2020 HANDBOOK

71st Annual Chicago Public Schools Student Science Fair, Inc. presents

STANDING ON THE SHOULDERS OF STEM

TAKE 2

2021 EXHIBITION OF STUDENT STEM RESEARCH

March 18 - 21, 2021

Symposium Presentations

March 18, 2021

Chicago Public Schools

CHICAGO PUBLIC SCHOOLS STUDENT SCIENCE FAIR, INC.

ILLINOIS INSTITUTE OF TECHNOLOGY

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Exhibition of Student STEM Research 2020
Frequently Asked Questions

Why participate in Exhibitions of Student STEM Research?

It is a chance to learn about something you are interested in and discuss your work with professional scientists. You show your teacher you know how to 'do science, technology, engineering and mathematics' (authentic assessment) according to state and national goals for learning. Also, when you are a senior, you may qualify for scholarships for college.

When is the city exhibition?

The opening ceremony and judging will be on Friday, March 20, 2020 at the Illinois Institute of Technology. Other important dates are listed on the Event Calendar on page 101.

How do I know if I need an endorsement?

If your project could harm you, or your test subject(s), you may need an endorsement. Read pages 10 – 20 to see if the Scientific Review Committee needs to check whether the plan for your experiment is safe. If it is safe your project will receive an endorsement, so you can go ahead and do the experiment. *If your project needs an endorsement and does not have one, it will not be allowed to participate in any Exhibitions. Should an unendorsed project mistakenly progress through a school exhibition or Regional Network STEM Exhibition, it will not be allowed to be exhibited at the City Exhibition of Student STEM Research.*

When are the endorsement requests due?

Projects conducted under the supervision of a professor or scientist at a university, hospital or research facility must submit endorsements prior to beginning – **must be received by October 25, 2019**. Request for Use of Firearms Endorsement – **must be received by October 31, 2019**. All other endorsements **must be received by November 22, 2019,** but if you want to start your experiment sooner you should send in your request earlier, so you have it before you start your experiment.

How many students can work on a research project?

High school students must work individually. Elementary students may work in pairs. See page 1 for more project rules.

Do I have to personally collect data for my project?

No. There is no fundamental problem with using existing data for a project. It's not better or worse than a project that involves data collection - it is just different. Data mining is particularly advisable when a student does not have the means to collect the data to their own research question, as with some aerospace projects. NASA may have collected data that a student can filter to find the information that addresses the research question. OSHA has a great deal of data that is in the public domain.

What papers do I have to turn in for the exhibition?

You need an entry form (p. 93), an abstract (p. 59), an image consent form (pp. 97 – 99), and any endorsements (pp. 63 - 76) necessary. Your regional exhibition chairperson will require a safety sheet (p. 61) when you register. The layout of required scientific papers is on pages 25 – 29. See pages 57 – 58 for a checklist.

What is APA format and how do I use it?

APA is a particular format for research papers that helps the reader identify the sources of information. See pages 30 – 33 for examples and on-line tools to cite your references and format your reference list.

Can I bring my experiment materials to display at the exhibition?

Experimental and Design projects MAY NOT exhibit any experimental materials or prototypes. Only a display board and computer may be on top of the table. The computer must be battery operated, no electricity will be supplied. **NO** microorganism cultures, glassware, chemicals, hazardous substances, fire hazards, firearms, etc. may be displayed on the table or on the display boards. See pages 34 – 37 for what is and what is not allowed at the exhibition.

My experiment was safe. Do I have to fill out a safety sheet?

Yes. Your statement on the safety sheet shows that you have considered all possible safety hazards. ANY potential and actual hazards must be specified as well as the safety measures you took. Safety Sheet must be signed by exhibitor and by sponsor.

How will my project be judged at the city exhibition?

CPS City Exhibition and most Regional Exhibitions use the same criteria (on pages 45– 48) as at the state science exhibition. Use these as you develop your project, as well as, when you get ready for the exhibition.

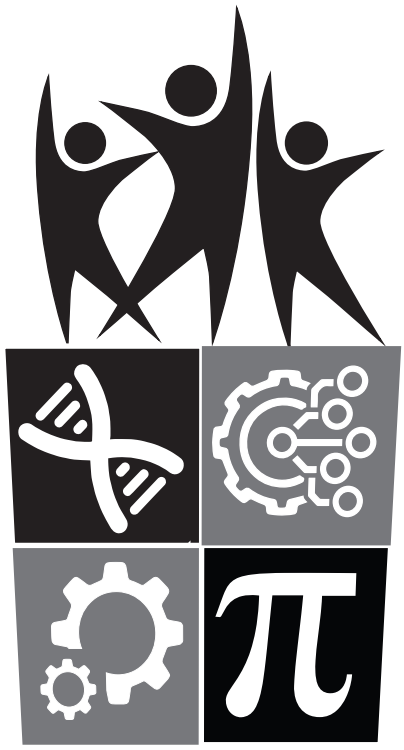
What is the symposium and how is it different from the exhibits competition?

Symposium is an alternate way a high school student may present research projects. The school STEM exhibition coordinator can send 30 papers from their school to be read by several science professionals, instead of the project being presented at a Regional Network STEM Exhibition. The best papers are selected to be presented to a panel of judges once at the City Exhibition Symposium session rather than presenting several times for individual judges. See pages 39-42 for details.

I need help! Can I get a mentor? Can I get money to pay for my experiment supplies?

Yes, see page 51 and page 83 for descriptions of our Advise-a-Student and Research Grant programs. Advise-a-Student pairs students up with scientists to talk or email about student projects. The Research Grant program reimburses students with qualified projects. Keep your receipts! Applications are on pages 79 – 82.

2020
STEM Exhibition Handbook



STANDING ON THE SHOULDERS OF STEM

70th Annual Chicago Public Schools Student Science Fair, Inc

Brought to you by:

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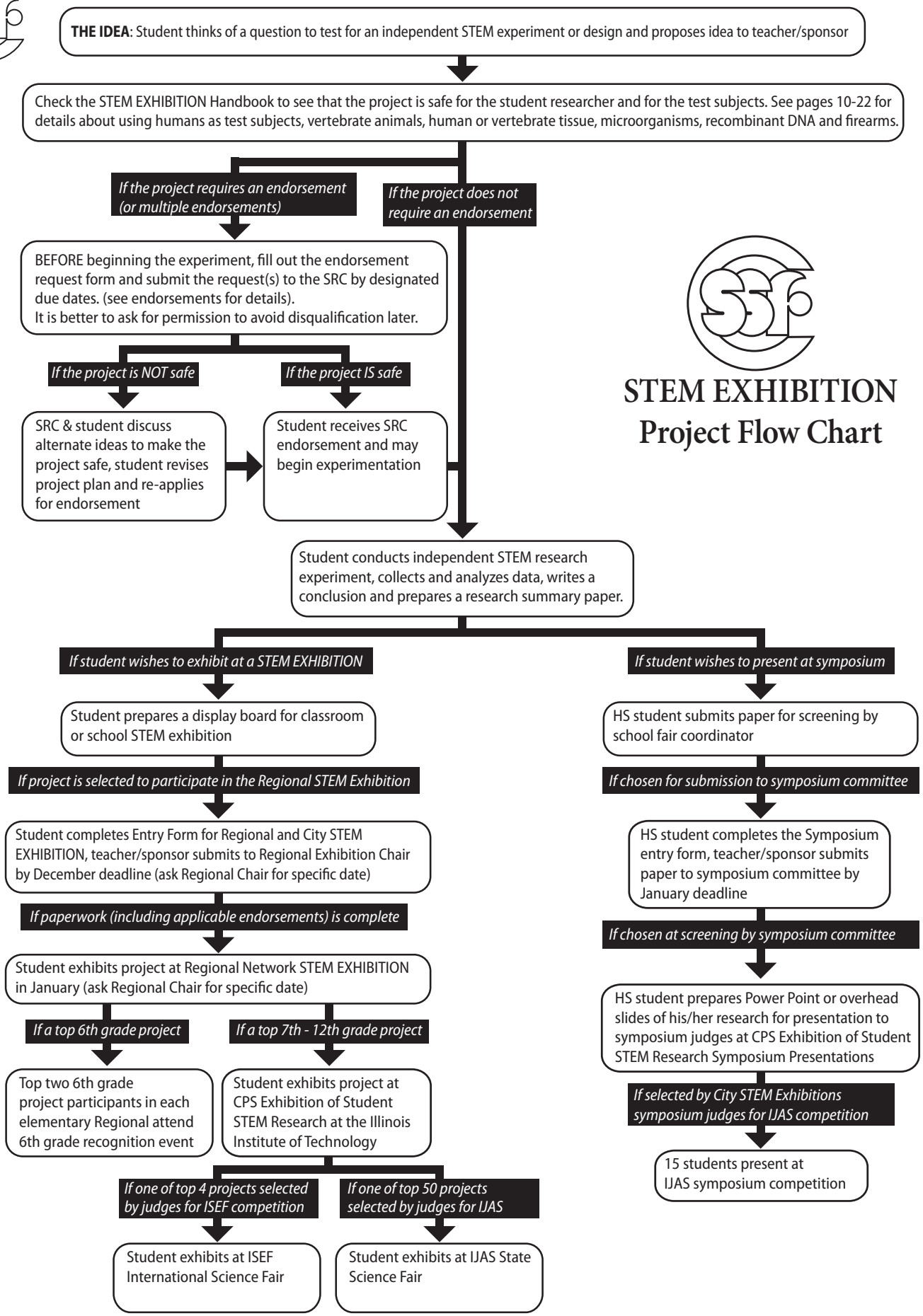
STEM EXHIBITION Project Flow Chart



Part One: Projects

Introduction

The *STEM Exhibition Handbook* is designed to assist the student in the development of a research project, a symposium paper or an essay, in the areas of science, technology, engineering and mathematics. The information contained in this handbook should be read carefully and thoroughly by the student and the teacher. Planning and selection of a research project, the method of developing a scientific paper, and the adherence to safety requirements are explained in depth in this handbook.

If significant progress has been made on a project, the participant may exhibit his/her project at the local school STEM exhibition. If successful, the participant may move on to a Chicago Public Schools Regional Network STEM Exhibition. From this level, the project may be chosen for exhibit at the City Chicago Public Schools Exhibition of Student STEM Research held at the Illinois Institute of Technology.

A student researcher at the high school level may also submit a research paper for evaluation and possible presentation in the City Exhibition Symposium. To participate in the Symposium, a student is not required to have an exhibit on display at the fair, but he/she must conduct primary research as a basis for the paper.

At the City Exhibition, a student may be selected to represent the Chicago Public Schools at the Illinois Junior Academy of Science Exposition held at Millikin University in Decatur, Illinois. The student may also be selected to represent the Chicago Public Schools at the International Science and Engineering Fair in Anaheim, California (The flow chart on the preceding page highlights the steps followed by a student as he/she proceeds from the school level to regional, city, state and international competition.)

CPSSSF Rules and Regulations

The following rules apply to all Chicago public school students participating in the Chicago Regional Networks STEM Exhibitions and the City Exhibition of Student STEM Research at the Illinois Institute of Technology.

- Students in sixth grade are restricted in the STEM exhibitions program to participation at the local and Regional Network levels. Only students in the seventh through twelfth grades attending a Chicago public school (including CPS charter schools) may participate in the City Exhibition at the Illinois Institute of Technology.
- All high school projects must be done on an individual basis. The maximum number of 6th - 8th grade students who may work together on a project is two.
- The students of two projects from the sixth grade will be selected from each Regional Network STEM Exhibition to attend the 6th Grade Recognition Luncheon during the City Exhibition. The participants will not exhibit projects at the City Exhibition.
- All exhibitors must have physically entered and attended at least one Regional Network STEM Exhibition. Exhibitors will be selected by their Regional Network Exhibition committee before being allowed to participate in the City Exhibition.
- Students will be judged only on the most recent year's research. This project year includes research conducted over a maximum of 12 continuous months from January of last school year to May of the current school year. Any project in the same field of study from a previous year's project is considered a continuation. These projects must document that the additional research is new and different from prior work (e.g., testing a new variable or new line of investigation, etc.). Examples of unacceptable continuation are repetition of previous experimentation and increasing sample size.
- If a project needs an endorsement and does not have one it will not be allowed to participate in STEM Exhibitions. **Should an unendorsed project mistakenly progress through a school exhibition or Regional Network STEM Exhibition, it will not be allowed to be exhibited at the City Exhibition of Student STEM Research.**

Choosing the Correct Research – Experimental vs Design

Most projects will be experimental in nature using the scientific method and will fall into the experimental category. However, if the objective of your project is to invent a new device, procedure, computer program, or algorithm, then your project may fall into the design category.

Scientific Method	Design Process
Identify and write a testable question	Define a need or real world problem
Perform background research	Perform background research
Formulate a hypothesis and identify variables	Establish design criteria
Design an experiment, establish procedure	Prepare preliminary design(s)
Test the hypothesis by conducting the experiment	Build and test a prototype
Analyze the results and draw a conclusion(s)	Test and redesign as necessary
Present results	Present results
1. IDENTIFY AND WRITE A TESTABLE QUESTION Decide what question you want to answer or what problem you want to solve. A testable hypothesis is answered through observations or experiments that provide evidence. Be sure to have adequate technical and financial resources available to conduct your research. State your objective clearly in writing.	**1. DEFINE A NEED** Instead of stating a question, state a need. Can you describe in detail a problem that your design will solve? Does your research relate to a real world need?
2. PERFORM BACKGROUND RESEARCH Before you begin your project, you must become as knowledgeable as you can about your topic and about other research that has been done on that topic. You may use books, scientific literature, the Internet, or interviews with scientists or other knowledgeable people. This research not only helps you get ready to conduct your experiment, but will form the background for the Background Research required in your report.	**2. PERFORM BACKGROUND RESEARCH** For a design project, the background research may include: • A complete description of your target user(s) • Information about the science behind your design area • Answers to research questions about user needs • Information about products that meet similar needs • Research about design criteria • What existing solutions are out there already, and how well do they solve the problem? You may use books, scientific literature, the Internet, or interviews with scientists or other knowledgeable people. This research not only helps you get ready to conduct your experiment, but will form the background for the Background Research required in your report

*See IJAS Policy and Procedure Manual https://drive.google.com/drive/folders/0B72J70LPcSv3OTRZeW9wclhvZEU/

Scientific Method	Design Process
3. FORMULATE A HYPOTHESIS AND IDENTIFY VARIABLES Based on the background research, write a statement that predicts the outcome of the experiment. Many hypotheses are stated in an "If... then" statement where the "If" statement pertains to the independent variable, and the "then" statement pertains to the dependent variable. For example: **'If** plants are grown under various colors of light, **then** the plants grown under the blue and red lights will show the greatest increase in biomass.'	**3. ESTABLISH DESIGN CRITERIA** **Engineering Projects**: Decide what features your design must have, for example: size, weight, cost, performance, power, etc. Perhaps include a table showing how each design criterion will be addressed by the features of the product being designed. **Computer Science Projects:** Creating or writing a new algorithm to solve a problem or improve on an existing algorithm. Discuss the criteria of the algorithm. **Mathematics Projects:** Proofs, development of a new model or explanation, concept formation or mathematical model design.
4. DESIGN AN EXPERIMENT, ESTABLISH A PROCEDURE Decide what data you need to meet your research objective and how you will collect it. Be sure to consider possible hazards in your experimental approach and decide how you can conduct your research safely. In addition, there are special rules concerning the use of human and non-human vertebrates in your research. Be sure to consult these rules before finalizing your experimental design. In order to obtain valid experimental results, consider the following items when designing the experiment: • Make sure the quantity and quality of data you collect provides a reasonable assurance that your research objectives will be met. • Identify all **significant** variables that could affect your results. • To the best of your ability, control any significant variables not manipulated in your experiment. • Include a control or comparison group in your experimental design. Be sure to establish deadlines for completing the different phases of your research. These phases might include building equipment, collecting data, analyzing the results, writing the report and construction your display board. Remember to use metric measurements whenever possible.	**4. PREPARE A PRELIMINARY DESIGN** Engineering projects should have a materials list, programming and mathematical projects do not need a materials list. Projects should include a block diagram, flowchart or sketch of the design that shows all of the parts or subsystems of the design. Describe how all of the parts of the design will work together.

*See IJAS Policy and Procedure Manual at https://drive.google.com/drive/folders/0B72J70LPcSv3OTRZeW9wclhvZEU

Scientific Method	Design Process
5. CONDUCT THE EXPERIMENT Follow your experimental design to collect data and make observations. Be sure to keep a log as you conduct the experiment to record your data, any problems you encounter, how you addressed them, and how these problems might have affected your data. This log will be used when you write your report. Keep these points in mind when conducting your experiment: • If you get results that seem wrong or inconsistent, do not just throw them out. Try to figure out what happened. Maybe the data is correct and your hypothesis is flawed. Try to explain these "outliers" in your Data, Analysis, and Discussion section. • Don't get discouraged when you encounter problems. Scientists often have to repeat experiments to get good, reproducible results. Sometimes you can learn more from a failure than you can from a success.	**5. BUILD AND TEST A PROTOTYPE** (Programs, algorithms, and mathematical models may be considered prototypes) When others are conducting their experiment, investigators doing an engineering, computer programming, or mathematics project should be constructing and testing a prototype of their best design. For example, you may involve targeted users in your testing to get feedback on your design; or some projects may analyze data sets.
6. ANALIZE THE RESULTS AND DRAW CONCLUSIONS Make sufficient calculations, comparisons and/or graphs to ensure the reliability and repeatability of your experiment. In what way does this analysis confirm or refute) your hypothesis. What conclusion(s) can you draw from this analysis?	**6. REDESIGN AND RETEST** Evidence that changes in design were made to better meet the performance criteria established at the beginning of the project. Test results may be included in tables, if applicable. Data analysis/ validation may also be a part of this step.
7. REPORT THE RESULTS Your report should provide all the information necessary for someone who is unfamiliar with your project to understand what you were trying to accomplish, how you did it, and whether you succeeded. It should be detailed enough to allow someone else to duplicate your experiment exactly. Be sure to include charts and graphs to summarize your data. The report should not only talk about your successful experimental attempts, but also the problems you encountered and how you solved them. Be sure to explain what new knowledge has been gained and how it leads to further questions. For IJAS judging, you must also prepare an oral report and a display board (page 20*) to accompany the written report. Be sure to consult the IJAS policy manual, section "Writing A Scientific Research Paper," for report guidelines . These guidelines must be followed exactly.	**7. REPORT THE RESULTS** Your report should provide all the information necessary for someone who is unfamiliar with your project to understand what you were trying to accomplish, how you did it, and whether you succeeded. The report should not only talk about your successful design attempts, but also the problems you encountered and how you solved them. Be sure to explain what new knowledge has been gained and how it leads to further questions. For IJAS judging, you must also prepare an oral report and a display board to accompany the written report. Be sure to consult the IJAS policy manual, section "Writing A Scientific Research Paper," for report guidelines. These guidelines must be followed exactly.

*See IJAS Policy and Procedure Manual at https://drive.google.com/drive/folders/0B72J70LPcSv3OTRZeW9wclhvZEU

Project Planning and Selection

The following basic steps may help you prepare your STEM project. The timeline suggested is provided by the SMILE program at IIT. Teachers should adjust this to meet their students' and school needs.

