Illinois Junior Academy of Science

Policy & Procedure Manual

September 2024 – August 2026

This Policy and Procedure Manual replaces and supersedes all previous publications.

A copy of this manual should be given to all project sponsors and student participants

This Manual May Be Downloaded from the IJAS Website and Duplicated as Needed

Official Website

www.ijas.org

Aims and Objectives of the Policy and Procedure Manual

The primary aim of this manual is to communicate the information needed by the student and sponsor so that a safe and humane experimental project or paper is presented at the regional and state expositions. Please read this book carefully and resolve any questions **before** you enter a project or paper.

The Illinois Junior Academy of Science expects all schools and regions to follow all rules, regulations, and guidelines of the state organization. The Illinois Junior Academy of Science will insist that all projects and papers entered into state competition meet **all** of the rules, regulations, and guidelines of the Illinois Junior Academy of Science. No arbitrary safety procedures or rules may be instituted at the regional level that will limit a school or student's participation at a regional fair and potentially prevent a student advancing to the state level.

Projects that are sent to the State Science Exposition that do not meet the rules, regulations, and guidelines of the Illinois Junior Academy of Science will be disqualified.

The Board of Directors of the Illinois Junior Academy of Science will allow no exceptions to the rules and guidelines as stated in this policy and procedure manual.

Safety rules are not meant to be barriers to progress that have been arbitrarily imposed to make it difficult for students to present a project. The objective of the *Policy and Procedure Manual* is to provide policies and procedures that are designed for the safety of the experimenter, as well as the safety of those that will judge and/or view the project.

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August/September 2024

This manual may be downloaded from the IJAS website and duplicated as needed.

Join IJAS!

Membership in IJAS is open to all public and private schools, including home schools, in the State of Illinois.

Find out how rewarding participation in IJAS activities can be. Visit us on the web at:

www.ijas.org

Join by **December 31** to take advantage of our regular annual membership fee.

Note: All participants in IJAS activities, projects or sessions at the State Exposition must be enrolled in IJAS member schools. IJAS Membership is determined at the state level. No regional rules, regulations, or procedures regarding membership may supersede those of the state. Regions must accept schools placed in their region by the state. Any discriminatory practices against a school, group, or program will not be tolerated.

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Effective September 2024 through August 2026

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This Policy and Procedure Manual is reviewed and revised every two years.

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Mission Statement

The mission of the Illinois Junior Academy of Science is to present science as a rational observation and systematic investigation of natural phenomena; to stress the importance of critical thinking and logical reasoning; and to encourage students to view science as an interdisciplinary study applicable to society and its interactions with the environment.

What is an Exposition?

An Exposition is the occasion at which students present their scientific posters and papers to judging teams and to other participants and visitors. The exposition may be local, regional, or statewide; it may involve from fewer than ten to over a thousand posters and papers. A science exposition is not a competition. Students do not compete against one another nor do schools compete against other schools. Each poster or paper is independently judged against a set of objective scientific criteria.

Science exposition means different things to different people:

- ➢ To students, it means an opportunity to pursue some aspect of science, which is interesting to them, and to learn first-hand the basics of the scientific and/or processes.
- ➢ To teachers, it is an incentive that may be placed before the more science-oriented student.
- ➢ To all of us, it provides encouragement and recognition for those students who may become the scientists of the future.

All Illinois schools, public and non-public (including home schools), which enroll students in grades seven through twelve, are invited to join the Illinois Junior Academy of Science (IJAS) and participate in the IJAS-sponsored science exposition by contacting the IJAS. In addition, if your school chooses not to participate then you can join as a science club with an adult as your Sponsor. You will find that there are many people willing to help you with student problems, with the local fair or exposition, and with the regional and the state exposition. For you, as a sponsor or student participant, this *Policy and Procedure Manual* represents one source of assistance.

To assure safety and minimize confusion, all participants at all local, regional, and state expositions should follow the rules and regulations described and detailed in this policy manual.

IJAS banquet (University of Illinois 2015)

Goals and Standards

As a result of participation in scientific investigation and the science exposition, students fulfill several national, state, and local goals and standards. The experiences of participation in authentic research inquiry and presentation at the IJAS Exposition aligns with the first dimension of the Next Generation Science Standards (NGSS), the College Readiness Standards (CRS), and the Common Core State *Literacy in Science and Technical Subjects and Writing*, and *Writing for Literacy in Science and Technical Subjects: Research to Build and Present Knowledge.* The experience also aligns with the Common Core *Mathematics: Standards for Mathematical Practice as well as the Common Core English Language Arts Standards* in both Reading and Writing. Please refer to the Appendix of this manual for alignment with these state and national standards.

Poster Session at the State Science Exposition

Categories

Students must design an experiment to investigate a question or problem, design or develop a new model, computer program, solve a mathematical proof, and so forth. A project based solely on library research 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. **Note that building without purposeful design, testing or demonstration is not an acceptable project. A control group may not always be possible or necessary for all projects; a comparison among trials is appropriate and may be used instead.**

Projects in *any* of the listed IJAS categories below may need an endorsement sheet(s), see pages 51-57. Please make sure that all safety rules are followed, and that all endorsements are completed and displayed.

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.

Agriculture - involves the "implementation, production, management, and processing of agricultural commodities and services from the farm to the grocery store. It encompasses all aspects of protection and management of land and natural areas. Research that fits into this category shall be the application of scientific principles to improve the food, fiber, or fuel production or management" (from National FFA AgriScience Fair Guidelines).

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.

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, and so forth. 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.

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.

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.

Cellular and 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.

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.

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, designing a network system, projects involving AI, testing computer speed and efficiency, overclocking, and so forth.

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.

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, digital and analog) for communication such as radio, radar, laser, transistor, television, and integrated circuits; electricity; electric motors; solar cells and amplifiers.

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.

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.

Health Science... is the study of the diseases/conditions and the health of humans, and/or the technologies associated with health. Topics to be found under this category may include anatomy, dentistry, pharmacology, physiology, pathology, ophthalmology, nutrition, sanitation, pediatrics, dermatology, neurology, allergies, speech and hearing, technical applications, and so on. May include studies using animals as models for human health studies.

Materials Science... is the study of materials, nonmetallic as well as metallic, and how they can be adapted, fabricated, and/or tested 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.

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.

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.

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 matter. 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.

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 comparisons, and product efficiency.

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

Choosing a Topic

- **Be creative!** Plan a project that is original in plan or execution. The project should express scientific ideas in new or better ways.

- **Be scientific**: investigate and explore an interest - a fascination - something that gives you a question you would like to be able to answer. The library and the Internet are excellent places to start.

- Consider the research problem in relation to your scientific background, financial situation, desire to contribute to science, the time required for the study, and the availability of resources and materials.

- It is important that each project has a central theme or purpose; that is, to answer a definite scientific question or to solve a problem.

- The experimentation and design behind an investigation is what is significant. A simple topic can offer a great challenge to the imaginative student.

- Start planning early in the school year.

- Be realistic about the time, cost, and available instrumentation.

Using the Scientific and Design Processes

Most projects will be experimental in nature using the scientific process and will fall into the experimental investigation classification. 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 investigation classification.

Comparison of the Scientific Process vs. the Design Process*

Experimental Process (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) including flowcharts as necessary
Test the hypothesis by conducting the experiment	Build and test a prototype
Analyze the results and draw a conclusion(s)	Test and redesign
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. For an experimental project, the background research may include: • General principles and laws in the area of your project • Definition of key terms • More specific information directly related to your project • Description of any scientific equipment you will use 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
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… because” statement where	**3. ESTABLISH DESIGN CRITERIA** Engineering Projects: Decide what features your design must have, for example: size, weight, cost, performance, power, etc. Include a table showing how each design criterion will be addressed by the features of the product

the"If"statement pertains to the independent variable, and the "then" statement pertains to the dependent variable and the "because" addresses what the experimenter theorizes will occur based on preliminary background research. . For example: 'If plants are grown under various colors of light, then the plants grown under the white light will show the greatest increase in biomass because white light is most like the sun and white light has the greatest range of light energy waves.'	being designed. Computer Science Projects: Creating or writing a new algorithm to solve a problem or improve an existing algorithm. Discuss the criteria of the algo rithm. 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. ***Have the safety plan approved by your sponsor prior to beginning the experiment.*** 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, con- sider the following items when designing the experi- ment: • 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, analyz- ing the results, writing the report and construction your display board. Remember to use metric measurements whenever possible.	**4. PREPARE A PRELIMINARY DESIGN** Design projects should have a materials list. Projects should include diagrams, flowcharts and/or sketches of the design that show all parts or subsystems of the design. Describe how all of the parts of the design will work together. Include a chart of the criteria with criterion descriptors by which the design's prototype and redesign(s) will be evaluated. If some criteria are more important than others, weigh these criteria more heavily.

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 construct and test a prototype of their best design. For example, you may involve targeted users in your testing to get feedback on your design; some investigators may analyze data sets.
6. ANALYZE 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** Plan for at least one redesign and execute retesting and evaluation after the prototype is evaluated. Evidence that changes in design were made to better meet the performance criteria established at the beginning of the project are to be included. Test results may be included in the original flowchart and in other 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 to accompany the written report.	**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 attempted to solve them. Be sure to explain what new knowledge has been gained, application of the design and its results, and how this knowledge leads to further questions. For IJAS judging, you must also prepare an oral report and a display board to accompany the written report.

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Check out the IJAS How-To Videos on the IJAS.org website

https://sites.google.com/ijas.org/ijas/students/how-to-videos

Scientific Process for Experimental Classification

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. State your objective clearly in writing. Be sure to have adequate technical and financial resources available to conduct your research.

Don't forget to utilize the IJAS President's Grant for an opportunity to alleviate some of the cost of materials.

https://sites.google.com/ijas.org/ijas/students/contests

Example: The purpose of this experiment is to test what type of water is most suitable to grow houseplants.
Question: Which kind of water allows for the best growth of houseplants?

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 basis for the Background Research paper (see pp. 25-27) required in your report.
Ensure that your document and the citations from all sources are in APA format.

Following the example, it would be wise to research all types of water that people often use to water their house plants, the type of soils that would allow for a constant, and what type(s) of plants on which one may choose to perform the experiment.

3. Formulate A Hypothesis

Based on the background research, write a statement that predicts the outcome of the experiment. Many hypotheses are stated in an – If . . . then…because statement where the – *if* statement pertains to the independent variable, and the – *then* statement pertains to the dependent variable. The reason related to – *because* should explain the researched scientific principle(s) that supports your prediction.

Question: Does fertilizer added to water affect the growth of house plants?

Example 1: If plants are watered with tap water or tap water containing fertilizer, then the plants watered with the added fertilizer will grow the tallest because the fertilizer will supply important nutrients the plant will need to grow…(explanation of the needed nutrients should be added with an intext citation from the background research).

