



Exploring the World of Science

2021 Event Logistics Manual

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SCIENCE OLYMPIAD

2021 EVENT LOGISTICS MANUAL

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Introduction

So, you are going to be a Science Olympiad Event Supervisor or an Event Volunteer. Thank You and Congratulations! You are stepping into the role that has the most impact on participants' Science Olympiad experience while at the same time offering some of the best opportunities to share your STEM knowledge and passion with students.

To help you in this role there are several key sources of information that Science Olympiad produces you need to be aware of and review. First are the event rules. If you haven't done so already, you can access a digital copy of the rules for your Division [here](#) for free. All Event Supervisors are encouraged to review both the General Rules, found in the Rules Manuals and Appendix A of this book, and specific event rules found in the manual, as both rule sets apply to your event. Second, make sure to visit the official Science Olympiad web site (www.soinc.org) often for Clarifications/Rules Changes and Frequently Asked Questions that may apply to the event that you are to supervise. Also, on the web you can find additional information such as checklists, scoresheets, and guidelines about your event on its Event Page. Third, you have this Logistics Manual which provides highlights of key information concerning your event as well as some general pieces of advice and guidance that will help make your experience as an event supervisor easier and more enjoyable.

As an event supervisor, you are responsible for **all aspects** of the event including but not limited to:

- familiarity with event rules, General Rules, [Rules Clarifications](#) and [FAQ's](#) on the National website. Students/coaches will have read the rules many, many times. Be sure you have done the same thing;
- working with the tournament director and host site to ensure all equipment, tests, and materials needed to run the event are in hand;
- approving and setting up event space;
- printing scoresheets and any additional paperwork required for the event;
- if necessary, developing and printing copies of test and answer sheets for students and answer keys for volunteer graders;
- starting and ending the event on time; and,
- coordinating roles and activities of any volunteers assigned to your event.

If you have any questions about expenses and materials, volunteers, meals, tournament shirts or submitting materials (e.g.; tests, answer sheets) for copying or archiving you should contact your tournament director in advance of the tournament.

When it comes to the day of the tournament, we would advise you to:

- Check all equipment ahead of time. All equipment should be the same for teams and in working order.
- Give yourself ample time to set up for your event; if at all possible, try to set up event the day before.
- Make sure the event is run so ALL participants have the same conditions for competition.
- **Be Flexible-** participants are young, excited, and unfamiliar with campus. Whenever possible, let students compete even if they're late. But if they do arrive late, they should not be given extra time to finish. They should only finish what they can do in the time since arrival.
- Read over the rules and make sure you understand them. The students will know them very well!
- Familiarize yourself with the [Rules Clarifications](#) and [FAQ's](#), they apply to all states and all tournaments and originate at the national level.
- Make sure you understand how the scoring criteria work.
- Remember that the RULES, INCLUDING THE GENERAL RULES, ALWAYS TAKE PRECEDENCE.
- If your event room has windows to the hall or in the door these windows should be covered.

Guidelines for Events with Written Tests

If your event should happen to feature a written test, please consider the following suggestions to facilitate a better testing experience and easier scoring.

- Write the event so that the questions, or activities, align to the event rules. Make sure to include a mix of difficulty within your activities so that about 15% of them are easy, 60% of them are of medium difficulty, and 25% are difficult.
- Avoid questions that are overly tricky or delve into trivial topics. Difficult does not mean tricky or trivial.
- Arrange your test so that it has a cover sheet which identifies the Event Name, Division, and Tournament date.
- Follow the cover sheet with a page that contains instructions on how answers should be recorded, how much time the participants have to complete the test, if they may write on the test packet, and any resources they may or may not use. Questions should follow on subsequent pages. This arrangement will allow participants to look at the instructions and ask any questions they may have without seeing the test questions.
- Questions and pages all should be sequentially numbered so participants will notice if a page is missing.
- Follow good test and question organization and structure. For example, questions and answers should not cross pages. For multiple choice – indicate “Select best answer” or “All that apply”.
- Evenly space out, align, and size answer boxes where participants should write their responses.
- Make sure each question’s point value reflects the information that you expect the participants to provide as an answer. For example, a question asking the participants to name the 3 bones found in the human ear should be worth 3 points with the correct name for each bone being worth a single point.
- Make sure to select questions so that no one can get every question correct. If several teams get every question correct, it is difficult to determine the final placement of a team.
- Have a header on each page which includes a space for the participants to write their team name and team number as well as their own names in case the pages separate.
- Have a footer that shows the page number and has space to record the total score for that page. Try to alternate the position left to right to make it easier to record the information on double-sided documents.
- Include a page at the end that has a place to record the totals from each page. This will facilitate calculating the sum of page totals and make it easier to find errors.
- Announce the amount of time left periodically (i.e., 30, 15, 10, 5 minutes).
- Provide staple pullers and staplers so that teams can separate events if they wish. Teams that separate the test should reassemble and staple them – missing pages are the responsibility of the team and not event staff.
- Use sign in sheets and check them to make sure that teams without grades did not show.

Guidelines for Events with Labs

If your event is best suited to be an experimental activity, or a rotation through a variety of laboratory stations, consider these suggestions to make sure participants have the best experience possible.

- Periodically notify teams of the amount of time remaining in the event.
- Make sure to provide instructions on how to clean up the laboratory space or laboratory stations.
- Model and enforce proper safety precautions and safety equipment usage.
- Prepare a rubric in advance to help you consistently score the participants’ work.
- Consider using an even number scale for your rubric (e.g.; 4 points, 6 points, or 8 points) to help avoid ties.
- Have a system for breaking all ties.
- Write an answer for essay questions that you consider ideal.
- Identify factors that make it ideal.
- Determine the number of points for an ideal score.

Guidelines for Events with Labs (continued)

- Determine what constitutes awarding few points.
- If different people are grading the reports, it is recommended that the same person grades the same part of the test. Having different people grade the entire test often results in unfair grading and should be avoided if at all possible.
- Include as much hands-on application as possible.
- Ensure there is a place for names and team numbers on all paper testing materials.
- Once judging begins, if a student leaves the testing room for any reason, he/she cannot return.
- All activities must begin and end on time. Do not give any extra time as this could make students late for their next event and this practice will not be consistent for all teams.

Guidelines for Building Events

- Identify all materials and equipment needed to carry out activities or test/measure events.
- Any equipment or materials that are not specified in the rules for the students to bring **MUST** be supplied by the event supervisor.
- Let your tournament director know as soon as possible if there are items you need but are having difficulty sourcing on your own.
- Consider using painter's tape instead of masking tape for marking dimensions on floors as it is much easier to remove.
- Most building events specify tie breakers in their rules. If one is not specified, you will need to designate a tie breaker before the tournament.
- Make sure students have their team numbers and names on all devices. Handle the devices as little as possible to avoid accidental damage.
- Have a checklist of things to check for each team/device.
- Make sure you have sufficient time to judge devices and determine if there are any construction violations before teams compete.
- For devices that are required to fit in a 3-D box, having a physical box of the desired dimensions is a quick way of making this judgement.
- For events that have other specific dimensions, consider building a measuring scale out of pasteboard. Much easier than measuring the device with ruler/tape.
- Do not release times, distances, or other pertinent information prior to impounding.
- Begin as close as possible to the time indicated on the event schedule.
- Read and follow the event rules carefully.
- If a device is judged to have a construction violation, the team should be notified immediately as to the exact nature of the violation.
- As the Event Supervisor, decide if you will allow teams to make minor adjustments to devices to eliminate construction violations. Whatever you decide, please be consistent.
- Students may not confer with spectators or be coached in any way.
- Do not allow students to compete without proper safety equipment.
- Consider using the Score Sheets for your event made available on the [Science Olympiad Scoresheets page](#).

Guidelines for Building Events (continued)

- Check that only materials allowed by the rules are brought in by students.
- Once judging begins, if a student leaves the testing room for any reason, he/she cannot return.
- If a team fails to show up for its sign-up time for a legitimate reason, the Event Supervisor can (but does not have to) allow them to be judged during a different time slot.

Key Terms

Event Name: Indicates how the event should appear in programs, schedules, and awards ceremonies. It is followed by the Division or Divisions in which the event is currently being run.

Impound: Indicates if any items associated with the event need to be collected and sequestered prior to any events starting on tournament day. If Impound is required, this will require additional space to securely hold the impounded items. It will also require additional volunteers to manage and supervise Impound throughout the tournament.

Room Type: Describes the types of classroom spaces in which the event can be successfully run.

Estimated Hours of Prep Time (including set-up): This is an estimate of the amount of time required of an event supervisor to prepare the needed event materials and set up the event space prior to the arrival of participants at the tournament.

Minimum Suggested Supplies: This is a description of the minimal amount of materials that an event supervisor needs to have in order to successfully run the event at a tournament. It reflects the items listed in the Event Parameter, and other sections, of the Event Rules.

Helpers: Indicates how many adult volunteers, in addition to the Event Supervisor, are needed to successfully run the event. Depending upon the event, these Helpers do not necessarily need a specialized science background. Often times, a general science background and experience working with and supervising children will suffice. In some cases, when the event has two parts running simultaneously (e.g.; Sounds of Music, Machines) additional event supervisors are needed and are called out here.

Additional Notes: This section shares special notes and tips from experienced Event Supervisors, Tournament Directors and Rules Committee Members. Often you can find ideas that will improve the event and offer some time savings for new supervisors.

Notes on Scheduling Events

Try to schedule the following events as early as possible in the day to give Event Supervisors as much time as possible to score all student work:

- Experimental Design
- Disease Detectives
- Write It, Do It (WIDI)

Disease Detectives, Experimental Design, and WIDI are likely to have the same students participating in each event. If possible, try to not schedule all the events at same time for one team. Disease Detectives can probably be a bit more flexible.

It is recommended that device events should be scheduled using a sign-up system as opposed to allowing walk-ins because walk-ins tend to create large clusters of teams at the end of the day. Ideally these sign-ups would be done online, at least one week prior to the tournament. Tournament directors should consider activating sign ups on different days and different times to ensure that teams signing up have equal opportunity and access to sign-up for slots. If at all possible, arrange the sign-up process so that a single person from a team can sign-up participants for all events.

Notes on Resources & Supplies

For more Information about coaches and supervisor sets of bulk supplies for many events, see the official site for Science Olympiad-approved kits: Ward's Science -- <https://www.wardsci.com/scienceolympiad>. Early bird savings: Save 12% on your Ward's Science Olympiad Kit Order with the promo code – SOVIP2020 until 12/31/20.

For more information about obtaining probes, sensors, photogates, calculators and other tech, use the Texas Instruments Educator Loan Program:

http://education.ti.com/educationportal/sites/US/nonProductMulti/support_borrowtitechnology.html

Public Health Recommendations for Tournaments

In an effort to support our State Chapters and Tournament Directors ability to hold in-person, single location Science Olympiad tournaments during the 2021 Season and the COVID-19 pandemic we have assembled this list of possible options that can be used to reduce the risk of a tournament attendee's (i.e., participant, coach, Event Supervisor, volunteer) exposure to COVID-19. This list is drawn from the best public guidance provided by doctors and public health officials but it is by no means comprehensive or guaranteed to prevent the spread of COVID-19 at an in-person, single location Science Olympiad tournament. Additionally, the recommendations provided here are not intended to override or replace guidelines and restrictions put in place by local, state, or federal officials. All Science Olympiad stakeholders (i.e., participant, coach, Event Supervisor, volunteer, Tournament Director, and State Director) are expected to follow the directions of their local, state, or federal officials.

In an effort to make this list of recommendations more usable, the recommendations have been grouped into three broad categories:

- Actions that Promote Safety, Tracking, & Transparency
 - These are general recommendations to create an overall safe atmosphere as well as establish protocols and actions in case a case of COVID-19 does occur within 14 days after the tournament.
- Actions that Limit Personal Exposure
 - These are recommendations that can limit the opportunity for individual exposure while at the tournament
- Actions that Limit Group Exposure
 - These are recommendations that can limit the opportunity for teams and large group exposure while at the tournament

It is expected that Tournament Directors will need to draw some, if not all, recommendations from each category in an effort to make sure everything possible is done to comply with local, state, or federal guidelines and restrictions.

Actions that Promote Safety, Tracking, & Transparency

- Have all Science Olympiad participants including Event Supervisors, Volunteers, and Tournament Staff submit a COVID-19 Wavier.
- Publish or share host steps, guidelines, and precautions to limit the spread of COVID-19 in advance of the tournament.
- All approved Science Olympiad attendees (e.g., participants, coaches, Event Supervisors, Volunteers, & Tournament staff) must wear a non-transferable ID (e.g., wristband, hand stamp).
- Conduct temperature checks of all attendees the morning of the tournament.
- Designate & label spaces and where participants and volunteers should stand.
- Do not have any "roaming" volunteers; everyone should have an assigned station and remain there for the duration of the tournament with the exception of designated breaks.

