2024-2025
Exhibition of Student
STEM Research
Information Update
And
Handbook Summary

Prepared by Roy Coleman, Elizabeth Copper & Carrie Kaestner

Website: cpsscifair.org/

Table of Contents

NOTE: For more details and the latest information, please go to the STEM Fair website at cpsscifair.org

General Information

Dates
Categories
Design Projects

Student STEM Exhibition Dates

- Tentatively the virtual judging portion of the Citywide STEM Exhibition is scheduled for March 13 – 17, 2025 with in-person judging on Friday, March 15, 2025 and the awards program on SundaySaturday, March 119, 2024 at Illinois Tech.
- Regional STEM Expositions will be virtual and will be held on January 28 through February 11, 2025 – All documents must be downloaded by January 15, 2025, 11:59 P.M.
- School STEM Exhibitions should be held prior to the end of school in December 2024
- Classroom presentations could be scheduled early to mid November

Please refer to the Calendar of Events on the STEM Exhibition website (cpsscifair.org/) for the most current dates, especially the due dates for any submissions that are marked with a #.

Students should have been exposed to inquiry-based science, design/engineering and math instruction since the beginning of the school year and from instruction in previous years.

STEM Exhibition Categories

Aerospace Science **	Botany	Electronics	Mathematics**
Agriculture	Cellular & Molecular Biology	Engineering Science	Microbiology*
Astronomy**	Chemistry	Environmental Science	Physics
Behavioral Science*	Computer Science**	Health Science*	Product/Consumer Science*
Biochemistry*	Earth Science	Materials Science	Zoology*

* Special rules apply for projects in this category. See the *2021 STEM Exhibition Handbook* (at cpsscifair.org) about biological hazards and applying for appropriate endorsements:

--Request for Non-Human Vertebrate Animal Endorsement
--Request for Humans As Test Subjects Endorsement
--Request for Human or Vertebrate Animal Tissue Endorsement
--Request for Microorganism Endorsement
--Request for Recombinant DNA Endorsement

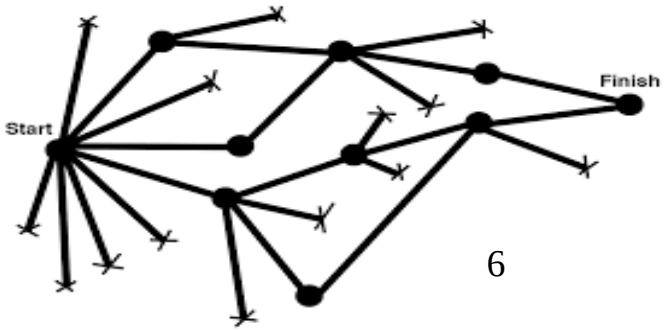
NOTE: For projects conducted in a university, hospital or research laboratory under the supervision of a Doctor, Professor or Scientist, endorsement(s) and supporting documents are due November 15, 2024#. All other endorsements must be submitted in duplicate by December 19, 2024#.

**** When a control group is not possible, a comparison among trials is acceptable.**

For the past several years there has been a new way to do STEM Research projects.

It is called a 'Design Project' where the student designs and tests a new product, algorithm, model or procedure.

For more details, see the section entitled '*A Comparison of the Scientific Method and the Design Process*' on pages 2-4 of the STEM Exhibition Handbook (cpsscifair.org).



Assistance

Mini-Grants
Maxi-Grants
Scholarships

Back to the table of contents

Financial Assistance for Students

Mini Research Grant Program

Awards a maximum of $100 per semester or $200 per year to help finance the research of students in Grades 7-12. All equipment and supplies become the property of the school when the project is completed.

All grants are evaluated on the basis of scientific merit, scientific approach, and potential for further development. See suggested submission dates listed in the Calendar of Events (at cpsscifair.org).

Financial Assistance for Students

Maxi Research Grant Program

Awards a maximum of $500 to help finance the research of students in Grades 9-12. All equipment and supplies become the property of the school when the project is completed.

All grants are evaluated on the basis of scientific merit, scientific approach, and potential for further development. See suggested submission dates listed in the Calendar of Events (at cpsscifair.org).

Scholarships mean MORE MONEY!

Scholarships are awarded to graduating seniors based upon STEM Exhibition participation, not financial need. This past spring over $95,000 was awarded in STEM Exhibition scholarships.

If you are a senior and have participated in a Regional, Network or Citywide STEM Exhibition you should apply.