4. Design The Experiment

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 **(consult the safety section on pp. 17-24)**. In addition, IJAS has special rules concerning the use of human and non-human vertebrates in your research. Be sure to consult these rules (see pp. 20-22) 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. Remember to use metric measurements whenever possible.
- Identify all significant variables that could affect your results.
- Control any significant variables not manipulated in your experiment to the extent possible.
- 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 constructing your display board.

5. **Conduct the Experiment, Modify as needed, and Perform Replicates**
   Follow your experimental design to collect data and make observations. Be sure to keep a notebook/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 notebook/log will be used when you write your report.

6. **Data, Data Analysis and Discussion, and Error Analysis**
   Keep these points in mind when conducting your experiment: If you get results that seem wrong or inconsistent, do not throw them out. Try to figure out what happened. Perhaps the data is correct, and your hypothesis is flawed. Try to explain these outliers. 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.

7. **Analyze the results and draw conclusion(s)**
   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.

8. **Present the Results**
   For IJAS judging, you must also prepare an oral presentation (see pg. 28) and a display board (for poster session) (see pg. 29) to accompany the written report. Be sure to consult this policy manual, the section ―Writing A Research Paper, for IJAS report guidelines (see pp. 24-27). These guidelines must be followed exactly.

Design Process for Design Classification

1. **Define a Need or a Real World Problem**
   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**
   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 basis for the Background Research paper (see pp. 24-27) required in your report. Make sure that you document and cite all sources.

3. **Establish Design Criteria -** Provided as examples but not limited to:
   Engineering & Health Sciences Projects: Decide what features your design must have, for example: size, weight, cost, performance, power, and so forth. Include a table showing how each design criterion will be addressed by the features of the product being designed.
   Computer Science Projects: Create or write a new algorithm to solve a problem or to improve on an existing algorithm. Discuss the criteria of the algorithm.
   Mathematics Projects: Develop proofs, develop a new model or explanation, concept formation, or mathematical model design.

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.

5. **Construct and Test a Prototype**
   (Programs, algorithms, and mathematical models may be considered prototypes)
   When others are conducting their experiment, investigators performing an engineering project, certain consumer science or health science projects, computer programming, or mathematics projects construct and test prototypes of their best design. For example, you may involve targeted users in your testing to get feedback on your design; other projects may require analysis data sets.

6. **Test and Redesign as Necessary**
   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. **Analyze the Design and Draw Conclusion(s)**
   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 discuss successful design attempts, but also the problems encountered, and how you attempted to solve them. Be sure to explain what new knowledge has been gained and how this knowledge leads to further questions.

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Rules and Regulations

The student and the sponsor have ultimate responsibility for the safety of the student and test subjects while doing experiments or otherwise developing a project for the Science Exposition. Because many dangers may not be readily apparent, some guidelines are presented here to aid in developing a safer project. Even if a project follows the rules listed, if a sponsor feels the project is not appropriate, the sponsor has the right and to not approve the project.

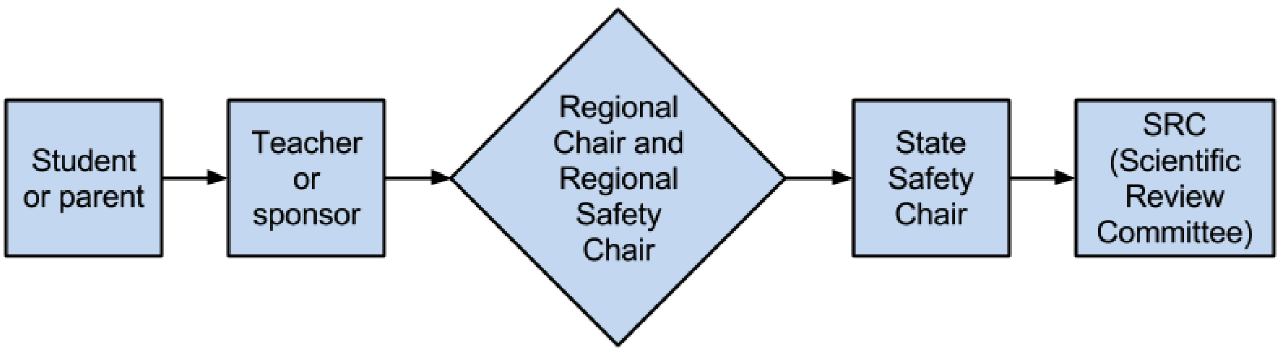
All project development and experimentation must be conducted only with proper supervision. This is particularly true for chemicals, radiation sources, biological cultures, and so forth, many of which are governed by rules and regulations, both State and Federal, that affect both handling and disposal. (see the full list of safety rules)

All exhibits must conform to the following regulations for Region and State expositions. These same rules should be used, where applicable, at local as well as district expositions.

- Your school must currently be a member of the Illinois Junior Academy of Science, Inc. If your school does not have an IJAS membership, a student may join as part of an independent group or as a homeschool student.
- To participate at the State Exposition, you must have participated in a Regional Fair and have been selected as a competitor for the State Exposition by the Region.
- No projects presented in previous years will be allowed at the Region or State Exposition unless they are the result of further research and experimentation. Differences from previous projects should be clearly stated.
- The IJAS State Exposition is open to students in 7th-12th grades. Students are divided into two divisions. Junior division : 7-8th grade, Senior division : 9-12th grade.
- Projects may involve more than one student, but may not exceed four students.
- Students may enter under only ONE project.
- No apparatus may be on top of, under, behind, in front of, alongside, or hanging off of the display table. Any materials displayed with the board will be removed by safety judges and stored at the safety table by the Safety Chair. Students may retrieve items at the end of the judging session.
- Only a display board and computer may be on top of the table. The computer must be battery operated; no electricity will be supplied.
- At the State Exposition, you must have **THREE complete** copies of your complete research paper. This includes Safety Sheets and any needed Endorsement Sheets and must be signed in ink by the student(s) and the teacher sponsor. If no safety hazards exist, a statement to that effect must be made. (See Appendix page 52). Lack of a correctly filled out and signed safety sheet will result in the project being disqualified by the Head Safety Judge/President. This sheet must specify all hazards and potential hazards in addition to the precautions taken by the experimenter to avoid these potential hazards.
- If your project involves humans, non-human vertebrates, vertebrate tissues, or microorganisms, the appropriate endorsement must follow the safety sheet in your research paper. (See Appendix pp. 51-54). Lack of these endorsements will result in the project being disqualified by the Head Safety Judge/President
- A copy of the abstract, safety sheet, and any applicable endorsement sheet **MUST** also be displayed on the front of the exhibitor's display board. These sheets may be reduced to a minimum of a half sheet of standard paper.
- Students shall remain with their projects during the official period of judging. See the exposition schedule for the complete list of judging times and additional rules or exceptions.
- Normal wear and tear on the exhibit is to be expected during the time that the exhibit is open to the public. If valuable equipment is with display (such as a computer), it is your responsibility for its supervision. Neither the Illinois Junior Academy of Science, Inc. nor the sponsors assume any responsibility for loss or damage to such equipment, materials, or research paper.

All questions, clarifications, and decisions regarding these safety regulations will be made by sponsors (not students or parents) to the Regional Chair in writing, by email, a minimum of one week prior to beginning the investigation. These regulations are designed for the safety of the fair participants, test subjects, judges, and visitors. There will be no deviation from these regulations. No questions posed to the State Safety Chair will be answered unless they come from the Regional Chair or Regional Safety Chair. If a parent, student or sponsor directly contacts the State Safety Chair, they will be politely redirected to ask their Regional Chair or Regional Safety Chair first.

Safety Contact Flowchart



Chemical Safety

- ➢ Students should always wear eye protection and appropriate protective clothing when working on their investigation.
- ➢ Students should work under the supervision of a responsible adult.
- ➢ Before beginning a project, review the recommended procedures for safe use and handling of the chemical. The student and the sponsor should seek data from a textbook, Merck Index, Safety Data Sheet (SDS) or other responsible source regarding the health hazards, combustibility, and compatibility of the chemical with other chemicals. All of these hazards need to be listed on the Safety Sheet as well as how the hazards were dealt with.
- ➢ No chemicals may be used that are explosives, carcinogens, mutagens, teratogens, or chemicals that could be used as illegal drug precursors.
- ➢ No project may use prescription drugs, illegal drugs, alcohol, nicotine, or THC, CBD, CBG.
- ➢ All chemicals must be disposed of in accordance with State and Federal Environmental Rules and Regulations.
- ➢ The Safety Sheet must include a statement as to the proper handling and disposal of any chemicals.
- ➢ All projects involving alcohol production must first (prior to doing experiment) receive approval by the SRC. See the Special Circumstances section on pp. 23-24.

Electrical and Mechanical Safety

- Students should always wear eye protection and appropriate protective clothing when working on their investigation.
- Students should work under the supervision of a responsible adult.
- All electrical apparatus that operate with 115-volt current should be constructed in accordance with the National Electrical Code (NEC). If in doubt, contact a competent electrician.
- Many experiments can be done using a low amperage, 6 or 12-volt, electrical source. As these are much safer electrical sources, their use should be considered when doing a project.
- The Safety Sheet must include a statement as to proper electrical construction and an explanation of protective measures.

Fire and Radiation Safety

- Students should always wear eye protection and appropriate protective clothing when working on their investigation.
- Students should work under the supervision of a responsible adult.
- Students using radiation sources (laser, U-V light, X-ray, microwaves, or high intensity radio waves) should be adequately shielded from such 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.
- Any student working with burning materials should perform the experiment under a fume or chemical hood or in an open air environment with appropriate fire safety equipment nearby. Students are encouraged to wear face masks to avoid breathing in fumes.
- The Safety Sheet must include an explanation of all protective measures.

Firearms and Explosive Safety

- **No demonstrations or experiments using firearms or explosives can be undertaken without prior approval from the Safety Review Committee (SRC). Make sure your Request for Use of Firearms letter is filed as soon as possible to allow enough time for the Safety Review Committee to review and process the request. The letter MUST describe in detail the experimental procedure and list the adult who will conduct the experiment as described below. 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.**
- Students should always wear eye protection and appropriate protective clothing when working on their investigation.
- Students should work under the supervision of a responsible adult.
- The student may not possess, handle or utilize any 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 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).
- ➢ 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. **This letter must be attached to the Safety Sheet (see pg. 50).**
- ➢ 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 Illinois Junior Academy of Science, 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 Illinois Junior Academy of Science, Inc., as ''ADDITIONAL INSURED".
- ➢ 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 Illinois Junior Academy of Science, Inc., such form shall be provided when the student is granted permission to conduct the demonstration or experiment.
- ➢ 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.
- ➢ Any demonstration or experiment involving a firearm must utilize commercially-loaded fixed cartridge ammunition at all times and manufactured according to SAAMI standards.
- ➢ The firearm utilized must be commercially-manufactured and may not be older than fifty (50) years of age.
- ➢ The demonstration or experiment shall not involve making or testing modifications or alterations to the firearm itself.
- ➢ All local, municipal, state and federal laws and regulations must be strictly adhered to at all times.
- ➢ No firearms or ammunition can be present at any level of the Science Exposition including but not limited to the school/district, Regional, State, ISAS, or ISEF fairs.
- ➢ 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 pocket, rocket engine or accessory.