- Teams need to report the exact participants in each event at registration
 - There is no changing of participants allowed
- Have Event Supervisors and volunteers report any instances of COVID-19 positive tests within 14 days post tournament to the tournament director.
 - This notification should include any areas on the campus that the Event Supervisor or volunteer may have visited outside of their designated space while on campus.
- Have Teams report any instances of COVID-19 positive tests within 14 days post tournament to the tournament director.
 - This notification from a coach should be limited to informing the Tournament as to the impacted school as well as the events & times in which the affected individual participated.
- Tournament directors should plan on notifying coaches if any participants, Event Supervisors, or relevant volunteers test positive for COVID-19 within 14 days post tournament.
 - This should include identify which events & time periods are involved.
 - This notification should simply let the impacted teams know that a positive test has occurred but it should not include any details as to the participant, or participants, involved as well as their school.
 - Tournament directors need to ensure that during this notification all the rights to privacy afforded to the affected individual under the Health Insurance Portability and Accountability Act of 1996 (HIPAA) are provided.

Actions that Limit Personal Exposure

- All Science Olympiad attendees (i.e., participants, coaches, event supervisors, volunteers, and tournament staff) will wear a mask at all times.
 - Depending upon conditions consider allowing participants & coaches to take masks off within the confines of their homeroom.
 - Need to identify where event supervisors, volunteers, and tournament staff can safely remove masks.
- Teams are restricted to their designated homeroom or their event rooms.
 - Participants may not wander campus
- Hand sanitizer in all rooms
- No station event set-ups; no rotating in event rooms
- No shared items (e.g., tools, stopwatch, tape measure)
- No handshakes or physical contact between attendees
- No aligning teams directly across from each other at a lab bench
- Leave Event Room doors open during the event to allow air flow
- Split Core Knowledge, Lab and Hybrid Events across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- Use Science Fair boards to create barriers and isolate teams at desks during their events
- No tournament or host provided food for teams & participants
 - Teams must bring their own food

Actions that Limit Group Exposure

- Teams attending a tournament will be limited to 15 participants plus the minimum number of Adult chaperones required by their school
 - This should make for 18 attendees/team
 - No parents will be allowed to attend the tournament
 - No spectators at the tournament
- Reduce the number of teams that are invited to attend a tournament

- This should only be implemented as last resort
- Hold all Coaches' Briefings and other meeting virtually the night before the tournament
 - You may need a final virtual briefing the morning of the tournament
- No large group ceremonies
 - Conduct these virtually if at all
- Host only 1 Division at a time
 - This makes a single B/C tournament a multiple day event
- Adjust the tournament schedule to allow start and end times that don't require teams to overnight in a hotel if possible
 - Delay announcement of winners & distribution medals
 - Allows more time to score events & verify results
 - For example, tournament could run between 9 AM to 3 PM
- Limit homerooms to 1/floor if possible
 - Consider limiting to 1 homeroom/bathroom
- Stagger event start times by 5 to 10 minutes to limit foot traffic and maximize social distancing during transitions

Anatomy & Physiology (B & C)

Event Type: Core Knowledge

Impound: No

Room Type: Biology lab/room with flat tables

Estimated Prep Time (including set-up): 8-12 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 6

Event Conflicts: None

Minimum Suggested Supplies

Microscopes and slides; models, pictures of organs or pictures of an individual suffering from a disease. If you have access to models, or dissected organs, consider using them instead of pictures.

Additional Notes

- This event is ideally done at stations; overheads and internet pictures may be used in a pinch.
- At least one station should include some actual data in graph or table form.
- Students should not be allowed to touch the specimens.
- Content of questions should focus on understanding how structure contributes to function, and how structures work together, rather than simple identification.
- Care should be taken that slides, pictures, samples and specimens are clearly and unambiguously marked with precise locations.
- Please be aware that many anatomical structures have more than one name so Keys or labels should contain all applicable names for a structure to allow proper grading.
- If using probeware, be sure to include directions for the participants on how to use the device.
- Additional guidance and resources for Event Supervisors may be found on the Event Pages for [Division B](#) and [Division C](#) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
 - Discontinue having teams rotate through a series of stations
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Anatomy & Physiology for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete an exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations (i.e., Satellite SO and mini SO) consider adding completion time as a tie breaker or scoring bonus.

Astronomy (C)

Event Type: Core Knowledge

Impound: No

Room Type: Large classroom with projection capabilities; large flat surfaces

Estimated Prep Time (including set-up): 8-12 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 5

Event Conflicts: Dynamic Planet

Minimum Suggested Supplies

Web/LCD projection capabilities, large projection screen; many different astronomy images

Additional Notes

- This event is ideally done as a group test with images projected for all to see.
- There should be more than 1 question for every image.
- Additional guidance and resources for Event Supervisors may be found on the [Event Page](#) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
 - Discontinue having teams rotate through a series of stations
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Astronomy for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations (i.e., Satellite So and mini SO) consider adding completion time as a tie breaker or scoring bonus.

Boomilever (B & C)

Event Type: Build

Impound: No

Room Type: Gym or room with tables

Estimated Prep Time (including set-up): 2-4 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 6

Event Conflicts: None

Minimum Suggested Supplies

- A Testing Wall as described in the event rules Section 5. Test Apparatus. If at all possible, consider having more than one to accommodate a higher number of teams per session. If using additional Testing Walls, make sure to increase the number of the items that follow accordingly.
- Two 5-gallon plastic buckets with handle. One to hold the sand and another to suspend from the Boomilever and fill with sand.
- A small (pint to quart size) scoop/cup to transfer sand to bucket
- Pair of bucket stabilizing sticks as described in the rules (5.d.)
- 15.1 Kg Sand
- A Loading Assembly as described in the rules (5.b.)
- A digital timer to measure the 6-minute event time
- Another bucket or bag to hold excess sand to replenish competition sand if/when it spills
- Scale to mass the Boomilever (accurate to 0.01 grams) (up to 50 or 100 grams)
- Scale to mass sand bucket/chain system (hold at least 15.2 Kg) accurate to at least .1 Kg
- A level to make sure the attached Boomilever is level

Additional Notes

Consider doing as a sign up and/or with multiple testing. Need to use sand and not cat litter. Sand must be dry!

Additional guidance and resources for Event Supervisors may be found on the Event Pages for [Division B](#) and [Division C](#) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - Leave Event Room doors open during the event to allow air flow
- For Satellite SO tournaments, consider treating this event as a Trail Event as not all teams at a given tournament may have adequate resources to appropriately test their Boomilever.
- For mini SO tournaments, discontinue this event as participants will not have adequate resources to appropriately or safely test their Boomilever in a home setting.
- For Satellite SO and mini SO tournaments consider moving Boomilever to an online testing environment using the rules and instructions posted on the event page at soinc.org

Chemistry Lab (C)

Event Type: Hybrid

Impound: No

Room Type: Chemistry Lab

Estimated Prep Time (including set-up): 10-15 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 10

Event Conflicts: Forensics

Minimum Suggested Supplies

Appropriate chemicals for all; various types of glassware; proper disposal containers.

Additional Notes

Long set-up and prep; need many sets of reagents, ideally one for each group; **be sure students and supervisors come with proper safety equipment.** If using probes, students may need directions on how to use. Students may have 5 notes sheets.

FOR ALL CHEM EVENTS SEE SUPERVISOR TIPS on www.soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Chem Lab for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.
- For Satellite SO tournaments, consider discontinuing the hands-on portion of this event, or greatly simplifying the materials requirements, to allow teams to compete equitably and safely.
- For mini SO tournaments, discontinue the hands-on portion of this event for safety and resource accessibility concerns.

Circuit Lab (B & C)

Event Type: Hybrid

Impound: No

Room Type: Ideally a science lab but a large classroom with tables can work

Estimated Prep Time (including set-up): 10-12 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 5

- 1 volunteer to address questions from students and greet them at the door
- 1 volunteer to assist the Event Supervisor with grading the practical portion of the exam
- 2 volunteers for grading paper exams (theoretical portion)

Event Conflicts: None

Minimum Suggested Supplies

Multimeter, Materials appropriate for the hands-on activity you choose (i.e.; breadboards, LEDs, wire, resistors, batteries, magnets, motors, compasses, light bulbs, and switches), Written Test, Key, & Answer Sheets

Additional Notes

Ideally, Circuit Lab would be run with a work station for each team where participants take the test and perform the hands-on activities using the materials supplied at each work station. This allows the students to manage their own time and task separation as they desire. Given that the hands-on portion of the event can count anywhere from 25% to 50% of a team's final score, Event Supervisors are strongly encouraged to not use a single hands-on activity. Ideally, there would be multiple small things for teams to complete at their work station. At turnover, each materials kit needs to be verified complete for the oncoming teams.

If your space or materials are limited, consider having a series of stations where participants rotate to answer questions and complete a series of tasks or call them up one at a time for your hands-on station to complete a series of tasks. You will want at least one supervisor who is good at writing and grading tests and another supervisor who is good with hands-on activities.

- Additional guidance and resources for Event Supervisors may be found on the Event Pages for [Division B](#) and [Division C](#) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Circuit Lab for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.

- For Satellite SO tournaments, consider discontinuing the hands-on portion of this event, or greatly simplifying the materials requirements, to allow teams to compete equitably and safely.
- For mini SO tournaments, discontinue the hands-on portion of this event for safety and resource accessibility concerns.

Codebusters (C)

Event Type: Core Knowledge

Impound: No

Room Type: Typical classroom with chalk/whiteboard

Estimated Prep Time (including set-up): 8-10 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 5

Event Conflicts: None

Minimum Suggested Supplies

Written Test, Key, Answer Sheets; stopwatch(es) or stopwatch app on smartphone; stapler, and scrap paper

Additional Notes

For help preparing your test, please check out these resources:

- Test-Creation Tool: <https://toebes.com/codebusters>
- Test-Creation Tool Instructional Video: https://youtu.be/pcz_3ql8ebM

Event Preparation

You will need:

1. Sufficient copies of the test for all teams (one booklet per team). They don't need to be stapled.
2. Folders for each of the teams to hold the tests.
3. Multiple timers which have a lap function on them - ideally one per volunteer. The timer app on an iPhone or Android Phone that has a stopwatch function with lap function is sufficient.
4. Optionally, extra scrap paper for any team that needs it.

Before the event begins:

1. Practice starting the timers and using the lap function to record the times. Make sure volunteers understand how to use the lap function and are not accidentally stopping the timer completely.
2. Memorize the answer to the timed question.
3. Place one copy of the test for each team in the provided folders with the first page outside the folder (fastened with a paperclip, for example)
4. When specifying which cipher to use (as it is the first year for this event) it is recommended that you should provide enough information as to make the event accessible to all participants. For example, if you were to use an Aristocrats cipher with spelling errors you would identify it as such but not specify the number of errors. Similarly, a message encrypted using the Atbash cipher should indicate that the Atbash was used.

Running the Event

1. When the students enter the room, instruct them to sit down, DO NOT OPEN THE FOLDER, and put their names, school name and school number on the first page.
2. CRITICAL: Check to see that students have ONLY brought:
 - a. Something to write with (pencils, pens, erasers)
 - b. Five function calculators (addition, subtraction, multiplication, division, and usually square root). The calculator can have a simple memory store/recall function but must not have a modulus or other scientific and programmable functions. If their calculator doesn't meet these requirements, they may not use it.

3. Remind the teams that:
 - a. They do not have to fill in the frequency table. It is simply there as an aid to help them solve the cryptogram. It will not be graded.
 - b. They are not restricted to only the timed question during the first 10 minutes of the event. They can move on or split up the work if they would like.
 - c. They will need to staple their test booklets after the event is over.
 - d. Writing anything after "time is called" at the end can lead to a penalty or disqualification.
4. Instruct the students that if they answer the timed question within 10 minutes, they can be awarded a bonus if they solve the timed question with no more than 2 letters incorrect.
 - a. Let them know that you will announce when the 10-minute time is up. After the first 10 minutes, no additional bonus points will be awarded.
 - b. When they have a solution for the cryptogram they should raise their hand.
 - c. When you see a team raise their hand, hit the LAP function and head to the team.
 - d. Determine if their answer is correct (see next page for grading), If so, write the time on their score sheet.
 - e. If their score is incorrect (more than 2 letters incorrect), tell the team that the answer is wrong, but DO NOT tell them what is wrong. They can continue to work on the question and raise their hand again to be checked. A team has an unlimited number of attempts during the 10-minute bonus.
5. When the timers hit the 10-minute point, put away the timers, and announce that no bonus points will be awarded but the students can still solve the question for its fixed-point value.
6. When time is up, have the students put writing instruments down and put their answer pages back into the folder in the correct order.

