod event, including Alternate team members. Adults are not team members.

(continued)

- All specimens or photos must bear collection data, associated with each individual specimen. Collection data should be on a paper card below pinned specimens or photo. Labels must consist of the following data:
 1. Date collected (month, day, year)
 2. Location collected (State, County, and nearest City)
 3. Brief behavior or habits observed during collection
 - For instance, you could say it was eating a leaf, or swimming in a pond.
 4. Name of collector
- All specimens should be identified to Class. Further, all specimens in Class Insecta should be identified to Order.
- Specimens should be grouped by Class first, then sub-grouped by Order (insects only). No further identification below this level is needed (or wanted!) for this event.

Requirements specific to pinned collections

- Collections should be housed in a sturdy cardboard or wooden box with a lid, not to exceed 16.5" x 19". Styrofoam or similarly porous and flexible material should be placed on the bottom for the pins to stick into.
- Professional insect pins must be used (#2 is an appropriate size).
- Professional vials may be used for soft-bodied specimens, but not other specimens.

Requirements specific to photographic collections

- The collection should be housed in a photo album or combined onto a poster, not to exceed 24" by 36".
- List the camera you used to take the pictures, including lenses.
- Photos must be in focus and allow for proper identification of the specimen (showing necessary features, like number of legs, wings, etc.) **and cropped to reduce excess background.**
- Photos must be of only one specimen.

SCORING:

Test: Approximately $\frac{2}{3}$ of the total score

- Each question may be assigned a value of 2 or 3 points, based on question difficulty.

Collection: Approximately $\frac{1}{3}$ of the total score

- **4** points for each unique Arthropod Class collected and properly identified (**not including Insecta**)
- **3** points for each unique Insect Order collected and properly identified (up to 10 orders)
- 1 point per specimen (up to 30 specimens). Duplicate specimens will not be counted.
- Up to **20** points for quality of work and adherence to the rules (e.g., a proper size box)

Note: Points may be deducted at the Supervisor's discretion, if it appears that the student misrepresented their Arthropod collection or if it appears that the collection was assembled by an adult.

Tie Breaker

Total points of the tie-breaker, fill-in-the-blank format questions.

SUPPORTING RESOURCES:

These are posted on the Macomb Science Olympiad website:

- Amazing Arthropods Study Guide
- Arthropod Species Student Workbook
- Anatomy Worksheets
- Scoring Rubric

If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: <https://macombso.org/arthropods>

CHARGED UP

DESCRIPTION: Students will be tested on their knowledge of electricity and related concepts. The exam will cover circuits, conductors, insulators, lamps, diodes, resistors, voltage, current, resistance, schematic drawings, meter reading, electrical sources and safety.

TEAM SIZE: 1 or 2 Students

APPROXIMATE TIME: 30 Minutes

THE COMPETITION:

The test will be given in a station format with multiple questions per station. Two or three essay questions or tasks will be included as tiebreakers.

Students need to understand the terms: conductor, insulator, open circuit, short circuit and know the difference between normally open and normally closed switches, series circuits, parallel circuits, and series-parallel circuits. They should be familiar with electrical safety practices, meter reading, voltage, current, resistance, diodes and sources of electricity. Students should know how to calculate the voltage or resistance of a series circuit. Students should be able to draw circuits using schematic symbols from written instructions and construct circuits from written instructions or schematic symbol circuit diagrams.

Study materials will be posted on the Macomb Science Olympiad web site at
<https://macombso.org/charged-up>

Examples of possible items at the stations:

- Schematic drawings with questions regarding the circuits.
- Questions about what happens when a switch is closed or opened, or whether a lamp in a given circuit will light or not.
- Identification of series, parallel, and series-parallel circuits.
- Questions about insulators, conductors and conductivity of various materials.
- Questions about meter reading, generators or voltage.
- Given a written description or a schematic drawing, construct an actual circuit.
- Identification of internally-connected circuits on mystery cards.
- Construct a circuit tester.
- Identify the resistance of a given resistor using the 4-band color code.
- Definitions of electrical terms.
- Questions on general electrical safety.
- Using a meter, measure voltage, resistance, and current of components.

SCORING:

Points will be awarded for correct answers. The team with the highest total number of points will be the winner. Predetermined tiebreaker questions or tasks will be used to break ties.

NOTE: Direct current (DC) circuits using low-voltage batteries will be used.
120V (AC) CIRCUITS WILL NOT BE USED!

If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: www.macombso.org/charged-up.

CODEBUSTERS

DESCRIPTION: Students will be tested on their ability to decode encrypted messages using cryptanalysis techniques and show skills with ciphers by decrypting a series of messages.

TEAM SIZE: 1 or 2 students

APPROXIMATE TIME: 30 minutes

Teams must bring:

- Pencils & eraser

Students will be provided:

- Resource Sheet with English letter frequencies, Atbash, Vigenère and **DancingMen** tables.
- Scratch Paper

THE COMPETITION:

Students may answer the questions in any order, working individually or in pairs. *Students will not be able to finish the test.* They will pick which problem they will attempt to solve.

Students must not open the exam packet until the test starts. Test can be taken apart so students can work independently on problems. Students must write their answers legibly.

The code types that may be used on the exam are:

Name	a.k.a.	Details
Atbash		A decryption table will be provided.
Caesar	Shift	A shift of no more than 5 characters in either direction.
Aristocrat		No letter can ever decrypt to itself. A hint may be provided depending on the level of difficulty.
Vigenère		A key and decryption table will be provided.
PigPen	Masonic	Decryption table is not included. Students must know how to create the table.
Tap Code		Decryption table is not included. Students must know how to create the 5 x 5 table with c and k sharing the same cell.
DancingMen		A decryption table will be provided

SCORING:

High score wins. Based on difficulty, each question will be worth a clearly indicated number of points. The points will be determined based on the number correct answers provided, and the respective point values for each. Bonus points will also be awarded for each cypher that is 100% correct.

Ties will be broken based on: 1) the number of problems that are decrypted 100% correctly; 2) the number of points awarded on the more difficult problems.

SUPPORTING RESOURCES:

Go to <https://toebes.com/codebusters/> for help with how each cipher works and for help creating practice tests. Thanks to John Toebes and his team, who created this event.

If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: www.macombso.org/codebusters.

CRASH CAR EGGSPERT

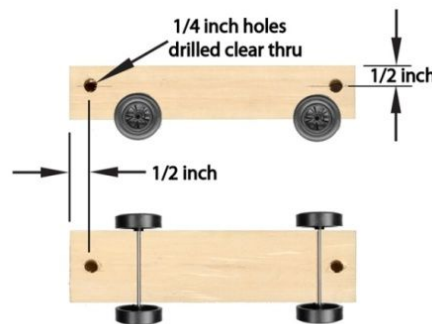
DESCRIPTION: Each team will build a structure on top of a PineCar Racer. The structure will be designed to hold and protect one or two eggs as the car is rolled down a progressively steeper series of ramps and crashed into an immovable barrier.