Drone Safety

- ➢ Students should always wear eye protection and appropriate protective clothing when working on their investigation.
- ➢ Students should work under the supervision of a responsible adult.
- ➢ 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. The Safety Sheet must state where the drone was used and how safety and privacy of others was handled.

Biological Safety

Use and Care of Humans as Test Subjects

Recognizing that human beings are animals needing different criteria than other living beings, the following policies will govern the use of human beings. No project will be allowed that is in violation of any of these rules. This includes design projects that use people for prototype testing.

No person may give permission for a project that will be in violation of these rules except in special cases. (See Special Circumstances/Exceptions' p 23-24).

If using humans as test subjects for projects that involve learning, motivation, hearing, vision, and surveys, the following rules must be observed and the Humans as Test Subjects Endorsement form must be completed PRIOR to experimentation. (See Appendix p 53 or the electronic versions at https://sites.google.com/ijas.org/ijas/rules-and-forms)

- ➢ Humans must not be subjected to treatments that are considered hazardous and/or that could result in undue stress, injury, pain, or death to the subject. To avoid potential disqualification, contact the Regional Safety Chair prior to experimentation if you are uncertain that the treatment may cause undue stress, injury, pain, or harm.
- ➢ For all students, eyes strain and being seated for too long can be a safety hazard. When working using computers or other screened devices, every 20 minutes, students should look at something 20 feet away for 20 seconds to help their eyes relax. All students should take a break from the screen each hour at a minimum.
- ➢ **No primary or secondary cultures** taken directly from humas or indirectly from humas will be allowed. However, cultures obtained from reputable biological suppliers or research facilities are suitable for student use. (See Microorganisms section p 22).
- ➢ 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. Normal serving amounts must be substantiated with reliable documentation, such as a food label. This documentation must be attached to the Humans as Test Subjects Endorsement form. (See page 53). No project may use over-the-counter drugs, prescription drugs, illegal drugs, alcohol, or THC, CBD, CBG in order to measure their effect on a person.
- ➢ No human blood and/or other bodily fluids (urine, saliva, tears, cerebrospinal fluid, etc.) may be used unless samples/specimens are either purchased or obtained from a blood bank, hospital, or laboratory. No blood may be drawn or other fluids collected from any person specifically for a science project. This rule does not preclude a student making use of data collected from tests run on blood or other fluids that were collected for a purpose other than exclusively for a science project. This includes NO blood sugar sampling.
- ➢ Any project involving human teeth must have the teeth sterilized prior to experimentation. Description of the sterilization process is required and must be included on the safety sheet.
- ➢ Projects that involve exercise or physical activity and its effect on pulse, respiration rate, blood pressure, and so on are allowed provided the exercise is not carried to the extreme. Electrical stimulation is not permitted. For minor children, 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 Humans as Test Subjects Endorsement form. For adult subjects, a consent form should be used and signed by the participant. This should also be attached to the Humans as Test Subjects Endorsement Form.
- ➢ While surveys might seem safe, they can actually pose a serious risk to participants. All projects involving surveys must adhere to the following rules, or they will be disqualified.
    - No names may be used in the paper or on the display.
    - A copy of the survey MUST be included in the paper with the Humans as Test Subjects Endorsement.
    - Approval from the IJAS SRC must be given prior to experimentation if the topic of study is one which could cause a feeling of shame, inadequacy, social exclusion, or prejudice. Such surveys may be related to: deception, social preference, friends, gender identity, sexual orientation, race/racism, religion, abuse, bullying, weapons, drugs, alcohol, mental illness, depression, girlfriend/boyfriend. (See Special Circumstances/Exemptions for the procedure to get approval from the SRC.)

Use and Care of Non-Human Vertebrates

The basic aim of experiments involving animals is to achieve an understanding of life processes and to further society's knowledge. Experiments requiring the use of vertebrates must have a clearly defined objective, investigate a biological principle, and/or answer a scientific inquiry. Such experiments must be conducted with a respect for life and an appreciation of humane considerations.

To the degree possible, all students should be cautioned about doing projects that involve vertebrates. However, if the teacher and the student feel that vertebrates must be used, the following rules must and will apply. This policy will place the Illinois Junior Academy of Science in close accord with the "School Code of the State of Illinois."

It is strongly recommended that living organisms such as plants, bacteria, fungi, protists, worms, snails, insects or other invertebrates be used. Their wide availability, simplicity of care, and subsequent disposal make them very suitable for student work.

No non-human vertebrate projects will be allowed that are in violation of any of these rules. No person may perform any experiment for the student that violates any of these rules. No person may give permission for a project that will be in violation of these rules except in special cases. (See Special Circumstances/Exceptions' p 23).

- ➢ Students who have projects that involve non-human vertebrates must complete with their sponsor prior to experimentation the Non-Human Vertebrate Endorsement form. See Appendix p 54 or the electronic versions at https://sites.google.com/ijas.org/ijas/rules-and-forms
- ➢ The student and the sponsor have the responsibility to see that all animals have proper care in well- ventilated, properly lighted locations with proper nutrition, proper temperature, adequate water, and sanitary surroundings. Care must be taken to see that the organisms are properly cared for during weekends and vacation periods.
- ➢ No primary or secondary cultures (the growth of microorganisms, tissue cells, or other living matter in a specially prepared nutrient medium) involving warm-blooded animals taken directly (mouth, throat, skin, etc.) or indirectly (cage debris, droppings, countertops, and so forth.) will be allowed. However, cultures purchased from reputable biological supply houses or research facilities are suitable for student use. (See Microorganisms section p 22).
- ➢ No intrusive or pain-producing techniques may be used. These prohibited techniques include, but are not limited to, surgery, injections, taking of blood, burning, electrical stimulation, stress, or giving over-the-counter drugs, prescription drugs, illegal drugs, or alcohol to measure their effects.
- ➢ No changes may be made in an organism's environment that could result in undue stress, injury, pain, or death to the animal without prior approval (See Special Circumstances/Exceptions on p 23).
- ➢ No vertebrates can be used as the independent or dependent variables in an experiment that could result in undue stress, injury, pain, or death to the animal.
- ➢ For maze running and other learning or conditioning activities, food or water cannot be withheld for more than 24 hours. If the animal has a high metabolic rate, then food or water cannot be withheld for a length of time that would produce undue stress on the animal.
- ➢ Chicken or other bird embryo projects are allowed, but the treatment must be discontinued at or before 72 hours before scheduled hatch day. At that time, the egg must be destroyed.
- ➢ Projects that involve behavioral studies of newly hatched chickens or other birds will be allowed if no changes have been made in the normal incubation and hatching of the organism, and that all vertebrate rules are followed. (Only non-manipulated eggs may be hatched).

Use and Care of Microorganisms

No microorganism projects will be allowed that are in violation of any of these rules. **No** person may perform any experiment for the student that violates any of these rules. No person may give permission for a project that will be in violation of these rules except in special cases. (See Special Circumstances/Exceptions p 23).

- Students should always wear eye protection and protective clothing when working on their investigation.
- Students should work under the supervision of a responsible adult.
- Students who have a project involving microorganisms must read this section and complete with their sponsor, prior to experimentation, the Microorganisms Endorsement form (See Appendix p 54).
- All microorganism experimentation must be conducted in a laboratory setting such as a science classroom or professional research facility. Experiments with microorganisms **may NOT be done at home**, except for *Saccharomyces cerevisiae*, (Baker's yeast).
- Any projects involving growth of mold, rotting of organic material, or biofuel cells that use soil, must be done in a science classroom or professional research facility and may not be done at home.
- It is the sole responsibility of all teacher(s)/sponsor(s) to teach students proper safety methods and aseptic techniques. Students should wear safety goggles, gloves and wash hands after each experiment.
- Pure cultures of microorganisms known to inhabit warm-blooded animals may be obtained from reputable suppliers and used in proper settings. The Illinois Junior Academy of Science prohibits the use of primary or secondary cultures taken from humans or other warm-blooded animals in any project because of the danger from unknown viruses or other disease-causing agents that may be present.

  Culture: the growth of microorganisms, tissue cells, or other living matter in a specially prepared nutrient medium.
  A **primary culture** is one taken from a vertebrate animal, living or dead. For example, a culture may not be taken from a mouth, throat, skin, hamburger, meat, chicken, or fish.
  A **secondary culture** is a culture taken from an object that has come in contact with a vertebrate animal. For example, a culture may not be taken from eating utensils, doorknobs, toilets, countertops, milk, eggs, and so forth.

- Projects involving viruses and recombinant DNA projects should be done with the help of a professional and should comply with the National Institutes of Health (NIH) Guidelines unless the project is limited to a kit obtained from a legitimate supply house.
- All cultures must be destroyed by autoclaving or with a suitable NaOCl (bleach) solution before disposal.

The following studies are allowed but <u>must be conducted in a science classroom or laboratory.</u> No prior approval from the IJAS SRC is needed.,Adult supervision is required:

- Studies involving non-pathogenic protists, bacteria and archaea obtained from a reliable biological supply company. Evidence of source must be included in the paper and on the display board.
- Studies involving microbial fuel cells if the device is sealed during experimentation and disposed of properly at the conclusion of the study.
- Studies of mold growth on food items if the experiment is terminated at the first evidence of mold.
- Studies of slime molds and edible mushrooms.

The following studies <u>do not need to be conducted in a school classroom or laboratory</u>, but may be. Adult supervision is required:

- Studies involving *Lactobacillus, Bacillus thuringiensis*, nitrogen-fixing, oil-eating bacteria, and algae-eating bacteria introduced into their natural environment as long as they are NOT cultured in a test tube or petri dish.
- Studies using manure for composting or other non-culturing experiments.
- Studies involving fermentation of baker's yeast and brewer's yeast, except in rDNA studies.
- Studies involving water or soil microbes not concentrated in media conducive to their microbial growth.
- Commercially-available color change coliform water test kits which are sealed and properly disposed of.

Use and Care of Tissue Culture

No Tissue Culture projects will be allowed that are in violation of any of these rules. **No** person may perform any experiment for the student that violates any of these rules. No person may give permission for a project that will be in violation of these rules except in special cases. (See Special Circumstances/Exceptions p 23).

- ➢ This area of science may involve many dangers and hazards while experimenting. It is the sole responsibility of all teacher(s)/sponsor(s) to teach students proper safety methods and sterile techniques.