How to grade

1. Teams can have up to two incorrect letters total on their cryptogram and still be correct. See the example below.

If the cryptogram was as shown:

Given Cryptogram - KZBAOF KFXMFXYF

Correct Response - SAMPLE SENTENCE

and the participants answered (underlined letters indicate mistakes)

Participant Response #1 - SAMPLESENTENCE

then it counts as four mistakes (even though the mistake was only in the letter E) and the answer DOES NOT count. However, if they put

Participant Response #2 - SAMPUL SENTENCE

It is considered correct with two letter mistakes.

2. For questions which have a numeric answer (such as determining the $a=$ and $b=$ values or the RSA questions), no mistakes are allowed.
3. Teams do NOT have to fill in the frequency table. It is simply there as an aid to them solving the cryptogram. It WILL NOT be graded. It is included in the answer key as an aid to the grader.
4. When scoring the Baconian ciphers (with strange text or symbols), they can write the answer under the Baconian symbols or on the line provided. Note that you will see lots of As and Bs, but they are not graded as the answer, only what they put on the answer line.
5. As you score each question, if correct, put the number of incorrect letters (0, 1, or 2) next to the question number on the scoring page. Also, put the value for the question into the score column. If they get more than 2 letters wrong, subtract 100 points from the score until it would be zero. If a question is worth 240 points and they get 4 letters wrong, you would start with 240 points (for up to 2 letters wrong) and then subtract 100 points for the next two letters wrong ending up with a final score of 40 points for that question. If they get 5 or more letters wrong on a 240 point question, they receive 0 points for that

question. With a 650 point question, they could get 8 letters wrong and receive 50 points (2 free letters then $6 \times 100 = 600$ points off). Just put the incorrect cost deduction on the score sheet and subtract it from the value for the question. Under no circumstance should the score for any question be less than zero. Note that while the timed question must have 2 or fewer letters incorrect in order to get the timing bonus, a team solving the timed question after the 10 minutes passed would be accepted as correct with 3 incorrect letters receiving 100 points for the timed question.

6. If they correctly answered the timed question in 10-minutes or less with 2 or fewer letters incorrect, you need to compute the bonus time. Take the value for the minute from this first table below:

0:xx	2,160	1:xx	1,920	2:xx	1,680	3:xx	1,440	4:xx	1,200
5:xx	960	6:xx	720	7:xx	480	8:xx	240	9:xx	0

and then add the seconds value from this table:

x:0 0	240	x:00	236	x:00	232	x:00	228	x:00	224	x:00	220
x:0 6	216	x:06	212	x:06	208	x:06	204	x:06	200	x:06	196
x:1 2	192	x:12	188	x:12	184	x:12	180	x:12	176	x:12	172
x:1 8	168	x:18	164	x:18	160	x:18	156	x:18	152	x:18	148
x:2 4	144	x:24	140	x:24	136	x:24	132	x:24	128	x:24	124
x:3 0	120	x:30	116	x:30	112	x:30	108	x:30	104	x:30	100
x:3 6	96	x:36	92	x:36	88	x:36	84	x:36	80	x:36	76
x:4 2	72	x:42	68	x:42	64	x:42	60	x:42	56	x:42	52
x:4 8	48	x:48	44	x:48	40	x:48	36	x:48	32	x:48	28
x:5 4	24	x:54	20	x:54	16	x:54	12	x:54	8	x:54	4

For example if they solved the time question at the 6:46 mark, you would add 720 (from the 6:xx entry in the first table) to 56 (from the X:46 entry in the second table) to get a bonus of 776. If they had solved it in exactly 4:00 minutes, you would add 1200 and 240 to get a bonus of 1440.

7. Add up all the scores and put the total on the bottom of the score sheet.
8. You must break all ties. Indicate the tie breaker by adding .1 to the score of the team ahead. With multiple teams tied, you will add more. (i.e. if five teams all scored 200 points, the final scores that you would enter on the score sheet would be 200.4, 200.3, 200.2, 200.1 and 200.)
9. To determine how to break the tie, you need to look at the correctly answered questions in the order from the table generated with the test. If both teams answered the same (i.e. they answered the question with zero mistakes) then you go on to the next question. If one team had no mistakes and the other team had one mistake, then the team with no mistakes is ahead. Using the table below as an example, if one

team answered question #8 (which is the highest value question) and another team didn't, the first team will be ahead.

Tie Breaker Order	Question #
1	12
2	8
3	7
4	6
5	17
6	5
7	11
8	14
9	4
10	18
11	15
12	3
13	Timed
14	19
15	16
16	20
17	13
18	10
19	9
20	2
21	1

10. If there is still a tie (typically when you have teams which answered either zero, one or two questions) then you will need to look at the tie breaker questions again and count the number of correctly answered letters. The team with the most correctly matched letters is to be ahead.

Additional guidance and resources for Event Supervisors may be found on the [Event Page](#) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Codebusters for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.

- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.
- For Satellite SO and mini SO tournaments, where the Event Supervisor will not be physically present with the teams consider discontinuing the Time Bonus for the first question to facilitate administration of the exam.

Crime Busters (B)

Event Type: Lab

Impound: No

Room Type: Chemistry Lab

Estimated Prep Time (including set-up): 10-20 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 6

Event Conflicts: Food Science

Minimum Suggested Supplies

Appropriate Chemistry lab supplies: Iodine reagent (Iodine dissolved in KI solution), 1M HCl, a waste container, thermometers, balances, reagents, usually at each station; chromatography supplies, pens; shoe prints. Hair, fabric and candles, plastics and density determining supplies. Distilled or ROI water for each team in wash bottle, unknowns.

Additional Notes

You will need many sets of reagents & supplies; a long prep time is associated with this event. There should be the same setup for each station and team. There are no heating tasks in this event.

You should consider using many different pens with black ink rather than different colored pens; consider a scenario in which any or none could be the perp; same size shoe prints but worn differently creates a different scenario. Test template, recipes for reagents, and other helpful hints available.

At all times, the participants and supervisors need to use proper safety equipment. Participants will come with proper safety equipment.

For all Chem events see Supervisor Tips on <http://www.soinc.org/>.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Crime Busters for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.
- For Satellite SO and mini SO tournaments, consider conducting this event as a “Dry Lab” where participants are given a test containing the data that they would normally have collected during the course of the event. This approach may be necessary to allow teams to compete equitably and safely.

Density Lab (B)

Event Type: Hybrid

Impound: No

Room Type: Ideally a science lab but a large classroom with tables can work

Estimated Prep Time (including set-up): 10-12 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 5

Event Conflicts: None

Minimum Suggested Supplies

Written Test, Key, & Answer Sheets; Materials and measurement devices appropriate for the hands-on activity you choose (e.g. mass scales/balances, rulers, graph paper, graduated cylinders, beakers, water, balloons, aquarium tank)

Additional Notes

If your space or materials are limited, consider having the teams all work on the written test at the same time and then call them up one at a time for your hands-on station. You will want at least one supervisor who is good at writing and grading tests and another supervisor who is good with hands-on activities.

Also, make sure that you are aware of, and follow, any and all safety and housekeeping rules established by the institution that is hosting the tournament.

Additional guidance and resources for Event Supervisors may be found on the [Event Page](#) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Density Lab for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.
- For Satellite SO and mini SO tournaments, discontinue the hands-on portion of this event, or greatly simplifying the materials requirements, to allow teams to compete equitably and safely.

Designer Genes (C)

Event Type: Core Knowledge

Impound: No

Room Type: Ideally a science lab but a classroom with large tables can work as well

Estimated Prep Time (including set-up): 10-20 hours to prepare the test; 1-2 hours day of to set-up the room

Ideal Number of Staff (Event Supervisor + Volunteers): 3

Event Conflicts: None

Minimum Suggested Supplies

Written Test, Key, & Answer Sheets; Stopwatch(es), samples or specimens (i.e. slides, pictures, karyotypes, diagrams, pedigrees, corn ears, beans, plants) if appropriate

Additional Notes

Ideally this event should be run as stations where participants get to interact with specimens, samples, or data to answer multiple questions. Use the number of teams per session as a guide to how many stations you will need. Typically, you would like to have more stations than you do teams. If using stations, participants should get about 4 minutes/station if you have 10 to 12 stations or 3 minutes/station if you have 15.

Try to include some graphs, interpretation of data, predictions across the stations.

Additional guidance and resources for Event Supervisors may be found on the [Event Page](https://soinc.org) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Designer Genes for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.

Detector Building (C)

Event Type: Hybrid

Impound: No

Room Type: Ideally a science lab but a classroom with large tables and easy water access and disposal can work as well

Estimated Prep Time (including set-up): 1-3 hours to prepare the test; 1-2 hours day of to set-up the room

Ideal Number of Staff (Event Supervisor + Volunteers): 6

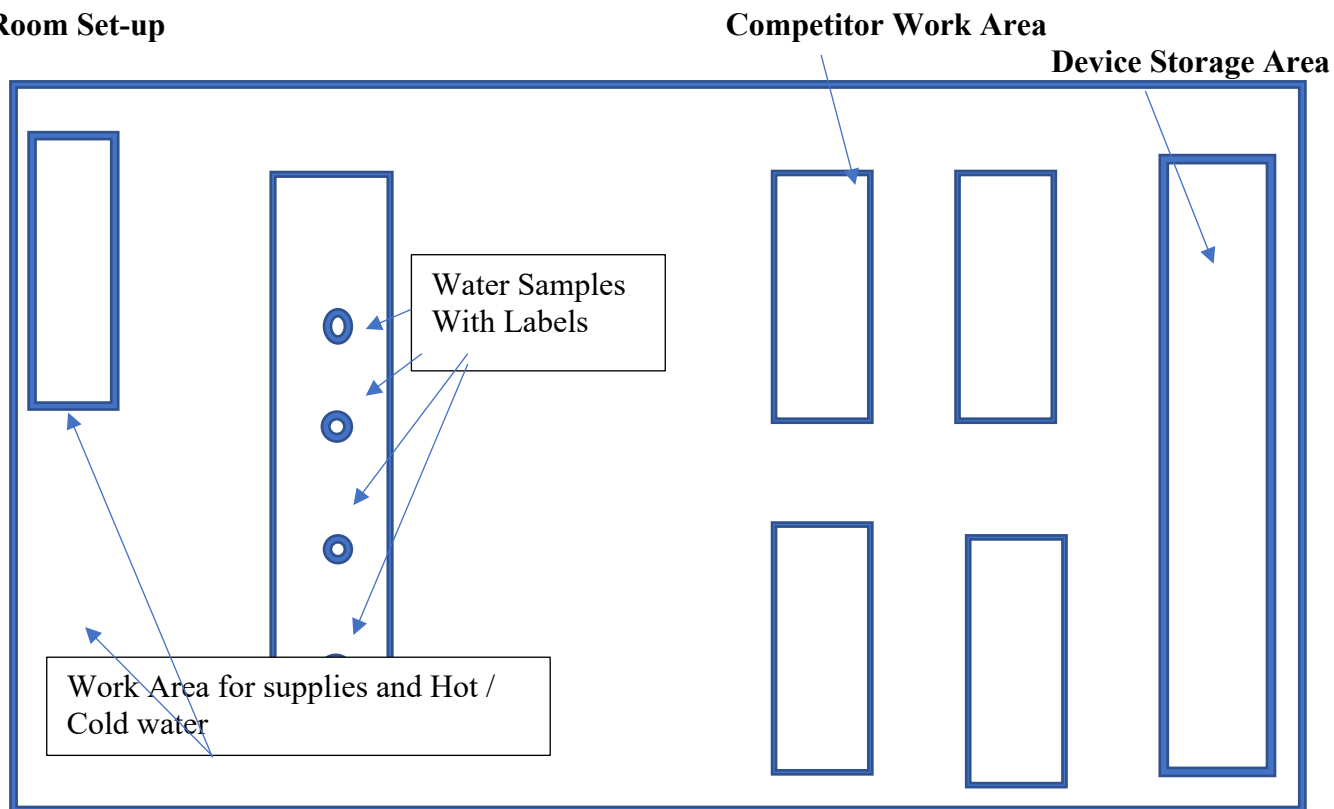
Event Conflicts: None

Minimum Suggested Supplies

Source of hot water (2-3 electric coffee pots), source of ice (small cooler), 4 insulated cups with lids to hold and help maintain temperature of the 4 Test Samples of water. (YETI style tumblers are ideal), container to hold extra water to refill containers as needed, disposable hot cups (~50 -100) and paper towels (~ 3-4 rolls) for participants to use while checking their devices calibration, a few clipboards (minimum of 4 – maximum 10) to hold individual score sheets while participants are being judged, score sheets, and written questions used to break ties (one for each team at the tournament), a heavy-duty extension cord, and power strip with multiple outlets maybe needed depending on room set-up and location of outlets, dry erase pen to post Temperature ranges for LED Colors, measuring device to establish 30 cm probe length requirement, labels for stations 1-4 identification, and for State and National Tournaments only 10 accurate digital thermometers (Calculators with temperature probe or and laboratory grade digital thermometer works)

Additional Notes

I. Room Set-up



II. Competition Guidelines

All construction guidelines must be followed but the main focus can be summarized in the following four competition goals;

- 1) Build a durable Temperature sensor. This sensor must be built by the competitor from basic components and not one purchased already in a water proof housing.
- 2) The code must show the conversion of the raw sensor data into a digitally displayed temperature using the Celsius scale. This conversion equation must be supported with recorded data in the form of a journal and not from a manufacturers library or supplied equation.
- 3) The assigned temperature ranges (low, medium and high) must be indicated by either a Red, Green or Blue LED. Also, a single RGB LED can also be used instead of the three individual LEDs. The temperature ranges will not be given until the competition so that the competitors must demonstrate their ability to alter their code to match the assigned temperature ranges. Typical low ranges could be 0-20°C, mid-range from 20-40°C, and high range from 40-60°C.
- 4) Because every commercially produced thermometer has a degree of uncertainty, the competitors will be allowed to adjust their device's calibration by using the actual thermometer that will be used to evaluate their sensor. The teams should be allowed access to hot and cold water, cups, the actual thermometer that will be used to verify their calibration and allowed to make coding adjustments before starting their competition. The calibration verification, code modification and actual judging must all occur in the assigned 50 minutes time rotation. The LED scores will be based on the temperature that the competitors' device indicates and not the calibrating thermometer.