TEAM SIZE: 1 or 2 students

APPROXIMATE TIME: Building time: 20 minutes
Ramp time: 15 minutes

CONSTRUCTION:

- Teams will be provided with a basic assembled PineCar Racer that will be modified with four $\frac{1}{4}$ " holes that are drilled all the way through the wood body. Two of the holes will be drilled through the side, both will be $\frac{1}{2}$ " from the top, one $\frac{1}{2}$ " from the front and one $\frac{1}{2}$ " from the back. The other two holes will be drilled through the top, on center, one $\frac{1}{2}$ " from the front and one $\frac{1}{2}$ " from the back.
- Additionally, teams will be provided with the following materials:
 - (4) Cotton balls
 - (4) 2 $\frac{5}{8}$ " long round wooden toothpicks
 - (3) 12" natural rubber latex balloons
 - (1) 36" piece of 3 lb. twisted cotton twine
 - (4) 12" long "Fuzzy Stick" brand pipe cleaners
 - (6) Paper clips size #1 plated steel
 - (4) 7 $\frac{5}{8}$ " long, $\frac{1}{4}$ " diameter flexible drinking straws
 - (4) Goody® brand 2" long bobby pins (Stk. no. 03705)
 - (4) Bicycle® brand standard playing cards
 - (4) 4 $\frac{1}{2}$ " long x $\frac{3}{8}$ " wide x $\frac{1}{16}$ " thick wood craft sticks (commonly known as popsicle sticks)
 - (14) $\frac{1}{4}$ " dia. self-adhesive reinforcement labels (equivalent Avery # 6755)
 - (1) 12" x 10 $\frac{3}{4}$ " sheet of aluminum foil (may come folded)The 10 $\frac{3}{4}$ " x 5 $\frac{1}{8}$ " x 3 $\frac{1}{4}$ " paper lunch bag holding these materials MAY be used in building the structure
- Up to three of the items listed in rule 2 may be omitted, or have their quantity reduced. The quantity of some items may be increased. The paper lunch bag will not be omitted. Students will not know the exact material list until they begin building. A list of the materials that the bag should contain will be packed inside the bag. If the students believe they are missing any material that is on the list they should immediately alert the Supervisor. DO NOT WAIT until the structure is built.
- The Supervisor will provide Large Grade A raw chicken eggs. Team members are responsible for the care and handling of their eggs from the time they take possession. If they wish, they may exchange an egg that they are given for another, but they must do so

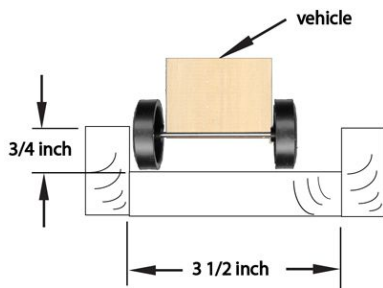


immediately after receiving them.

5. A team may design the structure to carry one egg (the 'driver') or two eggs (the 'driver' and 'passenger'). They must declare that intent when they are given their egg(s). The Supervisor will mark the eggs to differentiate between 'driver' and 'passenger'. The decision to carry a passenger egg carries additional responsibility. The cost in points for injuring a passenger is greater than the points awarded for carrying it.
6. Each team may bring 2 pairs of scissors, a ruler, 2 pencils and a pair of pliers. No other tools or materials are allowed.
7. The structure must be built in a way that allows each 'test egg' to fall free when the vehicle is inverted during inspection. Students will remove the egg by inverting their car. They are not allowed to disassemble their device to extract the egg. Pieces of the vehicle that fall away cannot be reattached. There is no vehicle repair allowed between runs.
8. No part of the structure may come in contact with the wheels on the PineCar Racer or the ramp. Wheels of the car must be able to rotate freely and no part of the structure shall slow the car's descent by making contact with the ramp.
9. Each team will be given 20 minutes to construct their crash structure. Times will be recorded to use as a tie breaker.
10. They will return at a later time, on a walk-in (first come, first served) basis, to roll their crash car down the ramps. Cars will be impounded until ramp time.
11. Competitors will be required to transport their completed crash car from the construction zone, to impound, to the competition area. The egg must be in the structure, from the end of construction, until removal after the car's first crash.

THE COMPETITION:

1. The Supervisor will provide three eight-foot ramps with a slope somewhere between 20 and 60 degrees. A fixed barrier will be located at the immediate end of each ramp. The ramp slopes will be posted 30 minutes prior to the beginning of the construction time.



The ramps will be made from 8' lengths of 1"x 4" pine lumber with 1"x 2" side guides.

2. Supervisors will inspect the crash car to make sure there are no violations of construction rules# 7 and 8. If any are found, students will have 2 minutes to correct them.
3. The students who place their car on the ramps must be the students who built the structure.
4. Each team will begin at the ramp with the lowest slope. The car will be rolled down the ramp and will crash into the barrier. Students will be instructed to remove the egg from their structure

and show it to the supervisor. The egg is considered to have survived as long as it does not leave a wet spot on a paper towel.

5. If the egg leaves the crash car during the crash, it will be considered to have broken, whether it actually did so or not.
6. After the ramp 1 crash, then again after the ramp 2 crash, the team will evaluate the condition of their vehicle and decide:
 - a. to continue to the next ramp to earn additional points, or
 - b. to continue to the next ramp without the passenger egg, or
 - c. to stop, and protect the points earned and not risk injuring the driver egg and falling to tier 2.

The car can continue with an injured or unloaded passenger, but must have an intact driver.

7. An unbroken passenger egg that a team decided to hold back from a ramp drop can be reintroduced for later drops,
8. Crash cars and eggs that advance to the next ramp will do so in an as is condition. Structures may not be repaired or refurbished between crashes.
9. Students determine which end of their car is the front, and where their passenger egg will ride as they prepare to load their car onto the ramp. They can change that orientation between runs, but don't forget rule #8.

SCORING:

1. Teams will accumulate points as described in the chart below:

Points Awarded after each run

	<i>Driver Egg Intact?</i>	<i>Passenger Egg</i>	
		<i>Intact?</i>	<i>Bleeding?</i>
Ramp 1	100	55	-15
Ramp 2	150	85	-25
Ramp 3	200	115	-35

2. If a team's driver egg is intact, they will be ranked in Tier 1 regardless of when they decided to stop.
3. A broken driver egg will move a team to Tier 2. A broken passenger egg has a point cost but does not affect score tier.
4. Teams with a construction violation that can't be modified within two minutes of discovery will be ranked in Tier 3.
5. Teams whose egg broke prior to the first ramp run will be ranked behind all others.
6. Ties will be broken based on construction time, shortest time first, longest time last.

If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: www.macombo.org/crashcar.

CRIME BUSTERS

DESCRIPTION:

Students will evaluate crime scene evidence to determine who committed a crime. Students will be expected to test unknown powders, use paper chromatography to identify ink, match fingerprints, footprints, tire prints, and more.

TEAM SIZE: 1 or 2 students

APPROXIMATE TIME: 30 minutes**

EVENT PARAMETERS:

Students must bring:

- A pencil or pen.
- Splash Proof OSHA Approved Chemical Safety Goggles. Students will not be allowed into the test room without safety goggles. They must wear safety goggles during the entire event, or the team may be disqualified.