The tentative application deadline is **April 14, 2025#**

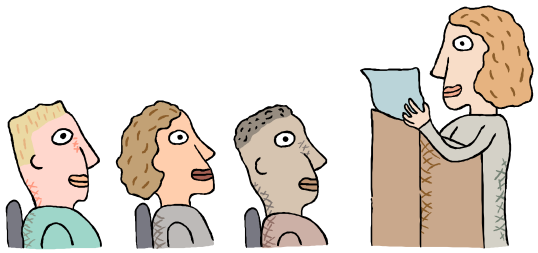
Workshops, Planning, Essay, Cover Design & Displays

Workshops
Project Planning
Continuation of a Previous Project
Display Board
Experimental Error
IJAS Essay & Cover Design
Judging Guidelines
Misconceptions

Back to the table of contents

STEM Exhibition Workshops

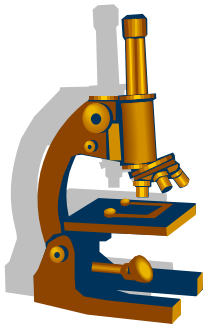
- Virtual workshops may be conducted by university professors for students, parents, and teachers; also a workshop to help students with data analysis
- CPS SSF workshops for Credentials Checkers and Safety Inspectors
- Workshops for parents
- Student STEM Exhibitions PowerPoint available on our website and YouTube
- Workshops for new science teachers and for school STEM Exhibition coordinators



Project Planning and Selection

- Encourage students to explore an interest, a fascination, an idea that raises a question that would be stimulating to answer.
- A list of STEM Exhibition (Science Fair) Websites is provided
- Guide students to proceed with a **scientific** or **design** project:
  - decide on a **purpose**, or **problem**;
  - research the topic;
  - **formulate a hypothesis** or **establish a design criterion**;
  - **design an experiment** or **create a preliminary design**;
  - **Conduct the experiment** or **build and test a prototype**;
  - Collect and analyze data;
  - draw conclusions and/or **redesign and retest**;
  - write a research summary with a reference list using APA format. (APA Resources are also provided)

(See the flowchart on page iv at the beginning of the STEM Exhibition Handbook at cpsscifair.org.)



ALL students should be strongly encouraged to perform and present some type of scientific independent study project even if it does not result in a STEM Research project.

Continuation of Projects

- This project year includes research conducted or updated over a maximum of 12 months from April 2024 to March 2025.
- Any project in the same field of study from a previous year's project is considered a continuation unless the student clearly documents that there is additional research which is new and different from prior work (e.g. testing a new variable, a new line of investigation, updated review of literature, etc.).
- Repetitions of previous experimentation from before the 2022/2024 school year or increasing sample size are examples of an unacceptable continuation.

Exhibit Display Board

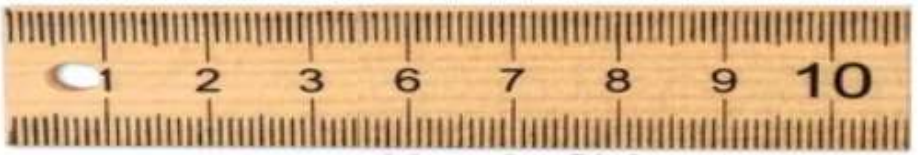
(Only required for an in-person fair, not for a virtual fair. Virtual Fair requirements will be provided through Checklists)

- The maximum dimensions of the display board are 61 cm (25”) deep, 107 cm (40”) wide, and 152 cm (60”) high.
- You can purchase three-sided display boards from: Showboard, Office Depot/Office Max, Staples, and at Science Fair Supply.
- The title of the project may contain **no more than 45 characters, including spaces.**
- Abstract (now up to 250 words), safety sheet and endorsements (if needed) must be posted on the front of the display board.
- No lights of any kind may be displayed on the board.
- No stapling of anything to the display board. Attachments to the board must be either glued or taped.

Estimating Experimental Error

- Science is all about measurement.
- Science can be defined as a system for measuring the world around you and drawing conclusions from those measurements.
- It is a fundamental scientific truth that no measurement is ever 100% accurate.
- Since there is always some error, it is important for students to understand where measurement errors are likely to occur.
- Measurement errors may come from the person doing the experiment, from variables, or from unidentifiable random error.
- In order to draw valid conclusions from measurement data, a student must understand how measurement error affects those conclusions.

Why are my results wrong? I measured everything with this meter stick!