- ➢ The Illinois Junior Academy of Science prohibits the use of primary cell cultures taken from humans or other vertebrate animals in any project because of the danger from unknown viruses or other disease-causing agents that may be present. Established tissue culture cell lines that are characterized as requiring biosafety level 1 (BSL1) procedures and precautions may be obtained from reputable suppliers and used in proper research settings. Cell lines requiring biosafety level 2 (BSL2) procedures and precautions for use must have approval from IJAS prior to use OR be used in an established research facility.

- ➢ Experiments using tissue culture cell lines must be conducted in a laboratory such as a science classroom.laboratory or research facility.

- ➢ Projects involving tissue culture should be done with the help of a professional and should comply with the standards and principles for biological safety.

- ➢ Experiments using tissue culture, including the culture of insect cells, with viruses and/or recombinant DNA must also follow the rules and regulations for these agents; one endorsement sheet detailing use of these agents together is acceptable.

Special Circumstances/Exceptions

Exceptions to the rules will be granted only in two circumstances:

1. The student performs the experiments and is supervised in a university lab, a research facility, or other professional facility. In these circumstances, the student must have a letter on the organization/research facility's letterhead from the supervisor describing the actions of the student and stating that the student worked under constant supervision and that all rules and regulations of the institution were followed.

- ➢ This original letter must 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 and must also be included with the written reports.

2. If the student will not be supervised in a professional research institute, approval for any exceptions to the rules will be granted only if the following conditions are met:

- ➢ The sponsor must seek approval for the project from IJAS before experimentation begins. The sponsor first must contact their Regional Chair/SRC. If approved at the regional level, the Regional Chair/SRC will contact the State Safety Chair for approval. The proposal is submitted to the IJAS Scientific Review Committee (SRC) https://sites.google.com/ijas.org/ijas/about/contact-us

- ➢ Included in this communication must be:
  - o A statement of which IJAS rule is being violated by the project.
  - o A statement of why an exception should be made to this rule for this project.
  - o A detailed description of the purpose, hypothesis, procedure, and safety precautions for the project.

- ➢ A written reply to the sponsor regarding the decision will be made no later than two weeks following receipt of the request. If the proposal receives approval, the project may be entered into the Regional Fair/State Expostion. A copy of the approval letter is displayed on the front of the display board with the other endorsements and a copy must be added directly behind the appropriate endorsement of the written report.

~Presentation~

Science Exposition is the time for presentation. You will be judged on your ability to present your research as a researcher. The Written report and the Oral Presentation common components to both Poster and Paper Sessions.

Written Report

Writing a Research Paper for a Science Investigation

Scientists, regardless of their level of achievement, are only as effective as their ability to communicate to others, in spoken or written word, the results of their endeavors. A scientific paper is, very simply, a clearly written, concise report of an experimental research project. Four copies of the paper are required for Poster Session and two copies of the paper are required for Paper Session.

References and embedded citations follow APA format; however, charts, graphs , tables, etc. do not have to follow APA format.

Technical Points of a Research Paper

In preparing the paper, the author should be concerned with the following mechanics:

- The paper must be **typed, doubled spaced** and have at least one-inch margins on standard 8 ½” X 11” paper.
- Printed pages may be double-sided.
- The font and type size must be appropriate for a scientific paper: example 12 pt, Times New Roman.
- Correct grammar and spelling are evident.
- The paper must be neat and legible.
- The primary scientist’s last name is in the upper right-hand corner of each page after the Table of Contents.
- Graphs should be suitably titled and have all axes correctly labeled. Do not forget to include the correct units of measurement for any numbers.
- Photographs should be of good quality and contrast, and should have captions typed under them.

Desired Qualities of Scientific Writing

The following points should help you to write your paper in an acceptable scientific style:

- When writing the first draft, do not start until you have clearly thought out your paper; the desired final result should be a clear and understandable paper.
- Learn to use the technical words that save space or that convey meaning better than common words; by all means avoid the use of vague terms.
- Scientific writing is concise and objective.
- Voice should be consistent throughout the paper. Scientific writing avoids the use of I or We. Most formal writing, including APA papers, uses the **third person** point of view. Third person point of view makes ideas sound less subjective since it removes direct reference to the writer.
- After you have written your first draft, reread, revise, and rewrite it. Your paper must be an accurate report of what you have done - check and recheck your calculations, references, spelling, and grammar.
- After you have finished the paper, have someone who is not familiar with the work read it over to make sure it makes sense.

The Physical Arrangement of the Written Report of the Experimental Investigation

The following section establishes the basic written report requirements. Familiarity with the basic techniques and requirements will help you to read and understand scientific publications, give you a view of how scientists think, and help you to write your own scientific paper that describes the results of your research investigation. Keep in mind, think before you write, then rethink, revise, rewrite, and reread again and again. Make it clear and concise.

The paper must include (in this order):

1) Abstract - Use the IJAS Abstract form, https://sites.google.com/ijas.org/ijas/rules-and-forms

- ➢ The abstract is a concise summary of your work and the first sheet of your research paper, it will help the reader form an opinion of your work. You will find writing and rewriting will help you produce a good short summary of your project in the required form.
- ➢ The physical form of the abstract is as follows: typed single-spaced, limited to 200 words or fewer, and limited to three paragraphs - purpose, procedure, conclusion.

2) Safety Sheet - All safety hazards and precautions must be identified. If no safety hazards exist, a statement to that effect must be made. Use the IJAS Safety Sheets https://sites.google.com/ijas.org/ijas/rules-and-forms)

3) Endorsements - When human or non-human vertebrates, microorganisms and/or tissue cultures are used, endorsement sheets are required. IJAS Endorcement Forms https://sites.google.com/ijas.org/ijas/rules-and-forms. IJAS SRC approval letter and/or endorsement letter from a professional on institutional letterhead should follow IJAS endorsement forms, if required.

4) Title Page - The title should be concise and clear. A scientific title includes the independent and dependent variable.

5) Table of Contents - Include subsection name and page numbers.

6) Acknowledgements – Give credit to those who have given you guidance, materials, and/or use of facilities.

7) Purpose and Hypothesis – State precisely the question you are attempting to investigate. Include your hypothesis or the expected outcome of your testable question.

8) Background Research – Report the background information and/or work done in the past that pertains to your investigation. These references should be properly documented and listed on Reference List. Traditional footnotes are not to be used for citing references.

9) Materials and Methods – A simple step-by-step account of what was done, must be clear and detailed enough so that the reader can duplicate the work. The apparatus and materials used should be listed. Explain the workings of any apparatus you constructed or used. Drawings, diagrams that are clearly labeled, and photographs are appropriate if they enhance and clarify your explanation but do not use them as filler.

10) Results and Discussion –

Data

- Data are to be organized in tables and/or figures with graphic presentations that are easily read by someone not familiar with the work. All data should be listed, when possible. Summary data should follow the raw data.
- Choosing the appropriate type of graph is important. Graphs should be presented so that someone not familiar with the work easily reads them. Axes should be labeled with titles and correct units of measurement in metric when appropriate.
- If quantitative data are not involved, a day-by-day log may be used in place of tables and charts. In either case, care should be taken to ensure accuracy and clarity.

Data Analysis and Discussion

- The results section should also include a description and explanation of figures and tables.
- Discussion should include an evaluation and interpretation of the data and/or results of investigation, and comparison of the experimental data to what others have found.

Error Analysis

- Finally, experimental and/or measurement errors potentially affecting the conclusion have been considered and are discussed. Ways in which error was/could have been avoided may also be addressed.

11) Conclusion – This should be a concise evaluation and interpretation of the data and/or results. The conclusion should be limited to the results of the investigation and should refer to the stated purpose and hypothesis**.** Internal citations from references used in the Background Research are encouraged.

12) Reference List - This is a list of published articles, books, and other communications actually cited in the paper. Sources should be current. The reference list section is arranged alphabetically according to the author/editor's last name when it is known or the first significant word in the title if the author/editor is not known. The correct style to use for citing references in the reference list section is discussed in detail in the *APA, 7th Edition.*

The Physical Arrangement of the Written Report of the Design Investigation

The following section establishes the basic written report requirements. Familiarity with the basic techniques and requirements will help you to read and understand scientific publications, give you an inside view of how scientists and engineers think, and help you to write your own scientific paper that describes the results of your research investigation. The main point to keep in mind is to think before you write, then rethink, revise, rewrite, and reread again and again. Make it clear and concise.

The paper must include (in this order):

1) Abstract - Use the IJAS Abstract form, https://sites.google.com/ijas.org/ijas/rules-and-forms

- ➢ The abstract is a concise summary of your work and the first sheet of your research paper, it will help the reader form an opinion of your work. You will find writing and rewriting will help you produce a good short summary of your project in the required form.
- ➢ The physical form of the abstract is as follows: typed single-spaced, limited to 200 words or fewer, and limited to three paragraphs - purpose, procedure, conclusion.

2) Safety Sheet - All safety hazards and precautions must be identified. If no safety hazards exist, a statement to that effect must be made. Use the IJAS Safety Sheets https://sites.google.com/ijas.org/ijas/rules-and-forms)

3) Endorsements - When human or non-human vertebrates, microorganisms and/or tissue cultures are used, endorsement sheets are required. IJAS Endorcement Forms https://sites.google.com/ijas.org/ijas/rules-and-forms. IJAS SRC approval letter and/or endorsement letter from a professional on institutional letterhead should follow IJAS endorsement forms, if required.

4) Title Page - The title should be concise and clear. A scientific title includes the independent and dependent variable.

5) Table of Contents - Include subsection name and page numbers.

6) Acknowledgements – Give credit to those who have given you guidance, materials, and/or use of facilities.

7) Problem or Need – Precisely state the question being investigated. Include a discussion of the problem or the need and the expected outcome of the testable question.

8) Background Research – Report the background information and/or work done in the past that pertains to your investigation. These references should be properly documented and listed on Reference List. Traditional footnotes are not to be used for citing references.

9) Design Plan – This should be a simple step-by-step account of what was done. The design plan will include the criteria with a rubric by which the prototype and redesign will be evaluated. A flowchart is also included. The explanation of what was done must be clear and detailed enough so that the reader could duplicate the work. The apparatus and materials used are listed. Explain the workings of any apparatus that was constructed or used. Drawings and diagrams that are clearly labeled, and photographs are appropriate if they enhance and clarify your explanation..

10) Results and Discussion

- **Constructing and Testing the Design Prototype –** A description of the prototype/computer program/mathematical algorithm is included. The prototype has been tested and the results have been discussed. After the initial testing, design modifications are made and the redesigned product is tested and evaluated again . This may involve targeted users and/or analysis of data sets. (This may or may not include traditional data such as tables and graphs).
- **Results of Testing and Redesign -** Testing results have considered the parts and subsystems that required redesign in order to meet the performance criteria. The redesign shows the changes in parts and subsystems.
- **Redesign and Retest -** This portion of the design process gives 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.