For more detailed help planning your project go to: www.cpsscifair.org

http://www.sciencebuddies.org/science-fair-projects/project_guide_index.shtml
or http://sciencefair.math.iit.edu .

▼ WEEKS 1–2: Identify your topic and establish a testable question or define a need or real world problem.

Select a topic. The following suggestions may help you choose a topic.

A: Pick something of interest to you and answer the following questions about it, listing several answers for each question.

1) What materials are readily available to complete your project?
2) How can I change the set of variables to affect the experiment or design?
3) How can I measure the response of these changes?
4) Do I have enough time to do this experiment or design process before it is due?

B: Past projects lead to new project ideas. A question you had while doing a project can lead to a new project. Alterations of previous experiments or designs are encouraged but simply repeating an old project is not.

C: Something you wondered about a STEM activity in class may make a great STEM project topic. Choose a different variable to manipulate and measure its effects.

Write a question or develop a design you can test. A testable question is a question that can be answered by experimentation and includes two parts; (1) the manipulated/independent variable = the single condition that will be changed in the experiment. (2) the responding/dependent variable = the single condition that will be measured in the experiment. Ex. How does changing the _____(1)_____ affect _____(2)_____?

▼ WEEKS 3–4: Research your topic, plan and prepare for your experiment or design.

Research the subject. Use books, magazines, encyclopedias, information from professionals and the internet to find background information on your topic to help you develop your hypothesis. Find information about the best way to do things and to prevent making mistakes others have made.

Write a hypothesis or develop design criteria. Predict the effect that changes in the manipulated variable will have on the responding variable. State your hypothesis or design criteria in a way you can measure and make sure it addresses your original question.

Write a step-by-step procedure. Include enough detail so someone else could follow your procedure to get the same results you get. Make sure the results are measurable and metric, that there is only one variable manipulated and all other conditions are kept the same in your experimental group. If possible include a control group in which the manipulated/independent variable is in its natural state. Perform enough trials to provide reliable results. Take necessary safety precautions. If your research question is one that you cannot personally collect data to answer, look for existing data that could answer it. "Data mining" is particularly advisable when a student does not have the means to collect the data to their own research question, as with some aerospace projects. NASA may have collected data that a student can filter to find the information that addresses the research question.

Prepare a preliminary design. Engineering projects should have a materials list, programming and mathematical projects might not require a materials list. Projects should include a block diagram, flowchart or sketch of the design that shows all of the parts or subsystems of the design. Describe how all of the parts of the design will work together.

Check to see whether your project requires an endorsement. Before you begin experimentation check the CPS STEM Exhibition rules (pages 10-22) and submit the proper request for endorsement if necessary. Do not begin experimenting until your plan has been endorsed/approved by the Scientific Review Committee.

Collect all material, equipment and verify your design. Make sure you have enough materials to repeat your experiment or verify your design in case you make a mistake. Make a complete list so someone else could repeat your work.

▼ WEEKS 5 – 6: Conduct your experiment or test your design and collect data/results.

Conduct your experiment or test your design. Prepare a data table before starting. Follow your procedure exactly as you planned. If you change the procedure write down exactly what changes you made. Make careful, consistent and accurate measurements. Take pictures for your display if possible.

Record data and observations in a journal. This is your research document. Make sure your data is quantitative and well-organized so you can analyze it later.

▼ WEEK 7: Analyze results and draw a conclusion.

Analyze the results. Compile results in tables, charts and graphs that best represent the data. Determine whether the differences between your control and your experimental runs are statistically significant. Estimate the impact of experimental error. See page 23 for details on experimental or design error.

Draw a conclusion. State whether your results support or contradict your hypothesis or design criteria. State the relationship between your independent and dependent variable and/or summarize and evaluate the effectiveness of your design procedure. Summarize and evaluate the effectiveness of your procedure. Suggest improvements and/or possible new questions to study.

▼ WEEK 8: Write your research paper and registration papers.

Write your research summary report and abstract. (See pages 25-29 for details)

Complete other paperwork for participation in the STEM Exhibition (See pages 57-58)

▼ WEEK 9 – 10: Prepare to present.

Prepare your display. Organize your board to give a complete explanation of your project. Use charts, graphs, photos, illustrations, neat lettering, etc. Follow guidelines on pages 34-38.

Prepare an oral presentation. Concisely summarize your project to show what you know and have accomplished making sure you discuss relevant information. Speak fluently with good eye contact. Be polite and dynamic. Show an interest in your project.

***Get help if you need it.** If you need advice, the Advise-a-Student program pairs students with professional scientists and engineers via email or phone to discuss students' science projects at beginning, intermediate or advanced stages. If questions about your project go beyond your teacher's range of expertise fill out an Advisor Request Application (page 83) to be matched with someone who can help. If you need financial help, the Research Grants program will reimburse students with qualified projects for expenses related to their experiments or designs. Students must submit an application (pages 79-82) and the original receipts.

2020 STEM Exhibition Categories

(Including new IJAS categories)

Students must design an experiment to investigate a question or problem, or design or develop a new model, computer program, mathematical proof, and so forth.

A project based solely on library research is not an acceptable project. Note that building without purposeful design and testing or demonstration is not an acceptable project. The following guidelines should give you an indication of what type of experimentation or project can be done within each category and should help to place a given project in the proper category for judging.

Projects in any of the listed IJAS categories below may need an endorsement sheet(s). Make sure that all safety rules are followed, and that all endorsements are completed and displayed.

A control group may not always be possible or necessary for all projects; a comparison among trials is appropriate and may be used instead.

1 Aerospace Science**

... is the science of the study and investigation of the earth's atmosphere and outer space. In the wide sense, it would include the design, manufacture, and operation of aircraft. Some topics that fall within this division are the operation of rockets, guided missiles, anything related to space travel, operation, and/or construction of satellites, observations of airflow patterns within tunnels, and the use of navigational equipment.

FOR IJAS ONLY – ASTRONOMY** ..is the science dealing with all of the celestial bodies in the universe, including the planets and their satellites, comets and meteors, the stars and interstellar matter, the star systems known as galaxies, and clusters of galaxies. Modern astronomy is divided into several branches: astrometry, the observational study of the position and motions of these bodies; celestial mechanics, the mathematical study of their chemical composition and physical condition from spectrum analysis and the laws of physics; and cosmology, the study of the universe as a whole.

2 Behavioral Science*

... is the science that studies the demeanor or deportment of humans and other animals by means of observable response and the interpretation of the same as offered by the social sciences, sociology, psychology, etc. Some topics that fall within this division are the effect of stimuli on organisms and their responses, learning, motivation, emotion, perception, thinking, individuality, personality, and adjustment.

3 Biochemistry*

... is the branch of chemistry relating to the processes and physical properties of living organisms. Topics that fall within the biochemistry division are the properties and reaction of carbohydrates, lipids, proteins, enzymes, blood, urine, vitamins, hormones, poisons, and drugs. The chemistry of absorption, digestion, metabolism, respiration, and photosynthesis as organic processes also belong in this category.

4 Botany

... is the division of biology that deals with plant structure, reproduction, physiology, growth, classification, and disease. Some topics included in this category are specialization in plants, functions of various plant structures, reproduction, and heredity.

5 Chemistry

... is the science that deals with the structure, composition, and properties of substances and of their transformations. Some topics included in this category are the composition of various compounds, the formulation of various compounds, the study of gas laws, atomic theory, ionization theory, and the analysis of organic and inorganic products.

6 Computer Science **

... includes the study and development of computer hardware, software engineering, Internet networking and communications, graphics (including human interface), simulations/virtual reality or computational science (including data structures, encryption, coding, and information theory). Topics in this category may include writing an original program and comparing it to an existing one, developing a new language and comparing it to an existing one, etc.

*Special rules apply for projects in this category. See the appropriate section of this book for clarification.

7 Earth Science ... is the science concerned with the origin, structure, composition and other physical features of the earth. Some topics that fall within this division are geology (earth composition, rock formation, fossils, minerals, and fossil fuel); geography (landforms, soils, classification of streams, erosion, and sedimentation); oceanography (ocean waves, ocean currents, composition of ocean water and coastal zone management); seismology; geophysics; and meteorology.

8 Electronics ... is the branch of engineering and technology that deals with the manufacture of devices such as radios, television sets, and computers that contain electron tubes, transistors, chips, or related components. Topics in this category are circuits (electrical, electric digital and analog) for communication such as radio, radar, laser, transistor, television, and integrated circuits; electricity; electric motors; solar cells and amplifiers.

9 Engineering ... is concerned with the practical application of scientific knowledge in the design, construction, and operation of roads, bridges, harbors, buildings, and machinery, lighting, heating, and communication systems. Some topics in this category are stress testing of building materials, strength composition of building materials, collection of data from operating systems to compare and contrast their effectiveness.

10 Environmental Science ... is the study of the protection and care of natural resources. Topics included in this category are solar energy and its uses, water purification and usage, pollution control, soil chemistry, and insecticides. Within this area is ecology, which is the study of ecological systems, and ecological population studies.

11 Health Science* ... is that science concerned with the study of the human body and good health practices. Topics to be found under this category are proper diet, care of the teeth, care of the eyes, and hygiene.

12 Materials Science ... is the study of materials, nonmetallic as well as metallic, and, how they can be adapted and fabricated to meet the needs of modern technology. Using the laboratory techniques and research tools of physics, chemistry, and metallurgy, science is finding new ways of using plastics, ceramics, and other nonmetals in applications formerly reserved for metals.

FOR IJAS ONLY -- PRODUCT/CONSUMER SCIENCE*... is the study of comparisons and evaluations of manufactured or commercial products. Topics included in this category are taste tests, color preferences, quality control, and product efficiency.

13 Mathematics** ... is the science dealing with the measurement, properties, and relationships of quantities as expressed in numbers or symbols whether in the abstract or in their practical connections. Some topics included under mathematics are arithmetic (use of numbers, symbols, and numerical systems); algebra (probability, theory of equations, progressions, permutations and combinations); geometry (topology, study of geometric figures, similar figures, and scale drawings); calculus; trigonometry; statistics; and graphing.

14 Microbiology* … is the branch of biology concerned with the study of microorganisms. Topics to be found in this category are the structure and physiology of bacteria, viruses, yeasts, fungi, and protozoa, and studies involving cells or tissues in cultures.

FOR IJAS ONLY -- CELLULAR & MOLECULAR BIOLOGY*... is the study of the organization and functioning of the individual cell; molecular genetics focusing on the structure and function of genes at a molecular level. Other topics may include the structure and function of the immune system, innate and acquired immunity, and the interaction of antigens with antibodies. Molecular biology concerns itself with understanding the interactions between the various systems of a cell, including the interrelationships of DNA, RNA and protein synthesis and learning how these interactions are regulated.

*Special rules apply for projects in this category. See the appropriate section of this book for clarification.

15 Physics ... is the science that deals with the laws governing motion, matter, and energy under conditions susceptible to precise observation as distinct from chemistry or sciences dealing with living mailer. Topics found in the category of physics are hydrostatic force and pressure, gravity, Newton's Laws, relativity, kinetic theory, motion forces, work, energy, sound, light, and magnetism.

16 Zoology* ... is the science that focuses on animals with reference to their structure, functions, development, evolution, and classification. Some topics that fall within this category are structural and functional studies of vertebrates and invertebrates, physiology, reproduction, heredity, and embryology..

* **Projects in these categories may need an endorsement(s).** See the appropriate sections of this site for clarification.

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

Endorsement requests MUST be made PRIOR to experimentation in order to ensure the safety of the test subject(s) and/or the scientist. The project plans are reviewed by the Scientific Review Committee and, if safe, the endorsement is granted and the experiment may be carried out. Permission to carry out an experiment CANNOT be given to one that has already been completed.

Projects conducted under the supervision of a professor or scientist at a university, hospital or research facility must submit endorsements prior to beginning – **must be received by is October 25, 2019**

Projects which include the use of firearms and must be conducted by a police officer or ISFPR-licensed professional must submit an endorsement with all required documents for approval prior to beginning – **must be received by October 31, 2019**.

Endorsement requests must be received by November 22, 2019 and TWO copies need to be submitted if submitted by GSR. It is highly suggested that you submit the endorsements on-line.

Safety in Experimentation

The safety of the student researcher, the test subjects (in cases of humans and vertebrate animals) and of the public are of paramount concern to Chicago Public Schools Student Science Fair, Inc. Projects using humans, vertebrates or potentially hazardous biological agents (including microorganisms, recombinant DNA, and human or vertebrate tissue) raise the greatest risks. For this reason, the plans for such projects must be reviewed by a team of qualified scientists and science teachers before experimentation or design construction begins. The Scientific Review Committee (SRC) serves this purpose. Projects that violate any of the rules for use of humans, vertebrates, microorganisms, recombinant DNA, human or vertebrate tissue, or firearms will be disqualified from the CPS Exhibition of Student STEM Research.

The Endorsement Process

1. Plan the project, check the rules

It is the responsibility of the teacher/sponsor working with the student to evaluate the research plan for any possible risks involved in order to ensure the health and safety of the student researcher, the test subjects and the public. The rules and guidelines on the following pages guide the student's project planning to produce a safe procedure for all concerned. These guidelines also help the student decide whether the project needs to be checked and approved (or endorsed) by the SRC. Projects (including use of humans, vertebrates, microorganisms, recombinant DNA, human or vertebrate tissue and firearms) most likely require an endorsement.

2. Request an endorsement = Ask for permission

To make sure the proposed project using humans, vertebrates or potentially hazardous biological agents is safe, the SRC needs to review the project details that pertain to safety risks and precautions BEFORE the student begins the experiment or design construction. On the endorsement request form the student explains the potentially hazardous aspects of the proposed project and what precautions are in place to prevent harm**.** Projects conducted under the supervision of a professor or scientist at a university, hospital or research facility must submit endorsements prior to beginning – **must be received by SCR by October 25, 2019.** Request for Use of Firearms Endorsement with all documents- **must be received by the SRC by October 31, 2019.** All endorsement requests which do not fall under the exception rule or use firearms **must be received the SCR by November 22, 2019. Endorsements must be typed.** Requests can be made in two ways. The endorsement requests can be accessed online at www.cssf.org, saved, printed, scanned and sent to the indicated email, or two copies of the completed typed request for endorsement form can be sent to the SRC committee member specified on the appropriate form (pages 63 - 76 of this handbook).

3. Review of the project plan

The SRC reviews the procedures and precautions on the request form. If the project is safe, the SRC will sign and stamp the form indicating they endorse the project. With this signature, the request form then becomes the endorsement. If the project is not safe the SRC will contact the student to notify him/her of the problem and that the project is not approved to begin experimentation or design construction. At this time the student and SRC can discuss safe alternatives. The student may then submit a new request for endorsement with the necessary revisions. The SRC will send back to the teacher/sponsor via GSR one of the two endorsements. The signed and stamped (in blue) endorsement must accompany the student's Research Summary at all STEM exhibitions. The other copy will be kept in SRC records.

4. Endorsement, then experiment

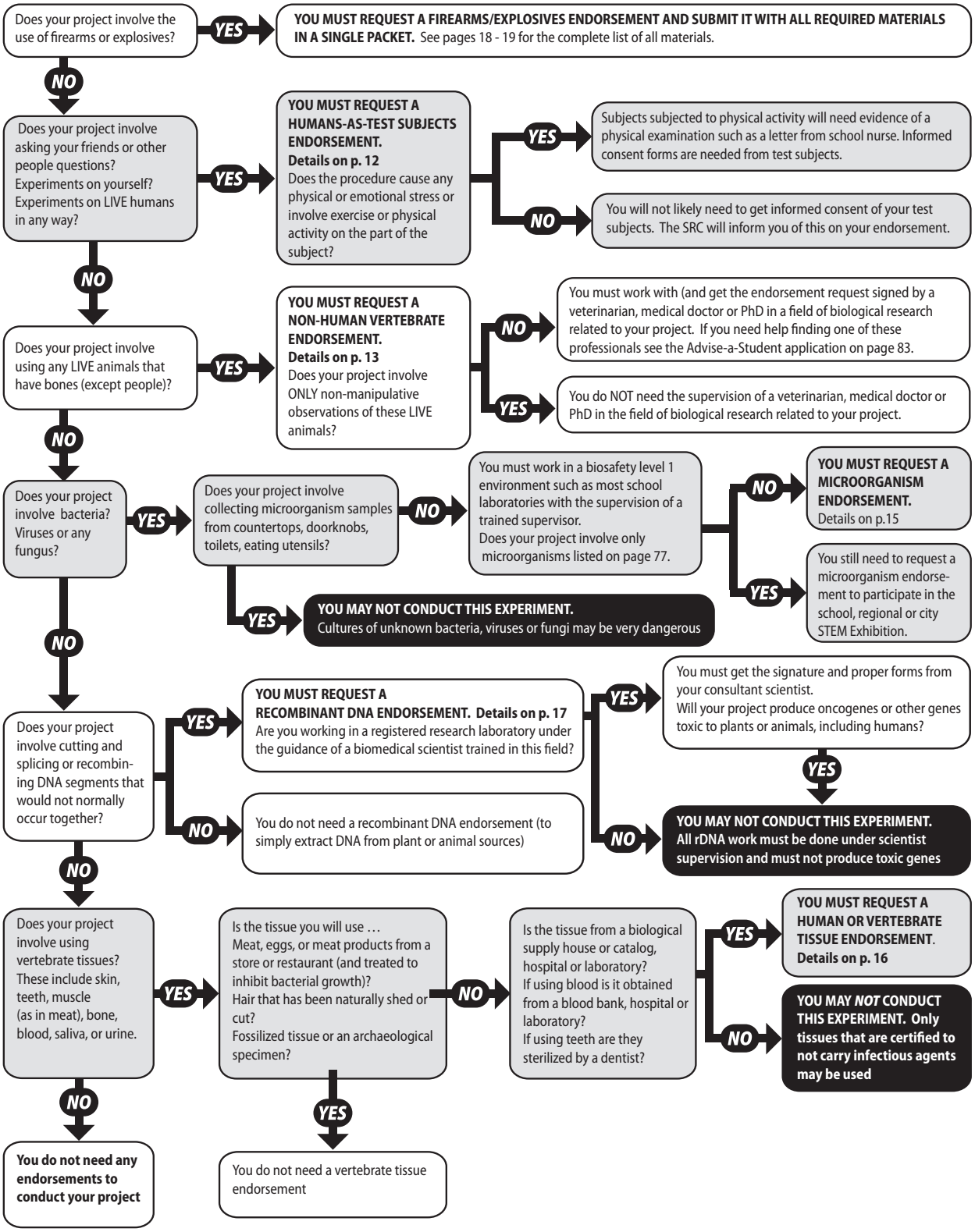
When the student has the SRC's signed and stamped endorsement the student may then begin the experiment or design construction as it has been assured to be safe for the student, the test subjects and the public.

Disqualification

Projects that violate any of the rules for use of humans, vertebrates, microorganisms, recombinant DNA, human or vertebrate tissue, or firearms will be disqualified from the CPS Exhibition of Student STEM Research. The purpose of the endorsement process is to detect and resolve unsafe projects and rule violations BEFORE a student puts anyone at risk. ***If your project needs an endorsement and does not have one it will not be allowed to participate in STEM Exhibitions. Should an unendorsed project mistakenly progress through a school exhibition or Regional Network STEM Exhibition, it will not be allowed to be exhibited at the City Exhibition of Student STEM Research.***

CPS STEM Exhibition Endorsement Flow Chart

This flow chart does NOT include all the rules regarding requests for endorsements. Read the following sections for complete details.