Students are allowed to bring:

- A 2-sided index card/sheet of paper up to 8.5"×11", with any notes on it. One sheet per team.
- A magnifying glass.

Students will be provided:

- A ZipGrade form and answer sheet.
- A list of possible powders.
- Tap water, vinegar (CH_3COOH), and iodine solution (KI_3)* to test powders only.
- Plastic cups, spoons, black paper, and toothpicks.
- Materials to make one chromatogram, including isopropyl rubbing alcohol **and chromatography paper marked with ink samples.**

THE COMPETITION:

All parts will be provided at the same time, and they are to be completed in no particular order.

Part 1: Powder identification

- The powders may include: powdered Alka-Seltzer, baking soda, calcium carbonate powder, cornstarch, flour, gelatin, salt, white corn meal, white granulated sugar, yeast.
- Each team will be given 6 cups containing powders. Each cup will contain 1, 2 or 3 powders. Cup 1 will contain the powders collected at the scene of the crime, while Cups A-E will contain powders collected from each of the suspects.
- Students will be asked to identify all powders in all cups, and they will have to match the powders in Cup 1 to one or two of the other cups.
- Combinations of powders that will NOT occur: flour and cornstarch; any combination among Alka-Seltzer, baking soda, and calcium carbonate.
- **Touching, tasting, feeling, or sniffing of the powders is not allowed**, and may result in disqualification.

Part 2: Chromatography

Students will be asked to make a chromatogram using isopropyl rubbing alcohol and filter paper marked with 6 ink samples. Sample 2 is an ink sample from the crime scene, and Samples A-E are ink samples from the suspects. **Students will use the chromatogram to help identify the criminal(s) by comparing the separation of the Sample 2 from the separation of Samples A-E.** The chromatogram will be turned in with the answer sheet **and ZipGrade form.**

Parts 3-5: Prints

Students will be asked to compare (3) Fingerprints, (4) Footprints or Shoeprints, and (5) Tire prints from the suspects to prints found at the crime scene. **Evidence from the crime scene** will be labeled with **numbers** (e.g., Fingerprint 3), and suspect prints will be labeled A-E. Partial or obscured prints may be used.

Part 6: Unspecified evidence

Students will be given one piece of “unspecified” evidence recovered from the crime scene that does not fall under any of the previous categories. This evidence will not require any new skills, but will instead focus on students’ critical thinking skills. Examples of unspecified evidence include but are not limited to: handwriting samples, hair samples, and liquid samples with varying pH. Ample instructions and assistance will be given.

Part 7: Criminal identification

After all the evidence is collected, the students will identify the **one or two suspects** who committed the crime. No more than two suspects will be implicated.

SCORING:

Students will earn points for:

- Correctly identifying powders in each **cup**.
- Creating a neat, clear chromatogram.
- Matching of all evidence to the suspects.
- Identifying the criminal(s).

Students may lose points for (including but not limited to):

- Identifying incorrect or extra powders, suspects, or criminals.
- Missing, incomplete, messy, or unsuccessful chromatograms.

Any ties will be broken using one or more tie breaker questions within the scope of the event. If tie breaker questions are insufficient, ties will be broken by chromatogram quality. **If the tie cannot be broken by chromatogram quality, then the tie will be broken by overall performance in powder identification.**

* Note: Povidone Iodine or a colored solution of Tincture of Iodine will work for practice sessions. These can be purchased at many pharmacies. Decolorized Iodine will not work.

** Note: Some competition time is allocated to providing instructions, collecting tests and other logistics.

If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: www.macombso.org/crime.

GRASP A GRAPH

DESCRIPTION:

Students will interpret and organize information using pictographs, pie, bar, and line graphs and Venn diagrams. Students may bring and use any or all of the following: a simple, non-programmable calculator, rulers, and colored or regular pencils. Students are allowed to whisper to their partner during the test.

TEAM SIZE: 1 or 2 students

APPROXIMATE TIME: 30 minutes

THE COMPETITION:

Part 1: The contestants will answer multiple choice questions based on their interpretation of pictographs, pie, bar, and line graphs, and Venn diagrams. The answers will be recorded on a ZipGrade score sheet.

Part 2: The contestants will be given one set of data and asked to prepare a graph. Graph paper will be provided. As contestants interpret the given data, they will need to decide the best method for displaying that data. For this part of the competition, they will be expected to use a bar or line graph. Pictographs and pie graphs are not appropriate for Part 2 and should not be used. Scoring will be based on the completeness of the graph, including neatness and labeling. Contestants will be asked to interpret their graph through a series of questions.

SCORING:

Part 1: approximately 60%

Part 2: approximately 40%

There is no specific time limit for each section. Multiple choice answers must be recorded on the ZipGrade form to be included in the score; markings on the test document will not be evaluated or transferred after time has expired.

Tiebreakers:

1. The score on the graph prepared for Part 2 of the competition will be used.
2. If ties remain, specific predetermined multiple choice questions will be used.

If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: <http://macombso.org/index.php/esofaqs>

MYSTERY ARCHITECTURE

DESCRIPTION: Students will be given a mystery set of materials to build a freestanding tower as tall as they can. The tower should be constructed to support a tennis ball at its top.

TEAM SIZE: 1 or 2 students

APPROXIMATE TIME: 30 minutes

COMPETITION:

1. Each team of students will be given a container of building materials. All teams will receive exactly the same materials. The materials might include: straight pins, paper cups, drinking straws, paper clips, tape, string, paper, etc. The actual materials may be anything that the supervisor deems appropriate.
2. Each team will have a maximum time of 20 minutes to construct a tower to support the tennis ball at its highest point. The top of the tennis ball must be higher than any part of the structure.
3. Only those materials supplied in the container, may be used to construct the tower. No other materials or adhesives may be part of the finished tower. Students may bring scissors, a ruler and a pair of pliers to use as tools while building the tower. **Teams will be provided a tennis ball to use while building, and it will match the ball used by the event supervisor.** *The measurements of an "official" tennis ball are: Diameter: 2 1/2 inches (6.5 centimeters); Weight: 2 - 2 1/16 ounces (56.7 - 58.5 grams).*
4. The students will inform the judges when they finish their tower. Measurements will be made at the point of construction. Students will not be required to move their tower. The overall height and width of the structure (across its widest points) will be measured before placing the tennis ball on it. These measurements will be used to rank towers that are unable to support the ball, and as a tie-breaker. The tower must be completely free standing. It cannot be attached to, or receive additional stability or support from any surface or object (e.g., a table, floor, wall or ceiling).
5. Students will then place the tennis ball provided by the event supervisor on the top of their tower. Students are allowed up to 10 seconds to place and stabilize the ball on the top of the tower. The tower must remain standing long enough to complete the height measurement.
6. No coaching of the students will be allowed during the competition. Remember, we are assessing the STUDENT'S ability to think on their feet.