11) Conclusion – This should be a concise evaluation and interpretation of the data and/or results. The conclusion should be limited to the results of the investigation (including background research) and should refer to the stated purpose and hypothesis**.**

12) Reference List - This is a list of published articles, books, and other communications actually cited in the paper. Sources should be current. The reference list section is arranged alphabetically according to the author/editor's last name when it is known or the first significant word in the title if the author/editor is not known. The correct style to use for citing references in the reference list section is discussed in detail in the *APA, 7th Edition.*

Oral Presentation

In presenting your investigation to the judges at a science exposition, the following approaches have proven successful for many students. Time should be limited to 15 minutes in total: 10-12 minutes for presentation, leaving 3-5 minutes for questions and discussion. **PLEASE, PUT AWAY YOUR CELL PHONE!**

1) Introduction
- ➢ State your name(s), age, school and town.

2) Acknowledgments
- ➢ Give credit to those whom you have contacted and to those who have helped you.
- ➢ Discuss any work done in the past pertaining to your project.

3) Purpose, Hypothesis, Need
- ➢ State exactly what the investigation is attempting to discover or the need it addresses.
- ➢ Make a prediction about the outcome.
- ➢ How did you get interested in this project? Give the reason for choosing it.

4) Background Information
- ➢ Background explanation for your project (to familiarize the judges), scope of your study, and so forth.
- ➢ This should include a summary of the Background Research.

5) Procedure/Design Process
- ➢ Summarize the experimental procedure and/or design process.
- ➢ Use visual aids: charts, pictures, graphs, and so forth. Point to your display, but stand aside when you do this.
- ➢ Explain how your apparatus was used. If you constructed it yourself, tell the judges you did, if not, give credit to those who helped you. Judges are more interested in your results and conclusions than in the apparatus, unless you have a design project.
- ➢ Discuss ways you avoided experimental error such as use of appropriate instrumentation and measurements, large enough sample size, and/or having controls when possible.

6) Results (Data and Conclusion)
- ➢ Explain both your controls and your experimental variables or prototype(s).
- ➢ Remember to use proper units of measure with your data.
- ➢ Point to tables, figures, and so forth when you refer to them.
- ➢ Analyze and discuss statistical aspects of experimental errors such as averages, ranges, and/or other statistical analogies.
- ➢ State in a concise and logical order the conclusions you can validly draw from the experimentation you have done and the data and/or observations obtained.

7) Discussion
- ➢ Discuss how you plan to continue your project, if applicable.
- ➢ Be sure to explain what new knowledge has been gained and how it leads to further questions.
- ➢ Discuss how your work, positively or negatively, relates to what others have done.

8) Any Questions
- ➢ When you have finished, ask the judges if there are any questions they would like to ask.
- ➢ When they ask you questions, think before you answer them. Answer slowly! If you don't know the answer say, "I'm not sure but I think ...”
- ➢ If they ask you a question that is not related to your project and you do not know the answer, then say, "I really haven't been concerned with this in my project, but it might be interesting to look into it."
- ➢ Thank the judges for any suggestions they may have for improving your research.

9) Other Suggestions
- ➢ Speak slowly!
- ➢ Be forward but polite, dynamic, and above all interested in what you are doing.
- ➢ Remember that you are a salesperson and therefore your job is to sell your product to the judges. The judges are interested in your work - which is why they are judging you.
- ➢ Your presentation should not exceed 10-12 minutes, and should allow an additional 3-5 minutes for questions.

Poster Session

Display Guidelines/Rules

This is neither the time nor place to demonstrate your experiment. No apparatus will be allowed to be displayed - display board and computer only. Pictures, drawings, diagrams and video footage of experiment should replace equipment. Computers may be used to enhance the presentation but media presentations, such as PowerPoint, Prezi or Google Slides, are not acceptable.

- Before judging, all of the displays will be carefully inspected by the safety committee at the regional and state expositions. A copy of the abstract, signed safety sheet(s), and possible endorsement(s) are required documents and one copy must be displayed on the front of the exhibitor's display board. They may be reduced to a minimum of a half sheet/75% (5.5 inches X 8.5 inches) of standard paper and stacked. In addition, for each of the 3-4 printed final papers that you must bring to the science fair, attach a copy of the abstract, signed safety sheets, and endorsements (if applicable) to the front of each final paper.
- Your display must not exceed the dimensions of 61 centimeters (24" inches) front to back, 107 centimeters (40" inches) from side to side, and 152 centimeters (60" inches) from table to top. This applies to all parts of your project.
- No apparatus may be on top of, under, behind, in front of, alongside, or hanging off of the display table.
- Only a display board, a computer (if necessary), and **THREE copies** of your final paper may be on the table. These copies MUST have original ink signatures on the Safety Sheet and Endorsement Sheets. The computer must be battery operated since no electricity will be supplied, WiFi may not be available depending on the location of the science fair, and presenting your science project must be through your display board (not your computer). Your computer may only be used for showing models, data, and experiments if performed virtually.
- Your display must be designed to sit on a table and be self-supporting.
- Material used for packing displays must be kept under the table.
- Table drapes or covers are not allowed beyond what is provided by IJAS.
- Spotlights, floodlights, or decorative lighting may not be used to illuminate your display.
- Any violation of these safety regulations will result in a letter to the sponsor with the reason for disqualification or potential disqualification. No project will be disqualified if the safety violation can be corrected on the spot with a minimum of effort.

Planning an Attractive Display

- The student should construct the display, with the parent, teacher, or sponsor providing guidance, encouragement, and constructive criticism.
- The title should be brief, captivating, and sufficiently descriptive to identify the project.
- Lettering should be neat, easily visible, and uncluttered. Check spelling.
- Displays should be neat and presentable.
- Do not display any previous awards or honors on your project.
- Wall space for posters, tape, tacks, etc., is not available. Construct displays so that wall space is not required. However, you are permitted to bring your own supplies to aid your displays without interfering with these rules.
- Exhibitors should bring their own tape, thumbtacks, and other supplies.
- Remember to attach a copy of your abstract, safety sheet, and possible endorsements to your display board.

Paper Session

The Following Set of Rules Applies Exclusively to Entering the Science Fair Paper Session

If you decide to enter your project in the Paper Session, write your paper following the guidelines given in the section entitled - Writing a Research Paper for a Science Investigation. Below are additional regulations and procedures for the Paper Session, but

- ➢ Paper session projects and presentations may involve more than one, but no more than four, studen(s)t. All awards will be presented to the student whose name is first on the Abstract.This designated student will then share the award with other project members equally.
- ➢ The paper should be an accurate presentation of a project done by the student(s) and should explain the experimentation and/or designs that have been made. Experimentation or design is required as explained in the Category section. A paper based solely on library research is not acceptable.
- ➢ Previously presented papers will *not* be allowed unless they include a significant amount of additional research, experimentation, and refinement. These previously presented papers must be made available to the state Paper Session Chair if requested.
- ➢ A digital copy (pdf) of the complete paper including the Abstract, Safety Sheet, and endorsements must be submitted to the Regional Paper Session Chair by the date established at the regional level.
- ➢ The student should bring **THREE copies** of their complete paper to their presentation room on the day of the State Exposition. These copies MUST have original signatures on the Safety Sheet and Endorsement Sheets. Failure to present copies of the paper with original signatures may result in disqualification.
- ➢ The presentation may be read, given from notes, or be a computer presentation (preferred). Students may use programs such as PowerPoint, Prezi, or Google Slides to create their presentation. The complete presentation may take no longer than 10-12 minutes, with additional time (3-5 minutes) allowed for questions and answers
- ➢ WIFI may not be available, make sure there is a copy of the presentation on the laptop/computer being used..
- ➢ Display boards are not permitted; however tables, figures, and so forth may be presented manually, but may not exceed the dimensions of a standard 8.5" X 11" sheet of paper.
- ➢ Further research, conducted after the regional fair, may be presented as a written addendum given to the judges at the time of the oral presentation, but a revised paper **may not** be submitted to the exposition.
- ➢ State awards for Paper Session will be given at the Awards Assembly on the final day of the State Exposition.

Additional Contests

- ➢ **Additional contests are posted annually on the IJAS website.**
  See the website for all rules and regulations: https://sites.google.com/ijas.org/ijas/students/contests

Judging Criteria for Posters and Papers – Experimental Investigation

The following are criteria for the Illinois Junior Academy of Science judging procedure. Judges who are not agents of the Illinois Junior Academy of Science may use other criteria for selection of their special awards. **The decision of the judges is final.**

- 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. The student(s) exhibit(s) 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 of data 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 Information for the Poster and Paper Sessions - Experimental and Design Investigation

An Overview

Judging is, without a doubt, one of the most important phases of any science exposition. Because of its extreme importance, all judges should carefully review the following.

- Expositions are not intended to be contests between students or schools. Each exhibitor is to be judged based on the rating criteria and not in comparison to another exhibitor.
- Even though many exhibits show a remarkable degree of scientific knowledge, all judges are asked to keep in mind that all of the exhibitors are junior or senior high school students, many of whom are experiencing their first taste of scientific evaluation by a distinguished critic.
- As a judge, use your own good judgment at all times. Be honest with yourself and the student. Keep in mind that only a small percentage of the students will ever actually go into scientific research; however, many of them will have a great deal to say about the future of science. Certainly, a valuable experience with science at this level might potentially reap valuable rewards later.
- The opportunity to discuss their project with interested adults acting as judges is a high point for most students. Be aware that most students have spent many months preparing for a judging period, which normally lasts fifteen minutes. Feel free to discuss any aspect of the student's work; they deeply appreciate all questions and comments.
- In order to participate as a judge, you must be beyond high school age.