Safety of the Test Subjects - Use of Humans in Experimentation

Endorsement requirements

Rules and regulations exist to govern research that involves humans to ensure the rights and welfare of the individuals who participate as research subjects. **All human test subject projects, in which a variable is manipulated, including surveys, require a *Humans as Test Subjects Endorsement*.**
Observational research projects are strongly encouraged. Observational research projects are those in which the researcher 1) has no interaction with the individuals being observed, 2) does not manipulate the environment in any way and 3) does not record any personally identifiable data. No endorsement form is required for such projects.
Endorsement requests must be **received by the SRC by November 22, 2019**. Projects conducted under the supervision of a professor or scientist at a university, hospital or research facility must submit endorsements prior to beginning – **must be received by SRC by October 25, 2019**. Requests can be made in two ways. The endorsement requests can be accessed online at www.cssf.org, saved, printed, scanned and sent to the indicated email, or two copies of the completed typed request for endorsement form can be sent to the SRC committee member specified on the appropriate form (pages 63 - 76 of this handbook). If the project is safe, the SRC will sign and stamp the form indicating they endorse the project. With this signature and stamp, the request form then becomes the endorsement. This endorsement must accompany the student's Research Summary and must be displayed on board at all STEM Exhibitions.

Informed Consent

In some cases, experiments that test the effect of a stressor such as exercise, loud music or personal questions about one's habits or thoughts may cause discomfort to the test subject. In such cases when the experiment causes the test subject(s) stress, discomfort or risk (physical, psychological, social, and/or legal), the student researcher must obtain the written consent of the person(s) involved. This consent means that the participant has been informed of the experimental procedure, understands the possible discomforts he/she may expect, and agrees to participate in the experiment. If the test subject is under 18 years of age, his/her legal guardian(s) must provide the informed consent, as the test subject is not of legal age to do so.

The SRC reviews all these endorsement requests to determine whether the test subjects will encounter stress. **One completed Informed Consent Certification is to be submitted with the *Humans as Test Subject Endorsement*.** The SRC will determine whether the Informed Consent Certification includes all needed information before it is given out for consent signature. A sample Informed Consent Certification form is found on page 65 in the Appendix. **Completed *Informed Consent Certification* forms should be kept on file with the sponsoring teacher and *not* sent to the SRC.**

Rules

1. Humans must not be subjected to treatments that are considered hazardous and/or that could result in undue stress, injury or death to the subject.
2. Projects that involve exercise and its effect on pulse, respiration rate, blood pressure, etc., of humans may be approved if a valid, normal, physical examination report of the participants being studied is on file at the school and if that exercise is not carried to the extreme. **Electrical stimulation is not permitted**. A valid, normal physical examination must be on file for each test subject. A letter from authorized school personnel, such as a school nurse, stating that all of the participating students have a physical examination on file indicating that they are physically able to participate, must be attached to the Human as Test Subjects Endorsement form.
3. Projects that involve color, texture, or any other choice are limited to preference only.
4. Quantities of food and non-alcoholic beverages are limited to normal serving amounts or less and must be consumed in a reasonable amount of time. Potential test subjects who have food allergies that may be triggered should not be tested. **Normal serving amounts must be substantiated with reliable documentation, such as a food label.** This documentation must be attached to the endorsement request form. No project may use over-the-counter drugs, prescription drugs, illegal drugs, or alcohol in order to measure the effect on a person.

5. **It is illegal to publish a report containing information that identifies the subject(s) directly or through identifiers linked to the subject(s) unless prior permission has been obtained**.
6. Projects that involve learning, ESP, motivation, hearing, vision, and surveys require the Humans as Test Subjects Endorsement Form

Additional requirements of the International Science and Engineering Fair

The ISEF requires that each high school must appoint an Institutional Review Board (IRB) to review and approve any proposed research involving human subjects. Students in grades 9 - 12 are highly encouraged to complete the appropriate ISEF approval forms. Approval forms and additional information about the use of humans as test subjects can be obtained from International Rules for Precollege Science Research: Guidelines for International Science and Engineering Fair 2019-2020, available online: http://www.societyforscience.org/isef/document.

Safety of the Test Subjects - Use of Animals in Experimentation

The basic aims of experiments involving animals are to achieve an understanding of life processes and to further human knowledge. When students conduct research with animal subjects, the health and well-being of the animal subjects must be considered. Such experiments must be conducted with a respect for life and an appreciation of the humane considerations that must be afforded both vertebrates and invertebrates. Good experimental design involves using the least number of animals and causing the least sum total of distress to produce significant results of value to the scientific community.

It is strongly recommended that certain living organisms, such as plants, baker's yeast, protozoans, planaria, daphnia, rotifera, paramecia, earthworms, snails, insects, and other invertebrates, be used. The wide variety, ready availability, simplicity of care, and subsequent disposal of such organisms make them well suited for student study. Be aware, however, that there are hazards involved in using some microorganisms and that there are special rules governing their use. **See the Safety in Experimentation (p. 10) and Use of Microorganisms (p. 15) of this handbook for further information. The use of organisms listed on page 77 in the appendix require an endorsement.**

Observational research projects are those in which the researcher 1) has no interaction with the animals being observed, 2) does not manipulate the environment in any way and 3) is at no time responsible for the care of the animals involved. Observational research projects (observations of normal living patterns in unrestricted, public settings such as zoos, public parks, neighborhood trees, animal shelters, etc.) are strongly encouraged. **No endorsement form is required for such projects.**

Use of Non-Human Vertebrate Animals in Experimentation

Endorsement requirements

Rules and regulations exist to govern vertebrate animal research to protect the welfare of both the animal subjects and student researcher.

All vertebrate animal projects, in which a variable is manipulated, require a *Non-Human Vertebrate Animal Endorsement.* Endorsement requests must be **received by the SRC by November 22, 2019.** Projects conducted under the supervision of a professor or scientist at a university, hospital or research facility must submit endorsements prior to beginning – **must be received by the SCR by October 25, 2019.** Requests can be made in two ways. The endorsement requests can be accessed online at www.cssf.org, saved, printed, scanned and sent to the indicated email, or two copies of the completed typed request for endorsement form can be sent to the SRC committee member specified on the appropriate form (pages 63 - 76 of this handbook).

If the project is safe, the SRC will sign and stamp the form indicating they endorse the project. With this signature and stamp, the request form then becomes the endorsement. This endorsement must accompany the student's Research Summary at all STEM exhibitions. For some types of research, Illinois Junior Academy of Science (IJAS) approval will be required. The Scientific Review Committee will make this determination before issuing the vertebrate animal endorsement.

Rules

1. Animals should be obtained from a reputable, certified animal supplier.
2. To provide for humane treatment of animals, a qualified adult supervisor trained in the care and use of laboratory animals must assume primary responsibility for any vertebrate experiment. This person must hold either an M.D. degree, a Ph.D. degree in a field of biological research, or a D.V.M. degree. If the student does not have access to such a supervisor contact the Advise-a-Student Program for assistance in this regard. The Advise-a-Student Program Advisor Request Application is found on page 83 of this handbook.
3. Normal living conditions must be maintained for the animal's comfort. A clean, ventilated comfortable environment and continuous, uncontaminated water and food supply must be provided at all times, including during weekends and vacation periods. Animals must be maintained at a location approved by the Scientific Review Committee. A maze may be used for short periods of testing but the animal must be kept as specified above at all other times.
4. No experimental procedures that cause the animal pain or distinct discomfort or that interfere with its health shall be attempted on vertebrates. No changes may be made in an organism's environment that could result in undue stress, injury or death to the animal, without prior approval.
5. No intrusive or pain-producing techniques may be used. Included in intrusive techniques are surgery, injections, taking/giving blood, burning, electrical stimulation, altering a normal diet, and administering drugs or other chemical agents to measure their effect.
6. Vertebrate animals may not be killed no matter how humane the method.
7. In projects involving the incubation of bird, reptile, and amphibian embryos, the manipulated variable (experimental treatment) must be discontinued 72 hours prior to the expected hatch or birth time. Continued exposure of the manipulated variable (experimental treatment) beyond this time will result in the project being disqualified.

Additional requirements of the International Science and Engineering Fair

Students in grades 9 - 12 are highly encouraged to complete the appropriate ISEF approval forms. Approval forms and additional information can be obtained from the International Rules for Precollege Science Research: Guidelines for International Science and Engineering Fair 2019-2020, available online: http://www.societyforscience.org/isef/document.

Exceptions to Non-Human Vertebrate and Humans as Test Subjects Rules

Exceptions to the rules governing the use of nonhuman and human vertebrates will not be granted except in the circumstance that a student works with a university or research facility on a research project approved by an official review board of that institution. Approval for this exception will be granted only if the following conditions are met:

The student must seek approval for the project **before experimentation begins and must be received by November 22, 2019 of the academic year in which he/she wishes to enter the** Regional or State exposition. Projects conducted under the supervision of a professor or scientist at a university, hospital or research facility must submit endorsements prior to beginning – **must be received by the SCR by October 25, 2019.** Requests for approval will not be accepted after experimentation has started.

The student must have a Request for Non-Human Vertebrate Endorsement (pages 67-68) or a Request for Humans as Test Subjects Endorsement (pages 63–65) signed by the director of the research institution indicating that the project has the approval of the local Institutional Review Board (IRB) when using humans as test subjects or the Institutional Animal Care and Use Committee (IACUC) when using vertebrate animals.

Students performing an experiment and are supervised in a university lab, research facility, or professional facility must have a letter, on the organization/research facility's letterhead, from the supervisor stating that the student worked under constant supervision and that all rules and regulations were followed. This original letter should directly follow the required endorsement form in the student's original written paper. A copy of this letter must be displayed on the front of the display board with the other endorsement sheets.

These rules will be strictly enforced at the city and state expositions. The Chicago Public Schools Student Science Fair, Inc. is a member of IJAS and ISEF, and as such agrees to follow the rules of these organizations as well as formulating its own. High school students will need to request and complete the required ISEF forms to be considered for ISEF participation. Students should keep in mind that these approvals take time, and they should allow for this waiting period.

Safety of the Student Researcher – Use of Potentially Hazardous Biological Agents

Endorsement requirements

Rules and regulations exist to govern research that involves potentially hazardous biological agents to ensure the health and well-being of the student researcher and of the public. In most cases, projects involving microorganisms, recombinant DNA or vertebrate tissue require an endorsement. Endorsement requests **must be received by the SRC by November 22, 2019**. Projects conducted under the supervision of a professor or scientist at a university, hospital or research facility must submit endorsements prior to beginning – **must be received by the SCR by October 25, 2019**. Requests can be made in two ways. The endorsement requests can be accessed online at www.cssf.org, saved, printed, scanned and sent to the indicated email, or two copies of the completed typed request for endorsement form can be sent to the SRC committee member specified on the appropriate form (pages 63 - 76 of this handbook). If the project is safe, the SRC will sign and stamp the form indicating they endorse the project. With this signature and stamp, the request form then becomes the endorsement. This endorsement must accompany the student's Research Summary at all STEM exhibitions.

Students in Grades 9–12 are strongly encouraged to download and complete forms required by the International Science and Engineering Fair (ISEF) prior to experimentation. Only students who have the required forms will be considered for ISEF. These forms are NOT included in this booklet. Approval forms and additional information can be obtained from the International Rules for Precollege Science Research: Guidelines for International Science and Engineering Fair 2019-2020, available online: http://www.societyforscience.org/isef/document.

Use of Microorganisms

Bacteria and fungi spores are all around us. Some are beneficial, some have no effect and some can be quite harmful, or pathogenic. We come in contact with them every day without becoming ill. Practicing good hygiene eliminates most of those that could invade our bodies and make us sick. A healthy immune system can defeat very small numbers of pathogenic microbes before one feels symptoms of illness.

For science experiments it is preferred to work with many microbes at one time (colony) so they are more easily visible and more easily manipulated. A single visible colony is tens of thousands of bacteria. This quantity of pathogenic bacteria is quite dangerous to a person if handled incorrectly. For CPS Student STEM Exhibition projects it is imperative that students not be exposed to any pathogenic bacteria; for this reason, all projects using microorganisms must be screened by the Scientific Review Committee prior to beginning the experiment.

Rules about microorganism sources

1. **No primary or secondary cultures taken from humans or other warm-blooded animals may be used. This includes, but is not limited to, those taken directly from the skin, throat, mouth, etc. or indirectly – eating utensils, doorknobs, toilets, counter tops, etc.** Microbes taken from any of these sources cannot easily be identified as pathogenic or not. Culturing large quantities (colonies) of these wild microorganisms may produce a serious hazard to the student researcher and so this is not allowed.

2. Wild cultures of fungi (limited to types of bread mold) may be used if incubated at or below room temperature.
3. Pure cultures of microorganisms known to inhabit vertebrate animals must be supplied by a reputable, certified biological supplier. Microorganisms available to schools from such sources are generally non-pathogenic when used under proper lab conditions.
4. Projects involving viruses should be done with the help of a professional and should comply with the National Institutes of Health Guidelines unless the project is limited to a kit obtained from a legitimate supply house.
5. The guidance and assistance of a science teacher should be obtained when ordering known fungi cultures from a biological supply company.
6. **All microorganisms** including the list of Microorganisms for Science Projects (page 77) **require an endorsement for participation in any of the CPS STEM exhibitions**.

Rules about experimental practices with microorganisms

7. *Sterile technique should be learned under proper guidance of a supervisor trained in this field of research before beginning any project involving microorganisms.* Sterile technique is the greatest safe-guard when working with microorganisms. Cultures of known bacteria, while they may be considered as nonpathogenic, must be treated in such a way that no bacterial contamination of the environment around the project work area can occur.
8. *All research involving potentially hazardous biological agents must be done in an appropriate laboratory (either at school or at a research facility) with a trained supervisor under Biosafety level 1 conditions;* For a complete explanation of Biosafety level 1 go to Section IV of the Center for Disease Control's Biosafety in Microbiological and Biomedical Laboratories at: http://www.cdc.gov/biosafety/publications/bmbl5/BMBL5_sect_IV.pdf .
9. Only research on Saccharomyces cerevisiae (Baker's Yeast) may be done in a student's home environment and these cultures must be incubated at or below room temperature.
10. Any project involving growth of mold or rotting of organic material must be done in a science classroom or professional research facility.
11. All cultures must be destroyed by methods such as autoclaving or using a suitable 10% bleach solution before disposal.
12. All proper safety methods and aseptic techniques must be adhered to during experimentation. Students must wear safety goggles, gloves and wash hands after each experiment.

For more information about the safe use of microorganisms go to: http://www.sciencebuddies.org/science-fair-projects/project_ideas/Micro_Safety.shtml

Use of Human or Vertebrate Tissue

The use of human or vertebrate tissue poses a danger to the student researcher because these tissues may contain pathogenic strains of microorganisms. For the purpose of student research, all body fluids (including blood, saliva, & urine), bone, hair, and teeth, are considered tissues.

Rules about tissue sources

1. The following types of tissue do not need to be treated as potentially hazardous biological agents provided procedures are followed to inhibit bacterial growth: plant tissues; eggs, meat or meat products including bones obtained from food stores, restaurants, or packing houses; hair that has been naturally shed or clipped; fossilized tissue or archeological specimens.
2. Students using teeth in a research project must use only sterilized teeth. A written statement to this effect, from a dentist, must accompany the request for the tissue endorsement.
3. The only human blood that may be used is that which is purchased or obtained from a blood bank, hospital, or laboratory. No blood may be drawn by or from any person specifically for a science fair project.
4. Human tissue studies where the tissue samples can be identified with a specific person must have Institutional Review Board review and informed consent.

Rules about experimental practices

5. All tissue studies must be conducted under adult supervision. ISEF requires that all tissue studies be conducted under the supervision of a Designated Supervisor.
6. All human and vertebrate tissue should be handled as though it were potentially infectious. Universal precautions must be used to prevent contact with blood or other potentially infectious materials in human and animal tissues. Lab coats, gloves, and other appropriate protective items must be worn and the worksite maintained in a clean and sanitary condition.
7. Any tissue or instruments with the potential of containing blood borne pathogens (e.g., blood, blood products, tissues which would release blood when compressed, blood-contaminated instruments) must be incinerated or autoclaved after use in order to effectively destroy blood borne pathogens.

Use of Recombinant DNA

The use of recombinant DNA techniques may pose a danger less to the student researcher than to the public at large. The practice of recombining genes, or inserting a foreign gene into a new host organism imbues it with new traits. These traits are sometimes unpredictable and potentially dangerous to the other organisms. Specific rules exist to prevent the release of the genes and altered organisms outside the lab.

Rules

1. All research involving recombinant DNA techniques must meet requirements of the National Institute of Health Guidelines for Research Involving Recombinant DNA Molecules. For more information about these guidelines see: https://osp.od.nih.gov/biotechnology/biosafety-and-recombinant-dna-activities/

   Guidelines for steps involved for approved research are in the following link: https://www.cdc.gov/biosafety/publications/bmbl5/BMBL.pdf
2. The study must only be conducted in a registered research laboratory under the guidance of a biomedical scientist, approved by an appropriately constituted and registered biosafety committee to conduct such work.
3. The study must have the approval of a biomedical scientist or the laboratory's IBC when necessary.
4. Propagation of recombinants containing DNA coding for oncogenes or other human, plant or animal toxins (including viruses) are prohibited.

Safety of the Student Researcher – Use of Hazardous Equipment

Safety is the watchword when developing a science fair project. Without exception, the highest standards of safety are required. All projects should be conducted with proper adult supervision. The following are safety measures of particular importance but do not require the approval of the Scientific Review Committee before you may conduct your experiment; with the exception of conducting a demonstration or experiment using firearms or explosives, and the production of alcohol, which will require prior approval from the Scientific Review Committee and/or Safety Review Committee before you begin your project.

Chemical Hazards

Any chemical can be dangerous when used improperly. Refer to the Merck Index and/or The Handbook of Chemistry and Physics http://www.chemnetbase.com/ to determine potential hazards of any chemicals that are to be studied. Refer to the Materials Safety Data Sheet (MSDS) for additional safety information. https://www.flinnsci.com/safety/

- Students should always wear eye protection when working with any chemical.
- All chemicals must be disposed of in accordance with State and Federal Environmental Rules http://www.epa.gov/chemfact/
- If possible, the student should work under the supervision of a responsible chemist.

Drone Hazards

Drones may be used in a science project PROVIDED the use complies with all Federal, State and community rules, regulations and ordinances. In addition, the use of a drone for a science project may not infringe on anyone's privacy or air space.

Electrical Hazards

All electrical equipment must be constructed according to standard electrical safety codes. If there is doubt, consult with an electric shop teacher or an electrician. The city of Chicago's electrical code for public exhibits requires all electrical devices connected to the circuits within the building to be grounded using type SO three-wire conductors.

All wiring, switches, and metal parts carrying current must be completely enclosed by barriers on all sides to absolutely prevent observers from reaching into the mechanism where they might receive an electrical shock.