SCORING:

1. The height of the tower will be measured as precisely as possible by the judges. Since no building materials are to extend above it, the top of the tennis ball will be considered the highest point of the tower.
2. All towers that support the tennis ball will be ranked above those that do not. The towers in each of these groups will be ranked according to their height. Tallest tower first, the shortest tower last.
3. In the event of a tie, the winner of the tie will be the tower with the smaller base measurement.

If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: www.macombso.org/mystery.

PRECISION PING PONG PROPULSION

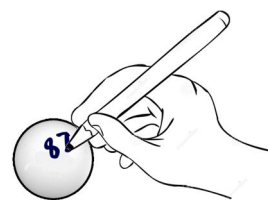
DESCRIPTION: Students will design, construct and test a launching device to propel ping pong balls at a target that is placed within a given range.

TEAM SIZE: 1 or 2 students

APPROXIMATE TIME: 20 minutes

THE COMPETITION:

1. Students are to design, construct, test and demonstrate at the tournament a launching device. This device should be capable of accurately and consistently shooting a ping pong ball a range of distances. A new launcher must be designed and built by members of this year's Science Olympiad team. Devices from previous years may not be used.
2. Safety goggles or safety glasses must be worn during the competition. Teams without will not be allowed to shoot. Standard eye glasses are not an acceptable substitute.
3. Launching Device:
 - There are no material or size restrictions for the launcher. However, devices that are deemed to be hazardous by the Event Supervisor will not be allowed to launch. Lead-acid batteries and flammable gas are not allowed.
 - The balls must be launched by releasing the stored energy that is contained in the device. For instance, no electric wall adapter would be allowed. Energy may be added by students while at the launch line (e.g., stretching or compressing a component).
 - Balls may be loaded individually or all together, but not before official time has begun.
 - All devices must sit upon rubber or soft material "feet" to prevent floor damage when being moved.
 - The device must be marked with the team name and number.
4. Ping pong balls:
 - The team may bring a total of fifteen (15) regulation 40mm Ping-Pong balls.
 - Ten (10) balls should be white; four (4) balls should be orange. One (1) ball should be orange marked with a black band around the circumference using a permanent marker. No other alterations are allowed.
 - Each ball must be clearly marked with their team number in two places on opposite sides using a black permanent marker.
 - Please underline the team number on each ball to aid identification. This applies to all teams.



5. Impound:

At least one competing student must be present for impound. All materials that the team will use must be impounded at the beginning of the tournament. This includes:

- Launch device (including anything required to prepare or adjust the device before or during the shoot)
- Up to 15 ping pong balls packaged in a clear plastic closeable bag
- Practice Log (2 copies)
- Goggles are not required to be impounded, but are required to compete.

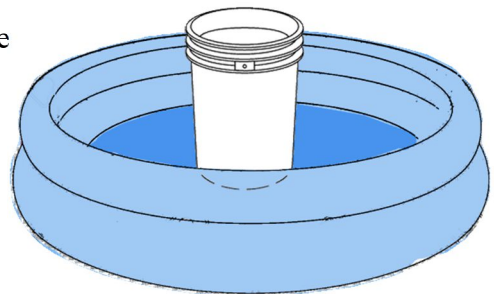
6. Practice Log:

- The team should submit, at impound, 2 identical copies of a practice log on standard 8 ½" x 11" sheet(s) of paper. Each should be labeled with the school name and team number. One copy will remain with the device for team use. The 2nd copy will be held for scoring purposes, and will not be returned.
- The data in the Practice Log may be of any presentation style (e.g., handwritten, typed), any format (e.g., graphs, tables) and any display style (B&W or color).
- The practice log should include a minimum of three variables and 20 launches related to launch performance. Examples of appropriate variables might include:
 - Score
 - Distance to the target
 - Elevation or angle of shooting
 - Stretched elastomeric membrane length
 - Type of Elastomeric membrane
 - Size of Elastomeric membrane
 - Other attributes not specifically listed here but deemed necessary by the Shooting Team to describe the performance of their launcher
- A Practice Log which meets minimum requirements will be awarded 50 points. They will also be judged in terms of data completeness, clarity and depth, as part of the tie-breaking process.

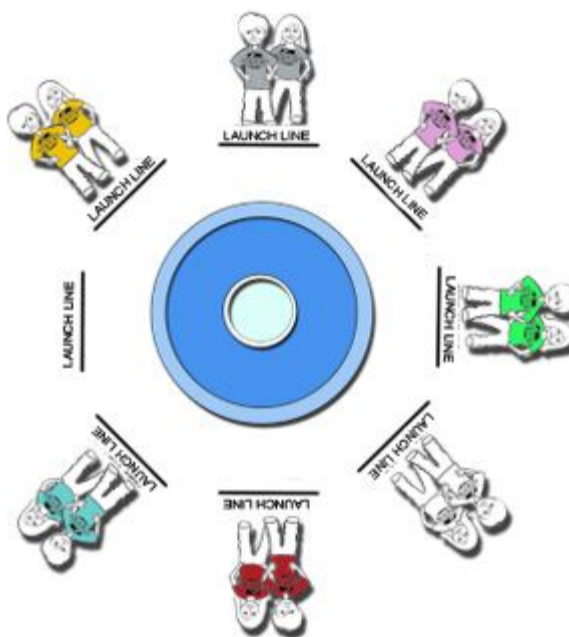
7. The target is a 5-gallon plastic pail with the handle removed (approx 12in. dia. x 14 ½ in. high) placed at the center of an inflatable wading pool (approx 49 in. inside dia. x 58 in. outside dia. x 13 in. tall). The pool bottom will be covered in a layer of foam rubber about 1" thick.

8. The launch line will be marked on the floor at any of the half-meter intervals, 4 to 8 meters from the center of the target.

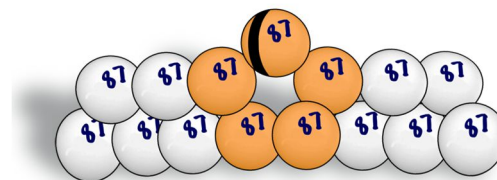
9. The target and launch area will be on a hard surface such as a tiled floor or hardwood gymnasium floor.



10. The participants will be notified of the distance to the target at the time of their individual shooting round.
11. The teams will wait with their launcher behind their assigned launch line. When they hear the Event Supervisor's whistle all teams may set up their launcher and "commence firing at will". No part of the launcher may extend beyond the back edge of the launching line. Back edge is defined as the edge furthest from the target.
12. No participant may manually weigh down or manually support the front edge of the device during active shooting. Students should stay behind the launching line.
13. A total of 4 minutes are allowed to set up and launch all 15 balls. The team decides what order to launch their different color balls. The Supervisor will announce when there is one minute remaining, and signal the end of 4 minutes when all launches must cease.
14. The target will be 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.
15. Once launched, balls cannot be retrieved and shot a second time. A team begins with 15 balls, and is allowed 15 shots. Misfires, which release a ball beyond the launch line, count as a shot. If the ball stays behind the launch line it may be re-fired. Practice shots at the tournament are not allowed.
16. The Event Supervisor will immediately intervene if:
 - A team's device or behavior appears unsafe for any reason.
 - If any part of the device crosses the launch line.
 - If there is any interference or coaching from outside the competition area
17. No one except contestants and judges are allowed in the competition area. Safety goggles are required for all contestants for the entire time they are in the competition area.