III. Suggestions to Running the Event

1. Room should have an impound area large enough to allow storage of devices without stacking.
2. The ideal number of volunteers is 4-5.
3. If time allows, evaluate journals prior to the team's competition, if not possible the team may have to retrieve their journal later or leave a copy for the supervisor.
4. Do not post the temperature ranges for the LED colors until the room is secured and the round has begun.
5. At State and Nationals, give each team a thermometer and tell them that this thermometer will be used as the reference thermometer to evaluate the accuracy of their device. Therefore, they should use this thermometer to verify or modify their device prior to testing and bring it with them when they come to the front tables to evaluate their device. Depending on the number of teams in the rotation, give them a minimum of 10 minutes and a maximum of 20 minutes to accomplish all on-site modification or calibration using their reference thermometer. Remind them that the digital display will be used to determine the temperatures and not a verbal answer based on a mental temperature modification.
6. Separate the 4 water samples to be tested on the front table far enough apart to allow one and only one team at each station at a time. If one sample is ice water, be sure to remove any ice before competition begins. Try to differ the temperature of the samples 15-20 degrees Celsius from each other. The exact temperature is not critical since the score is based on the agreement of their device to a standard thermometer at any temperature within the test range of 0°C to 100°C.
7. Limit the time that a team can be allowed at each station to 3-5 minutes to allow adequate time to judge all the teams.
8. Record the actual temperature as indicated by the thermometer supplied to the team when they entered the room, the temperature as indicated by a digital display on or attached to their device, and the color of the LED light at each station. Do not show the team their temperature results until they have completed all 4 stations. No program modification is allowed once the team starts their evaluation at the front tables. (See attached score sheet)
9. Allow the teams to work on the 10 -15 written question anytime during the rotation. The results are only used to break ties. Written questions shall be directly related to the hardware and software used in this year's event. Event supervisors can request sample question by emailing John Loehr at jfloehr@soinc.org.
10. If the device fails during the round, the team's score will be based on their score up to the point of failure and the team will be placed in Tier 2.

Additional guidance and resources for Event Supervisors may be found on the [Event Page](#) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Detector Building for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.
- For Satellite SO and mini SO tournaments, discontinue the hands-on portion of this event for safety and resource accessibility concerns.

Disease Detectives (B & C)

Event Type: Core Knowledge

Impound: No

Room Type: Science Lab or Classroom

Estimated Prep Time (including set-up): 10-15 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 4

Event Conflicts: None

Minimum Suggested Supplies

1 copy of test/team, Answer sheet for quick grading, stapler, staple puller

Additional Notes

Competitors should not be expected to know facts such as latency or incubation periods or causative agents about diseases or conditions. These should be provided in background information or the body of the question. However, they should be able to recognize, use and interpret that information when given in different forms.

Minimize duplicate calculations as much as possible. Avoid having teams calculate risk ratios for 10 different items in an outbreak investigation. This unreasonably rewards or penalizes teams who are able or unable to do it. One or two should be adequate.

In developing short answer and short essay questions, it is a good idea to give some indication of just what the answer should look like. For example, "Person, place and time are key to descriptive epidemiology. Gender and age are two variables associated with person. Give two variables associated with place and two variables associated with time".

The test associated with this event can take a long time to grade so consider scheduling this as the first event of the day; an alternative would be to recruit more volunteers than listed to serve as additional scorers. During the event, some graphs may be projected, but it is not a good idea for students who may need to return to them often.

The event has been run as stations with 10 or fewer teams in a laboratory setting. Stations were not order-dependent. Teams were given 3-4 minutes at each station. Stations requiring more time were duplicated so that teams just moved down but kept doing the same thing.

Additional guidance and resources for Event Supervisors may be found on the Event Pages for [Division B](#) and [Division C](#) at soinc.org. Many more resources, help, and information can be found at the [CDC website](http://www.cdc.gov).

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
 - Discontinue having teams rotate through a series of stations
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator,

or other academic resource as specified in the Rules for Disease Detectives for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.

- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.

Dynamic Planet (B & C)

Event Type: Core Knowledge

Impound: No

Room Type: Large room with flat tables

Estimated Prep Time (including set-up): 10-15 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 4

Event Conflicts: Astronomy, Water Quality, Road Scholar, Meteorology

Minimum Suggested Supplies

Enough copies of tests; actual maps/photos/images; rulers.

Additional Notes

Consider including High quality maps—satellite, topographic, etc. May be projected on large screen; be sure to include scale with photos; always ask some questions about causes and predictions.

Additional guidance and resources for Event Supervisors may be found on the Event Pages for [Division B](#) and [Division C](#) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
 - Discontinue having teams rotate through a series of stations
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Dynamic Planet for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.

Elastic Launched Glider (B)

Event Type: Build

Impound: No

Room Type: Gym, cafeteria, high "clean" ceiling, if possible, with no rafters

Estimated Prep Time (including set-up): 2-4 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 10

Event Conflicts: None

Minimum Suggested Supplies

Balance-gram to 0.01g, stop watches, metric rulers: 1-meter, 30 cm, timer; gauges to measure the specific dimensions, pieces of poster board with marks for each size limit, table. Consider using a door monitor to minimize disruptions and air currents during flights.

Additional Notes

Try to keep HVAC off; no entry or exit during flight. Consider having a long, expandable pole to get planes if they get stuck on rafters; separate area for spectators. If possible, work with the tournament director to provide room dimensions and type of room prior to the tournament to all teams.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
- For Satellite SO tournaments, consider treating this event as a Trail Event as not all teams at a given tournament may have adequate space to appropriately test their Elastic Launched Glider.
- For mini SO tournaments, discontinue this event as participants will not have adequate resources to appropriately or safely run Elastic Launched Glider in a home setting.

Experimental Design (B & C)

Event Type: Lab

Impound: No

Room Type: 1-2 labs with tables are ideal but can also be run in classrooms if no chemicals are used.

Estimated Prep Time (including set-up): 10-20 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 6

Event Conflicts: Write It, Do It

Minimum Suggested Supplies

Many equal set ups, materials/problems can be anything; at minimum, each station may need rulers or timers or beakers. Copies of the report packet for each team.

Additional Notes

Long set up with one station per team; Long time to grade; should be scheduled as early event; be sure that each station has identical materials; problem can be anything, but try to give students some ideas such as “process X is influenced by 3 different factors a, b, c. Devise an experiment that shows effect of one of these. Vague instructions of the form “design and do an experiment” (with nothing else) should not be used.

Requires good scoring rubric; strongly consider using scoring rubric on soinc.org. Graders should read pages describing scoring rubric. Have a grader meeting to discuss criteria prior to beginning grading of the reports and establish that there is more than one way to conduct an experiment. Use of appropriate units for many categories is essential. If multiple people are grading, consider having them only focus on one part of the report for all teams as opposed to grading the entire report for a few teams. This will promote more consistent and reliable grading.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Experimental Design for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same lab because of social distancing or quarantine/isolation have each partner complete a lab independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.
- For Satellite SO tournaments, consider simplifying the materials requirements to allow teams to compete equitably and safely.

- For Satellite SO and mini SO tournaments, do not conduct this event as a “Dry Lab” where participants are given a test containing the data that they would normally have collected during the course of the event. While this approach will allow teams to compete equitably and safely it goes against the “Spirit of the Problem – Science Olympiad General Rule #1.
- For mini SO tournaments, strongly consider discontinue this event for safety and equity reasons. mini SO tournaments who really want to run Experimental Design might consider using the free Science Journal app which will allow data to be collected using the sensors on a cell phone. The app will also allow a lab report to be written.

Food Science (B)

Event Type: Hybrid

Impound: No

Room Type: Ideally a chemistry lab but other science labs may work if they have lab benches or tables as well as the appropriate safety equipment and access to a water.

Estimated Prep Time (including set-up): 10 - 15 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 5

Event Conflicts: None

Minimum Suggested Supplies

Test, Answer Sheet, & Key; Salt; 400 to 600 mL beakers, appropriate chemistry lab supplies, safety equipment (e.g., goggles, lab coats, aprons) for all event supervisors and in room volunteers, FOR ALL CHEM EVENTS SEE SUPERVISOR TIPS on soinc.org

Additional Notes

Set up the hydrometer station near a sink and have plenty of paper towels available. One volunteer should be stationed at the hydrometer station. Any station instructions/additional questions at the hydrometer station need to be setup so that they don't get wet and destroyed. However, at the Regional level, participants may need to focus on testing their hydrometer, so additional questions at this station are not recommended.

If using higher concentrations of salt solution, make sure to allow enough time that the salt dissolves completely.

Long prep; need many sets of reagents. Be sure students come with proper safety equipment. Be sure the event supervisors and helpers have proper safety equipment.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Food Science for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.
- For Satellite SO tournaments, consider discontinuing the hands-on portion of this event, or greatly simplifying the materials requirements, to allow teams to compete equitably and safely.
- For mini SO tournaments, discontinue the hands-on portion of this event to allow teams to compete equitably and safely.

Forensics (C)

Event Type: Lab

Impound: No

Room Type: Chemistry lab with gas connections in the hoods

Estimated Prep Time (including set-up): 10-15 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 4

Event Conflicts: Chem Lab

Minimum Suggested Supplies

Appropriate chemistry lab supplies: thermometers, cylinders, balances, reagents, usually at each station; chromatography supplies, pens; shoe prints, Iodine reagent (Iodine dissolved in KI solution), 2M HCl, 2M NaOH, Benedict's solution, (no more than 50 mL of each of the solutions) a hot water bath, a Bunsen burner or equivalent BTU heat source to perform flame tests, a waste container, microscope, chromatography materials, unknowns, and a wash bottle with distilled water (no more than 250 mL). Hair, fabric and candles, plastics and density determining supplies.

Additional Notes

Long prep; need many sets of reagents; better done with same setup for each station and team; consider using many different pens with black ink rather than different colored pens; consider a scenario in which any or none could be the prep; same size shoe prints but worn differently creates a different scenario. Test template, recipes for reagents, and other helpful hints available. Be sure students come with proper safety equipment. Be sure the event supervisors and helpers have proper safety equipment.

For all Chem Events see Supervisor Tips on www.soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Forensics for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.
- For Satellite SO and mini SO tournaments, consider conducting this event as a "Dry Lab" where participants are given a test containing the data that they would normally have collected during the course of the event. This approach may be necessary to allow teams to compete equitably and safely.

Fossils (B & C)

Event Type: Core Knowledge

Impound: No

Room Type: Lab or large classroom with flat tables

Estimated Prep Time (including set-up): 10-15 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 5

Event Conflicts: None

Minimum Suggested Supplies

Many different kinds of fossils, actual specimens better than pictures

Additional Notes

Stations with actual specimens; actual specimens are better than images; local mineral society or museums are often good sources of help.

Event Supervisors are advised to **NOT** use the Genus *Carcharodon* for identification on **ANY** Science Olympiad Fossils exam; it was included on the Fossils List as an alternative genus for the species *C. Megalodon*. Both genera should be accepted for *C. Megalodon*. It would be considered an inappropriate question to have a station that includes a Great White tooth and a megalodon tooth, and ask to identify each. A more appropriate question would be to ask the participants the rationale for the change of *C. Megalodon* to the genus *Charcharocles*.