Doorbell push buttons must not be used to control 110 volt apparatus. Use toggle or push-button switches designed for proper load. Non-insulated switches, such as knife switches, will not be permitted. All electrical joints must be properly secured and insulated. All electrical joints must be permanent and soldered.

Federal Communications Commission (FCC) regulations are specific with regard to spark-discharge equipment. If equipment containing such devices is used, the machine must be operated so that it does not cause harmful interference to normal channels of communication.

Fire Hazards

Open flames, torches, burners, and electrical units should be used only with proper adult supervision and safety equipment. Any student working with burning materials should perform the experiment under a fume or chemical hood chemical hood or in an open air environment.

Firearms and Explosive Hazards

A. The provisions of this section shall not apply to model rocketry, provided any demonstration or experiment involving a model rocket is supervised by a parent, guardian or teacher over 21 years of age and all local, municipal, state and federal laws are strictly adhered to at all times concerning any model rocket, rocket engine or accessory.

B. For purposes of participating in programs sponsored by the Chicago Public Schools Student Science Fair, Inc., experiments or demonstrations involving: 1) the use of explosives of any type whatsoever (including, but not limited to black powder and gunpowder); or 2) the use of any air gun, firearm or black powder gun, is absolutely forbidden except when advance permission is obtained from the Chicago Public Schools Student Science Fair, Inc. to utilize an air gun or firearm only as stated in this paragraph below. Notwithstanding the prohibition set forth above, a student may make application to the Chicago Public Schools Student Science Fair, Inc. for advance permission to conduct a demonstration or an experiment utilizing an air gun or firearm only. The Chicago Public Schools Student Science Fair, Inc. may, at its sole discretion, deny permission if it has any concern whatsoever for safety related to the demonstration or experiment. Additionally, an experiment will be approved only if all of the following conditions are met at all times.

1. The student may not possess, handle or utilize any air gun or firearm at any time for conducting the demonstration or experiment for a science fair project; and the student and all bystanders, if present during the demonstration or experiment, must be behind a ballistic shield and wear eye and ear protection; the student is responsible for all items listed on the Checklist of the Physical Arrangement of the STEM Research Paper on pages 57and 58 of the 2020 STEM Exhibition Handbook.
2. The air gun or firearm must be handled at all times and the demonstration or experiment must be directly conducted at all times by a person over 21 years of age who is certified as a police officer by the Illinois Law Enforcement Training and Standards Board or by a person himself or herself licensed as a Private Detective or Private Security Contractor and in possession of a currently valid Firearms Control Card issued by the Illinois Department of Financial and Professional Regulation ("IDFPR") (Note: a Concealed Carry License issued by the Illinois State Police SHALL NOT SUFFICE, and a Permanent Employee Record Card "PERC" issued by the IDFPR SHALL NOT SUFFICE).

3. The police officer or IDFPR-licensed professional conducting and supervising the demonstration or experiment must provide a written statement describing the demonstration or experiment in detail, provide a copy of all of his or her credentials, and certify under the police officer's or IDFPR-licensed professional's signature that the demonstration or experiment is safe to all persons involved; and explain why and how the demonstration or experiment is safe to all persons involved to the satisfaction of Chicago Public Schools Student Science Fair, Inc.
4. The police officer or IDFPR-licensed professional supervising the demonstration or experiment must provide a Certificate of Liability Insurance in the amount of no less than $1,000,000.00 naming the Chicago Public Schools Student Science Fair, Inc. as "ADDITIONAL INSURED"; the facility where the demonstration or experimentation will be conducted must be recognized by the Illinois State Police and will be required to provide a Certificate of Liability Insurance in the amount of $1,000,000.00 naming the Chicago Public Schools Student Science Fair, Inc., as ''ADDITIONAL INSURED".
5. The student, parent, guardian, police or professional supervisor, and all persons present during the conduct of the demonstration or experiment must provide a release of liability for the benefit of, and in a form agreeable to, the Chicago Public Schools Student Science Fair, Inc., such form shall be provided when the student is granted permission to conduct the demonstration or experiment.
6. The demonstration or experiment must not involve the hand loading or reloading of ammunition and may not utilize any black powder or muzzle loading gun.
7. Any demonstration or experiment involving a firearm must utilize at all times commercially-loaded fixed cartridge ammunition manufactured according to SAAMI standards.
8. The air gun or firearm utilized must be commercially-manufactured and may not be older than fifty (50) years of age.
9. The demonstration or experiment shall not involve making or testing modifications or alterations to the air gun or firearm itself.
10. All local, municipal, state and federal laws and regulations must be strictly adhered to at all times.
11. No air guns, firearms or ammunition can be present at any level of STEM Exhibition (school STEM Exhibition, Regional Network STEM Exhibition, City STEM Exhibition, IJAS and ISEF).

Any advance permission issued shall be valid to conduct experiments or demonstrations for a period of thirty (30) days following approval, after which further experiments or demonstrations may not be conducted unless the advance permission is renewed or separate advance permission for a new or different demonstration or experiment is given.

Make sure your Request for Use of Firearms Endorsement application is filed as soon as possible to allow enough time for the Safety Review Committee to review and process it. No demonstrations or experiment using firearms or explosives can begin without prior approval from the Safety Review Committee.

Glassware Hazards

Care should be taken when using glassware. Broken glass should be disposed of in proper containers. Whenever possible, plastic lab ware should be substituted for glass.

Hazardous Materials

Explosive, flammable, corrosive, or highly poisonous substances should be used with proper adult supervision and safety equipment. Examples of such substances are gasoline, alcohol, lighter fluids, armed rockets, cylinders of compressed gas, aerosol cans, and automobile storage batteries containing sulfuric acid.

Laser Hazards

Any laser used in an experimental or design project must be no greater than Class 2 (visible-light continuous wave lasers under 1 mW such as red laser pointers) without special registration from the State of Illinois (see below). In general the lowest class laser possible should be used for a given project. The revised laser classification system along with associated hazards and safety precautions are reviewed at:
http://en.wikipedia.org/wiki/Laser_safety. Each experiment using lasers should clearly state the safety precautions taken. Under special circumstances, where the use of such a laser is absolutely critical to the success of a project, Class 3R lasers (also labeled as Class 3A for older lasers) may be used. These lasers require written documentation of registration from the State of Illinois and need to follow all applicable safety precautions required by the State (http://www.illinois.gov/iema/NRS/RadSafety/Pages/Laser.aspx). The scientific justification for using a 3R / 3A laser must

be explained, and incorporation of these extra safety precautions must be written into the experimental procedures. Among other practices, we require that 3A lasers use a protective housing or barricade which, when in place, prevents human access to the beam during operation. Under no circumstances may lasers above Class 3R / 3A be used in any project.

Mechanical Hazards

Materials and construction must be durable. All parts must be firmly attached. Power-driven parts must be protected with guards.

Production of Alcohol

Under current law and regulations, you cannot conduct experiments involving distillation of alcohol at your home. As an alternative, Federal Law requires a permit for an alcohol fuel plant, or AFP. Under this type of permit, experiments with alcohol fuels can be conducted at locations properly qualified with the Bureau of Alcohol, Tobacco, Firearms, and Explosives ATF. Approval for this type of project requires the following:

- An authorized representative of your school (a teacher or other school official) must complete and forward an application form 5110.74 to the ATF to establish a small AFP at your school.
- The experiment must be conducted at your school under appropriate adult supervision
- The school official must tell ATF how long the experiment will last. They may allow for additional time in case your experiment is selected for additional competition or display at a Regional, or the City Student STEM Exhibitions.
- The school official must describe the adult supervision that will be provided. This is required because of concern about the safety of students handling hazardous materials and using distillation equipment with alcohol--even with adult supervision.

Students who produce alcohol in connection with a science fair project must obtain permission from the Scientific Review Committee (SRC) prior to beginning the investigation.

Make sure your application is filed as soon as possible to allow enough time for ATF to process it. You cannot begin the experiment until ATF issues you a permit.

Application form 5110.74 and additional information are available from the Bureau of Alcohol, Tobacco, Firearms, and Explosives, National Revenue Center, Spirits Unit A, 550 Main Street, Room 8002, Cincinnati, OH 45202-3263, 1-800-398-2282 or (513) 684-7150, natirevctr@cinc.atf.treas.gov.

A copy of your permit must be attached with your Safety Sheet on the front of your display board and with each copy of your Research Summary.

Radiation Hazards

Projects dealing with radiation from cathode rays, X-rays, or radioactive materials must present no hazard to the public or the student exhibitor.

Ultraviolet Light Sources/Radiation

Students using ultraviolet light sources must be adequately shielded from these sources. Many experiments using these sources should not be undertaken unless under the direct supervision of an adult familiar with the equipment and hazards involved. No student may work with any radioactive materials unless the work is conducted in a licensed laboratory under the direct supervision of a licensed individual.

Resources for More Information on Safety in Experimentation

Humans as Test Subjects

Code of Federal Regulation (CFR), Title 45 (Public Welfare), Part 46- Protection of Human Subjects (45CFR46)
https://www.hhs.gov/ohrp/regulations-and-policy/regulations/45-cfr-46/index.html

Penslar, R.L., *Institutional Review Board (IRB) Guidebook.* (1993). Washington, DC: ORRP-NIH
https://www.hhs.gov/ohrp/education-and-outreach/archived-materials/index.html

Animals as Test Subjects

Animal Welfare Act and Animal Welfare Regulations
https://www.aphis.usda.gov/animal_welfare/downloads/AC_BlueBook_AWA_FINAL_2017_508comp.pdf

The Guide for the Care and Use of Laboratory Animals, Institute of Laboratory Animal Research (ILAR), Commission on Life Sciences, National Research.
http://www.grants.nih.gov/grants/olaw/olaw.htm

John's Hopkins Center for Alternatives to Animal Testing (CAAT)
http://caat.jhsph.edu/

Biosafety Hazards

Biosafety in Microbiological and Biomedical Laboratories (BMBL) – 5th Edition
Published by CDC-NIH
http://www.cdc.gov/biosafety/publications/bmbl5/

Microorganisms for Education
The College of William and Mary – Department of Biology
http://www.science-projects.com/safemicrobes.htm

NIH Guidelines for Research Involving Recombinant DNA Molecules
Published by National Institutes of Health
https://osp.od.nih.gov/wp-content/uploads/NIH_Guidelines.html

Guidelines for steps involved for approved research are in the following link:
https://www.cdc.gov/biosafety/publications/bmbl5/index.htm

General Lab Safety

Centers for Disease Control and Prevention
Guidelines for Biosafety Laboratory Competency
http://www.cdc.gov/mmwr/pdf/other/su6002.pdf

Centers for Disease Control and Prevention
School Chemistry Laboratory Safety Guide
http://www.cdc.gov/niosh/docs/2007-107/pdfs/2007-107.pdf

Safety in Academic Chemistry Laboratories, volumes 1 and 2, 2003.
To order a copy of these or other Safety publications from ACS, please contact the Office of Society Services at 1-800-227-5558 or help@acs.org.

Material Safety and Data Sheets (MSDS)
https://www.flinnsci.com/search-results/?type=All&query=material+safety

Drug Enforcement Agency list of controlled substances
http://www.deadiversion.usdoj.gov/schedules/index.html

Bureau of Alcohol, Tobacco, Firearms and Explosives
http:www.atf.gov

Occupational Safety and Health Administration Documents www.osha.gov
Search for: STD 01-05-001 - Guidelines for Laser Safety and Hazard Assessment

Sources for Animal Tissue and Microorganism Cultures

Carolina Biological Supply Company
Phone: (800) 335-5551
Website: http://www.carolina.com

American Type Culture Collection
Phone: (703) 365-2700 or (800) 638-6597
Website: http://www.atcc.org

Firearms and Explosive Hazards

National Rifle Association of America, 11250 Waples Mill Road, Fairfax, VA 22030
1-800-392-8683, training.https://gunsafetyrules.nra.org/

National Shooting Sports Foundation, Flintlock Office Center, 11 Mile Hill Road Newton, CT 06470-2359
Phone (203) 426-1087, FAX (203) 426-1087, www.nssf.org/safety/basics/

Wikipedia – Gun Laws in Illinois
https://en.wikipedia.org/wiki/Gun_laws_in_Illinois

Smith & Wesson, 2100 Roosevelt Avenue , Springfield, MA 01104
Phone 1-800-331-0852, Fax 1-413-747-3317 , E-mail https://www.smith-wesson.com

https://www.smith-wesson.com/.../Category4_750001_750051_757990_-1_7579
Wikipedia, the Free Encyclopedia, Gun Laws in Illinois, en.wikipedia.org/wiki/Gun_laws_in_Illinois dd to end of resources:

Estimating Experimental Error

Science is all about measurement. In fact, you could define science 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. There is always some error. When designing an experiment, it is important to understand where measurement errors are likely to occur and how to reduce them as much as possible. Measurement errors may come from the person doing the measuring, from variables, or from unidentifiable random error. In order to draw valid conclusions from measurement data, a scientist must understand how measurement error affects those conclusions.

Here's a simple example:
You are trying to determine whether two metal rods expand by different amounts when heated. You design an experiment to measure the expansion of these rods. You take three measurements and calculate the average expansion for each rod. Here is the data (in micrometers):

	M1	M2	M3	AVG
Metal Rod #1	**558**	**542**	**568**	**556**
Metal Rod #2	**543**	**551**	**556**	**550**

After looking at this data, you might be tempted to conclude that Rod #1 expands more than Rod #2. Would your conclusion change if you knew that your measurement error for the experiment was ± 5 micrometers? Let's take a look... If that error (± 5) is applied to the two averages, you would have a range instead of a single value. These ranges would be:

Metal Rod #1 Average: 556 ± 5 —> Range: 551– 561
Metal Rod #2 Average: 550 ± 5 —> Range: 545– 555

If you were to plot these ranges on a number line, you would see that they overlap... the "true" expansion of Rod #1 could be as low as 551 while the "true" expansion of Rod #2 could be as high as 555. In other words, you cannot conclude, based on the data you collected, that there is any difference in the expansion of the two rods. The difference that you do see in the data is due to chance, not to any real difference in the metals.

What if the measurement error for the experiment was ± 2 micrometers? The ranges would then be:

Metal Rod #1 Average: 556 ± 2 —> Range: 551– 558
Metal Rod #2 Average: 550 ± 2 —> Range: 545– 552

In this case, the ranges do not overlap. You can conclude with some confidence that the two metal rods do, in fact, expand differently when heated.

Here are some questions you may wish to consider when designing your science fair project:

How can I improve the precision of my data?

How can I improve the accuracy of my data?

Is there too much variability in my data?

Can I reduce my measurement error by: Collecting more data? Exercising better control of the measurement process? Exercising better control of the experimental variables?

The following websites provide more information on estimating experimental error

Science Buddies - summarizing your data
http://www.sciencebuddies.org/science-fair-projects/project_data_analysis_summarizing_data.shtml

Science Buddies - variation and standard deviation
http://www.sciencebuddies.org/science-fair-projects/project_data_analysis_variance_std_deviation.shtml
IIT IPRO Science Fair Extravaganza at http://sciencefair.math.iit.edu/analysis/

Correct SI Metric System Usage

SI is the symbol for the Système International d'Unités, the modernized version of the metric system that the USA and other nations have agreed to use. (Do not abbreviate it as S.I.)

This list is provided to point out the correct way to use the metric system and to show many of the incorrect examples of its usage that may be given on package labels and in other printed matter. These correct ways to use SI are set by the international standards that define the SI.

General Guidelines:

1. The short forms for SI units (such as mm for millimeter) are called **symbols**, *not* abbreviations.
2. SI symbols *never end with a period* unless they are the last word in a sentence.
   - **RIGHT:** 20 mm, 10 kg
   - **WRONG:** 20 mm., 10 kg.
3. SI symbols should be preceded by digits and *a space must separate the digits from the symbol*.
   - **RIGHT:** It was 300 mm wide. The millimeter width was given.
   - **WRONG:** It was 300mm wide. The mm width was given.
4. Symbols *always are written in the singular* form (even when more than one is meant).
   - **RIGHT:** 1 mm, 500 mm, 1 kg, 36 kg
   - **WRONG:** 500 mms, 36 kgs
   - **BUT:** It is correct to pluralize written-out metric unit names: 25 kilograms, 250 milliliters
5. The symbol for a compound unit that is *a quotient of two units is indicated by a solidus* or by a negative exponent.
   - **RIGHT:** km/h or $km \cdot h^{-1}$ (for kilometers per hour)
   - **WRONG:** kmph or kph (do *not* use p as a symbol for "per")
   - **BUT:** It is correct to say or write "kilometers per hour".
6. The meaning of an SI symbol can be changed when substituting a capital letter for a lower case letter.
   - **RIGHT:** mm (for millimeter, which means 1/1000 of a meter)
   - **WRONG:** MM or Mm (M is the prefix for mega, which means one million; a megameter is a million meters)

Note: A 5K race would be a five Kelvin race, while a 5k race would be a five kilo race, neither of which would be accurate. Kilometer should be pronounced KILL-oh-meet-ur, not kill-AHM- it-ur.

The information above was adapted from the U.S. Metric Association Website, http://www.metric.org . Students are encouraged to visit this Website for more information.

EXAMPLES OF CORRECT AND INCORRECT USAGE

▼ For	▼ Correct Usage	▼ Incorrect Usage
kilometer	km	Km, km., KM, kms, K, k
meter	m	M, m.
millimeter	mm	Mm, mm., MM
liter	L or l	L., l.
milliliter	mL or ml	ML, Ml, mL., ml., mls
kilogram	kg	KG, KG., Kg, Kg., kgr, kgs, kilo
gram	g	G, G., g., gr, GR, GRM, grms
microgram	µg	mcg
hour	h	hr, hrs, HR, h., HR., HRS.
second	s	sec, S, SEC, sec., s., S.
cubic centimeter	cm^3	cc
kilometer per hour	km/h	KPH, kph, kmph, km/hr
kilohertz	kHz	KHz, KHZ, Khz
megahertz	MHz	MHZ, Mhz
hectopascal	hPa	HPa, HPA, Hpa, mb
kilopascal	kPa	KPa, KPA, Kpa
degree Celsius	°C	C, deg CS
kelvin	K	°K, deg K

Required Experimental Research

There will be significant changes in the scoring rubrics this year due to the obvious conclusion that has been drawn that "one size does not fit all." Every project does not fit under what is typically called The Scientific Method whereby a student formulates a hypothesis, devises an experiment, identifies a variable and establishes controls, collects data. You know the drill. There are other kinds of projects which can be designated as "design" projects. These typically may fall under the category of mathematics, engineering, astronomy, and some others.

There are no identifiable controls and variables in a mathematical algorithm. A student may choose to use data collected by OSHA that is in the public domain and apply new meaning to it or may observe some astronomical phenomenon while working on a project using photos downloaded from the Hubble Space Telescope. Another student might fabricate a model of a new kind of heart valve material. None of these projects would lend themselves to the scoring rubric that is used for judging experimental projects.

Below are details how the two different types of projects will be judged. You will have to select whether your project is an Experimental Project or a Design Project.

1 Experimental Research Document

The Experimental Research Document is the grouping of all data pertinent to the investigation. It should include graphs, charts, a log of experiments, interviews with authorities, and an extensive explanation of the investigation. This document, which may number many pages, is the personal property of the researcher. This compilation of personal records is the source from which the Abstract and the Research Summary are developed

The design and arrangement of this document are left to the discretion of the researcher. Since this is a "one-of-a-kind" document, extreme care should be used in handling. It should be exhibited only when the researcher is present at his/her project.