Judging Mechanics - Information for Judges

- Be sure to report for final instructions promptly on the day of the Exposition. Allow yourself enough time to park your car, and to allow for traffic interference so that you will report on time. The Category Judging Chair will inform you about when and where to report.
- At the judges meeting, you will be informed of any last minute changes and/or special instructions concerning judging assignments.
- Each judging team is to be assigned about six projects or papers to judge. Again, each exhibitor is to be judged based on the rating criteria and not in comparison to other exhibitors or based on your personal preferences.
- The Regional and State Expositions are planned so that each judging team is allowed fifteen to thirty minutes for each project or paper.
- You may be asked to judge projects in both divisions: Junior, grades 7 and 8 and Senior, grades 9,10, 11, and 12. If so, remember to judge them based on individual merit, and please keep the age of the exhibitor in mind.
- Each project judged must have a final score so that the certificate of award can be made. Be certain that you are using the correct rubric when scoring the project. Do not show or discuss students' scores with them. Information on specific guidelines and procedures concerning ratings will be supplied by and discussed with the judging chair.
- Be pleasant and interested. Do not use cell phones while judging.
- Please remember that you are working with tomorrow's scientists; their "decision for science" may rest on the impression you give them.
- Students must be with their project or at their assigned paper session room at the time of judging. If the cannot be located within a reasonable period of time, then the project or paper is considered a No Show, and no rating is to be given.
- Many intangible factors are involved in judging. These can be evaluated only by talking with the student and cannot be estimated merely by looking at the physical aspects of the exhibit. Judges should keep in mind that a spectacular exhibit or one composed of costly equipment is not necessarily the best science project.
- Fill out and return the judges' comment sheet to the student. Please indicate comments that would help the student improve. Comments might be positive or constructive, but they should not be sarcastic. Please make sure that your comments are clear and to the point. Do not indicate the award on this sheet.
- It is imperative that each judging team finish its judging responsibilities in the allotted time, and have its judging results turned into the Category Chair on time. Enough time must be available to prepare the awards by the

Awards Chair. Please allot your time accordingly so that results are turned in when due.

- Be sure every project for which you are responsible has been judged. Return the scoring rubric immediately following the judging of each project. Do not hold all scoring rubrics until you are finished judging all projects.
- Judges must return all materials (except for abstracts) to the student. You may not keep any other portion of the student's paper.

Rating Criteria

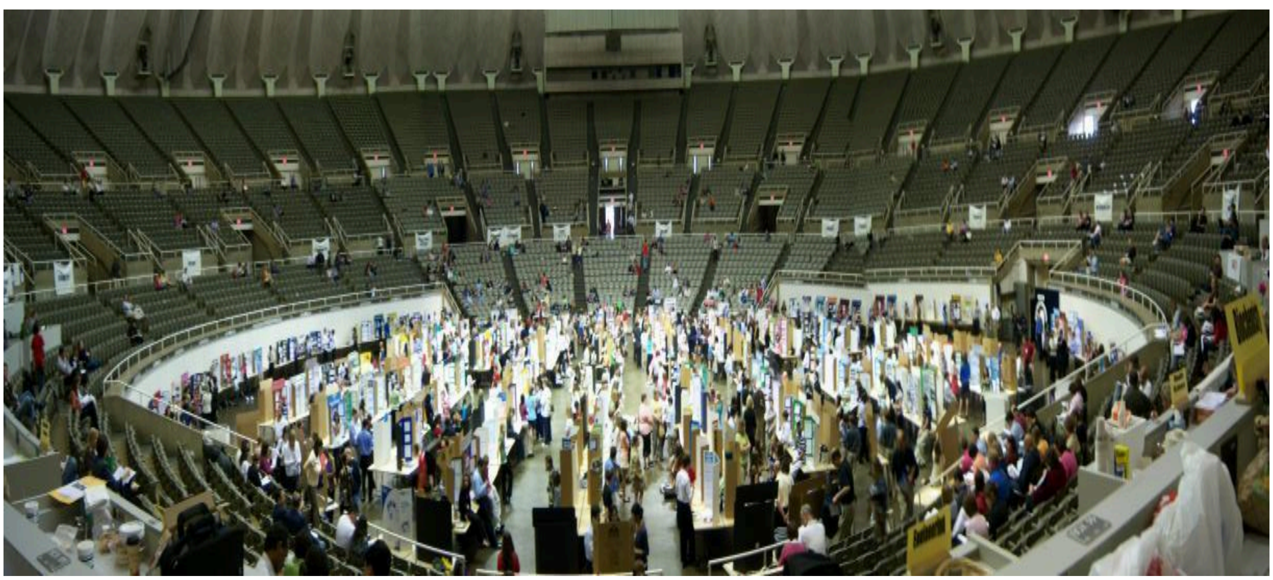
When rating the project and paper, the judges should consider the following:

Gold Award - The following criteria may identify an outstanding project.

- A scientific approach to a specific problem is supported with relevant experimentation.
    - Approach indicates creativity.
    - Conclusions logically deduced from experimental data.
    - Clear concise research paper containing abstract in required form, safety sheet, and Endorsement Sheet(s) when appropriate.
- Students can speak knowledgeably on contents of paper and area of investigation.
- Good quality and quantity of background information is reflected in the Review of the Literature and Reference List.

Silver or Bronze Award
A silver or bronze award is given for a lesser degree of the above criteria; for example, insufficient reference list, lack of thoroughness in experimental technique or observation, or lack of knowledge of subject area.

Participation Certificate
A serious omission or mistake is present; for example, no proof of experimentation or no scientific approach is evident. Any model or demonstration will be issued a participation certificate. The judging chair will supply specific tips and pointers for a given category.



Information for Teachers, Sponsors, and Parents

Sponsors and Teachers

Behind the student is the sponsor, often a teacher of a science subject, but occasionally a dedicated citizen. These volunteers are the unsung heroes of the local, regional, and state expositions. The ways in which they can assist the students are:

- ➢ Instill interest within the students.
- ➢ Register in the fall with the State Illinois Junior Academy of Science (IJAS). Registration deadline is December 31. https://ijas.wildapricot.org/
- ➢ Check with your Regional Chair for specific regional fees, deadlines, and registration requirements; regional fees and registrations will vary. https://sites.google.com/ijas.org/ijas/regional-info/regional-chairs-officers
- ➢ Provide materials that will help the student select the project*: The Illinois Junior Academy of Science Policy and Procedure Manual*, regional mailings, state mailings, and access to the IJAS website at www.ijas.org.
- ➢ Discuss how to develop a project, and show results of past projects.
- ➢ Review all rules, regulations, and safety policies and procedures. If students intend to carry out human or other vertebrate animal experimentation, make certain that they are aware of the procedures to follow and that they complete the proper endorsement forms (see Appendix pages 53-54).
- ➢ Participate in a local Science Exposition. This local exposition will give the students experience in the displaying and explaining of their projects and may determine which projects are worthy of Regional competition.
- ➢ Establish a deadline calendar. For example, project selection to be by the first week in October, progress reports by December, final sketches by January, and projects completed and ready for presentation by early February. This will leave time for final adjustments before the regional fairs.
- ➢ Arrange periodic small group discussions of progress on projects and provide an opportunity to analyze and solve problems related to individual projects.
- ➢ Offer encouragement and guidance.
- ➢ Ask others to assist, such as an English teacher for writing assistance, a mathematics teacher for assistance with statistics, or a science teacher with special expertise.
- ➢ Check the project and paper carefully to be sure the student has complied with all safety regulations and with the regulations for writing the paper and abstract before signing your name to the safety and/or endorsement sheets. As a sponsor, you are responsible for all aspects of the student's project.
- ➢ Request the necessary entry materials for both the project and paper sessions. Since regional procedures may vary, consult with your regional chair for specific details.
- ➢ Provide qualified judges for both the Regional and State Expositions. Failure to comply with this requirement may result in the return of your project and/or paper entries. Judges must be aware of their responsibilities. If they cannot attend, they must provide a suitable replacement in the same judging area.
- ➢ Provide safety inspectors, runners, awards room workers, and other volunteers as required by the regional and/or state organization. **In all stages of competition, the judges' decision is final.**

Parents

We know that you are proud of the accomplishments of your son or daughter and that you are anxious to see them succeed in this introductory phase of a possible career or a lifelong interest in science. The role of the parent is to support your child's independent efforts, not to take over the project. Your challenge is to provide just enough assistance to allow your child's own efforts to take center stage, while offering ideas and resources that might help them raise their efforts to a higher level.

Keep in mind the following suggestions:

- ➢ Review this *Policy and Procedure Manual* in its entirety and any other materials your child's science teacher (sponsor) sends home about the requirements of the project. All State information is available at www.ijas.org.

- ➢ Encourage your child as they brainstorms ideas for the project. Do not be too quick to shoot ideas down as impractical or expensive – let them explore ideas first. If you have concerns, form them into questions for your son or daughter to consider. If possible, allow him or her to rule out impractical ideas before you do.

- ➢ Make sure you understand what is required before approving a science project topic. Will it be able to be accomplished with all the other activities that your child is involved in, along with other academic requirements?

- ➢ Support your child in researching their topic and conducting the experiment; assist by supplying transportation (if needed), and access to information and materials. Often excellent learning opportunities will present themselves. You could teach your child to use a piece of equipment or machinery rather than doing it yourself just because it might be easier.

- ➢ Make sure you are familiar with the safety guidelines and see that they are followed. See pages 17-24. A student may be denied participation at the next level of exhibition if the project or paper is found to violate the established rules and regulations published in the most recent copy of the *Policy and Procedure Manual* of the Illinois Junior Academy of Science. **Some projects will be disqualified if done at home.**

- ➢ Assist your child in thinking through experimental or design procedures and how they plan to record and organize their data.

- ➢ Your child might need assistance in preparing their display board and presentation. Your role should be secondary to their efforts – things like reading through and suggesting editorial changes, helping with advanced computer applications, assisting with display board layout, and listening to their presentation.

- ➢ In general, show an interest in your child's progress, offer support and encouragement, help them overcome problems, and praise their good efforts.

- ➢ If in doubt, contact your child's science teacher or sponsor for assistance or encourage your child to do so.

- ➢ The Illinois Junior Academy of Science attempts to award and recognize as many students as possible. Proper handling of the successes and disappointments of a competition can lead to the continued efforts towards a higher goal.

- ➢ Celebrate the successes and spend a moment looking at what went wrong. Encourage a discussion as to how things might have been done differently. This process is an important part of both learning and science.

- ➢ **In all stages of competition, the judges' decision is final. Volunteers are NOT agents of IJAS.** Special award judges, who are not agents of the Illinois Junior Academy of Science, may use other criteria for selecting their special awards. Not all projects will be judged for special awards.

Appendix

	Student Project Checklist
	Abstract
	First page of paper.
	Three paragraphs with proper headings: Purpose, Procedure, and Conclusion.
	Typed single-spaced.
	200 words or less.
	Safety Sheet
	Second page of paper.
	Hazards listed, precautions described.
	Signed by sponsor.
	Endorsement(s)/required documents, if applicable
	Third page of paper; subsequent pages, as needed.
	Completed as per guidelines.
	Signed by student and sponsor; proper documentation is attached, if necessary.
	Title Page
	Clear and concise.
	Table of Contents
	Pagination is present and accurate.
	Acknowledgments
	Credit is given to those who have helped.
	Purpose and Hypothesis
	States precisely what the investigation or design was attempting to discover or solve.
	States a definite question or problem.
	Hypothesis is present.
	Background Research
	Consistent voice is evident.
	Logical and/or related grouping of information.
	Accuracy in calculations, spelling, grammar, and quotations.
	Typed double-spaced, one inch margins; may be double-sided.
	Parenthetically cited.
	Materials and Methods of Procedure
	Apparatus and materials are listed, or incorporated into the written procedures.
	Drawings and photographs are present if they enhance and clarify the apparatus.
	Step-by-step, chronological procedures are present; or procedures are written in past tense narrative.
	Number of test groups is adequate and the number of trials within each test group is adequate. The control of variables is evident.
	Results
	Data is organized into tables or charts with accompanying graphs, if appropriate.
	Data is quantitative and correct units of measurement (metric) are used.
	Data is clear and accurate.
	The effect of experimental error was estimated and considered.
	The data has been analyzed and discussed.
	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 come from a variety of sources.
	References are current.
	Reference list is alphabetical.
	Proper APA format is used for all references.