SCORING:



1. When the final whistle sounds the Event Supervisor 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.
2. The pail at the target center is worth 25 points. Inside the pool but outside the pail is worth nine (9) points.
3. A point multiplier is applied for colored balls. Orange balls count 3 times and the orange ball with a black band counts 5 times. White balls have no multiplier.
4. The final score will be equal to the sum of 50 points for submitting an appropriate Practice Log, plus the numerical scores for all shots taken within the time limit.
5. Teams which impound their device after the deadline will be penalized 20 points.
6. Devices which violate construction parameters will be scored in a tier below legal devices.
7. The greatest number of points determines the winner.
8. Devices judged to be unsafe by the Event Supervisor will not be allowed to launch, including those missing protective feet.
9. Ties will be broken in favor of the team based on these criteria, in order:
 - a. Total points in the bucket
 - b. Total points scored by colored balls
 - c. Quality of the team Practice Log

If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit www.macombso.org/pong.

REFLECTION RELAY

DESCRIPTION: A team of three students will work cooperatively to reflect a beam of light to a target using a series of plane mirrors.

TEAM SIZE: 3 students

APPROXIMATE TIME: 20 minutes

Each team will select a “Team Leader” from among the 3 students.

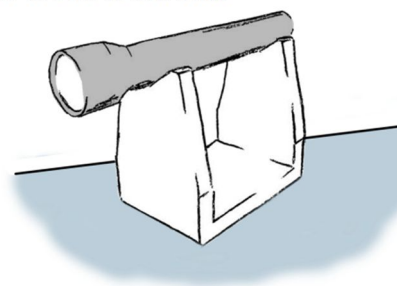
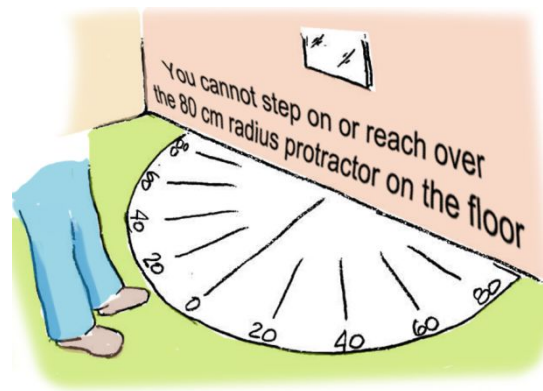
THE COMPETITION:

3D CHALLENGE: Three team members, supplied with four mirrors approximately 3” x 4”, cooperate to reflect a light beam onto a predetermined target. One of the mirrors will be mounted on the wall and cannot be moved. Team members must use the mirrors provided by the judge.

1. The light must reflect off of all four mirrors before hitting the target. There may be obstacles that the beam of light will have to be directed around.
2. A large protractor (radius of 80 cm) will be placed on the floor in front of the mirror. This will mark the distance the participants must stay away from the mirror and will also provide a measuring device if the participants choose to use it. The protractor will have 0 degrees at its center, continuing up to 90 degrees on both the left and right sides.
3. Each team will be given up to one minute of preparation time before the clock is started.
4. Materials that will be provided for each team:

- A light source (‘Mag-Lite’ **LED** focusable flashlight on a wooden stand),
The light source will already be in position and focused,
- 3 movable ‘handheld’ mirrors (3” x 4”),
- 1 protractor (80 cm radius), will already be positioned on floor,
- 1 non-moveable mirror (3” x 4”), will already be attached to the wall,
The fixed mirror will be directly over the protractor center “zero degree” line.
The mirror height can vary between 6 inches higher to 6 inches lower than the light source.
- Targets, already fixed in some location.
Targets are flat and circular, between 5 inch and 12 inch diameter.

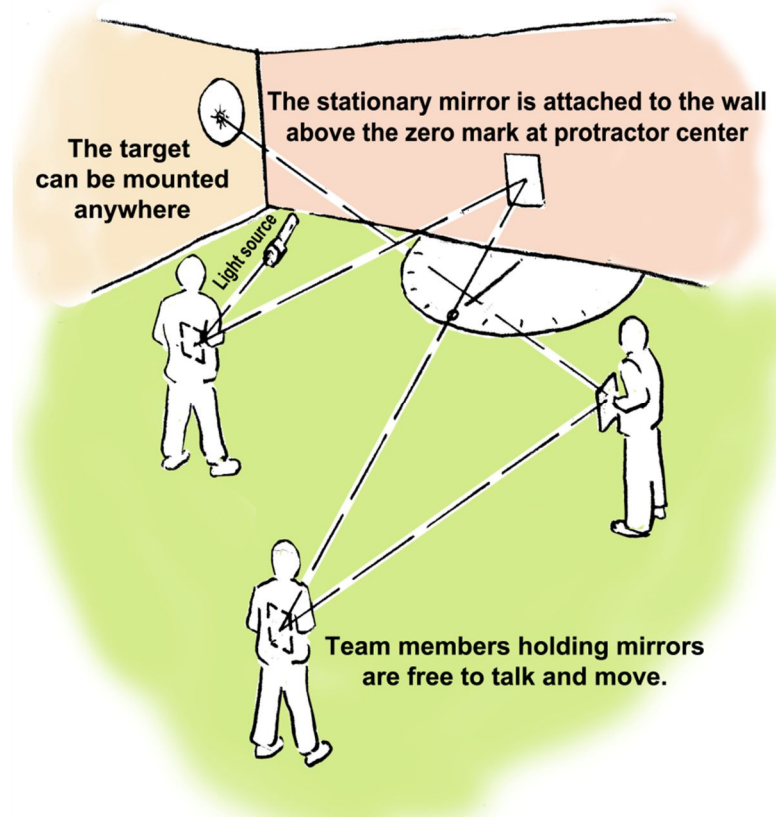
Students may bring any other equipment they deem necessary, with the exception of their own light source.



- Each team will be given two different reflection relay challenges. The target size for the 1st and 2nd challenge may not be the same.
- If spectators are allowed in the room, no talking or signaling among these guests will be tolerated until the 2nd challenge is completed. Photographs are not allowed at any time and cellphones should not be visible. Violations will be cause for immediate team disqualification for this challenge solely based on the discretion of the staff running the event.