(How long is a 5cm line?)

IJAS Essay Contest

State Essay

- **The 2025 IJAS** Student Essay theme is:

  yet to be announced

- **Chicago Essay** Contest For Students in Grades 7-12
- Same topic as the IJAS Student Essay.
- The top essays will receive cash awards.
- The first place essay will represent CPSSSF, Inc. at IJAS in May.

DUE DATE for all essays is **January 19, 2025#**

IJAS Cover Design Contest

- The theme for the IJAS cover design is **yet to be announced.** Students are to use an 8½" x 11" sheet of white paper and use only black ink. The design must include "Illinois Junior Academy of Science". Keep the design simple.
- Entries are to be submitted by **December 16, 2024#**.
- Please visit the IJAS website ijas.org for more specific information regarding winners and awards.

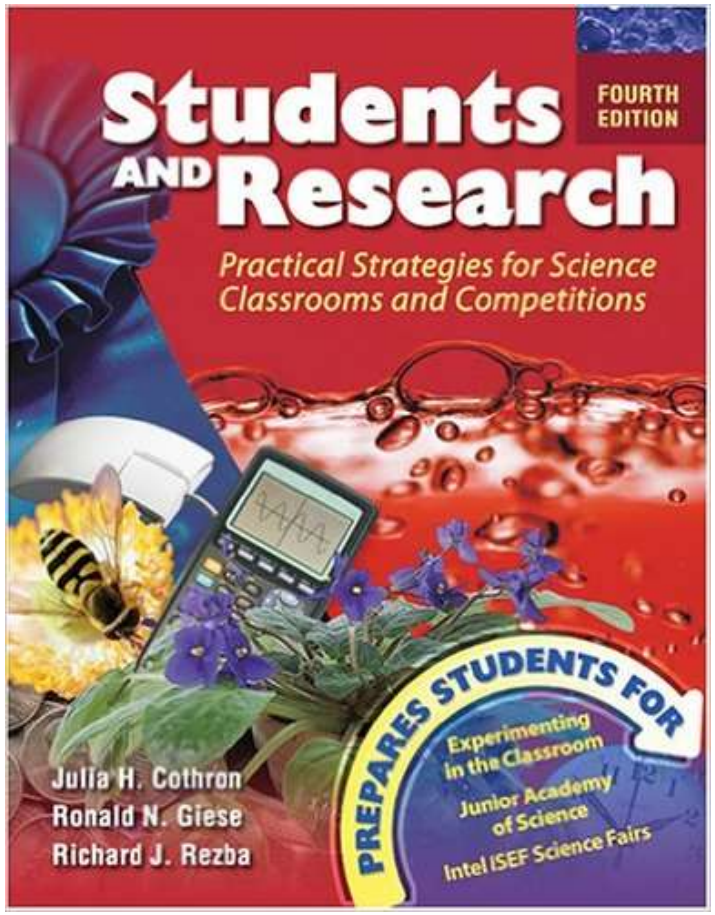
Guidelines for Judging Exhibits

- Regional Networks and schools are encouraged to use the criteria for judging as listed in the 2020 Handbook.
- Refer to the guidelines described in the *2020 STEM Exhibition Handbook* (at cpsscifair.org).
- Sources of judges include: scientists working in local research institutions, university professors who teach science, math and/or engineering courses, scientists from private industry, CPS STEM Exhibition Alumni, students enrolled in high school AP science classes (school level only), family doctors and other medical professionals, students enrolled in college or university science classes, retired science teachers, and the Army Corp of Engineers.
- Ask parents and students to suggest the names of individuals working in science-related careers to serve as a school or regional network judge.

Misconceptions About STEM Exhibitions

- STEM Exhibitions are only for nerds–those smart kids.
- Teachers have to set time aside to teach *STEM Research.*
- Doing *STEM Research* projects is only an extracurricular activity and is beyond either the Illinois Learning Standards or the Next Generation Science Standards.
- *STEM Research* projects are short-term assignments done overnight or over the weekend.
- Models and demonstrations make good *STEM Research* projects.
- *STEM Research* projects are best done by parents, older siblings, good friends, or professional researchers.
- Data can be collected and analyzed by 'professionals' and presented as the project.