2 Experimental Research Paper

The Experimental Research Paper must be typed, it is to have no binder or protective cover and must be securely stapled in the upper left corner. Students selected to participate in the STEM Exhibition will be assigned an exhibit number. The exhibit number must be written in the *upper left corner of each* copy of the *Abstract, Safety Sheet, and Title Page*, *The Experimental Research Paper* must be no longer than 30 pages (up to 33 pages only if an endorsement is included). The page total includes *Abstract, Safety Sheet*, endorsement (if required), and the Research Summary (title page, table of contents, body of paper, reference list of literature cited, and appendixes of data, graphs, photos, and other items). *The page limit and other criteria will be strictly enforced.* Papers submitted with excess pages will have the excess pages removed and returned to the author. **The student's last name and research title are in the upper right-hand corner of all pages after the Table of Contents**. All of the following sections should be included and in the order listed below.

a. Abstract

The *Abstract* is a concise, one-page abbreviation of the *Research Summary.* It should contain only information or statements that are an inherent part of the *Research Summary.* This paper must use the exact form presented on page 59 and must be typed. The *Abstract* consists of three paragraphs (purpose, procedure, and conclusions) having a total of 250 words or fewer. *The* Abstract *is required for all projects.* Words and phrases should be carefully chosen so that the full impact of the research is conveyed in the minimum number of words. *The limit of three paragraphs consisting of 250 words or fewer will be strictly enforced.* The *Abstract* must be displayed on the front of the exhibitor's display board.

b. Safety Sheet

The purpose of the *Safety Sheet* is to keep students aware of all actual and potential safety hazards. Describing hazards involved with the project on the *Safety Sheet* does not mean the project will be disqualified. The important issue is how the potential hazards were handled.

A statement of the hazards encountered and precautions taken in the project is to be prepared by the student and signed by both the student and the sponsoring teacher. The *Safety Sheet* is found on page 61 of this handbook. High school students who want to be considered for the ISEF will need to download the proper forms. The *Safety Sheet* is required for all projects and must be displayed on the front of the exhibitor's display board.

c. Endorsement

Projects using humans, vertebrates, firearms or potentially hazardous biological agents often pose risks to the student researcher or the test subjects. For this reason, the plans for such projects must be reviewed by a team of qualified scientists and science teachers before experimentation begins. When permission is granted, the student is provided with a document called an endorsement. Endorsements are required for research on vertebrate animals (including humans), human or vertebrate tissue, recombinant DNA, for some projects involving microorganisms, and for use of firearms. (See pages 10 -22 of this handbook to determine whether a project requires an endorsement.) A copy of the endorsement(s) must be displayed on the front of the exhibitor's display board.

d. Research Summary

The *Research Summary* is a condensation of the *Research Document*. It should be an accurate summary of the research done by the student and should reveal the experimentation and/or observations which have been made. Specific criteria have been established for the preparation of this report. Details for writing this paper follow.

The components of the format of the *Research Summary* are as follows:

i. **Title Page:** See page 56 for correct format. No address is to be listed on the Title Page.

ii. **Table of Contents:** The list of topics or matter contained in the paper, including page numbers.

iii. **Acknowledgments:** A listing of persons or agencies that gave the student guidance and helped with this research. It may include a single individual, an organization, a hospital, or some other agency.

iv. **Purpose and Hypothesis:** An explanation of what is to be accomplished by doing this research. A description of the expected outcome should be included.

v. **Background Research:** A discussion of the background information that helps establish the hypothesis and explains procedures adapted for the experiment where necessary. Also any similar research that helps establish the hypothesis or procedure. Other background information about the topic that may help the reader understand the project should also be included. Paraphrased information should be cited as such. No references to the literature are to be placed in footnotes. Citation to particular pages in the text should be in the form (Smith, 2010, p. 10); for a general citation in the text (Smith, 2002). This citation should be placed at the end of the sentence to which it refers. The style for citations is based on the *Publication Manual of the American Psychological Association*, 6th ed., (APA style) which is the official style manual for the Illinois Junior Academy of Science. Materials with a copyright date within the last seven years should be used whenever possible.

vi. **Materials and Methods of Procedure:** A listing of the materials used in the research. How the materials in the research problem were used should be included. The method used in research should be described in sufficient detail so that others may duplicate this work. Drawings and/or photographs are appropriate if they enhance or clarify the explanation.

vii. **Results:** A clear, concise presentation of all the data accumulated as a result of the procedure, including data inconsistent with the hypothesis. All data is valuable. Drawings, charts, graphs, and other items pertinent to the project are important in conveying results and should be included. Caption all photographs. Label all drawings, charts, graphs. Include units of measurement. Always label axes of the graphs.

viii. **Conclusions:** A concise evaluation and interpretation of the data and results. Opinions of the results may be expressed in this section. The conclusions should be limited to results of the investigation and should refer to the stated purpose and hypothesis. The effects of experimental error should be estimated and considered while drawing conclusions.

ix. **Reference List**: A list of at least 12 published articles, books, and other communications, including works either quoted or paraphrased that are actually cited in the Review of Literature. Use the format described in the *Publication Manual of the American Psychological Association*, 6th ed. (APA style). The reference list should be presented alphabetically by author's last name and should be placed at the end of the paper. (The correct style for listing references can be found on pages 30–33 of this Handbook.

Required Design Research

1 Design Research Document

The *Design Research Document* is the grouping of all data pertinent to the investigation. It should include graphs, charts, a log of the work done, interviews with authorities, and an extensive explanation of the investigation. This document, which may number many pages, is the personal property of the researcher. This compilation of personal records is the source from which the *Abstract* and the *Research Summary* are developed.

The design and arrangement of this document is left to the discretion of the researcher. Since this is a "one-of-a-kind" document, extreme care should be used in handling. It should be exhibited only when the researcher is present at his/her project.

2 Design Research Paper

The Design Research Paper must be typed, it is to have no binder or protective cover and must be securely stapled in the upper left corner. Students selected to participate in the City STEM Exhibition will be assigned an exhibit number. The exhibit number must be written in the *upper left corner* of *each* copy of the *Abstract, Safety Sheet,* and *Title Page*. The *Design Rersearch Paper* must be no longer than 30 pages (33 pages if an endorsement is included). The page total includes *Abstract, Safety Sheet*, endorsement (if required), and the Research Summary (title page, table of contents, body of paper, reference list of literature cited, and appendixes of data, graphs, photos, and other items). The *page limit and other criteria will be strictly enforced*. Papers submitted with excess pages will have the excess pages removed and returned to the author. **The student's last name and research title are in the upper right-hand corner of all pages after the Table of Contents.** All of the following sections should be included and in the order listed below.

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b. Safety Sheet

The purpose of the *Safety Sheet* is to keep students aware of all actual and potential safety hazards. Describing hazards involved with the project on the *Safety Sheet* does not mean the project will be disqualified. The important issue is how the potential hazards were handled.

A statement of the hazards encountered and precautions taken in the project is to be prepared by the student and signed by both the student and the sponsoring teacher. The *Safety Sheet* is found on page 61 of this handbook. High school students who want to be considered for the ISEF will need to download the proper forms. The *Safety Sheet* is required for all projects and must be displayed on the front of the exhibitor's display board.

c. Endorsement

Projects using humans, vertebrates, firearms or potentially hazardous biological agents often pose risks to the student researcher or the test subjects. For this reason, the plans for such projects must be reviewed by a team of qualified scientists and science teachers before experimentation begins. When permission is granted, the student is provided with a document called an endorsement. Endorsements are required for research on vertebrate animals (including humans), human or vertebrate tissue, recombinant DNA, for some projects involving microorganisms, and for use of firearms. (See pages 10 -22 of this handbook to determine whether a project requires an endorsement.) A copy of the endorsement(s) must be displayed on the front of the exhibitor's display board.

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ii. **Table of Contents:** The list of topics or matter contained in the paper, including page numbers.

iii. **Acknowledgements:** A listing of persons or agencies that gave the student guidance and helped with this research. It may include a single individual, an organization, a hospital, or some other agency.

iv. **Define a need:** Instead of stating a question, state a need. Can you describe in detail a problem that your design will solve?

v. **Background Research:** A discussion of the background information that helps establish the need and explains procedures adapted for the testing of the prototype or algorithm. Also any similar research that helps establish the above. Other background information about the topic that may help the reader understand the project should also be included. Paraphrased information should be cited as such. No references to the literature are to be placed in footnotes. Citation to particular pages in the text should be in the form (Smith, 2002, p.10); for a general citation in the text (Smith, 2010). This citation should be placed at the end of the sentence to which it refers. The style for citations is based on the Publication Manual of the American Psychological Association, 6th ed., (APA style) which is the official style manual for the Illinois Junior Academy of Science. Materials with a copyright date within the last seven years should be used whenever possible.

   a. **For a design project, the Background Research may include:**
      i. The definition of your target user
      ii. Information about the STEM behind your design area
      iii. Answers to research questions about user needs
      iv. Information about products that meet similar needs
      v. Research about design criteria
      vi. What existing solutions are out there already, and how well do they solve the problem?

vi. **Materials and Methods of Procedure:** A listing of the materials used in the research. How the materials in the research problem were used should be included. The method used in research should be described in sufficient detail so that others may duplicate this work. Drawings and/or photographs are appropriate if they enhance or clarify the explanation.

   a. **Establish Design Criteria**
      i. Engineering Projects: Decide what features your design must have, for example: size, weight, cost, performance, power, etc. Perhaps include a table showing how each design criterion will be addressed by a feature of the product being designed.
      ii. Computer STEM Projects: Creating or writing a new algorithm to solve a problem or improve on an existing algorithm. Discuss the criteria of the algorithm.
      iii. Mathematics Projects: Proofs, solving equations, development of a new theory or explanation, concept formation or mathematical model design.

   b. **Prepare a Preliminary Design**
      i. Engineering projects should have a materials list, programming and mathematical projects do not need a materials list. Engineering projects should include a block diagram or sketch of the design that shows all of the parts or subsystems of the design. Describe how all of the parts of the design will need to work together. Computer science and mathematics projects should list a specific goal or solution that the researcher is trying to attain.
      ii. Build and Test a Prototype. When others are conducting their experiment, investigators doing engineering, computer programming, or mathematics projects should be building and/or testing a prototype of their best design. You should involve targeted users in your testing to get feedback on your design, if possible.

iii. Demonstrate that the design meets each of the design criteria established at the beginning of the project. What needs to be changed and retested? Test results may be included in tables, if applicable. Data analysis may also be a part of this step.

vii. **Results:** Your report should provide all the information necessary for someone who is unfamiliar with your project to understand what you were trying to accomplish, how you did it, and whether you succeeded. The report should not only talk about your successful design attempts, but also the problems you encountered and how you solved them. Be sure to explain what new knowledge has been gained and how it leads to further questions. A clear, concise presentation of all the data accumulated as a result of the procedure, including data inconsistent with the design. All data is valuable. Drawings, charts, graphs, and other items pertinent to the project are important in conveying results and should be included. Caption all photographs. Label all drawings, charts, graphs. Include units of measurement. Always label axes of the graphs.

viii. **Conclusions:** A concise evaluation and interpretation of the data and results. Opinions of the results may be expressed in this section. The conclusions should be limited to results of the investigation and should refer to the stated established design criteria. The effects of experimental error should be estimated and considered while drawing conclusions.

ix. **Reference List:** A list of at least 12 published articles, books, and other communications, including works either quoted or paraphrased that are actually cited in the Review of Literature. Use the format described in the *Publication Manual of the American Psychological Association*, 6th ed. (APA style). The reference list should be presented alphabetically by author's last name and should be placed at the end of the paper. The correct style for listing references can be found on pages 30-33 of this Handbook.

Writing conventions

The Research Summary should be written according to the information in this handbook. A clear and concise presentation is important in scientific communication. Use short, simple sentences in the third person point of view to clearly explain the project. Facts should be grouped logically without being repeated needlessly. The 30 page limit is adequate when this is done well. The paper should be well-typed, without errors in spelling, grammar, punctuation.

Be sure to include all necessary information without going beyond the section guidelines above. Have the Research Summary proofread to help ensure the guidelines have been followed consistently throughout the paper.

Paper layout

The *Research Summary* must be *typed, using double spacing, on only one side* of each sheet of paper, using a standard font and size, such as Times New Roman and 12-point font size.

A margin of 2.5 cm (1") must be maintained on the left and right sides, top, and bottom of each page. All pages must be numbered and referenced in the Table of Contents.

The *Title Page of the Research Summary* must be formatted as shown on page 56. The signature of the sponsoring teacher and the school coordinator as well as the student's name, school, school's zip code and grade must be positioned as shown in the example.

The student's last name and the title of the project must be typed at the upper right-hand corner of each page after the Table of Contents. Each page should have the student's last name and title of the paper at the top right *(Example, Smith: The Effect of Sunlight on Plants).* Use the last name of the first student listed on the Abstract.

Exhibitors are required to have **nine** copies of the *Science Research Summary. Duplicating services will not be provided for those lacking the required number of copies. Students must have the required number of copies when they report to the museum.* Of this number, *eight copies are to be submitted to the Judging Committee and one copy is to be retained at the exhibit site*. The student should always retain the original copy.

Use the Checklist for the Physical Arrangement of the STEM Research Paper on pages 57-58 before submitting the paper.

Reference List Format

The correct style to use for citing references in the Reference List section is discussed in detail in the most current ***Publication Manual of the American Psychological Association, 6th Edition (***APA style). Be careful to follow the exact punctuation, indentation, and format shown in the samples. The Reference List must be double-spaced. Note: If using the *APA Publication Manual*, all *example* references are single-spaced to save space in the *Publication Manual*. The Reference List should be alphabetized according to the first letter of each entry. Entries should be formatted using a hanging indent. Entries should begin flush left and the second and all subsequent lines should be indented. Italics are preferred over the use of underlining. The abbreviation for Page(s), p. or pp. is not used except in references to newspapers. Electronic sources must provide the date the information was retrieved, and also the name and/or address of the source.

The following are examples of how to cite a reference in the *Review of Literature*

1. One method of citing a direct quote in the research paper should be in the form: She stated, "The 'placebo effect', which had been verified in previous studies, disappeared when behaviors were studied in this manner" (Miele, 2001, p.276), but she did not clarify which behaviors were had been studied.
2. A paraphrasing of the text should be in one of the following forms:-as Smith (2002) demonstrated… -as has been demonstrated (Smith, 2002).

Sources of Information

▼ *Books*

Book - One author:

Arnheim, R. (2001). *Art and visual perception*. Berkeley, CA: University of California Press.

Book - Multiple authors:

When a work has between two and six authors, cite all authors. When a work has more than six authors cite the first six authors followed by "et al." to indicate the remaining authors.

Festinger, L., Riecken, H., & Schachter, S. (2003). *When prophecy fails*. Minneapolis: University of Minnesota Press.

West, S., Sandler, I., Tein, J., Ivy, P., Patterson, H., Roeder, K., et al. (2001). *Nerve cells and insect behavior*. Cambridge, MA: Harvard University Press.

Book- Corporate author:

Institute of Financial Education. (2001). *Managing personal funds* Chicago: Midwestern Publishing.

Book - Edited volume:

Maher, B. A. (Ed.). (2003). *Progress in experimental personality research*. New York: Academic Press.

Letheridge, S., & Cannon, C.R. (Eds.). (2001)**.** *Bilingual education: Teaching English*

Book - No author:

Experimental psychology. (2004). New York: Holt.

Book - Work in an anthology:

Rubenstein, J. P. (2003). *The effect of television violence on small children***.** In B.F. Kane (Ed.),

Television and Juvenile Psychological Development (pp. 112-134). New York: American Psychological Society.

▼ *Journals-Magazines-Newspapers*

Articles in journals or magazines with continuous pagination:

Passons, W. (2001). Predictive validities of the ACT, SAT, and high school grades for first semester GPA and freshman courses. *Educational and Psychological Measurement, 27*, 1143-1144.

Posner, M.I. (2000, October 29). Seeing the mind. *Science,* 262, 673-674.

Articles in journals or magazines with non-continuous pagination:

Because pagination begins anew with each issue of the journal, it is necessary to include the issue number in italics followed by the volume number in parentheses, if applicable. Note that there is a comma between the issue number and the page numbers, but no comma between the italicized volume number and the issue number.

Sawyer, J. (2003). Measurement and prediction, clinical and statistical. *Psychological Bulletin***,** *66*(3), 178-200.

Mellers, B. A. (2005). Choice and consequences. *Psychological Bulletin, 126,* 1040-1049.

Daily Newspaper article:

Schwartz, J. (2005, September 17). Urbana firm obstacle to office project. *The Champaign-Urbana News-Gazette*, pp. A1, A4, A9-11.

Daily Newspaper article (no author):

President Clinton puts 'human face' on health-care plan. (2002, September 6). *The New York*

Times, p. B14.

Articles in weekly periodicals:

Kauffmann, S. (2005, October 18). On films: class consciousness. *The New Republic*, p.30.

Articles in monthly periodicals:

Chandler-Crisp, S. (2003, May). Aerobic writing: A writing practice model. *Writing Lab Newspaper*, pp. 9-11.

▼ *Other Sources*

Encyclopedia:

Photosynthesis and plants. (2004). *Encyclopedia Americana* (Vol. 22, p. 453).
New York: Americana Corporation.

Entry in an Encyclopedia:

Wagner, D.H. (2002). Relativity. In *The new encyclopedia Britannica* (Vol. 26, pp. 501-508). Chicago: Encyclopedia Britannica.

Encyclopedia article, CD-ROM:

Basic form

Author/editor (if given). (Date). Title of material accessed. In *Source*. Retrieved Publication medium, *edition or version (if relevant)*. Location: Name of Producer.

Example with author:

Daniel, R. T. (2003). The history of Western music. In *Britannica Online: Macropaedia.* Retrieved CD-ROM. Carlsbad, CA: Compton's NewMedia, Inc.

Example without author:

Genetic engineering. (2001). In *Compton's Interactive encyclopedia* , *Version 2.0*. Retrieved CD-ROM. Carlsbad, CA: Compton's NewMedia, Inc.

Film or videotape:

Weir, P.B. (Producer), & Harrison, B.F. (Director). (2003). *Levels of consciousness* [Videotape].

(Available from the American Psychological Association, 750 Second Street, Boston,

MA 73002-4224).

Interviews – Published:

Archer, N. (2004). [Interview with Helen Burns, author of *Sense and Perception*] *Journal of Sensory Studies*, *21*, pp. 211-216.

Interviews- Unpublished:

Unpublished interviews do not need a reference page entry because they are what the Publication Manual of the APA calls "personal communications" and so "do not provide recoverable data."

Davis, N. (2003, October 11). Personal interview.

Recording:

Shocked, M. (1992). Over the waterfall. On *Arkansas traveler* [CD]. New York: PolyGram Music.

▼ *Electronic Sources*

Electronic formats can be found at: http://www.apa.org/science/pubs.html

World Wide Web, Home page/Secondary page:

Basic form

Author/editor (if known). (Revision or copyright date, if available). Title of page. Publication, Page number(s). Retrieved Date, from Protocol: Site/Path/File

Example

Goizueta, R. C. Annual report to share owners. Coca-Cola Newsletter, 1- 23. Retrieved October 13, 2005, from http://www.cocacola.com/co/chairman.html

Periodical – Electronic:

Basic form

Author, A. A., Author, B. B., & Author, C. C. (2000). Title of article. *Title of Periodical, xx,* xxxxxx. Retrieved month day, year, from source.