Event Supervisors should also make allowances for participant responses concerning #20, the Genus *Eldredgeops* and accept either *Eldredgeops* or *Phacops* as valid. While *Eldredgeops* is the preferred, and scientifically correct name for the genus, the former name *Phacops* is still in common use and may be found in many references and should be accepted where appropriate.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
 - Discontinue having teams rotate through a series of stations
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Fossils for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.

Game On (B)

Event Type: Lab

Impound: No

Room Type: Computer room

Estimated Prep Time (including set-up): 10-15 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 6

Event Conflicts: None

Minimum Suggested Supplies

Computers with the Scratch program (Available for download from <http://scratch.mit.edu>) to create an original computer game based on the assigned theme. Projector and screen to display time remaining and instructions to competitors.

Additional Notes

Tournaments are encouraged to provide computer specifications and which Scratch version they will be running to the teams as early as possible. A broad theme to build their original computer game around.

Work with your tournament director to coordinate with the tournament site's IT department. They can be a huge help in getting things set-up for you.

The Scoring Rubric for this event and additional guidance and resources for Event Supervisors may be found on the [Event Page](#) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Game On for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same game because of social distancing or quarantine/isolation have each partner complete a game independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.

Geologic Mapping (C)

Event Type: Core Knowledge

Impound: No

Room Type: Typical classroom, ideally with flat tables & projection equipment (i.e.; LCD projector, screen)

Estimated Prep Time (including set-up): 10 – 15 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 4

Event Conflicts: None

Minimum Suggested Supplies

Test, Answer Sheet, & Key; Rulers and Protractors; High quality images (if at all possible avoid photocopying)

Additional Notes

If providing maps to students, be sure they are HIGH quality and resolution; if projecting things, allow ample time; be sure scale is included.

Additional guidance and resources for Event Supervisors may be found on the [Event Page](#) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
 - Discontinue having teams rotate through a series of stations
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Geologic Mapping for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete an exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.

Gravity Vehicle (C)

Impound: Yes

Room Type: Wide, flat hallway, gym, or other open indoor space; space for impound at all tournaments

Estimated Prep Time (including set-up): 1-2 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 8

Event Conflicts: None

Minimum Suggested Supplies:

- Unsharpened #2 pencils for teams to start their Vehicles (bring extra in case team accidentally takes them)
- Rope/Caution Tape/Barriers to separate track/impound from spectators
- Tape (1/2" wide) to mark the track
- Measuring tapes (metric, at least 12 m long)
- Meter stick to measure ramps & vehicles
- Short ruler or gauge to measure dowels
- Mass balance (at least 2 kg capacity) to weight the Vehicle
- Stopwatches (3 for the three timers, plus 1 for each track to time setup time)
- Photogate timing system, if possible. If not using a photogate system, have 2 lasers set up at the timing lines for ease of the timers to see when the dowel passes the timing lines.

Additional Notes:

This event is best run in a large space where the impound area and participants can be kept separated from spectators. Rope, or some other queuing device, should be used to designate where spectators are allowed off the area to keep spectators away. If you have a large number of teams competing, consider setting up additional but identical tracks.

To be successful, a smooth surface is paramount. Avoid tile floors with seams. Notify teams ahead of the tournament, via email or a tournament website, the type of surface (e.g., vinyl, wood, concrete) that will be used. Do not reveal Target Distance until impound period is over. Make sure the Track is clearly marked as described in rules.

Additional guidance and resources for Event Supervisors may be found on the [Event Page](#) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location and Satellite SO tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
- For Satellite SO tournaments, consider treating this event as a Trial Event as not all teams at a given tournament may have adequate space to appropriately test their Gravity Vehicle.
- For mini SO tournaments, discontinue this event as participants will not have adequate resources to appropriately or safely run Gravity Vehicle in a home setting.

Heredity (B)

Event Type: Core Knowledge

Impound: No

Room Type: Any science lab or classroom with flat tables

Estimated Prep Time (including set-up): 15 – 20 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 4

Event Conflicts: None

Minimum Suggested Supplies

Additional Notes

Minimum Suggested Supplies

Test, Answer Sheet, & Key; Timer(s)/Stopwatch(es); Materials for Stations (i.e.; Microscopes, slides, pictures, karyotypes, diagrams, pedigrees, specimens such as corn ears, beans, plants, etc and laboratory data/genetic test results)

Additional Notes

This event is best run as stations; either 10-12 at 4 minutes/station, or 15 at 3min/station. Questions should be designed to challenge student understanding of basic concepts of genetics such as mono- and di-hybrid crosses, pedigrees, karyotyping, structure and function of DNA, and chromosomal abnormalities. Questions focused on the application of this knowledge to problem solving are preferred. Be sure to include both forward thinking (genotype to ratio of progeny) and backward thinking (phenotype and numbers to probable genotypes). For karyotypes, be sure to use either all diploid or all haploid images. In the more challenging questions, students will solve problems/identify reasons for genetic malformations/find transmission patterns of hereditary diseases/identify abnormal genetics at each station. Avoid having participants create pedigrees as they take a long time to create and scoring can be problematic.

Additional guidance and resources for Event Supervisors may be found on the [Event Page](https://soinc.org) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Heredity for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.

Machines (B & C)

Event Type: Hybrid

Impound: Yes

Room Type: Large room with tables/desks and enough space (in same room or adjacent) for impound of devices. 2x3 feet (on average) per team should be sufficient space for impound.

Estimated Prep Time (including set-up): 10-15 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 4 (including during impound)

Event Conflicts: None

Minimum Suggested Supplies

Prior to Impound: Scale capable of measuring masses between 20.0 and 800.0 g.

Impound: Meterstick or measuring stick (80.0 cm long for Div. B, 40.0 cm for C), team checklists

Part I – Stopwatches, protective eye wear for judges, masses labeled A, B, and C.

Part 2 – Written test, answer sheets, and answer key.

Scoring – Pens for grading, computer with Microsoft Excel and official Machines BC Score Sheet.

Additional Notes

When possible, it is recommended that most construction parameters are checked during impound. Pay close attention to the time to ensure all teams are able to impound before impound period is over. Multiple impound stations may be required if there are a large number of teams at the competition. It is recommended to budget for at least 3 minutes per team per impound station when running the event for the first time. Do not forget that the charts (device diagram, tables/graphs) must be impounded.

The longer the written test, the greater the final score diversity will be. To allow for a longer test, it is recommended that teams are given the opportunity to work on the written exam during the entire event block (outside of 5-minute setup and device testing). In addition to the length of the test, it is important to include a broad range of question difficulties. Questions should range from very easy to quite difficult, with a continuous distribution of difficulties in between. This avoids ties at the top or bottom of the score distribution. (Unlike the ideal test for a school class, no competitor should be able to correctly answer every question on the ideal Science Olympiad test.)

When creating masses, it is important to avoid certain constructions. For instance, masses consisting of a bolt holding a stack of large washers enable competitors to estimate mass ratios by simply counting the number of washers on each bolt. Similarly, ratios of masses that are solid pieces of a uniform material, such as brass cylinders, can be estimated by measuring their dimensions and computing their volume. Better masses will appear identical but differ in mass, e.g., identical containers made of PVC pipe and filled with differing amounts of sand.

Suggested event format:

At the start of the time block, provide teams with five minutes to set up or modify their devices. During this time you may give other instructions pertaining to how the event will be run. After the five minutes, teams may begin the written test.

Call teams up one by one to the device testing area (or) if enough space is provided at each teams' workstation, the masses may be moved from station to station.

To ensure there is enough time to adequately test all devices, plan for approximately five minutes per set of masses. For example, if the event time block is 50 minutes, there is at most 40 minutes available for device testing. Ensuring all teams are provided up to the four minutes allowed, eight teams could safely be tested with the same masses.

Five minutes before the end of the event, have students stop work on the written exam. This should provide enough time to collect all exams and allow students to pick up and leave the room by the end of the time block.

Two important things to take into consideration:

- Ensure all device testing is complete before having teams' stop working on written test. This will ensure the last team to perform device testing isn't given more time than other teams to work on test.
- Note how much time the first event block was given to work on the written test. Ensure all time blocks are given the same amount of time.

Grade the written exams and charts during the day and enter scores into the spreadsheet as scores are available. Do not wait until the end of the day to enter scores into the spreadsheet.

Example tournament: 50 teams, five 50-minute time blocks with 10 teams each, and a one hour impound.

Impound: Using the recommended guidelines, 150 person minutes (3 mins * 50 teams) are required for impound. In this scenario, at least three people should be available to impound devices with three sets of measuring equipment.

Event Block: Five minutes are required for device set up and five minutes at the end for cleanup and test collection. This leaves 40 minutes for device testing. Using the recommended guidelines, 50 minutes (5 mins * 10 teams) are required for device testing. To ensure all teams are given up to the maximum time allowed, two sets of identical masses should be used.

During second and subsequent time blocks, at least one person is needed to grade tests and enter scores. So a minimum of two additional helpers are required during the event block.

Example timing if event block starts at 9am:

9:00 – 9:05	Device Setup
9:05	Written Test Start
9:10 – 9:14	Teams #1 and #2 Device Testing
9:17 – 9:21	Teams #3 and #4 Device Testing
9:24 – 9:28	Teams #5 and #6 Device Testing
9:31 – 9:35	Teams #7 and #8 Device Testing
9:38 – 9:42	Teams #9 and #10 Device Testing
9:45	Written Test End
9:45 – 9:50	Written test collection and team cleanup

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Machines for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.

- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.
- For Satellite SO tournaments, consider discontinuing the hands-on portion of this event, or greatly simplifying the materials requirements, to allow teams to compete equitably and safely.
- For mini SO tournaments, discontinue the hands-on portion of this event to allow teams to compete equitably and safely.

Meteorology (B)

Event Type: Core Knowledge

Impound: No

Room Type: A large room with enough space, such as a large classroom with tables, for teams to work comfortably is ideal for the Meteorology event for either the Stationary Workstation or the Timed Station formats. A larger room will allow adequate spacing of teams from one another, minimize distractions from other teams and provide ease of movement.

For the Stationary Workstation format, larger tables will provide adequate room for teams to spread out maps and images.

For a Timed Station format, longer laboratory tables would be ideal as they encourage an ordered and systemized movement of teams from station to station. Be sure that the floor plan is free of obstructions that would hinder or confuse the movement of teams from one station to the next.

Estimated Prep Time (including set-up): 10-15 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 6

For a Stationary Workstation format, one or two volunteers would be helpful in setting up the event, checking-in and checking-out teams as well as for scoring events and event take-down.

For a Timed Station format, at least two or three volunteers would be needed to time stations and rotate students as well as for the activities mentioned above.

Event Conflicts: Dynamic Planet

Minimum Suggested Supplies

Enough copies of exam for each team; Actual weather maps from NOAA, charts

Whether you are using a Stationary Workstation or a Timed Station format, it is imperative that you standardize the resources that you provide. All resources that you provide **MUST** be the **EXACT** same as those provided to every other team in every session of your competition. This even applies to such minute things as the kinds of ruler you provide, the amount of string, the amount of time teams have to answer questions and even the kind of pencils each team uses. Standardization of event resources and conditions prevents accusations that some teams had 'better' resources for competition than others did.

For the Meteorology competition, you will likely use Images or sets of Images. If you are using 8.5x11" images, place each into its own sheet protector to minimize damage that may be caused by team handling of the images during competition. You can also laminate images of any size.

You should also provide rulers and protractors for teams to take measurements. Scrap paper for calculations or notes and pencils are also important items.

If you are using PowerPoint, or any other media to display images, be sure to have a computer and LCD projector available. It is also advisable to have a contact for any technology or laboratory issues that you may encounter prior to and during competition.

Additional Notes

Actual weather maps from NOAA, charts, etc. online are ideal; some images can be projected. Try to avoid creating a test that only has multiple-choice questions. Include questions that require some calculations or analysis where possible. Local TV weather people may be able to help, offer suggestions or provide images. Contact these folks many weeks in advance.

Additional guidance and resources for Event Supervisors may be found on the [Event Page](#) at soinc.org.

Meteorology may be run in one of the following formats:

Stationary Workstation

Teams are provided with all of the images, maps and other resources needed to complete the event at individual workstations for each team. Teams do not move from station to station and have the entire period of competition to complete the activities. You will need to provide enough materials for each workstation to accommodate the number of teams competing per session.

Advantages:

- Teams have flexibility in determining how much time they will devote to answering certain questions.
- You can ask more detailed, higher level questions or provide extended problem-solving activities.
- Less volunteers are needed to run the event

Disadvantages:

- You will need to provide multiple sets of materials for each workstation, which can be more expensive than using a single resource in a timed station format.

Timed Stations

Teams move from station to station answering one or more questions using a set of resources provided at each station. The amount of time to answer each question or set of questions is limited, and you must include enough time for all teams to visit every station. You will need to provide enough stations to accommodate the number of teams competing in each session. You will also need stopwatches and extra volunteers to help run the event.