Suggested Reference:



Cothron, Julia H., Giese, Ronald N., & Rezba, Richard J. (2006). *Students and Research: Practical Strategies for Science Classrooms and Competitions (4th ed.). Dubuque, IA: Kendall/Hunt Publishing Co.*

ISBN: 978-0-7575-1916-1

Call 1-800-770-3544

E-mail: orders@kendallhunt.com

This book is also available on Amazon.com

Safety

Safety Chair

Safety Guidelines

(including links to IJAS & ISEF Guidelines)

Safety Sheet

Back to the table of contents

Safety Issues

Safety Chair
Elizabeth Copper
ecopper3@gmail.com

Safety is the watchword when developing a STEM research project.

Safety concerns are divided into two major areas:

- Review **Safety Guidelines for Experimentation** with your students during the planning stage of their projects. (pp. 10-22 in the handbook at cpsscifair.org)
- Revisit the safety issue when your students start developing their presentation display by reviewing **Safety Guidelines for Project Display** (pp. 35-37) and **Rules and Regulations** (pg. 1) in the ***STEM*** *Exhibition Handbook* at cpsscifair.org.

For IJAS and/or ISEF information, visit the following websites:

IJAS Policy & Procedure Manual here

ISEF Information here

ALL projects must have a signed Safety Sheet

There are no exceptions to this rule. No matter how safe a project might be, we still want to teach students that safety issues must be addressed. Discuss with students the "safe" choices they made while working on their projects.

P.S. Don't say "None" when a safety inspector asks what safety precautions you took.

A fillable safety sheet is available here.

SAFETY SHEET

The Illinois Junior Academy of Science

Directions: The student is asked to read this introduction carefully, fill out the bottom of this sheet. The assistant teacher and/or advisor must sign in the indicated space. By signing this sheet, the sponsor assumes all responsibilities related to this project.

Safety and the Student: Experimentation or design may involve an element of risk or injury to the student, test subjects and to others. Recognition of such hazards and provisions for adequate control measures are joint responsibilities of the student and the sponsor. Some of the more common risks encountered in research are those of electrical shock, infection from pathogenic organisms, uncontrolled reactions of incompatible chemicals, eye injury from materials or procedures, and fire in apparatus or work area. Examining these hazards and others with suitable controls is an integral part of good scientific research. In the **chart** below, list the principal hazards associated with your project, if any, and what specific precautions you have used as safeguards. Be sure to read the entire section in the *Policy and Procedure Manual of the Illinois Junior Academy of Science* entitled "Safety Guidelines for Experimentation" before completing this form.

Possible hazards	Precautions taken to deal with each hazard

Please check off any other possible endorsements needed. Include these documents in your paper and on your board.

____ Human or Test Subjects –for any projects involving human-seven surveys.
____ Microorganisms-for any projects involving bacteria, viruses, yeasts, fungi or protozoa.
____ Non-Human Vertebrates –for any projects involving fish, amphibians, reptiles, birds or mammals.
____ Tissue Culture-for any projects involving growing eukaryotic tissues or cell cultures.
____ Recombinant DNA must be conducted in a registered research laboratory under professional supervision.
____ Use of Firearms – including all required documents.
____ Letter from institution where research was done or IJAS SRC if an exception to the IJAS rules has been granted.

SIGNED

Student Exhibitor(s)

SIGNED

Sponsor *

*As a sponsor, I assume all responsibilities related to this project.

This Sheet Must Be Typed and This form **must** be displayed on the front of the exhibitor's display board. It may be reduced to half a sheet of paper, 8.5 inches (vertical) X 5.5 inches (horizontal), from at 60% reduction.

Endorsements

Research Labs
Humans as Test Subjects
(including informed consent)
Human or Vertebrate Animal Tissue
Non-Human Vertebrate
Microorganism
Recombinant DNA
Alcohol Production
Lasers and Drones

NOTE: For the latest information and fillable Endorsement forms go to the STEM Exhibition website Endorsement page at cpsscifair.org

CAUTION: Students MAY NOT perform any microorganism, culture or DNA experimentation at HOME. Endorsements will only be approved for students who are able to complete their experimentation in a Bio-Safety Level 1 lab such as a school laboratory.

NOTE: Endorsements must be signed and submitted by teacher sponsors ONLY.

Back to the table of contents

Research Labs

Any student working in a research lab on a project which may exceed IJAS human and non-human vertebrate guidelines must notify the Illinois Junior Academy of Science at least two weeks prior to the state exhibition.

Regional Winners!