Student Safety Checklist	
Experimental and Design Investigation Safety The following procedures were followed:	
	No cultures were obtained from humans, except those from supply houses.
	Quantities of food and non-alcoholic beverages were limited to normal serving sizes, and consumed in a reasonable amount of time.
	Blood was not drawn exclusively for the science project.
	Projects involving exercise have a valid normal physical examination on file and exercise was not carried to the extreme.
	No cultures were obtained from warm-blooded animals.
	No intrusive techniques were used.
	No extreme changes were made in the organism's normal environment.
	Food or water was not withheld for a period that would cause undue stress based on the animal's metabolic rate.
	Animals were properly cared for with adequate ventilation, food, and water.
	Chicken or other bird embryo treatment was discontinued at or before 72 hours before hatching.
	All microorganisms were destroyed by autoclaving or with NaOCl (bleach) solution.
	All safety guidelines (chemical, electrical, mechanical, fire, radiation, biological) were followed and documented.
Miscellaneous	
	Four copies of the complete research paper for Poster Session participants.
	Two copies of the complete research paper for Paper Session participants.
	Display board - Reminder: no chairs or table covers are allowed.
	A copy of the Abstract, Safety Sheet, and Endorsements (if applicable) are displayed on the front of the display board during Poster Session.
	Friday night banquet tickets - see sponsor for information.

APA Style Resource Websites

These websites will introduce you to APA documentation, step-by-step instructions, format, citations, and reference lists. However, it is suggested to use the *Publication Manual of the American Psychological Association, 7th edition*.

http://www.apastyle.org/

http://www.easybib.com

http://www.noodletools.com

http://www.citationmachine.net

Online Writing Lab (OWL) at Purdue University
http://owl.english.purdue.edu/

Zotero
http://www.zotero.org/

Mr. Freeze at the IJAS banquet.

The experiences of participation in authentic research inquiry and presentation at the IJAS Exposition aligns with the first dimension of the Next Generation Science Standards (NGSS), the College Readiness Standards (CRS), and the Common Core State *Literacy in Science and Technical Subjects and Writing*, and *Writing for Literacy in Science and Technical Subjects: Research to Build and Present Knowledge.*

Next Generation Science Standards As students progress through a research investigation they will engage in the first dimension of the NGSS, which involve the processes of science. This dimension relates to the behaviors that scientists engage in as they investigate and build models and theories about the natural world and the key set of engineering practices that engineers use as they design and build models and systems.
1. Asking Questions and Defining Problems
1a. Ask and evaluate questions that challenge the premise of an argument, the interpretation of a data set, or the suitability of a design.
2. Developing and Using Models
2a. Develop a model based on evidence to illustrate the relationships between systems or between components of a system.
3. Planning and Carrying Out Investigations
3a. Design an investigation individually and collaboratively and test designs as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled.
3b. Design and conduct an investigation individually and collaboratively, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
3c. Design and conduct investigations and test design solutions in a safe and ethical manner including considerations of environmental, social, and personal impacts.
4. Analyzing and Interpreting Data
4a. Use tools, technologies, and/or models (e.g., computational, mathematical) to generate and analyze data in order to make valid and reliable scientific claims or determine an optimal design solution.
4b. Evaluate the impact of new data on a working explanation of a proposed process or system.
5. Using Mathematics and Computational Thinking
5a. Use mathematical representations of phenomena to describe explanations.
6. Constructing Explanations and Designing Solutions
6a. Make quantitative and qualitative claims regarding the relationship between dependent and independent variables.
6b. Apply scientific reasoning, theory, and models to link evidence to claims to assess the extent to which the reasoning and data support the explanation or conclusion.
7. Engaging in Argument from Evidence
7a. Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.
7b. Evaluate the evidence behind currently accepted explanations to determine the merits of arguments.
8. Obtaining, Evaluating, and Communicating Information
8a. Produce scientific and/or technical writing and/or oral presentations that communicate scientific ideas and/or the process of development and the design and performance of a proposed process or system.

College Readiness Standards (CRS)

Engaging in authentic research investigations addresses the process standards of the College Readiness Standards (CRS), which align to the process of inquiry. The three CRS standards include:

1) Interpretation of data,

2) Scientific Investigation, and

3) Evaluation of Models, Inferences, and Experimental Results

College Readiness Standards — Science

	Interpretation of Data	Scientific Investigation	Evaluation of Models, Inferences, and Experimental Results
13–15	Select a single piece of data (numerical or nonnumerical) from a simple data presentation (e.g., a table or graph with two or three variables; a food web diagram) Identify basic features of a table, graph, or diagram (e.g., headings, units of measurement, axis labels)		
16–19	Select two or more pieces of data from a simple data presentation Understand basic scientific terminology Find basic information in a brief body of text Determine how the value of one variable changes as the value of another variable changes in a simple data presentation	Understand the methods and tools used in a simple experiment	
20–23	Select data from a complex data presentation (e.g., a table or graph with more than three variables; a phase diagram) Compare or combine data from a simple data presentation (e.g., order or sum data from a table) Translate information into a table, graph, or diagram	Understand the methods and tools used in a moderately complex experiment Understand a simple experimental design Identify a control in an experiment Identify similarities and differences between experiments	Select a simple hypothesis, prediction, or conclusion that is supported by a data presentation or a model Identify key issues or assumptions in a model
24–27	Compare or combine data from two or more simple data presentations (e.g., categorize data from a table using a scale from another table) Compare or combine data from a complex data presentation Interpolate between data points in a table or graph Determine how the value of one variable changes as the value of another variable changes in a complex data presentation Identify and/or use a simple (e.g., linear) mathematical relationship between data Analyze given information when presented with new, simple information	Understand the methods and tools used in a complex experiment Understand a complex experimental design Predict the results of an additional trial or measurement in an experiment Determine the experimental conditions that would produce specified results	Select a simple hypothesis, prediction, or conclusion that is supported by two or more data presentations or models Determine whether given information supports or contradicts a simple hypothesis or conclusion, and why Identify strengths and weaknesses in one or more models Identify similarities and differences between models Determine which model(s) is(are) supported or weakened by new information Select a data presentation or a model that supports or contradicts a hypothesis, prediction, or conclusion
28–32*	Compare or combine data from a simple data presentation with data from a complex data presentation Identify and/or use a complex (e.g., nonlinear) mathematical relationship between data Extrapolate from data points in a table or graph	Determine the hypothesis for an experiment Identify an alternate method for testing a hypothesis	Select a complex hypothesis, prediction, or conclusion that is supported by a data presentation or model Determine whether new information supports or weakens a model, and why Use new information to make a prediction based on a model
33–36†	Compare or combine data from two or more complex data presentations Analyze given information when presented with new, complex information	Understand precision and accuracy issues Predict how modifying the design or methods of an experiment will affect results Identify an additional trial or experiment that could be performed to enhance or evaluate experimental results	Select a complex hypothesis, prediction, or conclusion that is supported by two or more data presentations or models Determine whether given information supports or contradicts a complex hypothesis or conclusion, and why

Common Core Reading

Literacy in Science and Technical Subjects

Key Ideas and Details

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure

RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

RST. 11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST. 11-12.6 Analyze the author's purpose in providing an explanation, describing procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Common Core Writing

Writing for Literacy in Science and Technical Subjects: Research to Build and Present Knowledge

W.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

W.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

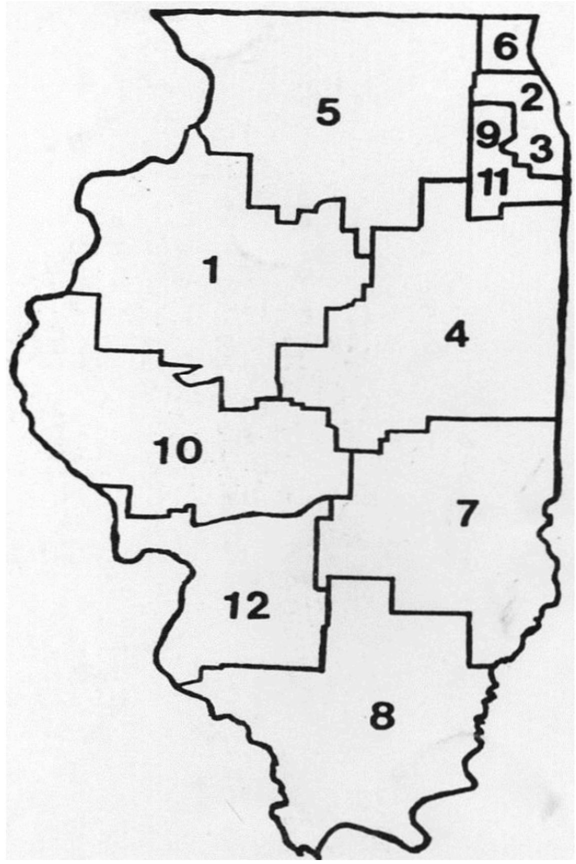
W.11-12.9. Draw evidence from informational texts to support analysis, reflection, and research.

Common Core Mathematics

Standards for Mathematical Practice

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

ILLINOIS JUNIOR ACADEMY OF SCIENCE



Region 1 - Central
Fulton, Henderson, Henry, Knox, Marshall, Mason, McDonough, Menard, Mercer, Peoria, Rock Island, Stark, Tazewell, Warren, and Woodford Counties.

Region 2 - Chicago and Metropolitan Area Non-Public Schools
East of Route 83, North of Route 12/20, South of I-90 to O'Hare Field, West of Lake Michigan.

Region 3 - Chicago Public Schools

Region 4 - East Central
Champaign, DeWitt, Ford, Grundy, Iroquois, Kankakee, Livingston, Logan, Macon, McLean, Piatt, and Vermillion Counties.

Region 5 - Northern
Boone, Bureau, Carroll, DeKalb, Jo Davies, Kane, Kendall, LaSalle, Lee, McHenry, Ogle, Putnam, Stephenson, Whiteside, and Winnebago Counties.

Region 6 - North Suburban
North Half of Cook and DuPage Counties (Route 20 extended is the dividing line), and Lake County.