Journal article - Electronic:

Basic form

Author. (Date). Title. *Journal Title, volume,* paging. Retrieved Date, from URL

Example

Koehn, D. (2001). The ethics of handwriting analysis in pre-employment screening. *Journal of Applied Psychology, 78,* 443-449. Retrieved October 9, 2001, from PsycARTICLES database.

Magazine article - Electronic:

Basic form

Author. (Date). Title. *Magazine Title, volume* (if given), paging. Retrieved Date, from URL Protocol: Site/Path/File

Example

Rosner, H. (2003, March 4). Will e-mail become j-mail? *Brandweek 37*, 30. Retrieved from ABI/INFORM. telnet://melvyl.ucop.edu

Daily Newspaper article – Electronic:

Basic form

Author. (Date). Title. *Newspaper Title* . Retrieved Date, from URL Protocol: Site/Path/File

Example

Markoff, J. (2005, June 5). Voluntary rules proposed to help insure privacy for Internet users. *New York Times.* Retrieved November 21, 2006 from http://www.nytimes.com/library/cyber/week/y05dat.html

Newsgroup article - Electronic:

Basic form

If the author's name is available list it last name first. If only a screen name is available, use the screen name. Provide the exact date of posting. Follow the date with the subject line of the message. Do not italicize it. Provide any identifier for the message in brackets after the title. Finish the reference with ***Message posted to*** followed by the address of the newsgroup. Note that the protocol is ***news.***

Author (if given). (Date). Subject line of message. Message posted to news://Protocol:Topic.Subtopic(s)

Example

Chalmers, D. (2000, November 11). Seeing with sound [Msg 1]. Message posted to news://sci.psychology.consciousness

Personal communication - Electronic:

Basic form

Communicator (personal communication, Date)

Example

Omar, B. W. (personal communication, June 5, 2005)

APA Resource Websites

These materials will introduce you to APA documentation, step-by-step instructions, Format, Citations, and Reference Lists.

http://www.apastyle.org/apa-style-help.aspx

http://www.apastyle.org/learn/quick-guide-on-references.aspx#Websites

http://www.stylewizard.com/apa6index.html

http://www.noodletools.com

http://www.easybib.com

http://www.rapidcite.com

http://www.citationmachine.net

http://www.wisc.edu/writing/Handbook/DocAPA.html

http://www.cws.illinois.edu/workshop/writers/citation/apa/index.html

http://www.zotero.org/

http://citationmachine.net/index2.php

Exhibit Guidelines

Display Design and Evaluation

- **The exhibit must not exceed dimensions of 61 cm (24") front to back and 107 cm (40") from side to side. Build the exhibit no higher than 152 cm (60")** No overhang is allowed. If the scientific apparatus exceeds the height limit, use photographs to show what has been done. No part of the project may be placed on the floor.
- Construct your own exhibit; teachers and parents are to provide only the necessary guidance, encouragement, and constructive criticism.
- Keep the title of your project brief, captivating, and prominently visible on the exhibit. **It may contain no more than 45 characters and spaces**. Titles in excess of 45 characters will be shortened to fit into available space on the entry form.
- Determine the best way to present the research. The presentation may include graphs, charts, and demonstration of design apparatus only (must meet safety inspection guidelines). **Attach a copy of your Abstract, Safety Sheet, and Endorsement(s) (if necessary) to the front of your display board**. These documents must be part of your display board and cannot be attached to the board with clips, block the view of posted information on the display board or overhang on any side of the display board. The Abstract and Safety Sheet can be reduced to one half of a page, 8.5 inches (verticle) x 5.5 inches (horizontal). Less than 75% reduction is not acceptable..
- No apparatus for Experimental or Design projects will be allowed to be displayed. You may only bring your display board and computer. Pictures, drawings, diagrams and video footage of experiment should replace equipment. Computers may be used to enhance the presentation, **but media presentations, such as, Power-Point, Prezi or Google Slides, are not acceptable**.
- Exhibits must conform to size limitations. No easels or tripods are allowed on the floor around the exhibit. Floor-mounted exhibits will not be considered for competition.
- Exhibits must be constructed so that wall space is not required. All exhibits must be freestanding. Objects may not be attached to draperies or the exhibitor identification sign. No lighting of any type may be used to illuminate the exhibit. No items may be stored under the exhibit table.
- The City Science Fair Exhibits Committee will provide space on a table, a table covering, and a identification sign. The student must provide all other needs of his/her exhibit (for example, tape, staples…). The exhibit space can only accommodate a display of the following dimensions: 61 cm deep, 107 cm wide, and 152 cm high. No exceptions are made.
- All equipment and materials brought into the exhibit area during the exhibition is at the risk of the exhibitor. The Science Fair Exhibits Committee, the CPS Student Science Fair, Inc., and the Illinois Institute of Technology assume no responsibil-ity for loss or damage to such equipment and materials.
- Normal wear and tear on exhibits is to be expected during the time the exhibition is open to the public. For this reason, each exhibitor is advised to protect his/her project as completely as possible. Valuable equipment should be secured to prevent its removal and should be safely stored and guarded when the exhibitor is away from his/her project.

Presentation Tips

The exhibitor's personal appearance adds to the attractiveness of the exhibit. Students should dress neatly and appropriately for the occasion.

- Be well versed in as many aspects of the project as possible.
- Be enthusiastic about the project.
- Prepare not only for direct questions pertinent to the research but also for related questions.
- The Research Summary paper must be in English. Students who require a language interpreter or sign language interpreter are encouraged to seek the assistance of their sponsoring teacher to make arrangements to have one available during the judging session. The following resources are available: Language Line, (800) 752-6096, contact person is Tom Costello; Sign Language Interpreter, CPS Office of Diverse Learner Support & Services, (773) 553-1880.

Safety Guidelines for Project Display

The City Exhibition for Student STEM Research is an opportunity to communicate research findings. Part of the judging process is to evaluate each exhibitor's ability to present research findings to judges. By this time, experiments have been completed and data have been collected, analyzed, and interpreted. This is not the time to perform experiments. The City Exhibition for Student STEM Research is not a place for demonstration. All lab equipment and prototypes should be left at home or at school. Displaying pictures, drawings, and diagrams on the display board should replace display of equipment at the exhibit area.

Only display boards and a computer (if required) will be allowed to be displayed in the exhibit area.

Glassware Hazards

No glassware may be displayed on the display board and/or on the table.

Chemical Hazards

No chemicals may be displayed. Photographs or drawings may be attached to the presentation board to illustrate chemicals used in the experiment. Food or drugstore products, such as toothpaste, deodorant, mouthwash, antacids, sleep aids, aspirin, sunscreens, and so forth, may not be displayed on the display board or on the table, Empty packages of products may not be displayed on display board or table. Water may not be displayed.

Hazardous Materials

Explosive, flammable, corrosive, or highly poisonous substances are not to be brought to any exhibit area. This includes gasoline, alcohol, and lighter fluids. Armed rockets or their propellants are prohibited. Cylinders for compressed gas or aerosol cans are not allowed in the display area. Batteries containing any type of liquid electrolytes are not allowed. No firearms of any type may be brought to any exhibit area. No drones may be displayed in the exhibit area.

Fire Hazards

Open flames, torches, electric heaters, or burners are not to be displayed. No apparatus which has fire hazards can not be displayed in the exhibit area.

Radiation Hazards

No radiation hazardous materials are allowed in the exhibit area.

Projects dealing with radiation from cathode rays, X-rays, or radioactive materials must present no hazard to the public or the student exhibitor.

Laser Hazards

No lasers or laser pointers of any kind may be displayed on display board or on the table in the exhibit area.

Any laser used in an experimental or design project must be no greater than Class 2 (visible-light continuous wave lasers under 1 mW such as red laser pointers) without special registration from the State of Illinois (see below). In general, the lowest class laser possible should be used for a given project. The revised laser classification system along with associated hazards and safety precautions are reviewed at: http://en.wikipedia.org/wiki/Laser_safety. Each experiment using lasers should clearly state the safety precautions

taken. Under special circumstances, where the use of such a laser is absolutely critical to the success of a project, Class 3R lasers (also labeled as Class 3A for older lasers) may be used. These lasers require written documentation of registration from the State of Illinois and need to follow all applicable safety precautions required by the State (http://www.illinois.gov/iema/NRS/RadSafety/Pages/Laser.aspx). The scientific justification for using a 3R / 3A laser must be explained, and incorporation of these extra safety precautions must be written into the experimental procedures. Among other practices, we require that 3A lasers use a protective housing or barricade which, when in place, prevents human access to the beam during operation. Under no circumstances may lasers above Class 3R / 3A be used in any project.

Ultraviolet Light Sources

No ultraviolet light source may be exhibited on the display board or any place in the exhibit area. Exhibitors may show light source by using pictures displayed on their display board.

Electrical Hazards

No electrical apparatus for experimental or design projects can be displaced in the exhibit area. Exhibitors should adhere to the Electrical Hazards safety rules.

All electrical equipment must be constructed according to standard electrical safety codes. If there is doubt, consult with an electric shop teacher or an electrician. The city of Chicago's electrical code requires all electrical devices connected to the circuits within a building to be grounded using type SO three-wire conductors.

All wiring, switches, and metal parts carrying current must be completely enclosed by barriers on all sides to absolutely prevent receiving an electrical shock.

Mechanical Hazards

No mechanical apparatus may be displayed.

All moving parts of machines and/or electrical circuitry must have adequate protective coverings or guards.

Push-buttons and levers must be securely mounted. Materials and construction must be durable. All moving parts must be firmly attached. Power-driven parts must be protected with guards.

Biological Hazards

Cigarettes and tobacco may not be displayed. Empty packages may not be displayed on display board or in exhibit area.

No live or preserved invertebrate or vertebrate animals may be exhibited. All vertebrate projects, including those dealing with humans, must have an approved *Vertebrate Animal Endorsement*. (See pages 13-14 of this handbook for rules regarding animal experimentation.)

It is imperative that students not be exposed to any bacteria that are considered pathogenic; for this reason, two rules are very strictly enforced:

1. *No primary or secondary cultures taken from humans or other warm-blooded animals may be displayed. This includes, but is not limited to, skin, throat, mouth, and other areas.*
2. *No display of cultures/fungi is permitted at the exhibit area, although they may be used in experiments if incubated at or below room temperature.*

Hypodermic syringes, needles, and surgical tools cannot be part of the display board or displayed at the exhibit area.

Wild cultures cannot be displayed at a STEM exhibition.

No materials may be displayed that can undergo a chemical or biological change**.** This includes molds, bacteria, yeasts, pond water, aquatic plants, and other potentially gas-producing substances. Those projects should display photographs.

All safety rules must be followed. Violations may result in disqualification. Refer all questions about safety to the Safety Committee Chairperson.

Chicago Public Schools Student Science Fair, Inc. is an affiliate of the Illinois Junior Academy of Science and the International Science and Engineering Fair. As such, Chicago Public Schools Student Science Fair, Inc. is obligated to enforce the rules of those organizations even when their rules change after the publication of the handbooks. Every attempt is made to inform coordinators and sponsors of these rule changes as soon as they are known. Students selected to participate in STEM Exhibitions will receive the handbook of the appropriate organization which contains specific rules that pertain to the organization.

Safety Sheet

The *Safety Sheet* (see page 61) signed by the student and his/her sponsor must be included in the *Research Summary* pages 25-26 (Experimental Research) and pages 27-28 (Design Research). This sheet must specify any and all actual and potential hazards, as well as the specific measures used as safeguards. *Any violations of safety rules may result in disqualification and removal from the exhibition*. The *Safety Sheet* must be displayed on the front of the exhibitor's display board. It may be reduced to fit on a half sheet of letter-size paper. Displayed Safety Sheet can not be smaller than 8.5 inches (vertical) x 5.5 inches (horizontal).When making a copy, print at 75% reduction of original page. See page 34 for more details.

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 science 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 provision 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. Countering 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 as Test Subjects –for any projects involving humans-even surveys.
_____Microorganism-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). Print at 75% reduction.

Part Two: Symposium, Essay, Cover Design Contest, International Science & Engineering Fair, and QED

STEM Exhibition Symposium

A major part of the annual Chicago Public Schools Student STEM Exhibition is the Symposium Competition. The Symposium is an opportunity for the exchange of ideas between a student presenter and a panel of university and industrial scientists in a particular area of STEM. This differs from the Exhibit presentations which are several discussions between the student scientist and individual judges at different times. Emphasis is placed on a student's inherent scientific interest, gained knowledge and his/her ability to express himself/herself completely and correctly in oral and written form on their research

Like STEM Exhibition exhibitors, symposium entrants are required to conduct original research as a basis for the Symposium paper. However, this research need not be exhibited at the City STEM Exhibition. The research project and paper requirements for exhibits and the Symposium are identical. The page limit of 30 pages also applies. Only the format for presentation differs.

Entry Procedure

Each school is allowed to submit to the Symposium & Essay Committee no more than 30 research papers (including both Symposium papers and Essay papers). The school STEM Exhibition coordinator should screen the papers before submission. The School STEM Exhibition coordinator must make sure four copies of each qualifying paper including Symposium Entry Form and the complete symposium paper (of which the sequence and contents are listed on page 89) are received by Jennifer Patush, Symposium & Essay Co-Chairperson no later than **Friday, January 10, 2020. Additionally, each Abstract, Safety Sheet, Endorsement(s) and Research Summary must be sent as one PDF file to cpssciencefair@gmail.com by this deadline**. There will be no extension of the deadline. Papers submitted after the deadline will be stamped Deadline, dated, and returned to the author.

Students entering both the Symposium and the Exhibits presentations need to submit four copies for Symposium in addition to the copies needed for the Exhibit presentation.

Papers submitted by the due date will be read and evaluated by the Screening Committee. **All schools submitting Symposium Papers are required to send Readers to Curie High School on January 25, 2020. The Symposium Reading hours are from 9:00am-3:00pm**. All papers that do not follow the guidelines in this handbook (pages 25-28) will be returned to the student. Students and their sponsors whose papers are selected will be notified by email on February 14, 2020 and given a complete set of instructions for participation in the City STEM Exhibition Symposium. Examine the Symposium Paper/IJAS State Essay Checklist on page 89 for helpful information in completing the Symposium paper.

Symposium Program

An orientation meeting for all finalists will be held at the Museum of Science and Industry before the Symposium date to familiarize the students with the Symposium room locations and available audiovisual equipment. Participants will receive information about the presentation format and presentation schedule. During the Symposium presentation, each finalist will be given 10 minutes to present his/her paper, followed by a five-minute question-and-answer period. The presentation may be read, given from notes, or a computer presentation (preferred). Students may use programs such as Powerpoint, Prezi, or Google Slides to create their presentation.

All participating students must remain for the entire morning or afternoon session. Computers with LCD projectors will be available for student use during their presentation. The main task of the participant is to present (in the time allotted) a recapitulation of his/her Research Paper, highlighting the Purpose, Hypothesis, Review of Literature, Materials, Procedure, Results, and Conclusion(s). Judges will not accept revisions of student papers after they have

been received by the Symposium & Essay Committee. Further research, conducted after the regional and/or city exhibitions, however, may be presented as a written addendum given to the judges at the time of the oral presentation.

The 15 top scoring Symposium participants proceed to the IJAS state paper session and will each receive cash awards.

State Essay Contest

Students in Grades 7 through 12 may compete with a library research paper in the "Essay Only" segment of the Illinois Junior Academy of Science Paper Session Competition. However, this does not rule out the possibility of personal experimentation as a supplement to the library research.

Topic 2020 - "Revolutionizing Science"

General IJAS Essay Guidelines:

Make sure the topic is narrow enough to write a proper essay--do not try to overview every topic that relates to the theme.

- Choose a topic that has been developed or is being theorized.
- Support your topic's significance through research.

Structure of the Essay:

- The author must follow the essay theme: as specified in this handbook and on the www.cpsssf.org website
- The author must use the formal essay style that adequately expresses the chosen topic.
- The essay must be original and follow the basic rules of essay writing.

Essay Entry Procedures

Students are to submit to the school coordinator four copies of their essay and three copies of the 2019 Exhibition of Student STEM Research Official Entry Form for Symposium and Essay Competition. Each essay must include the Essay Cover Page. Students should keep the original copy of their essay. Essays are due to Jennifer Patush, by **Friday, January 10, 2020**. The physical arrangement of the essay must be as follows:

- Essay Cover Page (See sample in the Appendix, page 91) Give the essay a title that is indicative of the content of the essay.
- If supplemental experimentation is used, a Safety Sheet and any applicable endorsement(s) must be attached.
- Table of Contents
- Introduction
- Body–Discussion, including an alternate point of view or counter argument
- Conclusion or Summary
- Reference List – A list of published articles, books, and other communications actually cited in the essay, using APA format. Do not refer to this list as a bibliography.

The essay should be 1,200 to 1,500 words. The essay should include at least 12 current references and no more than one reference to an encyclopedia. Students are to type their last name and the title of the essay at the upper right-hand corner of each page. Papers should follow the basic rules of essay writing and should be carefully proofread. (See Symposium Paper/IJAS State Essay Checklist on page 89 for helpful information.)

Entries are to be received by Jennifer Patush at Curie High School, GSR #37, by by Friday, January 10, 2020. *This deadline will not be extended*. Papers submitted after the deadline will be returned unopened to the author. All schools submitting Essays are required to send Readers to Curie High School on January 25, 2020. The Symposium Reading hours are from 9:00am-3:00pm. For additional information, contact the STEM Exhibition coordinator at your school.

Note: When submitting papers through GSR, send an email to cpssciencefair@gmail.com. You will be notified when papers are received.

IJAS Cover Design Contest

Any student in Grades 7 through 12 is eligible to take part in the cover design contest. Students do not need to compete with a project, paper, or essay in local, area, or state science expositions to be eligible. Submit all entries to: IJAS Cover Design CPS, Student Science Fair, Inc., P.O. Box 803945, Chicago, IL 60680-3945. Entries must be received by December 17, 2019.

This year the theme of the design entry is ***Revolutionizing Science.*** Use an 8½" X 11" sheet of white paper for each entry. The design must be oriented portrait, not landscape. Indicate the words Illinois Junior Academy of Science on your design entry. This should be large enough to be seen. The design must be in black ink on white paper and must not be computerized. Keep the design simple. Please include the following information on the back of your entry: Your name, home mailing address, home phone number, school name, sponsor name, state region number (which is 3 for all Chicago public schools) and sponsor's email address.

The design committee will judge all entries. The top entries will be presented to the IJAS Student Officers and the final voting will take place. The entries of the top 10 finalists will be displayed at the State Science Exposition in May, and the designers of the winning entries (banquet brochure, T-shirt, and paper session brochure) will receive monetary awards.

International Science and Engineering Fair

Selection of Students

Four students who receive Gold awards at the City Exhibition of Student STEM Research will be selected to attend the International Science and Engineering Fair, held May 10 – 15, 2020, in Anaheim, California. All expenses for the international competitions are funded by the Chicago Public Schools Student Science Fair, Inc. and its corporate sponsors.