Mail a copy of this letter to:

Illinois Junior Academy of Science
Scientific Review Committee
PO Box 268958
Chicago, IL 60626

This means anyone going on to the city exhibition must have on file a letter from their sponsor, on institution letterhead, stating that the student worked under supervision and followed all institutional guidelines regarding the ethical treatment of animals during research. This is IN ADDITION to the necessary endorsement forms.

NOTE: For projects conducted in a university, hospital or research laboratory under the supervision of a Doctor, Professor or Scientist, endorsement(s) and supporting documents are due November 15, 2024#.

NOTE: Endorsements must be signed and submitted by teacher sponsors **ONLY**

Humans as Test Subjects

NEEDS SIGNATURES

All projects involving humans must have an approved Humans as Test Subjects Endorsement signed and submitted by the teacher sponsor; and must be signed by the designated committee member (see the form for details on our website.

An Informed consent form must also be kept on file. (see pg. 65 of the handbook at cpsscifair.org). Social distancing must be observed.

If the project involves exercise and its effect on pulse, respiration rate, blood pressure, and so on, a valid, normal physical examination along with documentation from authorized school personnel must be on file for each test subject.

NOTE: For projects conducted in a university, hospital or research laboratory under the supervision of a Doctor, Professor or Scientist, endorsement(s) and supporting documents are due November 15, 2024#. All other endorsements must be submitted in duplicate by December 19, 2024#.

NOTE: Endorsements must be signed and submitted by teacher sponsors ONLY.

Human or Vertebrate Animal Tissue Endorsement

All projects involving vertebrate animal tissue (human or non-human) must have an approved Tissue Endorsement signed by the designated committee member (see the form for details p. 71-72 at cpsscfair.org).

NEEDS SIGNATURES

This endorsement no longer applies to processed animal products.

However, be sure your safety sheet addresses the prevention of microbial growth (during and after) experimentation.

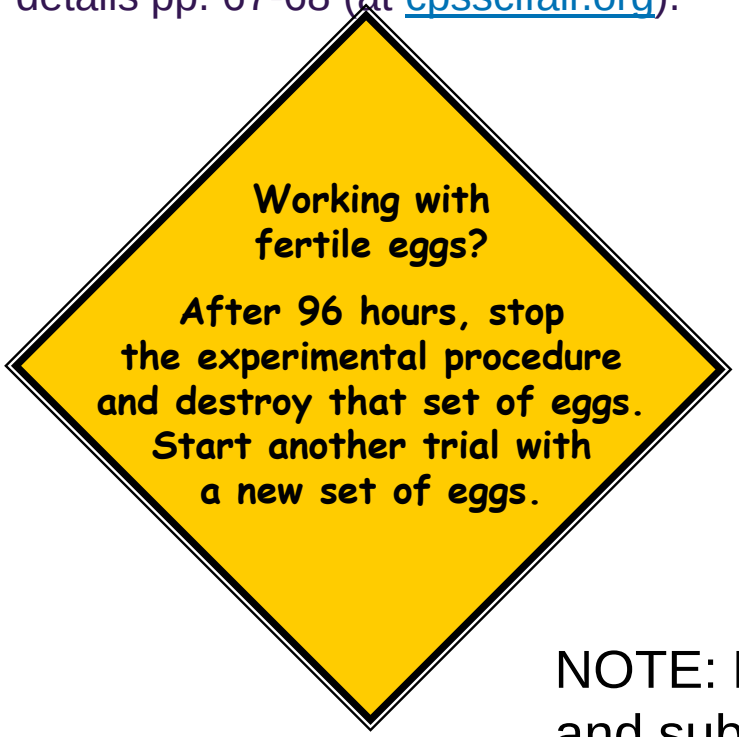
NOTE: For projects conducted in a university, hospital or research laboratory under the supervision of a Doctor, Professor or Scientist, endorsement(s) and supporting documents are due November 15, 2024#. All other endorsements must be submitted in duplicate by December 19, 2024#.

NOTE: Endorsements must be signed and submitted by teacher sponsors **ONLY**.

Non-Human Vertebrate Endorsement

NEEDS SIGNATURES

All projects involving live animals with bones must have an approved Non-Human Vertebrate Endorsement signed by both a licensed veterinarian **AND** the designated committee member (see the form for details pp. 67-68 (at cpsscifair.org).



Projects involving changes in an animal's normal environment will NOT be approved.

NOTE: For projects conducted in a university, hospital or research laboratory under the supervision of a Doctor, Professor or Scientist, endorsement(s) and supporting documents are due November 15, 2024#. All other endorsements must be submitted in duplicate by December 19, 2024#.