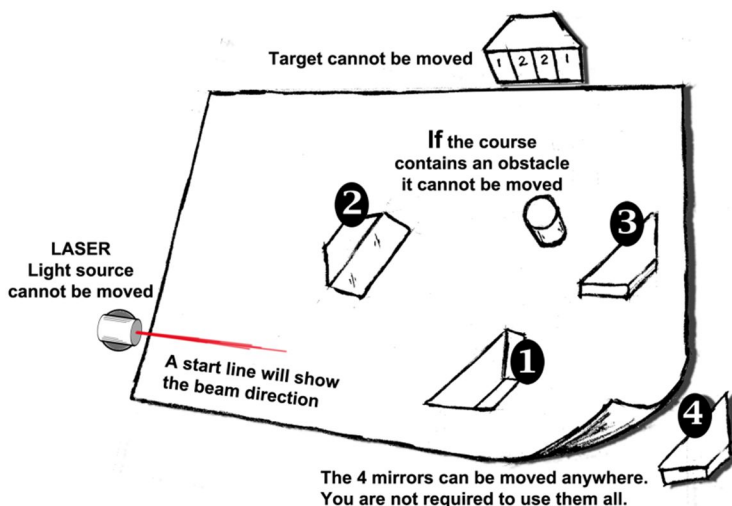
3D CHALLENGE SCORING:

- The team's planning time (1 minute maximum) will be recorded and used as a tie-breaker. The team leader will be responsible for telling the judge the team is ready.
- Each challenge will be timed. The objective is to attain the lowest elapsed time in seconds. One point will be added for each second.
- The beam of light must rest on the target for 3 seconds (without wandering off) before the judge stops the timer. The minimum score for each challenge will be 3 points.
- No team will be allowed to use more than one minute to accomplish each challenge. Maximum score for each challenge will be 60 points.
- The AVERAGE time of the two 3D challenges will be used to calculate the final score.



2D CHALLENGE:

1. For the table top Reflection Relay challenge each team will be given a new 1.5 x 3 foot paper area to work on. A laser light source will already be secured to the table top and cannot be moved. A six inch line will be drawn on the paper starting at the laser to show the exact direction of the beam.
2. A target will also be secured to the table top, and cannot be moved. There may also be obstacles placed on the playing field. The team is not allowed to disturb any obstacles.



3. Four movable mirrors (3" x 4") mounted on stands will be provided. The mirrors will be the same height as the laser.
4. The three team members have 5 minutes to work together, positioning the movable mirrors (while the laser is turned off) to reflect the beam onto the target. When planning their mirror placement, the team has a choice as to how many of the mirrors they want to use. *Using more mirrors increases difficulty, but earns additional points.*
5. **The students may begin work when the timer starts**, and the supervisor will warn the team when there is only 1 minute of prep time remaining. All team members must immediately step back from the playing field when the supervisor signals that time is up. Absolutely no further adjustments are allowed, no matter how subtle.
6. Participants may bring any other equipment they deem necessary, with the exception of a light source.
7. If spectators are allowed in the room, no talking or signaling among these guests will be tolerated until after the challenge and scoring is completed. Photographs are not allowed and cellphones should not be visible. Violations will be cause for immediate team disqualification for this challenge solely based on the discretion of the staff running the event.

Event staff will review the 2D scoring with student team members and answer their questions. To complete the scoring process the student team leader will be asked to initial the score sheet, accepting the team 2D score. If they do not, because of an open issue regarding the appropriate score, any guests will be excused from the room and the Event Supervisor will be summoned to conduct a final review and judgment.

2D CHALLENGE SCORING:

At the end of 5 minutes the supervisor switches on the laser to check the beam path.

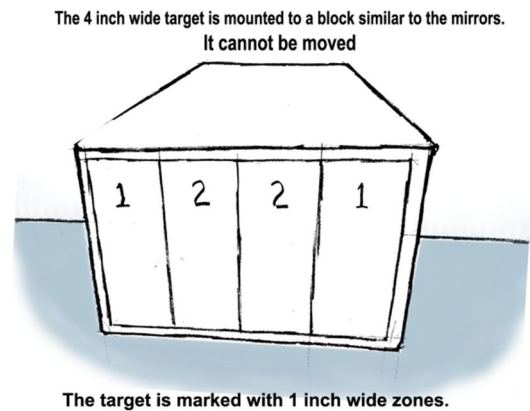
The team starts with 60 points.

Points are subtracted for mirrors reflecting the laser:

1 mirror	-1 point
2 mirrors	-3 points
3 mirrors	-6 points
4 mirrors	-10 points

The beam striking the target will be scored:

Zone 1	- 4X mirror points
Zone 2	- 6X mirror points



FINAL SCORE -

$(2D \text{ score}) + (\text{average } 3D \text{ time}) = \text{Final Score}$ Lowest total score wins.

Example 1:

Team 91 tried to use all 4 mirrors to reach the 2D target, but they only hit 3 mirrors (and missed the target). Their 3D challenge times were 18 seconds and 12 seconds.

$$\begin{array}{r} 60 \text{ (starting points)} \\ - 6 \text{ (mirror points)} \\ \hline 54 \text{ points (2D score)} \end{array} \quad 54 \text{ (2D score)} + 15 \text{ (average 3D time)} = \text{Total score } 69$$

Example 2:

For their 2D challenge, Team 89 successfully reflected from 2 mirrors and hit the target in a zone 1. Their 3D challenge times were 21 seconds and 14 seconds

$$\begin{array}{r} 60 \text{ (starting points)} \\ - 12 \text{ (4X the mirror points)} \\ \hline 48 \text{ points (2D score)} \end{array} \quad 48 \text{ (2D score)} + 17.5 \text{ (average 3D time)} = \text{Total score } 65.5$$

In case of a tie, the team with the shortest combined preparation times for both 3D challenges will be declared the winner.

Scores will range from 3-120.

If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: www.macombso.org/reflection.

ROCK HOUND

DESCRIPTION: Students will identify various rock and mineral specimens and answer questions about the characteristics of these specimens. They will also be expected to answer questions about the various processes that are involved with formation of these rocks and minerals. One chart is allowed per team, **limited to 8 ½" x 11"**.

TEAM SIZE: 1 or 2 students

APPROXIMATE TIME: 30 minutes

THE COMPETITION:

1. Teams will rotate through approximately 20 stations where they will identify rock and mineral specimens and answer questions about them. Answers will be recorded on a Zip Grade sheet. Most stations will have covered boxes with specimens inside. Some stations will only have questions inside the box. The boxes will be opened and closed at the supervisor's direction. Students are allowed to touch the specimens unless specifically instructed otherwise. Teams will have about 1 minute per station to answer 4 to 6 multiple choice or true/false questions.
2. The rocks and minerals that competitors need to be able to identify and answer questions about are listed on the next page. There are additional **metamorphic** rocks and associated minerals that have been added to this year's scope.
3. Rock characteristic questions may be about their **chemical class**, color, texture, uses, physical characteristics, special properties (reaction to 3 molar hydrochloric acid) and environments of formation.
4. The students also need to have an understanding of the rock cycle, the processes of the formation of igneous (extrusive, intrusive, volcanic glass), sedimentary (erosion, deposition, lithification) and metamorphic rocks. (the effects of heat and pressure on existing rocks).
5. Special questions relating to this year's **metamorphic** focus may be asked. **These could include questions relating to textures (foliated, non-foliated), types of metamorphism (regional, contact, subduction zone and dynamic), factors that control the formation of metamorphic rocks and metamorphic facies and the significance of index minerals in metamorphic rocks.**
6. Mineral characteristic questions may be about their color, luster, density, relative hardness, reaction to 3 molar hydrochloric acid, crystal shape, texture, cleavage, fracture, special properties (conductivity, fluorescence, optical properties and reaction to flame), uses and environment of formation.
7. Prior to the tournament, students may prepare a chart that can be used to help them during the event. The only items that the teams will be allowed to bring into the event will be pencils and their chart. The chart will not be turned in. The chart size is limited to **8 ½" x 11"**. Both sides may be used and any information the students find helpful may be included.