Required Approvals and Forms

At the same time that students in Grades 9–12 apply for Scientific Review Committee endorsements and approvals, they should complete the required ISEF forms. If a project involves endorsements, it will be necessary to establish an Institutional Review Board at the local school. All students must meet with the project sponsor, obtain approval from the Scientific Review Committee, and complete the required ISEF forms before beginning experimentation.

Find specific information about International Science and Engineering Fair rules and appropriate documents at: https://student.societyforscience.org/international-rules-pre-college-science-research

Judging criteria for ISEF can be reviewed at: https://student.societyforscience.org/judging-criteria-intel-isef

QED

QED is Chicago's only Youth Math Symposium, essentially a science fair for participants whose projects are in mathematics, applied mathematics, or computer science. Participants are divided into three divisions: Junior, grades 5-6; Intermediate, grades 7-8; Senior, grades 9-12. Any public school student in Chicago (including those attending charter schools) at these grade levels is eligible to participate.

To participate in QED, students need to complete an original paper on a math or computer science research topic. Junior and Intermediate papers are 3-5 pages, and Senior papers are 10 pages or more. Instructions for the content of the paper can be found at our website at https://mathcirclesofchicago.org/qed/. Participants also bring a traditional science fair presentation display to facilitate their presentations at QED.

Students interested in completing a QED project but who need support can participate in the QED Advisor Program. Email qed@mathcirclesofchicago.org to inquire. Generally QED Advisors are graduate students in Mathematics from Chicago universities (DePaul, the University of Illinois at Chicago, University of Chicago, etc.) who will provide support through email and phone calls. Also consider registering for sessions at the Math Circles of Chicago--attending these sessions are an excellent way to generate research ideas: https://mathcirclesofchicago.org/

QED will be held on Saturday, December 7, 2019 at Walter Payton College Prep. Students can pre-register after September 1st but no later than November 12, 2019; Senior papers must be submitted by this date (Intermediate and Junior papers do not need to be submitted prior to the Symposium itself).

At QED, each presentation is evaluated by two or three judges; the rubric our judges use is posted on our website. Projects are placed into three categories: Successful Contributor, Contributor with Distinction, and Contributor with High Distinction. The top six Senior level projects, as well as, the top six projects at the Intermediate level automatically qualify for the Citywide 2020 Exhibition of Student STEM Research. These projects will need to adhere to the rules and regulations of participating in the City 2020 Exhibition of Student STEM Research as published in the 2020 STEM Exhibition Handbook.

Patent and Copyright Information

You may want to consider applying for a patent or copyright if you want to protect your work. More information on Patents can be found at: http://www.uspto.gov or you can contact the Customer Support Center of the U.S. Patent and Trademark Office, at (800) 786-9199 or (571) 272-1000 for patent information. The Copyright Office at the Library of Congress can be reached at (202) 707-3000 or (877) 476-0778. You can also go to: https://www.copyright.gov/ for copyright information.

Additional information can be obtained from two libraries that serve as patent depositories in Illinois: The Illinois State Library in Springfield; and the Harold Washington Library of the Chicago Public Library system (Science and Technology, 4th Floor).

General information concerning patents

https://www.uspto.gov/patents-getting-started/general-information-concerning-patents

What is a patent?

A ***patent*** is granted by the federal government to an inventor "to exclude others from making, using, offering for sale, or selling the invention throughout the United States or importing the invention into the United States." There are three types of patents:

- ***Utility*** patents may be granted to anyone who invents or discovers any new and useful process, machine, article of manufacture, composition of matter, or any new useful improvement thereof.
- ***Design*** patents may be granted to anyone who invents a new, original, and/or ornamental design for an article of manufacture.
- ***Plant*** patents may be granted to anyone who invents or discovers and asexually reproduces any distinct and new variety of plant.

Answers to the following questions can be answered by reading *Basic Facts About Patents*.

How long does patent protection last?

Who owns the patent rights?

How do I get a patent?

Do I need to hire a lawyer?

What about patent promotion organizations?

Do I need to do a patent search before I apply?

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Part Three: Guidelines for Judging

Judging Criteria for Posters and Papers – Experimental Investigation

The following are criteria for judging used by the Illinois Junior Academy of Science. The CPS Exhibition of Student STEM Research uses the same criteria with some modifications where necessary

- There are usually three scoring levels for each factor being examined during the judging procedure.
- Student experimenters should strive to achieve the top criteria listed below.

Evidence of Scientific Processing Skills

Science Processing Skills

- Exhibits a thorough understanding and the application of the scientific method. The student has acquired scientific skills.

Scientific Approach: Overall

- Has a well-defined problem and a clearly stated hypothesis. Uses a logical, orderly method for solving the problem. Problem was solved using scientific principles. Method was appropriate and effective.

Scientific Approach: Variables

- The independent (experimental) variable(s) have been thoroughly defined. Those significant variables not manipulated have been controlled.

Scientific Approach: Control/Comparison Group

- A control (known standard) was present OR when a control group is not possible or appropriate a comparison was made among trial groups.

Accuracy of Data and Observations

- An adequate sample size and/or sufficient repetitions were performed to gather enough data to reach a reliable conclusion. Data collected is numerical and metric, if applicable. Observations were carefully recorded and accurate.

Data Analysis and Discussion

- The data has been analyzed and its importance has been discussed. Logical inferences were made.

Experimental Error

- Measurement error affecting the conclusion has been considered and discussed.

Validity of Conclusion

- Conclusion is consistent with data and observations and is supported by the data collected.
- Conclusion referred to purpose and hypothesis.

Originality

- Demonstrates a novel approach and/or idea. Exhibits a creative approach to problem-solving.

Scientific Communication - Display

Information: Experimental

- Gives complete explanation of the project. Display includes graphics, charts, and/or pictures.

Artistic Qualities

- Display board is neat, organized, and appealing. No spelling errors are present.

Scientific Communication - Oral Presentation

Presentation Quality

- Clear presentation; concisely summarizes the project. Information is relevant and pertinent. Student exhibits a thorough understanding of their topic area.

Dynamics

- Speaks fluently with good eye contact; polite, dynamic, and interested in their project.

Written Report

The parts of the written report should be evaluated for their merits as further evidence of scientific processing skills.

Abstract

- Abstract present; contains a concise summary of the purpose, procedure, and conclusion in 250 words or less. The proper IJAS form was used.

Safety Sheet

- The safety sheet identifies all of the major safety hazards, precautions taken, and any endorsement sheets (if necessary), which describe the use of human or non-human vertebrates or microorganisms, and ensures the safe use of such organisms. The proper IJAS form was used.

Title Page/Table of Contents

- Title page is clear and concise. The table of contents is complete and includes pagination.

Acknowledgements

- Credit has been given to those who have helped with the project.

Purpose and Hypothesis

- The testable question (purpose) has been identified and a prediction has been made.

Background Research (BR)

- Background research is in-depth and the information is pertinent and supports the experiment. BR is adequately cited using APA format.

Materials

- All materials are listed and measurements are in metric, if applicable.

Procedure

- Procedure is complete and easily followed; all steps included. Measurements are in metric, if applicable.

Results

- Results (data) are organized in tables or graphs and can be easily read by someone not familiar with the work. Discussion or interpretation of data and effect of error should be included.

Conclusion

- A concise evaluation and interpretation of the data and/or results.

Reference List

- Quality, quantity and variety of sources are adequate for topic. Sources listed are cited within Background Research.
- Most sources are current.

Technical Aspects

- Good grammar and spelling are evident. The student's last name is in the upper right-hand corner of all pages after the table of contents. Font size and type are appropriate.

Neat and Orderly

- Is neat and follows the Policy and Procedure Manual order as illustrated on left side of judging sheet

Judging Criteria for Projects and Papers – Design Investigation.

Evidence of Design Processing Skills

Design Processing Skills

- Exhibits a thorough understanding and the application of the design process. The student has acquired design skills.

Design Approach: Overall

- Has identified a need or real world problem. Uses a logical, orderly method for addressing the problem or need. Method was appropriate and effective.

Design Approach: Performance Criteria

- Clear performance criteria have been developed to address the features of the product, algorithm, proof, model, etc.

Design Approach: Preliminary Design Plan

- A clear plan had been presented using a block diagram, flowchart or sketch. The design plan shows all of the parts and/or subsystems of the design and how all parts of the design work together.

Constructing and Testing the Design Prototype

- Have constructed and tested a prototype of their best design. This may involve targeted users and/or analysis ofdata sets. (This may or may not include traditional data).

Redesign and Retest

- Shows evidence that changes in design were made to better meet the performance criteria established at the beginning of the project. Test results may be included in tables, if applicable. Data analysis/validation may be present.

Validity of Evaluation/Conclusion

- The conclusion accurately reports the successes and failures of the preliminary design, what changes were made, and how the redesign more closely met the performance criteria.

Originality

- Demonstrates a novel approach and/or idea. Exhibits a creative approach to design. Shows evidence that other designs were investigated that addressed the same need or real world problem.

Scientific Communication - Display

Information: Experimental

- Gives complete explanation of the project. Display includes graphics, charts, and/or pictures.

Artistic Qualities

- Display board is neat, organized, and appealing. No spelling errors are present.

Scientific Communication - Oral Presentation

Presentation Quality

- Clear presentation; concisely summarizes the project. Information is relevant and pertinent. Student exhibits a thorough understanding of their topic area.

Dynamics

- Speaks fluently with good eye contact; polite, dynamic, and interested in their project.

Written Report

- The parts of the written report should be evaluated for their merits as further evidence of design processing skills.

Abstract

- Abstract present; contains a concise summary of the purpose, procedure, and conclusion in 250 words or less. The proper IJAS form was used.

Safety Sheet

- The safety sheet identifies all of the major safety hazards, precautions taken, and any endorsement sheets (if necessary), which describe the use of human or non-human vertebrates or microorganisms, and ensures the safe use of such organisms. The proper IJAS form was used.

Title Page/Table of Contents

- Title page is clear and concise. The table of contents is complete and includes pagination.

Acknowledgements

- Credit has been given to those who have helped with the project.

Problem or Need

- Described in detail a real world problem or need.

Background Research (BR)

- Background research is in-depth and the information is pertinent and supports the design. BR is adequately cited using APA format.

Design Plan

- Design plan is complete and easily followed; all of the parts and/or subsystems of the design are included.

Results of Testing and Redesign

- Testing results have considered the parts and subsystems that required redesign in order to meet the performance criteria, and the redesign shows the changes in parts and subsystems.

Evaluation/Conclusion

- A concise evaluation and interpretation of the design, redesign and testing were made as they are related to the performance criteria.

Reference List

- Quality, quantity and variety of sources are adequate for topic. Sources listed are cited within Background Research.
- Most sources are current.

Technical Aspects

- Good grammar and spelling are evident. The student's last name is in the upper right-hand corner of all pages after the table of contents.
- Font size and type are appropriate.

Neat and Orderly

- Is neat and follows the Policy and Procedure Manual order as illustrated on left side of judging sheet.

Judging Criteria taken from IJAS Policy and Procedure Manual. (IJAS.org)

Part Four: Awards

In addition to the awards of *Gold, Silver*, and *Bronze*, the following presentations will be made.

Special Awards and Tours

Companies and organizations offer special awards and tours to selected exhibitors. These awards are made on the basis of criteria established by the companies or organizations that provide the special award. Judging in this category involves numerous diversified criteria and does not always correspond to the general evaluative judging all participants at the city STEM Exhibition undergo. It should be noted that many of these awards are based on the subject matter of the project as well as its quality.

International Science and Engineering Fair (ISEF) Awards

Four high school students selected from among the projects earning Gold awards will compete at the ISEF in Anaheim, California, May 10-15, 2020. Additional information can be found at the Student Science, Intel ISEF website: http://www.societyforscience.org/isef; or email: isef@societyforscience.org

Illinois Junior Academy of Science (IJAS) Awards

Fifteen symposium participants and forty-five (45) exhibitors receiving a Gold award will be eligible to compete in the statewide competition held at Millikin University, Decatur, Illinois on Friday and Saturday, May 1, 2020 and May 2, 2020. Additional information can be obtained from the IJAS website: http://www.ijas.org

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Part Five: Programs

Research Grant Programs

Students who have started on their investigation by completing their library research and formulating an experimental design may apply for funds to reimburse expenses for supplies and equipment not normally available at the local school. All reusable equipment reimbursed through either the mini or maxi grant becomes the property of the school when the project is completed for future students to use.

The ***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. The application may be found on pages 79 – 80 of this Handbook, and may be duplicated for your use. The Research Grant Committee awards grants on the basis of the application. Criteria included on the application will be used to evaluate projects and should be used as guidelines when applying.

Pre-approval for reimbursement - A student may apply by November 20, 2019 to be pre-approved for reimbursement prior to beginning experimentation if reimbursement will affect whether he/she wishes to purchase the materials and continue with the project. Applicants will be notified promptly by the Research Grant Committee whether they will be reimbursed for their materials should they pursue the proposed project. Students whose applications are approved must purchase only the materials for which they've applied and submit original receipts for these materials. A check for the exact amount of the materials will be issued only after original receipts have been received by the Research Grant Committee.

Post-project reimbursement - Alternately, a student may apply by February 21, 2020 (after purchasing the materials and finishing the STEM project) to be reimbursed should his/her project qualify. Students applying after purchasing materials must submit the original receipts for these materials and finished science project paper with the application.

A check for the exact amount of the materials will be issued only after original receipts have been received by the Research Grant Committee.

High school students whose funding requirements exceed $100 should apply by February 21, 2020 for funds through the ***Maxi Research Grant Program***. Students applying for a Maxi Research Grant must have participated in a past Area/Regional or City STEM Exhibitions. (The application for this grant appears on pages 81 - 82 of this handbook.) The application should be completed with careful attention to detail. Do not request equipment that is usually part of the school inventory.

Maxi Research Grant applications are screened by the Research Grant Committee and evaluated using an initial point system. If an application passes the initial screening, the student will be invited to a personal interview conducted by selected Chicago Public Schools Student Science Fair, Inc. committee chairpersons. *Maxi Research Grants are awarded to students on a one-time-only basis.*

A student may apply for either the Mini Research Grant or the Maxi Research Grant, but not both.

Advise-A-Student Program

The *Advise-A-Student Program* is designed to assist students who have exhausted the help of teachers and parents. Upon receipt of an application demonstrating that the student has completed the necessary library research, the committee attempts to find a research scientist who will provide expert help. The research scientist only provides suggestions on improving the project and should not be asked to provide equipment or laboratory space. This program is not designed to provide money, equipment, or general information. (The application form on page 83 of this handbook may be duplicated.)

Scholarship Program

Over $3.9 million in scholarships have been award to 2157 Chicago public school students who have participated in the Student STEM Exhibitions as exhibitors of projects and/or as Symposium participants.

Scholarships are awarded by corporations, individuals, philanthropic organizations, universities, and the Chicago Public Schools Student Science Fair, Inc. The number of available scholarships varies each year.

Any senior who has participated in at least one Chicago Public Schools STEM Exhibit at either the Regional Networks or city level and/or the symposium, is graduating in June 2020 from a Chicago public high school, and is majoring in a STEM related field is eligible to apply for a scholarship

Interested seniors may obtain scholarship application forms from their high school science fair coordinator, their senior counselor, or science department chairperson. (The application is also found in the Appendix of this handbook.) Applicants should be aware that a completed application with required documents is due on or before the March 27, 2020, deadline for receiving their applications. *Late and/or incomplete entries will not be considered and will be returned to the student. Faxed applications will not be accepted.*

Completed application forms will be judged on the following criteria:

- pursuing a major in a STEM related field
- amount of science fair participation, and level of achievement
- academic profile: type of courses and grades, class rank, and standardized test results
- personal essay
- letter of recommendation

Approximately 25 candidates will be selected and invited to meet with the Scholarship Committee in the final step of screening. Recipients of scholarships are selected by the committee to discuss their candidacy with the committee in an informal setting. The candidates are notified by letter as to the decision of the Scholarship Committee whose decisions are final. A formal presentation of scholarships takes place at an awards dinner to honor the recipients, their parents, and teachers.

The university scholarships listed below and on the following page were available to Chicago Public Schools Science Fair, Inc. at the time of publication. *The list is subject to change. See the STEM Exhibition website for updates and changes*.

DePaul University

One renewable $8,000 tuition-waiver scholarship
Requirements: ACT score of 22+
GPA of 3.0 or higher;
Class rank in top 20%

Illinois Institute of Technology

One renewable $4,000 tuition-waiver scholarship
Requirement: Admission to IIT by April 1, 2020

Loyola University Chicago

One $2,000 per year renewable tuition waiver
Requirements: Admission to Loyola by
April 1, 2020
ACT score 24+ or 30+ for the Honors Program
Class rank in upper 10%
Major in biology, chemistry, physics,
pre-medicine, or mathematics

The University of Chicago

One tuition waiver of $2,000
Requirement: Accepted by the University by
April 1, 2020

University of Illinois at Urbana-Champaign

One $2,000 per year renewable tuition waiver.
Requirement: Admission to the University of Illinois at Urbana-Champaign by April 1, 2020

University of Illinois at Chicago

One 4-year, tuition-free scholarship
Requirement: Admission to
UIC Honors College by April 1, 2020
Call 312.413.2260 for details regarding acceptance into the Honors Program.

A number of monetary scholarships will be available. The funding of these scholarships depends on the generosity of corporations and philanthropic organizations that contribute to Chicago Public Schools Student Science Fair, Inc. Cash grants may range from $1,000 to $10,000. (The application for a STEM Exhibition Scholarship can be found on pages 85-87 of this handbook.)

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Appendix

(SAMPLE OF RESEARCH SUMMARY TITLE PAGE)

The Effects of Sunlight on Plants

(title)

Botany

(category)

Experimental Investigation

(type of investigation)

Signature of Sponsoring Teacher

Signature of School STEM Exhibition

John Smith
School
Chicago, IL 60601
Grade 9

CHECKLIST FOR THE PHYSICAL ARRANGEMENT OF THE STEM RESEARCH PAPER

(Abstract, Safety Sheet, Endorsements, & Research Summary)

ALL ITEMS MUST BE TYPED

☐ **ABSTRACT**
- ☐ Included in paper and a copy must be displayed on front of display board
- ☐ Three (3) paragraphs with headings: Purpose, Procedure, and Conclusion
- ☐ Typed single-spaced, 250 words or less
- ☐ Check appropriate box - either Experimental or Design Investigation
- ☐ Exhibit number in the upper left corner if going to the STEM exhibition

☐ **SAFETY SHEET**
- ☐ Included in paper and a copy must be displayed on front of display board
- ☐ Lists possible hazards, precautions described
- ☐ If no hazards were possible a statement indicating this is included
- ☐ Signed by student and sponsor
- ☐ Exhibit number in the upper left corner if going to the STEM exhibition

☐ **APPROPRIATE ENDORSEMENTS AND ATTACHMENTS** (If applicable)
- ☐ Included in paper and a copy must be displayed on front of display board
- ☐ Endorsement signed and stamped by the Scientific Review committee member
- ☐ Signed by student and sponsor
- ☐ All pages of completed endorsement and proper documentation is attached, if necessary
- ☐ ISEF approval forms - if applicable
- ☐ Exhibit number in the upper left corner if going to the city STEM exhibition

☐ **TITLE PAGE OF RESEARCH SUMMARY**
- ☐ Formatted as on page 56 and indicate type of investigation either Experimental or Design
- ☐ Approval signed by both the sponsor and school coordinator
- ☐ Exhibit number in the upper left corner if going to the city STEM exhibition

☐ **TABLE OF CONTENTS**
- ☐ All subsections are listed with page numbers
- ☐ Pagination is accurate

☐ **ACKNOWLEDGMENTS**
- ☐ Credit is given to those who have helped with the research

☐ **PURPOSE AND HYPOTHESIS**
- ☐ States precisely what the investigation was attempting to discover
- ☐ Hypothesis and prediction is present

☐ **BACKGROUND RESEARCH**
- ☐ Provides information that supports the hypothesis and if necessary, the procedure
- ☐ Provides adequate background information about the topic
- ☐ Use of third person is evident
- ☐ Logical and/or related grouping of information
- ☐ Accurate spelling, grammar, quotations and citations and page set-up
- ☐ Parenthetically cited.