NOTE: Endorsements must be signed and submitted by teacher sponsors **ONLY.**

Microorganism Endorsement

NEEDS SIGNATURES

All projects involving microorganisms must be conducted in a lab and must have an approved Microorganism Endorsement signed by the designated committee member (see the form for details pp.69-70 at cpsscifair.org).

No more 'kitchen' cultures!!!

All microorganisms should be grown in Bio-safety level 1 laboratories (i.e. a school science lab).

Exceptions: Baker's Yeast

Don't even think about culturing micro-organisms from humans or other warm-blooded animals. These are strictly forbidden.

And don't grow anything outside of a laboratory.

NOTE: For projects conducted in a university, hospital or research laboratory under the supervision of a Doctor, Professor or Scientist, endorsement(s) and supporting documents are due November 15, 2024#. All other endorsements must be submitted in duplicate by December 19, 2024#.

For more information go to www.science-projects.com/safemicrobes.htm

NOTE: Endorsements must be signed and submitted by teacher sponsors **ONLY**.

Recombinant DNA Endorsement

NEEDS SIGNATURES

All projects involving recombinant DNA technologies must have an approved DNA Endorsement signed by the designated committee member (see the form for details p.73-74 at cpsscifair.org).

NOTE: For projects conducted in a university, hospital or research laboratory under the supervision of a Doctor, Professor or Scientist, endorsement(s) and supporting documents are due November 15, 2024#. All other endorsements must be submitted in duplicate by December 19, 2024#.

NOTE: Endorsements must be signed and submitted by teacher sponsors **ONLY**.

Alcohol production? Be sure to check out the new ATF guidelines (pg.20 at cpsscifair.org)

Only teachers can apply for permits and the still has to be on school premises.

P.S. The application goes to IRS- just to be sure you're not supplementing your teacher's income.

Students MUST obtain permission from the Scientific Review Committee BEFORE beginning their investigation.

NOTE: Endorsements must be signed and submitted by teacher sponsors **ONLY**.

Lasers and Drones

Lasers and drones MAY be used in a STEM Research project provided ALL Federal, State, Local and STEM Exhibition laws, regulations and rules are obeyed and clearly addressed on the Safety Sheet AND in the Procedure section of the research paper. See pages 17-20 of the *STEM Exhibition Handbook* here.

Displaying Your Investigation

No living things

Use batteries – Electricity will not be provided

What NOT to display

NO Hazardous Materials

NO means NO

NO Laboratory Apparatus

NO Design Project Models

Judges LOVE pictures

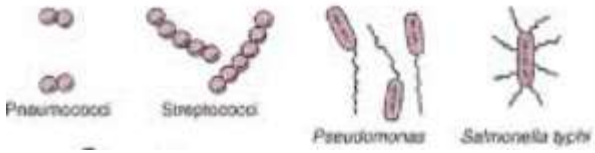
A Note to students

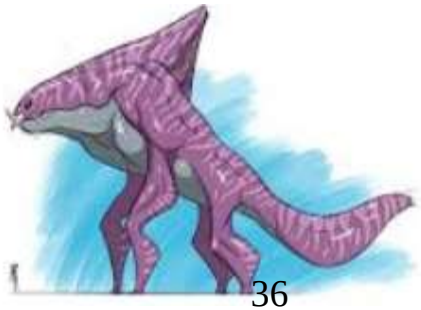
Back to the table of contents

ACHOOO !

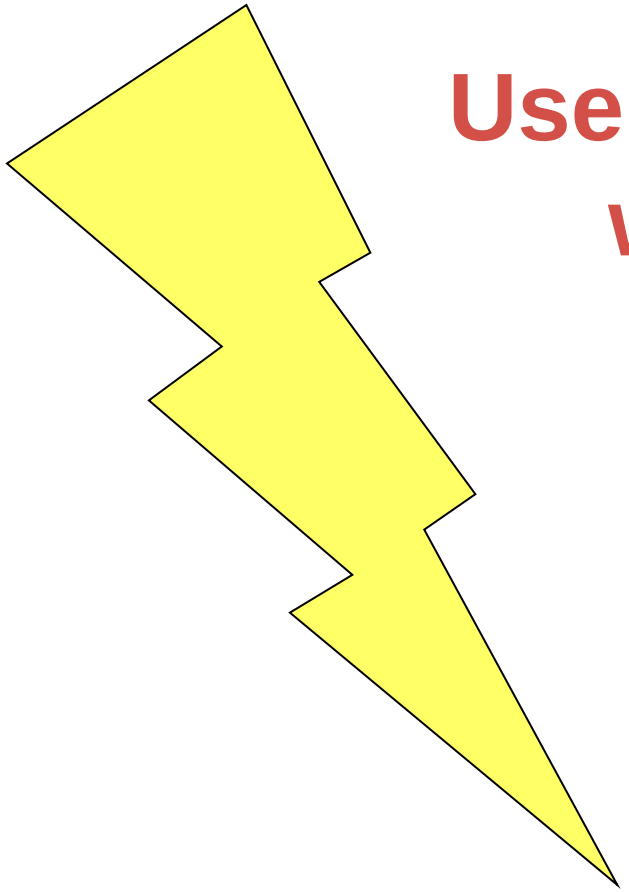
Leave your mold at home.