Advantages:

- Event setup may be less expensive as all teams use a common resource provided at a single station.
- Moving from station to station provides teams with a variance of activity as they are not seated in one place for the entire period of competition.

Disadvantages:

- Teams have less flexibility in determining how much time they will devote to answering certain questions.
- It is more difficult to ask higher-level thinking questions or provide extended problem-solving activities in a timed station format.
- You will need more volunteers to help run the event.
- It is important to clearly communicate directions for moving from station to station, checkout and other event procedures to teams.

The format that is chosen should ultimately be based on your preferences, and any prior experience you have in running Science Olympiad events. You will also want to consider the Event Needs discussed in the previous sections including room type, the number of volunteers available to help you run the event, availability and cost of Meteorology images, maps, stereoscopes, LCD projectors and other equipment. You will also need to check the Tournament Schedule to ensure that you will have enough time to set up/take down your event should other events be scheduled at your location.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- Discontinue having teams rotate through a series of stations for all tournament formats.
- If not already allowed, each individual participant can have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the specific event rule for use during the competition to facilitate social distancing, isolation, and to prevent resource sharing. Personal sets of resource materials must meet all the criteria established in the specific event rule.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a time breaker or scoring bonus.

Mission Possible (B)

Event Type: Build

Impound: Only at State & Nationals

Room Type: Large room with many flat tables. Multiple tables for set up and testing of devices as well as Sign up

Estimated Prep Time (including set-up): 2-4 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 10

Event Conflicts: None

Minimum Suggested Supplies

Timers, Stopwatches, Clipboards, Protective eye wear for judges, metric tape measure

Additional Notes

Impound for State & Nationals. Consider a sign-up schedule. Teams may come 30 minutes before test time to set up. Note: steps do not have to be in order, only specific start and end tasks per rules.

It is recommended that each scorer either should be looking for different transfers with an additional person timing or have each scorer responsible for each side of the device to watch for transfers and have an additional person be the timer.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - Leave Event Room doors open during the event to allow air flow
- For Satellite SO tournaments & mini SO tournaments, consider treating this event as a Trail Event or discontinuing it as it may be difficult to ensure that all safety measures are in place and the event can be judged fairly and equitably.

Mousetrap Vehicle (B)

Impound: Yes

Room Type: Wide, flat hallway or gym; area for impound at all tournaments

Estimated Prep Time (including set-up): 1-2 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 8

Event Conflicts: None

Minimum Suggested Supplies:

- Unsharpened #2 pencils for teams to start their Vehicles (bring extra in case team accidentally takes them)
- Rope/Caution Tape/Barriers to separate track/impound from spectators
- Tape (1/2" wide) to mark the track
- Measuring tapes (metric, at least 12 m long)
- Meter stick to measure Vehicles
- Ruler or gauge to measure dowels & mousetraps
- Stopwatches (3 for the three timers, plus 1 for each track to time setup time)

Additional Notes:

This event is best run in a large space where the impound area and participants can be kept separated from spectators. Rope, or some other queuing device, should be used to designate where spectators are allowed off the area to keep spectators away. If you have a large number of teams competing, consider setting up additional but identical tracks.

To be successful, a smooth surface is paramount. Avoid tile floors with seams. Notify teams ahead of the tournament, via email or a tournament website, the type of surface (e.g., vinyl, wood, concrete) that will be used. Do not reveal Target Distance until impound period is over. Make sure the Track is clearly marked as described in rules.

When timing the runs with manual timers, Event Supervisors should use the *lap* function in case the Vehicle has recoil or does not stop cleanly.

Additional guidance and resources for Event Supervisors may be found on the [Event Page](#) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location and Satellite SO tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
- For Satellite SO tournaments, consider treating this event as a Trial Event as not all teams at a given tournament may have adequate space to appropriately test their Gravity Vehicle.
- For mini SO tournaments, discontinue this event as participants will not have adequate resources to appropriately or safely run Gravity Vehicle in a home setting.

Ping Pong Parachute (B & C)

Event Type: Build

Impound: No

Room Type: Indoor room with at least 20-foot ceilings clear of obstructions; possible locations include a gym, cafeteria, auditorium stage/lecture hall, 3 story open center stairwells, 3 story atriums

Estimated Prep Time (including set-up): 1 – 3 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 6

Event Conflicts: None

Minimum Suggested Supplies

Balance, ruler/measuring device, launcher platform, air compressor or tire pump with pressure gauge, painter's tarp, brown craft paper, timers/stopwatches

Additional Notes

Make sure to verify all team selected pressures based on data provided in their Data Logbooks.

Consider having multiple launcher set-ups depending upon the number of teams at your tournament. If you choose to have multiple launchers allow the teams to select which one they would like to use.

Consider having a floor covering (e.g., painter's tarp, brown craft paper) available to protect the floor from the launcher assembly moving.

This event may be run as a walk-in or self-scheduled event

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
- For Satellite SO tournaments, consider treating this event as a Trail Event as not all teams at a given tournament may have adequate space to appropriately test their Ping Pong Parachute.
- For mini SO tournaments, discontinue this event as participants will not have adequate resources to appropriately or safely run Ping Pong Parachute in a home setting.

Protein Modeling (C)

Event Type: Hybrid

Impound: Yes

Room Type: A computer lab with open table space to store models

Estimated Prep Time (including set-up): 10-15 hours;

Ideal Number of Staff (Event Supervisor + Volunteers): 4

Event Conflicts: None

Minimum Suggested Supplies

Test, Answer Sheets, & Key (provided by Milwaukee School of Engineering (MSOE) for Regional and State Tournaments); rulers and other measuring devices to evaluate models.

Additional Notes

Make sure to review all materials from MSOE before the tournament. Also work with the Tournament Director to discuss event needs and use of computers with the host site's IT department. Try building and/or scoring the pre-built model in advance of the tournament so you can have practice using the rubric.

Additional guidance and resources for Event Supervisors may be found on the [MSOE Protein Modeling Event](#) page as well as on the Event Page for [Division C](#) at [soinc.org](#).

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Protein Modeling for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.
- For Satellite SO tournaments & mini SO tournaments, consider treating this event as a Trail Event or discontinuing it as it may be difficult for the event to be judged fairly and equitably.

Reach for the Stars (B)

Event Type: Core Knowledge

Impound: No

Room Type: A classroom with desks or tables

Estimated Prep Time (including set-up): 6 - 10 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 4

Event Conflicts: None

Minimum Suggested Supplies

Large classroom with projection capabilities. PowerPoint will often suffice

Additional Notes

Equal time for each projection, etc.; probably best to run all teams at same time. May use sections of maps.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
 - Discontinue having teams rotate through a series of stations
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Reach for the Stars for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete an exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.

Road Scholar (B)

Event Type: Core Knowledge

Impound: No

Room Type: Large classroom with flat tables

Estimated Prep Time (including set-up): 10-15 hours for experienced people, 20-30 for novices

Ideal Number of Staff (Event Supervisor + Volunteers): 5

Event Conflicts: None

Minimum Suggested Supplies

Identical highway and topo map for all teams; topo symbol chart; identical questions for all teams; LARGE FLAT TABLES ARE ESSENTIAL

Additional Notes

Consider laminating topo symbol charts; make sure all have same maps; try to ask a variety of different kinds of questions; do not photo copy the topo (obtain from USGS). May consider laminating topo and road maps also.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
 - Discontinue having teams rotate through a series of stations
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Road Scholar for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete an exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.

Sounds of Music (C)

Event Type: Hybrid

Impound: No

Room Type: One large room for the written test, two, or more, adjacent rooms for instrument testing

Estimated Prep Time (including set-up): 10-15 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 10

2 for each instrument testing room, 2-4 others in the exam room

Event Conflicts: None

Minimum Suggested Supplies

For instrument testing rooms (1 set per room): computer with pitch testing program downloaded from www.pascioly.org/sounds, USB microphone; stopwatch or timer, table to put instrument on since some sit on a table, 3-4 chairs, paper checklist for recording scores.

For exam room: Test, Answer Sheet, & Key, computer for Sounds of Music scoresheet, a way to measure instrument size (prebuilt box to maximum dimensions is the fastest method)

Additional Notes

Be careful with the timing of this event, you will need to complete the written test and the instrument in the allotted session time. Have participants go to test their instrument while the written test is being taken. Each instrument testing room can only handle about 7-8 teams per time slot.

The recommended pitch tuner is available free at www.pascioly.org/sounds.

Additional guidance and resources for Event Supervisors, including a forthcoming dedicated Event Supervisors Guide, may be found on the Event Page for [Division C](#) at soinc.org.

Instrument testing rooms must be quiet with little or no noise from hallways and HVAC system.

Students should be escorted from exam room to instrument testing room and back to exam room to prevent cheating. One student may continue to work on the test while the other plays the instrument. Instrument testing rooms and exam room should be close together to minimize lost time.

Venue

It is very important that this event be run using two rooms, one for the exam and at least one for instrument testing (for large tournaments, several instrument testing rooms may be required). One instrument testing room will be needed for each 7-8 teams in a time slot. Fewer teams should be scheduled in each time slot if the people doing the pitch testing are not experienced. The instrument testing rooms should be away from outside noise that might interfere with measuring the pitch and volume of the instrument. A music practice room might work very well for instrument testing, but they are very small and may not accommodate three persons (one student, and the Event Supervisor and an adult volunteer, and it may need to fit both students if both are needed to play the instrument). Remember that Science Olympiad has a “Never Alone” policy, so two adults need to be present in each room of the event.

The instrument testing room must be quiet. Please find a place in which no air handling equipment or HVAC is running to keep it quiet since it will affect measurements. Electric power should be available for the Event Supervisor to plug in his/her phone and computer since they are used throughout the event.

Instrument Review

Please make sure no commercial parts are used in the instrument construction, except strings are permitted. Students may use 3D printed parts that look like commercial parts, e.g., mouthpiece, valves, and other printed parts. Event Supervisors are encouraged to ask questions about the instrument construction to ensure the student actually made the device.

It is recommended that the instrument size be checked in the exam room before leaving for an instrument testing room. The instrument size may be larger after assembled, which is another reason for building a box to check the size since all parts must fit into the box. All instrument sizes should be checked by the same person for consistency. The Event Supervisor may want to build a box that has the interior dimensions equal to the maximum size to quickly check the dimensions of the instrument before assembly.

Instrument Pitch Testing

Each instrument testing room will need identical equipment to ensure consistency between rooms. This equipment includes a laptop, microphone, and stopwatch. The computer should be preloaded with the pitch testing program available free at www.pascioly.org/sounds. This is the best pitch tester available and is specifically made for this year's event. While many microphones are available, the one used at nationals will be the Newer USB condenser microphone for Windows and Mac available from Amazon. It clamps to a table and comes with a scissors arm that makes it easy to adjust to different instruments. The computer for the pitch scores must be positioned so that the students cannot see the screen and be able to make pitch adjustments while playing.

The pitch testing program gives the cents deviation from the true pitch once you enter the starting scale. The cents should be recorded on the checklist available for Sounds of Music event on the national website. It is recommended that you record the cents in a way that the student does not know the value and take advantage of this information for future pitches.

The student should progress up to the next note in the major scale. Continue for 8 notes total. The student must be ready to play the next note quickly to keep the event moving on time. The student may adjust the instrument for each pitch, but those adjustments should be rapid like a musician playing a song.

The Sounds of Music scoresheet will calculate the pitch score. The Event Supervisor will enter the starting note and octave number (choose the appropriate letter). If the student does not know the octave number it is a competition violation and the Event Supervisor will assume an octave number based on measurements so that the pitch score is reasonable before the penalty is applied (in other words, do not assume an octave number to penalize the student). The Event Supervisor will then enter the measured cents for each of the eight notes. The scoresheet can be downloaded from www.soinc.org.

The penalty for the student failing to put his/her tuner away is called a construction violation instead of a competition violation because it results in a greater penalty. This is the intent of the Physics Committee. This gets recorded as a construction violation that is corrected (yes). When the Event Supervisor notices this, he/she should warn the student. If the tuner is not put away for the first note, the Event Supervisor gives the construction violation and then requires the student to put the tuner away or all other notes will be scored as skipped.

Any student who in the opinion of the Event Supervisor attempts to play more than one pitch should be warned and given another attempt to play a single pitch. Sliding through a bunch of notes is a violation of the spirit of this event. This can be determined by the pitch measurement app displaying more than one note value. If the student repeats this same thing a second time, the score for that note should be zero (like if it is skipped).

Students may not use vibrato or any pitch altering process and must attempt to play a single note for each of the eight notes in pitch testing.