☐ **MATERIALS AND METHODS OF PROCEDURE**

- ☐ All equipment and materials are listed
- ☐ Drawings and photographs are present if they enhance and clarify the project
- ☐ Step-by-step, chronological procedures are present and replicable
- ☐ A control or comparison group is present and appropriate
- ☐ Number of trials within each test group is adequate
- ☐ Control of variables is evident

☐ **RESULTS**

- ☐ All data is presented, including results inconsistent with the hypothesis, if applicable
- ☐ Data and calculations are clear and accurate
- ☐ Data is quantitative and correct units of measurement (metric) are used
- ☐ Data is organized into clear & informative tables or charts with accompanying graphs
- ☐ Effect of experimental error was estimated and considered

☐ **CONCLUSIONS**

- ☐ Evaluation and interpretation of data is present
- ☐ Refers back to purpose and hypothesis
- ☐ Answers the original question
- ☐ Is valid and limited to the results of the experiment

☐ **REFERENCE LIST**

- ☐ References in this list are actually cited in the paper
- ☐ References from a variety of at least 12 sources and are current (copyright within the last seven years)
- ☐ Reference list is alphabetical
- ☐ Proper APA format is used for all references
- ☐ Titled "Reference List" or "References Cited" not "Bibliography"

☐ **NUMBER OF PAPERS REQUIRED**

- ☐ Nine (9) copies of the STEM Research Summary are needed to register for the City STEM Exhibition

☐ **OTHER REQUIREMENTS**

- ☐ STEM Project Paper clearly and concisely explains the project in short, simple sentences
- ☐ Exhibitor's last name & project title typed at top **right** corner of all pages after Table of Contents
- ☐ Typed double-spaced, one inch margins on all sides, single-sided
- ☐ All pages are numbered and referenced in the Table of Contents
- ☐ Standard type font and size (ex. Times New Roman 10 - 12 point font)
- ☐ STEM Research Summary (Abstract, Safety Sheet, and Research Summary) is no more than 30 pages (33 if an endorsement is included)
- ☐ Paper is well typed, with correct spelling, grammar, punctuation and consistent point of view
- ☐ Indicate Experimental or Design Investigation on all forms and pages were required
- ☐ No address is to be given on the Title Page.

(ALL ITEMS LISTED MUST BE TYPED)

ABSTRACT

The Illinois Junior Academy of Science

CATEGORY _____ STATE REGION # **3**

SCHOOL _____ IJAS SCHOOL # **3001**

CITY/ZIP _____ SCHOOL PHONE _____

SPONSOR _____

CHECK ONE: ☐ EXPERIMENTAL INVESTIGATION ☐ DESIGN INVESTIGATION

(Choice will determine rubric used for assessment)

NAME OF EXHIBITOR * _____ GRADE _____

NAME OF EXHIBITOR _____ GRADE _____

* If this project is awarded a monetary prize, the check will be written in this scientist's name and it will be his/her responsibility to distribute the prize money equally among all participating exhibitors.

PROJECT TITLE _____

1. Limit Abstract to 3 paragraphs (250 words or less). Include: a) Purpose– what you set out to investigate; b) Procedure – how you did it; c) Conclusion – based on your results. Label each paragraph.
2. Must be typed, single-spaced, on the front side of this form. DO NOT write on back side of this form.
3. Three (3) copies of your COMPLETE paper are required at the State Science Project Exposition. Four (4) copies of your COMPLETE paper are required for the State Paper Session Competition.

The above form must be duplicated. (Student-generated forms must be in essentially the same format.)
*This form **MUST** be displayed on the front of the exhibitor's display board. It may be reduced to fit on a half sheet of paper. (Print at 75% reduction) Displayed abstract cannot be smaller than 8.5 inches (vertical) x 5.5 inches (horizontal).*

Sample of Abstract Reduction

(ALL ITEMS LISTED MUST BE TYPED)

ABSTRACT

The Illinois Junior Academy of Science

CATEGORY _____ STATE REGION # 3

SCHOOL _____ IJAS SCHOOL # 3001

CITY/ZIP _____ SCHOOL PHONE _____

SPONSOR _____

CHECK ONE: ☐ EXPERIMENTAL INVESTIGATION ☐ DESIGN INVESTIGATION
(Choice will determine rubric used for assessment)

NAME OF EXHIBITOR * _____ GRADE _____

NAME OF EXHIBITOR _____ GRADE _____

* If this project is awarded a monetary prize, the check will be written in this scientist's name and it will be his/her responsibility to distribute the prize money equally among all participating exhibitors.

PROJECT TITLE _____

1. Limit Abstract to 3 paragraphs (250 words or less). Include: a) Purpose– what you set out to investigate; b) Procedure – how you did it; c) Conclusion – based on your results. Label each paragraph.
2. Must be typed, single-spaced, on the front side of this form. DO NOT write on back side of this form.
3. Three (3) copies of your COMPLETE paper are required at the State Science Project Exposition. Four (4) copies of your COMPLETE paper are required for the State Paper Session Competition.

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*This form **MUST** be displayed on the front of the exhibitor's display board. It may be reduced to fit on a half sheet of paper. (Print at 75% reduction) Displayed abstract cannot be smaller than 8.5 inches (vertical) x 5.5 inches (horizontal).*

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 science 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 provision 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. Countering 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 as Test Subjects –for any projects involving humans-even surveys.
_____Microorganism-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. Displayed Safety Sheet can not be smaller than 8.5 inches (vertical) X 5.5 inches (horizontal). Print at 75% reduction.

Sample of Safety Sheet Reduction

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 science 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 provision 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. Countering 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 as Test Subjects –for any projects involving humans-even surveys.
_____Microorganism-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. Displayed Safety Sheet can not be smaller than 8.5 inches (vertical) X 5.5 inches (horizontal). Print at 75% reduction.

2021 forms and documents are available on our website at

https://cpsscifair.org

SYMPOSIUM PAPER / IJAS STATE ESSAY CHECKLIST

Please check each item as it is compiled to ensure the paper will be included and given consideration by the Symposium readers.

STUDENT SCIENCE SYMPOSIUM AND ESSAY ENTRY FORMS

- ☐ **Typed** and properly completed form.
- ☐ Submitted four (4) paper copies of the *Official Entry Form for the Symposium and Essay Competition,* page 95, by Friday, **January 10, 2020**. **This is a firm deadline. It will NOT be extended**. The information in this form MUST be typed.
- ☐ Attached copy of the *CPS Media Consent Form* on pages 97 - 99 of the current *STEM Exhibition Handbook.*

SYMPOSIUM PAPER

- ☐ Completed the work as an individual student.
- ☐ Typed the paper with prescribed margins.
- ☐ Typed student's name and title of paper at the upper right hand corner of each page. Each page numbered. See page 29 - Paper Layout
- ☐ Limited the paper to a maximum of 30 pages (33 pages if Human, Vertebrate Animal, Vertebrate Animal Tissue, Microorganism, Recombinant DNA Endorsement or Firearms Endorsement is required). NO EXCEPTIONS.
- ☐ Included (in this sequence): Abstract (in IJAS format); Safety Sheet; Vertebrate Animal, Human or Vertebrate Tissue, Microorganism, Recombinant DNA Endorsement, or Firearms Endorsement (if required); Title Page; Table of Contents; Acknowledgments; Purpose and Hypothesis; Background Research; Materials and Methods of Procedure; Results; Conclusions; and Reference List.
- ☐ Stapled pages securely in the upper left corner without cover or folder.
- ☐ Had each copy signed by the sponsoring teacher and school STEM exhibition coordinator.
- ☐ Submitted four (4) copies of the abstract, safety sheet, endorsement(s) and research paper by Friday, January 10, 2020. **This is a firm deadline. It will NOT be extended.**
- ☐ Email together as one (1) PDF file: the abstract, safety sheet, endorsement(s), and research paper by Friday, January 10, 2020. **This is a firm deadline. It will NOT be extended**

ESSAY

- ☐ Completed the work as an individual student.
- ☐ Type the paper, double-spaced, on one side only.
- ☐ Typed student's name and title of essay at the upper right hand corner of each page.
- ☐ Included (in this sequence): Essay Cover Page; Table of Contents; Introduction, Body, Conclusion or Summary, and Reference List.
- ☐ Limited the paper to 1200–1500 words.
- ☐ Stapled pages securely in the upper left corner without cover or folder.
- ☐ Had each copy signed by the sponsoring teacher and school STEM exhibition coordinator.
- ☐ Submitted four (4) copies by **Friday, January 10, 2020 This is a firm deadline. It will NOT be extended**.

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ESSAY COVER PAGE

The Illinois Junior Academy of Science

CATEGORY: ☐ STUDENT OFFICER ESSAY **STATE REGION #** 3

(Mark X in Box) ☐ OTHER _____

NAME: _____ GRADE: _____

ADDRESS: _____ AGE: _____

CITY ZIP: _____

PHONE: _____

SCHOOL: _____ **IJAS #**: 3001

ADDRESS: _____

CITY ZIP: _____

PHONE: _____

SPONSOR: _____

ESSAY TITLE: _____

STUDENT SIGNATURE: _____

SPONSOR SIGNATURE: _____

THIS SHEET MUST BE TYPED

Media Consent Form and Release

Consent/Release

I hereby consent to have my child photographed, digitally recorded, video taped, audio taped and/or interviewed by the Board of Education of the City of Chicago (the "Board") or the news media when school is in session or when my child is under the supervision of the Board. Further, I consent for these photos, digital recordings, video tapes, audio tapes and/or interviews to be shared with third parties who have received written approval from the Office of Communications. I understand in the course of the above described activities that the Board might like to celebrate my child's accomplishments and work. Therefore, I further consent for the Board's release of information on my child's name, academic/non-academic awards and information concerning my child's participation in school-sponsored activities, organizations and athletics.

I also consent to the Board's use of my child's name, photograph or likeness, voice or creative work(s) on the Internet or on a CD or any other electronic/digital media or print media.

As the child's parent or legal guardian, I agree to release and hold harmless the Board, its members, trustees, agents, officers, contractors, volunteers and employees from and against any and all claims, demands, actions, complaints, suits or other forms of liability that shall arise out of or by reason of, or be caused by the use of my child's name, photograph or likeness, voice or creative work(s), on television, radio or motion pictures, or on the Internet, or on a CD, or any other electronic/digital media or print media.

It is further understood and I do agree that no monies or other consideration in any form, including reimbursement for any expenses incurred by me or my child, will become due to me, my child, our heirs, agents, or assigns at any time because of my child's participation in any of the above activities or the above-described use of my child's name, photograph or likeness, voice or creative work(s).

I understand that I may cancel this consent by providing written notice to the principal. I also understand that my consent to have my child photographed, digitally recorded, video taped, audio taped and/or interviewed by the Board or the news media when school is in session or when my child is under the supervision of the Board is valid for one school year, including the following summer.

Instructions: Check Box #1 or Box #2

1. ☐ I consent as outlined in the above consent/release section.

2. ☐ I **DO NOT** consent as outlined in the above consent/release section.

Signature of Parent/Guardian/Student if age 18 or older	Printed Name of Parent/Guardian/Student if age 18 or older
Student's Name	Student ID #
Date	School

I understand that I have the right to inspect and copy my student's records, challenge the contents of such records; and limit my consent to the designated records or designated portions of information within the records.

Consentimiento de prensa y dispensa de responsabilidad

Consentimiento/Dispensa

Por la presente autorizo a que mi niño sea fotografiado, grabado digitalmente, grabado en video, audio y /o entrevistado por la Junta de Educación de Chicago (la "Junta") o por medios de prensa cuando la escuela esté funcionando o cuando el niño se encuentre bajo la supervisión de la Junta. Más aun, autorizo que dichas fotografías, grabaciones digitales, en video, audio y/o entrevistas sean compartidas con terceras partes que hayan recibida la aprobación por escrito de la Oficina de Comunicaciones. Entiendo que en el curso de las actividades descriptas la Junta quiera celebrar los logros y el trabajo de mi niño. Por lo tanto, también autorizo a la Junta la divulgación de información sobre el nombre de mi niño, de sus premios académicos y no académicos y de información relacionada con su participación en actividades auspiciadas por la escuela, organizaciones y deportes.

También autorizo a la Junta el uso del nombre, fotografías o retratos de mi niño, o de su voz o trabajo creativo, en Internet o en un CD educativo, o en cualquier otro medio electrónico/digital o impreso.

Como padre o tutor legal del niño, libero de toda responsabilidad a la Junta, a sus miembros, síndicos, agentes, oficiales, contratistas, voluntarios y empleados ante cualquiera y todos los reclamos, demandas, acciones, quejas, juicios u otras formas de responsabilidad que puedan surgir por cualquier razón, o puedan ser causadas por el uso del trabajo creativo, fotografía, retrato o voz en televisión, radio o películas, o en medios impresos, Internet o cualquier otro medio electrónico/digital.

Es entendido además, y estoy de acuerdo, en que no se me debe a mí, a mi niño, a nuestros herederos, agentes o designados ningún dinero o consideración de ninguna especie, incluyendo el reembolso de cualquier gasto realizado por mí o por mi niño durante la participación en cualquiera de las actividades mencionadas, o por el uso de su trabajo creativo, fotografías, retrato o voz.

Entiendo que puedo cancelar este consentimiento mediante una comunicación por escrito al director escolar. También entiendo que mi consentimiento para que mi hijo sea fotografiado, grabado digitalmente, en video, audio y o entrevistado por la Junta o los medios de prensa cuando la escuela se encuentre funcionando, o cuando mi hijo se encuentre bajo supervisión de la Junta, es válido por un año escolar, incluyendo el verano siguiente.

Instrucciones: marque la caja #1 o caja #2

1. ☐ Autorizo lo señalado arriba en la sección consentimiento/dispensa.

2. ☐ **NO DOY** la autorización, según lo descripto arriba en la sección de consentimiento/dispensa.

Firma padre o tutor, o del estudiante si tiene 18 años o más	Nombre en imprenta del padre o tutor, o del estudiante si tiene 18 años o más
Nombre del estudiante	Número de ID del estudiante
Fecha	Escuela

Entiendo que tengo el derecho de inspeccionar y copiar los registros de mi estudiante, de disputar el contenido de dichos registros; y limito mi consentimiento a los registros designados o porciones designadas de información contenida en los registros.

WYRAŻENIE ZGODY I ZEZWOLENIE NA PUBLIKACJĘ W MEDIACH

Zgoda/Zezwolenie na publikację

Wyrażam zgodę na fotografowanie mojego dziecka, nagrywanie cyfrowe, nagranie głosu i / lub rozmowy/wywiadu z uczniem, przeprowadzone przez Kuratorium Oświaty ("Kuratorium") lub inne media informacyjne, na terenie szkoły w czasie zajęć lekcyjnych lub gdy moje dziecko jest pod nadzorem Kuratorium Oświaty . Wyrażam również zgodę aby te fotografie, nagrania cyfrowe, nagrania video, taśmy audiowizualne i/lub wywiady mogły być udostępniane osobom trzecim, które są zatwierdzone przez Biuro Informacyjne CPS. Rozumiem, że w zwiazku z powyższym Kuratorium może wykorzystywać osiagnięcia i prace mojego dziecka. Wyrażam zgodę na publikację informacji na temat mojego dziecka, jego/jej imię, informacje o nagrodach w nauce i innych zajęciach, informacje dotyczące uczestnictwa mojego dziecka w sponsorowanych przez szkołę zajęciach, działalności w organizacjach i sporcie.

Wyrażam również zgodę, na wykorzystanie przez Kuratorium imienia mojego dziecka-ucznia, jego fotografii lub podobieństwa, głosu, albo prac twórczych w Internecie i edukacyjnych płytach kompaktowych, lub innych elektronicznych mediach cyfrowych lub drukowanych.

Jako rodzic lub prawny opiekun dziecka zgadzam się na publikację i zwalniam od odpowiedzialności Kuratorium Oświaty Miasta Chicago, jego członków, powierników, agentów, oficerów, wykonawców, wolontariuszy i pracowników, z tytułu wszelkich roszczeń, działań, skarg, pozwów lub innych rodzajów odpowiedzialności, które mogą powstać w związku z, lub być spowodowane, przez użycie imienia mojego dziecka, twórczości – prac mojego dziecka, zdjęć, podobizny lub głosu w telewizji, radio lub filmie albo w postaci drukowanej lub w Internecie albo innych elektronicznych mediach cyfrowych.

Rozumiem ponadto i zgadzam się, że: ja, moje dziecko, nasi spadkobiercy czy przedstawiciele nie będą żądać żadnych form zapłaty pieniężnej lub korzyści w jakiejkolwiek formie, w tym zwrotu poniesionych przeze mnie lub moje dziecko kosztów, związanych z udziałem w powyższych czynnościach lub wyżej opisanym wykorzystaniu imienia, twórczości mojego dziecka, jego zdjęć, podobizny lub głosu.

Rozumiem, że mogę odwołać powyższe zezwolenie poprzez pisemną notę skierowaną do dyrektora szkoły. Rozumiem, również, że moja zgoda na fotografowanie, nagrywanie głosu i filmowanie, i/lub wywiad z moim dzieckiem przeprowadzony przez Kuratorium lub media w czasie trwania zajęć lekcyjnych, lub w czasie kiedy dziecko jest pod opieką Kuratorium jest ważna tylko na jeden rok szkolny z włączeniem lata po nim następującego.

Instrukcje: Zaznacz kwadracik #1 lub kwadracik #2

1. ☐ Zezwalam, po zapoznaniu się z zasadami zamieszczonymi powyżej.
2. ☐ **NIE ZEZWALAM**, po zapoznaniu sie z zasadami zamieszczonymi powyżej.

Podpis rodzica/opiekuna/ucznia w wieku 18 lat lub więcej	Nazwisko rodzica/opiekuna/ucznia w wieku 18 lat lub więcej- PISMEM DRUKOWANYM
Imię i nazwisko ucznia	Numer identyfikacyjny ucznia – ID#
Data	Szkoła

Rozumiem, że mam prawo do wglądu i kopiowania dokumentacji ucznia, kwestionowania ich zawartości, oraz ograniczenia zgody co do dostępu do wyznaczonych informacji lub części informacji zawartych w dokumentacji ucznia.

The full 2020-2021 calendar of events is available at

https://cpsscifair.org

Notes

Notes

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