Speaking of humans, animals, plants and microorganisms; leave them all at home. You are not allowed to display any living things.





Electrical Projects



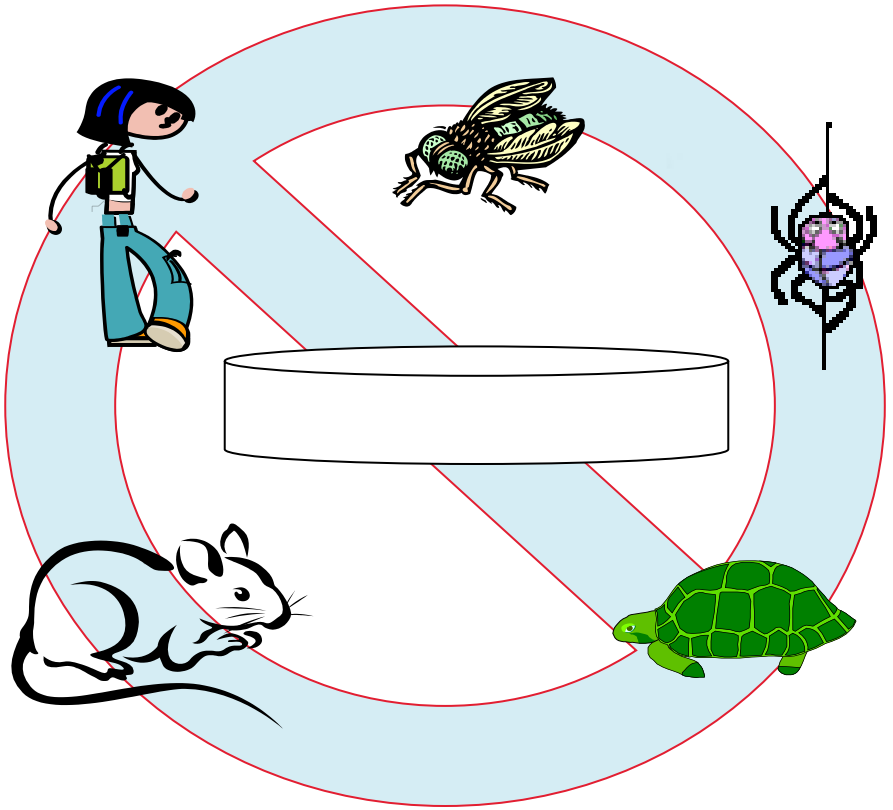
Use batteries whenever possible

However, if you are going to use a laptop, be sure to have your battery pack charged.
<u>There will be NO electrical outlets for laptops if held on site.</u>

DO NOT DISPLAY

use

PICTURES!



Hazardous Materials

Can be used in experiments (if handled properly and safely) – but are not to be displayed at the exhibition.