Song Score

Ask the students to play the required measures of Twinkle Twinkle Little Star. They may not make adjustments to the instrument after pitch testing for this part of the event. Begin timing the student when he/she begins to play the song. They must complete the song in 15 seconds. The student must maintain a consistent rhythm and the pitches must be the correct relative pitches for the song. The song score is a total of 9 points, three for playing in 15 seconds or less (time), three for rhythm, and three for pitch accuracy. The time score is all or nothing, either they finish within the 15 seconds or they do not. Exceeding 15 seconds as measured on the stopwatch results in a zero for this score.

The rhythm and pitch scoring are based on Event Supervisor judgment. Measurements are not required. Attempting to use a tuner to check the pitch is not likely to be successful since the notes may not be played long enough to register. While it may be successful for teams that play the song slow, it would not work for teams that play it fast. Therefore, a tuner should not be used since there is no way to be consistent for all teams. Rhythm should be judged based on the tempo the student begins using when the song is played. The rhythm score can be broken down as follows: 3 for good rhythm (all quarter notes and half notes identical in length and tempo maintained throughout), 2 for slightly non-uniform on rhythm (quarter notes and/or half notes not completely uniform, tempo not consistent throughout), 1 for more non-uniform rhythm (notes values not consistent, but still somewhat discernible, tempo very erratic), 0 for very non-uniform rhythm (note values not at all consistent with the song, tempo extremely erratic).

The pitch should be based on the initial note played by the student. The pitch score is also broken down: 3 for high quality pitch (it sounds like the song), 2 for medium quality pitch (some note slightly off pitch), 1 low quality pitch (many notes off pitch), 0 poor quality pitch (song not recognizable or monotone).

Bonus

The students may elect to play a bonus pitch. No adjustments may be made to the instrument after pitch testing or song testing for this part of the event. Ask the students what their bonus pitch is and use the pitch tester like used in pitch testing. The bonus with worth 5 points and uses the same tournament level scale as is used for the pitch for determining what is acceptable. The bonus all or nothing. It must be within the tournament level value in cents to get the five points. If the student does not know the bonus pitch octave and letter, the bonus will not be allowed since the Event Supervisor must input this into the pitch tester program.

Written Exam

The written exam must include at least four questions from each of the five content areas listed in the rules. These questions do not have to have equal value but may if the Event Supervisor wants. However, the values may not skew the scores in such a way to significantly de-value any one of the content areas.

It is recommended that students be given the whole time period for the exam and that the Event Supervisor pull students out of the exam for instrument testing. One student may continue to work on the exam while the other student tests the instrument. If this process is used, the written exam should have more than the minimum required number of questions, but each content area should be covered approximately equally.

Scoring

You should note that the pitch scores vary depending on the level of the tournament. This is built into the scoresheet. All you have to do is enter the correct tournament level.

Any skipped notes are given a score of zero. If there is no instrument, then all notes are skipped. The scoresheet does this for you automatically when you choose Yes for No Device. Students are not allowed to hum or sing

into the instrument. If they do, score each such note as a skipped note. You have to enter skipped for each note, but do not check Yes for No Device. This gives a better score since they attempted to make a device but could not play according to the rules.

The box for Construction Violations Corrected must have a Y or an N in order to get the PS score to calculate.

Log Scoring

1. Complete list of all materials used in the instrument. Review and ask questions to ensure the list is complete and accurate. Assign two points for a complete list. Assign one point if any item is missing from the list. Assign zero points if there is no list of materials.

2. Pitch accuracy tuning and adjustment. Review to see the history of how the instrument tuning was achieved for only one note. The Event Supervisor may choose which note if more than one is recorded. The log must include data to show pitch accuracy using a chromatic tuner and the measured pitch for various trials and designs. Assign two points for adequate records. Assign one point for inadequate records of the tuning mechanism and design changes. Assign zero points for no record of any pitch accuracy tuning or design changes.

3. Data for five trials. This refers to the adjustments made to tune a single pitch. It should not be a calculation (like the calculation for pipe length for a certain frequency). It is something done to modify the instrument to achieve a correct pitch after originally designed or calculated. Assign two points for five trials. Assign 1 point for 1-4 trials. Assign zero points for zero trials. Note that it is not five trials if only one trial is done for five different notes.

4. Proper labeling. All pages of the log must include appropriate titles, team name, team number, and correct units. Each section of the log must clearly identify one of required log components (however, pitch accuracy testing and the five data points may be included in one section. That means the log must include three sections: (1) list of materials, (2) discussion of pitch accuracy tuning and design changes, and (3) figures(s) showing figuring and/or how the instrument is used to play different pitched notes. Assign two points if all the above is included. Assign one point if anything is missing. Assign zero points if none of the above is included in the log.

5. Diagrams. The log must include at least one diagram/picture that is labelled to indicate how different pitched notes are played. A figuring chart is adequate in most cases. Assign two points for a complete diagram/picture that shows how all 8 notes are played. Assign one point if any note is missing or it is not clear how each note is played. Assign zero points if no diagram/picture is included in the log.

Competition Violations

Competition violations include the following:

- adjusting the instrument between pitch testing and song testing
- adjusting the instrument between pitching testing and bonus
- adjusting the instrument between song testing and bonus
- failure to inform the Event Supervisor of a skipped note causing wrong data to be recorded in the checklist
- taking too much time between notes in pitch testing
- not knowing the octave number for the starting note in the pitch testing

Note Frequency Chart

	Octave 0	Octave 1	Octave 2	Octave 3	Octave 4	Octave 5	Octave 6	Octave 7	Octave 8
C	16.35	32.70	65.41	130.81	261.63	523.25	1046.50	2093.00	4186.01
C#	17.32	34.65	69.30	138.59	277.18	554.37	1108.73	2217.46	4434.92
D	18.35	36.71	73.42	146.83	293.66	587.33	1174.66	2349.32	4698.64
D#	19.45	38.89	77.78	155.56	311.13	622.25	1244.51	2489.02	4978.03
E	20.60	41.20	82.41	164.81	329.63	659.26	1318.51	2637.02	5274.04
F	21.83	43.65	87.31	174.61	349.23	698.46	1396.91	2793.83	5587.65
F#	23.12	46.25	92.50	185.00	369.99	739.99	1479.98	2959.96	5919.91
G	24.50	49.00	98.00	196.00	392.00	783.99	1567.98	3135.96	6271.93
G#	25.96	51.91	103.83	207.65	415.30	830.61	1661.22	3322.44	6644.88
A	27.50	55.00	110.00	220.00	440.00	880.00	1760.00	3520.00	7040.00
A#	29.14	58.27	116.54	233.08	466.16	932.33	1864.66	3729.31	7458.62
B	30.87	61.74	123.47	246.94	493.88	987.77	1975.53	3951.07	7902.13

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Sample Major Scales (just change the number for the starting note to agree with the student's choice, and then change all of the other numbers by the same amount).

C Major Scale

C4 D4 E4 F4 G4 A4 B4 C5

D \flat Major Scale

D \flat 4 E \flat 4 F4 G \flat 4 A \flat 4 B \flat 4 C5 D \flat 5

D Major Scale

D4 E4 F \sharp 4 G4 A4 B4 C \sharp 5 D5

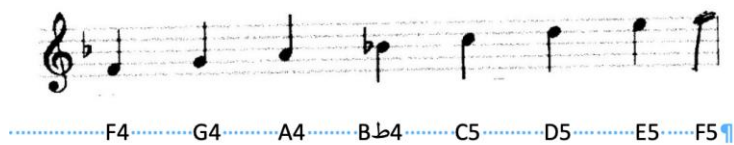
E \flat Major Scale

E \flat 4 F4 G4 A \flat 4 B \flat 4 C5 D5 E \flat 5

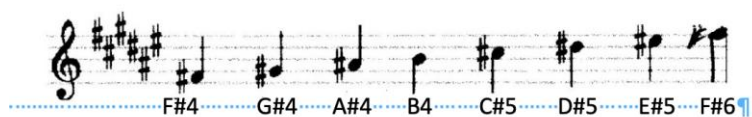
E Major Scale

E4 F \sharp 4 G \sharp 4 A4 B4 C \sharp 5 D \sharp 5 E5

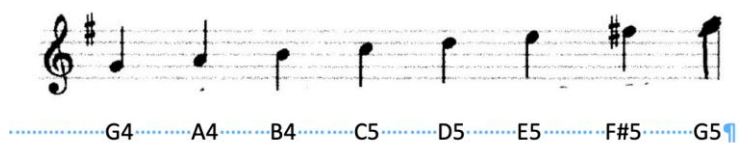
F Major Scale



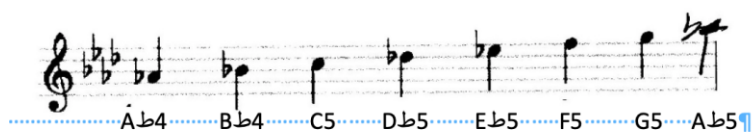
F# Major Scale



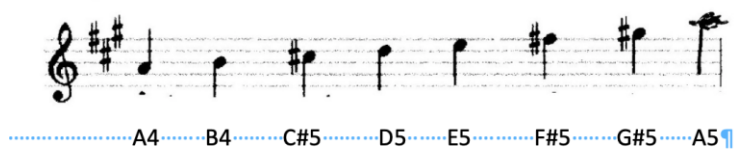
G Major Scale

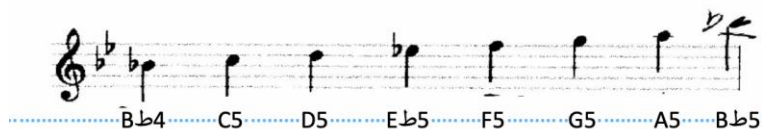


Ab Major Scale

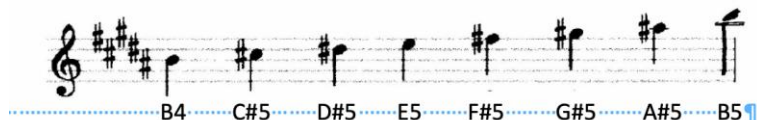


A Major Scale





B Major Scale



Event Supervisors and Tournament Directors with questions should contact Dave Moyer via email at dmoyer@pascioly.org. **Coaches and participants with questions should submit them via the Science Olympiad FAQ system found online at soinc.org.**

Additional guidance and resources for Event Supervisors, including a forthcoming dedicated Event Supervisors Guide, may be found on the Event Page for [Division C](http://soinc.org) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Sounds of Music for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.
- For Satellite SO tournaments and mini SO tournaments, consider treating this event as a Trail Event or discontinuing the hands-on portion as it may be difficult for the event to be judged fairly and equitably.

Water Quality (B & C)

Event Type: Hybrid

Impound: None

Room Type: A science lab with access to water and electricity

Estimated Prep Time (including set-up): 10 -15 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 4

Event Conflicts: None

Minimum Suggested Supplies

Test, Answer Sheet, & Key; Salt; 400 to 600 mL beakers, Microscopes (if using live specimens); Images or models of Macroinvertebrates

Additional Notes

This event is ideally run as a series of stations. When selecting questions consider including graphs and tables, food webs, ecological pyramids, life cycles, sampling and population density, and data from ecological studies. Try to have questions focus on process skills and use strictly vocabulary questions sparingly.

Set up the hydrometer station near a sink and have plenty of paper towels available. One volunteer should be stationed at the hydrometer station. Any station instructions/additional questions at the hydrometer station need to be setup so that they don't get wet and destroyed. However, at the Regional level, participants may need to focus on testing their hydrometer, so additional questions at this station are not recommended. When doing identifications, try to avoid using pictures of specimens/macroinvertebrates. Nature areas are great sources of specimens/macroinvertebrates.

If using higher concentrations of salt solution, make sure to allow enough time that the salt dissolves completely.

Additional guidance and resources for Event Supervisors may be found on the Event Pages for [Division B](#) and [Division C](#) at soinc.org.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- To facilitate social distancing, isolation, and to prevent resource sharing, allow each individual participant to have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the Rules for Water Quality for use during the competition. Personal sets of resource materials must meet all the criteria established in the Rules.
- If partners are unable to collaborate on the same exam because of social distancing or quarantine/isolation have each partner complete and exam independently and combine the scores to determine the final team score.
- For events conducted synchronously in multiple locations consider adding completion time as a tie breaker or scoring bonus.
- For Satellite SO tournaments and mini SO tournaments, consider treating this event as a Trail Event or discontinuing the hands-on portion as it may be difficult for it to be judged fairly and equitably.

Wright Stuff (C)

Event Type: Build

Impound: No

Room Type: Gym, cafeteria, high "clean" ceiling, if possible, with no rafters

Estimated Prep Time (including set-up): 2-4 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 10

Event Conflicts: None

Minimum Suggested Supplies

Balance-gram to 0.01g, stop watches, metric rulers-1-meter, 30 cm, timer; gauges to measure the specific dimensions

Additional Notes

Try to keep HVAC off; no entry or exit during flight. Consider having long expandable pole to get planes if stuck on rafters; separate area for spectators; if possible, work with the tournament director to provide room dimensions and type of room prior to the tournament to all teams.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
- For Satellite SO tournaments, consider treating this event as a Trail Event as not all teams at a given tournament may have adequate space to appropriately test Wright Stuff airplane.
- For mini SO tournaments, discontinue this event as participants will not have adequate resources to appropriately or safely run Wright Stuff in a home setting.