SCORING:

Each question answered correctly will be worth between 1 and 4 points. The team with the highest total score will be the winner. Ties will be broken using predetermined tiebreaker questions.

If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: www.macombso.org/rocks.

ROCKS:

Igneous

basalt
granite
obsidian
pumice
scoria

Sedimentary

bituminous coal
chert
conglomerate
limestone - fossiliferous
limestone-oolitic
sandstone
shale

Metamorphic

anthracite coal
garnet schist
gneiss
marble
mica schist
phyllite
quartzite
slate
staurolite schist

MINERALS:

apatite
chalcopyrite
calcite
copper
feldspar (pink)
fluorite
galena
garnet

graphite
gypsum (satin-spar)
gypsum (selenite)
halite
hematite
kaolinite
kyanite
mica - biotite
mica- lepidolite
mica - Muscovite

pyrite
quartz (crystal)
amethyst
citrine
milky quartz
rose quartz
smoky quartz
staurolite
talc

SIMPLE MACHINES

DESCRIPTION:

Participants will identify, use, and answer questions about simple machines and recognize the relationships between work, force and distance as they apply to each simple machine.

Knowledge of the following six simple machines will be demonstrated: lever, inclined plane, pulley, screw, wheel and axle, and wedge. Students should know and understand the concept of mechanical advantage and be able to estimate it by comparing the ratio of forces or distances.

TEAM SIZE: 1 or 2 students

APPROXIMATE TIME: 30 minutes

THE COMPETITION:

Participant(s) will move between stations containing pictures or examples of devices made up of one or more simple machines. Teams must move at the time indicated by the event supervisor to ensure that all teams have equal opportunity to use the equipment at each station (e.g. 2 minutes per station). Students may carefully handle and manipulate objects found at each station.

At each station students will answer questions designed to test their ability to:

- Identify the simple machines illustrated
- Identify parts of the simple machines (e.g. load, effort, fulcrum)
- Use equipment to measure some variable(s) such as length, force or weight
- Recognize the relationships between work, force and distance as they apply to each simple machine
- Know and understand the concept of mechanical advantage and be able to estimate it by comparing the ratio of forces or distances
- Perform simple calculations

Possible question formats could include:

- Identifying simple machines as parts of an object (yes or no for each type)
- Matching
- Multiple choice
- True/false

SCORING:

Points will be awarded for correct answers. Questions will be worth either 1 or 2 points. The team with the highest total points for all stations will win. Ties will be broken by a predetermined set of questions.

If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: www.macombso.org/machines.

Source Code – Data Structures and Algorithms

1. Description:

This event combines computer science and mathematics to solve problems. The objective is to answer related to computer concepts, logic and mathematical problem-solving using computers.

Team Size: Up to 2 Impound: None

Eye Protection: None Approximate Time: 30 mins

2. Event Parameters:

1. Each team will be given a written test with 30-60 questions and a scantron to answer the questions.
2. Teams will be allowed to bring one page (both sides) of notes.
3. Students will be tested in Data Structures and Algorithms.
4. Test may be conducted as station based.

3. The Competition:

1. Basic Math Operations
2. Algorithms and Logic
3. Data Structures - Array, List, Stack, Queue, Heap, Hash, Graph, Map, Set
4. Recursion
5. Searching and Sorting
6. Complexity of Algorithms

4. Scoring:

1. High score wins

5. Tie-Breaking:

1. Tie-breaking questions will be used as 1st tie-breaker.
2. Time to finish the test will be used as 2nd tie-breaker.

STARRY, STARRY NIGHT

DESCRIPTION: This event will test students' knowledge of astronomical facts and concepts relating to the earth, moon, solar system, celestial sphere, stars and constellations. This year, they will also be tested on **planets, moons, and other things found in our solar system.**

TEAM SIZE: 1 or 2 students

APPROXIMATE TIME: 30 minutes

THE COMPETITION:

The students will take a written test, consisting of a variety of question formats, including: true/false, multiple choice, matching, fill in the blank, short answer, and sketch a diagram. Reference materials are posted at www.macombso.org/stars.

Part I: A series of written questions about our solar system:

- A. General Solar System
 1. Glossary of terms
- B. Orbital Mechanics
 1. Distinguish between the motions of rotation and revolution.
 2. Explain the astronomical basis for units of time--day, month, year - and how they relate to the periods of the Earth and Moon.
- C. Seasons – Know the terms and explain the causes for seasons on the earth.
- D. Moon Phases - Identify the phases of the moon and understand why they occur.
- E. Eclipse - Compare solar and lunar eclipses and the conditions that produce them.
- F. **Demonstrate knowledge about the planetary members of the solar system.**
 1. **Characteristics of the planets, such as which has the longest day or year, the most number of moons, the widest temperature variance, order from the sun, and relative size.**
 2. **Visual identification of planets and planetary features.**

Part II:

- A. Celestial Sphere - Demonstrate knowledge about the celestial sphere and the following concepts: zenith, nadir, horizon, celestial meridian, celestial poles, celestial equator and ecliptic.
- B. Constellations - Be able to identify these constellations and specific stars or star cluster, galaxy or nebula on a star chart of any month with no constellation lines visible.

Constellation	Star or Star Cluster
Andromeda	Andromeda galaxy (M31)
Bootes	Arcturus
Canis Major	Sirius
Cassiopeia	
Cepheus	
Cygnus	
Draco	
Gemini	Castor, Pollux

Constellation	Star or Star Cluster
Hercules	Kornephoros, Hercules Cluster (M13)
Leo	
Orion	Betelgeuse, Rigel, Orion Nebula (M42)
Scorpius	
Taurus	Aldebaran, Pleiades
Ursa Major	
Ursa Minor	Polaris
Virgo	Spica

Part III: A series of written questions and visual identification of the non-planetary members of the solar system. Know glossary terms specific to the solar system.

- A. Meteoroids, meteors, meteorites, comets, asteroids – location, origin, composition.**
- B. Dwarf planets (aka Plutoids or Trans-Neptunians) – definition, names, locations.**
- C. Moons – In addition to Luna, be familiar with the characteristics of the following moons:**
 - a. Phobos, Deimos (Mars)**
 - b. Io, Europa, Ganymede, Callisto (Jupiter)**
 - c. Mimas, Enceladus, Hyperion, Iapetus, Titan (Saturn)**
 - d. Triton (Neptune)**
- D. Structure of the outer solar system – Kuiper Belt, Oort Cloud, Interplanetary Medium.**
- E. Visually identify specific planets, planetary features, moons, and dwarf planets.**

Part IV: A series of written questions on various space missions.

- A. Be able to recognize a basic description of each mission.**
- B. Know the important findings from each mission.**

SCORING: One (1), two (2) or three (3) points will be awarded for each correct answer, depending on the level of difficulty. There will be about 65 questions that add up to about 130 points. Tie-breaker questions will be included on the test.