NO **matches.**

NO **open flames.**

NO **electric heaters.**

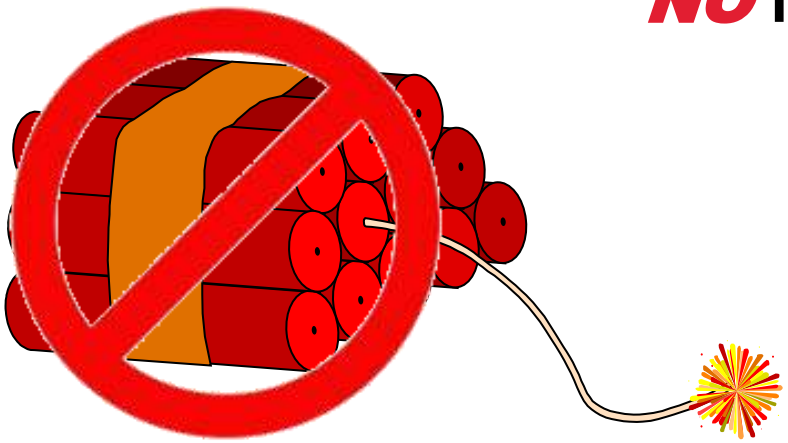
NO **lasers**

NO **chemicals.**

NO **compressed gas cylinders.**

NO **radioactive materials.**

NO **firearms or explosives**



Ordinary home chemicals and supplies can be used in experiments (if handled properly and safely) – but are not to be displayed at the exhibition.

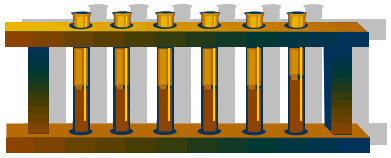
NO **salt,**
NO **sugar,**
NO **water,**
NO **food coloring,**
NO **chemicals will be allowed on display.**

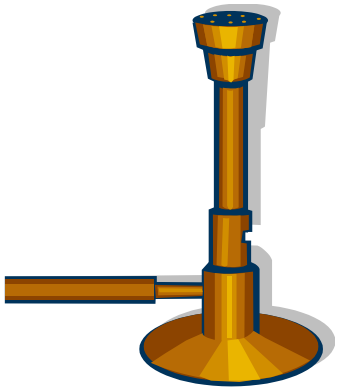
NO means NO

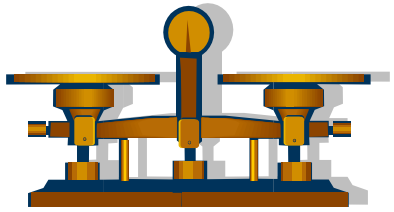
The only things that may be displayed on the table is your Display Board and a computer. For on site only.

Laboratory Apparatus

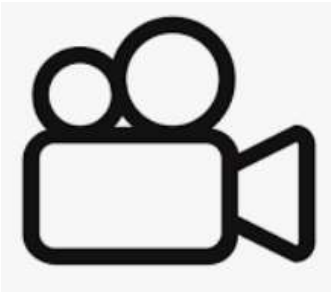
Judges know what beakers, graduated cylinders, balances, thermometers, etc. look like — leave them at school.







It is suggested that you have at least one photograph of you **doing** your experiment posted in your power point. Make sure safety precautions are evident in your picture.

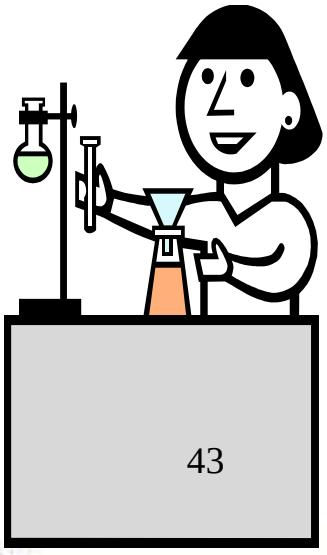


For a virtual STEM Exhibition or a Design Project, a BRIEF video may be helpful.

Note to students:

You have completed your project at home. You are not coming to the STEM Exhibition to do an experiment; you are coming to communicate your Results and Conclusions with the judges. You will be able to download your research paper and your YouTube presentation. Show your charts, graphs, pictures, drawings, explanations, and other information in your research paper as well as in your power point presentation. Use the Virtual Checklists for Research Papers and for the Power Point presentation to insure correctness.

Remember, this is *Tell* - not *Show and Tell*.



Additional References, Checklist and People You Should Know

Back to the table of contents

Checklist:

A checklist for the arrangement of the required paper is here.

Websites:

Chicago Public Schools Student Science Fair, Inc.: Here
Illinois Junior Academy of Science: Here
International Science and Engineering Fair: Here

People you should know:

Carrie, Kaestner, Chairperson 2019/2024 – cjkessinger@cps.edu
Elizabeth Copper, Executive Director of CSSF – ecopper3@gmail.com
Jodie Ulaszek, Scientific Review – photodragonfly@gmail.com
Safety – Elizabeth Copper – ecopper3@gmail.com

Be good, be safe and, above all, have fun with Science, Technology, Engineering and Mathematics!