Write It Do It (B & C)

Event Type: Lab

Impound: No

Room Type: 2 adjacent large rooms with flat tables

Estimated Prep Time (including set-up): 12-20 hours

Ideal Number of Staff (Event Supervisor + Volunteers): 6

Event Conflicts: Experimental Design

Minimum Suggested Supplies

Various identical supply bags: corks, beads, paper clips, index cards, stickers, toys (Lincoln Logs, Legos, K'Nex, blocks, etc.) In addition, coffee stirrers and coffee sleeves and different colored plastic eating utensils are good things to use. Use your imagination.

Additional Notes

Will need at least 1 model for every 4-5 teams. Make sure supply bags are uniform. Setting up bags and building structures requires much time; No spectators. Glass doors and windows to hallways should be covered. Develop good rubric for scoring.; 25-30 pieces should usually be maximum; do not make object too complicated for completion; experiment with different structures; office and craft stores are good source of supplies; long time to score so schedule early. With 25-30 pieces one can create 75 + points since many pieces will have orientation and attachment to evaluate.

Many people develop a scoring rubric with long phrases. Consider developing a rubric similar in form to what is used for Experimental Design. If one is talented with use of camera and cropping pictures, one can create a scoring rubric that show a few views of the object. At each junction, imbed a small box that can be used to check if connection, orientation, etc. is good. Done properly, one person can score 30 structures in an hour.

Be sure to record finish time of teams, since this is tie breaker criterion. Any creative person can be used to supervise this event. English and art people are often good for this event.

Additional Considerations for In-person, Single Location, Satellite SO & mini SO Tournaments

- For in-person, single location tournaments:
 - No shared items (e.g., tools, stopwatch, tape measure)
 - No handshakes or physical contact between attendees
 - No aligning teams directly across from each other at a lab bench
 - Leave Event Room doors open during the event to allow air flow
 - Split across two rooms to increase social distancing between teams
 - 5 teams/room/hour
 - 6' between teams within the room
- Satellite SO and mini SO tournaments should consider replacing Write It Do It with Write It CAD It which allows for a similar experience but entirely online using the rules and instructions posted on the event page at soinc.org.
- For Satellite SO tournaments, consider treating this event as a Trail Event as not all teams at a given tournament may have adequate resources or be appropriately supervised to run this event.
- For mini SO tournaments, consider discontinuing this event as participants will be separated and may have adequate resources or be appropriately supervised to run this event.

Appendix A

GENERAL RULES, CODE OF ETHICS, AND SPIRIT OF THE PROBLEM

The goal of competition is to give one's best effort while displaying honesty, integrity, and good sportsmanship. Everyone is expected to display courtesy and respect - see Science Olympiad Pledges. Teams are expected to make an honest effort to follow the rules and the spirit of the problem (not interpret the rules so they have an unfair advantage). Failure by a participant, coach, or guest to abide by these codes, accepted safety procedures, or rules below, may result in an assessment of penalty points or, in rare cases, disqualification by the tournament director from the event, the tournament, or future tournaments.

1. Actions and items (e.g., tools, notes, resources, supplies, electronics, etc.) are permitted, unless they are explicitly excluded in the rules, are unsafe, or violate the spirit of the problem.
2. While competing in an event, participants may not leave without the event supervisor's approval and must not receive any external assistance. All electronic devices capable of external communication as well as calculator applications on multipurpose devices (e.g., laptop, phone, tablet) are not permitted unless expressly permitted in the event rule or by an event supervisor. Cell phones, if not permitted, must be turned off. At the discretion of the event supervisor, participants may be required to place their cell phones in a designated location.
3. Participants, coaches and other adults are responsible for ensuring that any applicable school or Science Olympiad policy, law, or regulation is not broken. All Science Olympiad content such as policies, requirements, clarifications/changes and FAQs on www.soinc.org must be treated as if it were included in the printed rules.
4. All pre-built devices presented for judging must be constructed, impounded, and operated by one or more of the 15 current team members unless stated otherwise in the rules. If a device has been removed from the event area, appeals related to that device will not be considered.
5. Officials are encouraged to apply the least restrictive penalty for rules infractions - see examples in the Scoring Guidelines. Event supervisors must provide prompt notification of any penalty, disqualification or tier ranking.
6. State and regional tournament directors must notify teams of any site-dependent rule or other rule modification with as much notice as possible, ideally at least 30 days prior to the tournament.

Appendix B

COVID-19 PANDEMIC RULES MODIFICATIONS

The COVID-19 pandemic requires that some general modifications be made to the Event Rules listed in this manual in order to permit Science Olympiad competitions to continue in a way that reflects best public health, disease prevention, and personal safety practices. The modifications listed here will be in effect for all Science Olympiad competitions, regardless of level (e.g., Invitational, Regional, State, National), or type (e.g., In-Person, Satellite SO, mini SO). As the pandemic is ever evolving, these modifications may be amended or rescinded as local conditions warrant. If changes are made the Tournament Director for the affected tournament will make an announcement to all participating teams as soon as possible.

1. If not already allowed, each individual participant can have a personal set of reference materials (e.g., binders, single sheets of paper), calculator, or other academic resource as specified in the specific event rule for use during the competition to facilitate social distancing, isolation, and to prevent resource sharing. Personal sets of resource materials must meet all the criteria established in the specific event rule. This does not apply to Recommended Lab Equipment for Division B or Division C Chemistry Events or tool kits for Build Events.
2. Given local conditions, participants may not be able to be in the same location as their partner during competition. Tournaments will allow designated partners to compete from separate locations and competing teams will only need one device for Build or Hybrid with Build Events.
3. At the discretion of the Tournament Director, portions of Hybrid Events containing hands-on activities as well as Build and Lab Events may be dropped from the tournament or be conducted as trial events.
4. At the discretion of the Tournament Director and Event Supervisors completion time may be used as a tiebreaker for Core Knowledge and other events where a test either written or online is used.

Appendix C

2021 Science Olympiad Calculator Guide

The following document was prepared to offer some guidance to teams as they select calculators for use in different Science Olympiad events. By no means are the calculators listed here inclusive of all possible calculators; instead they are offered as common examples. The decisions of the event supervisors will be final.

Class I - Stand-alone non-graphing, non-programmable, non-scientific 4-function or 5-function calculators

are the most basic type of calculators and often look like the one shown to the right. These calculators are limited to the four basic mathematics functions and sometimes square roots. These calculators can often be found at dollar stores.



Class II - Stand-alone non-programmable, non-graphing calculators look like the calculator to the right or simpler. There are hundreds of calculators in this category but some common examples include: CASIO FX-260, Sharp EL-501, and TI-30X.



Class III- Stand-alone, programmable, graphing calculators and stand-alone non-graphing, programmable calculators, often look like the calculator shown on the right. Some examples are: Casio 975 0/9850/9860, HP 40/50/PRIME, and TI 83/84/89/NSPIRE/VOYAGE.

To identify a stand-alone non-graphing, programmable calculators Are look for the presence of the 'EXE' button, the 'Prog' button, or a 'file' button. Examples include but are not limited to: Casio Super FXs, numerous older Casio models, and HP 35S. A calculator of this type with the buttons labeled is shown to the right.



PROG Button



EXE Button

Class IV - Calculator applications on multipurpose devices (e.g., laptop, phone, tablet, watch) are not allowed unless expressly permitted in the event rule.



2021 Science Olympiad Division B

Calculator Guide

Revised (9/4/20)

Events	Type of Calculator Allowed				
	None	Class I	Class II	Class III	Class IV
Anatomy & Physiology		X	X		
Boomilever	X				
Circuit Lab		X	X	X	
Crime Busters	X				
Density Lab		X	X	X	
Disease Detectives		X	X		
Dynamic Planet		X	X	X	
Elastic Launched Glider		X	X	X	
Experimental Design		X	X		
Food Science		X	X		
Fossils	X				
Game On	X				
Heredity		X	X		
Machines		X	X	X	
Meteorology		X	X	X	
Mission Possible	X				
Mousetrap Vehicle		X	X	X	
Ornithology	X				
Ping Pong Parachute	X				
Reach for the Stars		X	X		
Road Scholar		X	X		
Water Quality		X	X		
Write It Do It	X				
Trial Events					
Aerial Scramble	X				
Awesome Aquifers	X				
Botany		X	X		
Codebusters		X			
Electric Wright Stuff	X				
Home Horticulture		X	X	X	
Solar Power		X	X	X	
Storm the Castle		X	X	X	

2021 Science Olympiad Division C

Calculator Guide

Revised (9/4/20)

Events	Type of Calculator Allowed				
	None	Class I	Class II	Class III	Class IV
Anatomy & Physiology		X	X		
Astronomy		X	X	X	X
Booilever	X				
Chemistry Lab		X	X	X	
Circuit Lab		X	X	X	
Codebusters		X			
Designer Genes		X	X		
Detector Building		X	X	X	
Disease Detectives		X	X		
Dynamic Planet		X	X	X	
Experimental Design		X	X	X	
Forensics		X	X	X	
Fossils	X				
Geologic Mapping		X	X		
Gravity Vehicle		X	X	X	
Machines		X	X	X	
Ornithology	X				
Ping Pong Parachute	X				
Protein Modeling	X				
Sounds of Music		X	X	X	
Water Quality		X	X		
Wright Stuff		X	X	X	
Write It Do It	X				
Trial Events					
Aerial Scramble	X				
Botany		X	X		
Electric Wright Stuff	X				
Environmental Chemistry		X	X		
Home Horticulture		X	X	X	
Robot Tour		X	X	X	
Solar Power		X	X	X	
Trajectory		X	X	X	
WiFi Lab		X	X	X	

Appendix D

Eye Protection Guide

This resource was created to help teams comply with the Science Olympiad Policy on Eye Protection adopted on July 29, 2015 and posted on the Science Olympiad Website (soinc.org).

Participant/Coach Responsibilities: Participants are responsible for providing their own protective eyewear. Science Olympiad is unable to determine the degree of hazard presented by equipment, materials and devices brought by the teams. Coaches must ensure the eye protection participants bring is adequate for the hazard. All protective eyewear must bear the manufacturer's mark Z87. At a tournament, teams without adequate eye protection will be given a chance to obtain eye protection if their assigned time permits. If required by the event, participants will not be allowed to compete without adequate eye protection. This is **non-negotiable**.

Corresponding Standards: Protective eyewear used in Science Olympiad must be manufactured to meet the American National Standards Institute (ANSI) standard applicable at its time of manufacture. The current standard is ANSI/ISEA Z87.1-2015. Competitors, coaches and event supervisors are not required to acquire a copy of the standard. The information in this document is sufficient to comply with current standards. Water is not a hazardous liquid and its use does not require protective eyewear unless it is under pressure or substances that create a hazard are added.

Compliant Eyewear Categories: If an event requires eye protection, the rules will identify one of these three categories. Compliance is simple as ABC:

CATEGORY A

- Description: Non-impact protection. They provide basic particle protection only
- Corresponding ANSI designation/required marking: Z87
- Examples: Safety glasses; Safety spectacles with side shields; and Particle protection goggles (these seal tightly to the face completely around the eyes and have direct vents around the sides, consisting of several small holes or a screen that can be seen through in a straight line)

CATEGORY B

- Description: Impact protection. They provide protection from a high inertia particle hazard (high mass or velocity)
- Corresponding ANSI designation/required marking: Z87+
- Example: High impact safety goggles

CATEGORY C

- Description: Indirect vent chemical/splash protection goggles. These seal tightly to the face completely around the eyes and have indirect vents constructed so that liquids do not have a direct path into the eye (or no vents at all). If you are able to see through the vent holes from one side to the other, they are NOT indirect vents
- Corresponding ANSI designation/required marking: Z87 (followed by D3 is the most modern designation but, it is not a requirement)
- Example: Indirect vent chemical/splash protection goggles

Examples of Non-Compliant Eyewear:

- Face shields/visors are secondary protective devices and are not approved in lieu of the primary eye protection devices below regardless of the type of vents they have.
- Prescription Glasses containing safety glass should not be confused with safety spectacles. "Safety glass" indicates the glass is made to minimize shattering when it breaks. Unless these glasses bear the Z87 mark they are not approved for use.

Notes:

1. A goggle that bears the Z87+ mark and is an indirect vent chemical/splash protection goggle will qualify for all three Categories A, B & C
2. VisorGogs do not seal completely to the face, but are acceptable as indirect vent chemical/splash protection goggles