If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: www.macombso.org/stars.

WEATHER OR NOT

DESCRIPTION: Students will be tested on their knowledge of meteorology (weather and climate).

TEAM SIZE: 1 or 2 students

APPROXIMATE TIME: 30 minutes

EVENT PARAMETERS:

The only items each team may bring into the competition are pencils, and one 5"x 8" index card per team, with notes on weather concepts. Both sides of the card may be used.

THE COMPETITION:

Student teams will answer questions regarding weather concepts. Students will remain seated, with a copy of the complete test, during the entire session.

Part 1: Teams will answer multiple-choice format questions related to photographs and videos projected on a screen. Each item will be projected for a specific period of time.

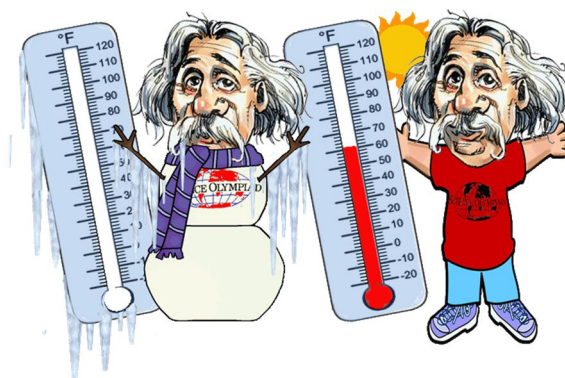
Part 2: Teams will answer multiple-choice format questions in a written test. They may be answered by each team at their own pace, within the allotted time.

Topics may include, but are not limited to, clouds and cloud formation, weather instruments, fronts, the atmosphere, the water cycle, severe weather, wind, seasons, weather terms, and precipitation types. The topics of **air masses, fronts, and winds** will be emphasized for this season.

SCORING:

The team with the highest score will win. The questions will be in multiple-choice format of 2, 3, or 4 options. Each question will be worth 1, 2, or 3 points based on the difficulty of the question.

There will be two tie-breaker questions. The first tie breaker will be based on the number of 3 point questions that are correct. The second tie breaker will ask a short answer question. Correct spelling and legibility is recommended to help prevent errors in scoring.



If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: www.macombso.org/weather.

WILDLIFE SAFARI

DESCRIPTION: In this event, students will demonstrate their ability to identify wildlife and their habitats, as well as answer general information about the animals using field guides.

TEAM SIZE: 1 or 2 Students

APPROXIMATE TIME: 30 Minutes

THE COMPETITION:

Students will demonstrate their ability to identify **reptiles and amphibians of the Great Lakes region and answer questions about their behaviors, characteristics and other interesting facts. Students will also be expected to identify selected frog vocalizations.**

Students will be tested on all the species and information covered in the *Reptiles & Amphibians of Minnesota, Wisconsin and Michigan Field Guide*. Students should be familiar with the entire book, as questions may derive from any information presented, including the scientific name of each species.

Teams will rotate between 18 and 20 stations where they may view photographs and biofacts of **reptiles and amphibians** and photographs of their habitats. Each station will consist of 3 to 5 questions and each team will have about 1 minute to answer all questions at a station. The question format will be multiple choice and true/false. **Before beginning the rotation, students will identify a series of frog and toad vocalizations with fill-in-the-blank answers. Audio clips used in the tournament may include a sample that has one or more than one species calling (see the frog call links below).** An answer sheet will be provided.

Students will be responsible for bringing pencils and up to two field guides per team (one per student). Students may bring the Adventure Publications field guide and may write, highlight and/or place tabs in their book to assist them in using it. Students may choose to bring a student-created field guide. A student-created field guide must be contained in a standard-sized binder or notebook (no larger than 11 inches), with no loose pages. No other materials will be allowed in the competition (no clipboards).

SCORING:

Each correct answer will be worth between 1 and 4 points based on variation in difficulty. **The first tie-breaker will be the frog and toad vocalizations questions. Exact spelling is not required.** A second tiebreaker will be based on the number of difficult questions answered correctly.

RESOURCES:

Reptiles & Amphibians of Minnesota, Wisconsin and Michigan Field Guide

By Stan Tekiela

ISBN-13: 978-1591932802

ISBN-10: 1591932807

Publisher: Adventure Publications

Publication date: March 11, 2014

216 pages

Frog and toad species calls:

Individual Species:

[Blanchard's Cricket Frog](#)

[Boreal Chorus Frog](#)

[Bullfrog](#)

[Cope's Gray Tree Frog](#)

[Eastern Gray Tree Frog](#)

[Eastern American Toad](#)

[Fowler's Toad](#)

[Green Frog](#)

[Mink Frog](#)

[Northern Leopard Frog](#)

[Northern Spring Peeper](#)

[Pickerel Frog](#)

[Western Chorus Frog](#)

[Wood Frog](#)

Multiple Species:

[Gray Tree Frog, Spring Peeper, and Western Chorus Frog](#)

[Green Frog, Mink Frog, Gray Tree Frog](#)

[American Toad and Western Chorus Frog](#)

Frog and toad vocalization audio files will also be posted on the Wildlife Safari event webpage at www.macombso.org/wildlife.

If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: www.macombso.org/wildlife.

ZOWIE ESTIMATION

DESCRIPTION:

Presented with a variety of tasks, students will be asked to estimate mass in grams, number of objects in a container, and volume in cubic centimeters.

TEAM SIZE: 1 or 2 students

APPROXIMATE TIME: 30 minutes

THE COMPETITION:

The competition will consist of three stations.

Station 1 Students will place an estimated 100 grams of a substance such as sand, cereal, corn meal or paper clips in a given container.

Station 2 Students will estimate the number of objects in three different containers holding from 100 to 20,000 pennies, beans, golf balls, etc.

Station 3 Students will estimate the volume of three different boxes between 100 and 4000 cubic centimeters. (Volume = length × width × height)

SCORING:

The score for each estimation will depend on how close the students' estimate comes to the correct value. The maximum score for each estimation is 100 and the minimum score is zero. Any estimate double the actual number, or larger, will result in a score of zero.

Example:

Estimate lower than actual: The students' estimate 3500 and the actual number is 4000. Their score will be: $3500/4000 = 0.875 \times 100 = 87.5$ points.

Estimate higher than actual: The students' estimate 5000 and the actual number is 4000. Their score will be: $5000/4000 = 1.25 - 2 = -0.75 \times 100 = 75$ points. Notice that the negative sign is dropped to get the score

The overall score for the event will be the sum of the scores for Stations 1, 2 and 3. A perfect score for all three stations will total 700 points.

NOTE: Students will be provided with pencils and calculators (TI-108). The pencils and calculators may not be used as measuring devices. Fingers with pre-marked lines on them are not allowed. No other objects or measuring devices will be allowed. Students are allowed to handle and pick up the material at Station #1, and the boxes at Station #3. The containers at Station #2 may be touched but not picked up.

If a rule clarification is posted on the Macomb Science Olympiad website, the supervisor will score this event accordingly. Please visit: www.macombso.org/zowie.