Region 7 - Southeastern
Clark, Clay, Coles, Crawford, Cumberland, Douglas, Edgar, Edwards, Effingham, Fayette, Jasper, Lawrence, Moultrie, Richland, Shelby, and Wabash Counties.

Region 8 - Southern
Alexander, Franklin, Gallatin, Hamilton, Hardin, Jackson, Jefferson, Johnson, Marion, Massac, Perry, Pope, Pulaski, Randolph, Saline, Union, Wayne, White, and Williamson Counties.

Region 9 - South Suburban
Southern Half of Cook and DuPage Counties (Route 20 extended is the dividing line) and Will County.

Region 10 - Southwestern
Adams, Brown, Calhoun, Cass, Christian, Green, Hancock, Macoupin (North of Route 16), Montgomery (North of Route 16), Morgan, Pike, Sangamon, Schuyler, and Scott Counties.

Region 11 - Joliet Area Non-Public Schools
DuPage, Grundy, Kankakee, Kendall, and Will County Parochial and Private Schools.

Region 12— Edwardsville Area
Bond, Calhoun, Clinton, Jersey, Macoupin (South of Route 16), Madison, Monroe, Montgomery (South of Route 16), St. Clair, and Washington Counties.

ABSTRACT 2024-2026

The Illinois Junior Academy of Science

This form/paper may not be taken without IJAS authorization.

CATEGORY	________________	STATE REGION #	________________
SCHOOL	________________	IJAS SCHOOL #	________________
CITY/ZIP	________________	SPONSOR E-MAIL	________________
SPONSOR	________________	SPONSOR CELL (optional)	________________

MARK ONE: EXPERIMENTAL INVESTIGATION ☐ DESIGN INVESTIGATION ☐

NAME OF SCIENTIST*	________________	GRADE	________________
NAME OF SCIENTIST	________________	GRADE	________________
NAME OF SCIENTIST	________________	GRADE	________________
NAME OF SCIENTIST	________________	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 scientists.

PROJECT TITLE ____

Purpose or Problem:

Procedure:

Conclusion:

1) Limit Abstract to 3 paragraphs (about 250 words or less). 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 of this form. Do not write on the back of this form.
3) Three copies of your complete paper are required at the State Science Project Exposition.
Four copies of your complete paper are required for the State Paper Session Competition.

This form must be used. 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).

SAFETY SHEET
2024-2026

The Illinois Junior Academy of Science

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 the joint responsibilities of the student and sponsor. Any projects that violate any of the safety rules without a special circumstance that has been presented to and accepted by the IJAS State board will be disqualified from the competition.

Follow each of the following steps:

1. The sponsor, student, and parent (when appropriate) need to read ALL of the safety guidelines in the current IJAS Policies and Procedures carefully **PRIOR** to starting the project.
2. Determine whether the project violates any of the IJAS safety regulations. If there are any questions related to any of the safety rules, the sponsor should contact the Regional Safety Chair. Sponsors, students and parents must not contact the State Safety Chair directly.
3. If the Regional Safety Chair has further questions, they should contact the State Safety Chair stating the region and specific questions related to the project. Sponsors, students and parents must not contact the State Safety Chair directly.
4. No project is without any hazards. A blank safety sheet or one without any listed hazards will not be accepted as complete.
5. If the project involves humans in any way, microorganisms, vertebrate animals, or cells or tissue cultures, the proper endorsement form must also be filled out and included with this safety sheet.
6. This Safety Sheet must be included in the paper, on the project board and turned in electronically when the project is entered into the State Competition. (Rules for regional competitions may vary).

Location(s) where procedure was conducted:	______If project was done at an outside facility, check here and include a letter from the facility with this form assuring safety was adhered to and that the student role in the project.
Were microorganisms involved in any way?	_____If yes, check here and fill out a Microorganisms Endorsement sheet
Were humans involved in as a test subjects?	_____If yes, check here and fill out a Humans Endorsement Sheet
Were cells or tissue cultures involved in any way?	_____If yes, check here and fill out a Tissue Culture Endorsement Sheet
Were cells or vertebrate animals involved in any way?	_____If yes, check here and fill out a Vertebrate Animal Endorsement Sheet
Were there any violations of IJAS Safety Rules that were either approved by the IJAS SRC or by a qualified institution?	_____If yes, check here and include the letter from the IJAS SRC or the qualified institution where the project was conducted.
List any chemicals used:	Precautions taken with use of chemicals:
List any other safety hazards that are not covered on the endorsement sheets:	For each listed safety hazard, describe what precautions were taken: (note this can extend to the next page if needed)

I/We the student(s) who conducted this project have followed each of the steps listed above and have used all of the safety precautions stated.

Signature(s)____**Date**____________

I, the sponsor of this project take responsibility for the instruction of the student on safety precautions and/or verified the safety credentials of any institution with which they worked.

Signature____________________________________***E-mail***____________________________**Date**_________

Humans Endorsement

2024-2026

The Illinois Junior Academy of Science

Students and sponsors doing a project involving humans as test subjects must complete this form PRIOR to experimentation. This included Projects that involve food/drink consumption, human physical movement,learning, hearing, vision, and all **surveys**. The signature of the student or students and the sponsor indicates that the project was done within all IJAS rules and regulations. Failure to comply with these rules will mean the disqualification of the project at the level. This form must also follow the Safety Sheet in the project paper and must be on the project board.

A few reminders:

1. Humans must not be subjected to treatments that are considered hazardous and/or that could result in undue stress, injury, pain, or death to the subject. This includes any electrical stimulation, fear inducing measures and cold or heat exposure.
2. **No** primary or secondary cultures taken directly (mouth, throat, skin, etc.) or indirectly (eating utensils, countertops, doorknobs, toilets, etc.) will be allowed. However, cultures obtained from reputable biological suppliers or research facilities are suitable for student use.
3. 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.
4. No project may use over-the-counter drugs, prescription drugs, illegal drugs, nicotine or alcohol in order to measure their effect on a person.
5. The only human bodily fluids that may be used is that which is either purchased or obtained from a blood bank, hospital, or laboratory. No blood may be drawn by any person or from any person specifically for a science project. This rule does not preclude a student making use of data collected from blood tests not made exclusively for a science project. Documentation of source of body fluids or associated data must be included with this form.
5. Projects that involve exercise and its effect on pulse, respiration rate, blood pressure, and so on are allowed provided the exercise is not carried to the extreme. A valid, normal physical examination must be on file for each student test subject. Documentation of same must be attached to the this form.
7. All projects involving surveys must adhere to the rules in the survey section of the safety rules in the Policy and Procedure Manual.

Fill out the following charts:

Briefly describe how humans were used in the investigation.	
Were humans given food or drink?	____If yes, check here and state what was consumed and how much. Also attach to this form **reliable documentation of the** normal serving amounts.
Were humans subjected to exercise of any kind? This includes if the human was doing exercise to test a device or product.	____If yes, check here and: ● attach to this form a note from the school nurse or other official any students involved have a physical on file. ● For adult subjects, a consent form must be used and signed by the participant. These must be available for review if needed. ● describe in the procedure how test subjects were informed of the exercise they were to do ● state the duration and description of the exercise involved in the top box of this table.
Were humans asked to complete a test or survey or answer interview questions?	____If yes, check here and attach a copy of the test or survey or interview that they completed. (note–be sure to review the limitations on what can be asked of humans as part of an IJAS project in the survey section of the Policy and Procedure Manual.
Were any human bodily fluids used?	_____If yes, check here and state the source of the fluids or data from the fluids.
Were there any violations of IJAS Safety Rules that were either approved by the IJAS SRC or by a qualified institution?	_____If yes, check here and include the letter from the IJAS SRC or the qualified institution where the project was conducted.

Describe the possible risks to humans test subjects.	Describe how each risk was handled or avoided (this can continue on to the next page if necessary.

I/We the student(s) who conducted this project have followed each of the steps listed above and have used all of the safety precautions stated.

Signature(s)____**Date**____________

I, the sponsor of this project take responsibility for the instruction of the student on safety precautions and/or verified the safety credentials of any institution with which they worked.

Signature____________________________________***E-mail***___________________________**Date**_________

Non-Human Vertebrate Endorsement
2024-2026

The Illinois Junior Academy of Science

Students and sponsors doing a non-human vertebrate project must complete this form, prior to experimentation. The signature of the student or students and the sponsor indicates that the project was done within all IJAS rules and regulati Failure to comply with these rules will mean the disqualification of the project at the state level. This form must follow the Safety Sheet in the project paper.

1. The student and the sponsor have the responsibility to see that all animals have proper care in well-ventilated, properly lighted locations with proper nutrition, proper temperature, adequate water, and sanitary surroundings. Care must be taken to see that the organisms are properly cared for during weekends and vacation periods.
2. **No** primary or secondary cultures involving warm-blooded animals taken directly (mouth, throat, skin, etc.) or indirectly (cage debris, droppings, etc.) will be allowed. However, cultures purchased from reputable biological supply houses or research facilities are suitable for student use.
3. No intrusive or pain- producing techniques may be used. Included in these techniques would be things such as surgery, injections, taking of blood, burning, electrical stimulation or giving of over-the-counter, prescription, illegal drugs, nicotine, THC or CBG or alcohol to measure their effect.
4. No changes may be made in an organism's environment that could result in undue stress, injury, pain, or death to the animal.
5. No vertebrates can be used as the independent or dependent variables in an experiment that could result in undue stress, injury, pain or death to the animal.
6. For maze running and other learning or conditioning activities, food or water cannot be withheld for more than 24 hours. If the animal has a high metabolic rate, then food or water cannot be withheld for a length of time that would produce undue stress on the animal.
7. Chicken or other bird embryo projects are allowed, but the treatment must be discontinued at or before 96 hours from fertilization.
8. Projects that involve behavioral studies of newly hatched chickens or other birds will be allowed if no changes have been made in the normal incubation and hatching of the organism, and that all vertebrate rules are followed.

The signatures of the student or students and sponsor below indicate that the project conforms to the above rules and all of those in the IJAS Policy and Procedure manual.

Fill out the following charts

Scientific and common name of animal(s) being used.	
Were there any violations of IJAS Safety Rules that were either approved by the IJAS SRC or by a qualified institution?	_____If yes, check here and include the letter from the IJAS SRC or the qualified institution where the project was conducted.
Brief description of use of the organism(s).	

Describe the possible risks to the non-human vertebrates	Describe how each risk was handled or avoided

I/We the student(s) who conducted this project have followed each of the steps listed above and have used all of the safety precautions stated.

Signature(s)____Date____________

I, the sponsor of this project take responsibility for the instruction of the student on safety precautions and/or verified the safety credentials of any institution with which they worked.

Signature_____________________________________E-mail____________________________Date_____

Tissue Culture Endorsement
2024-2026
The Illinois Junior Academy of Science

Students and sponsors doing a tissue project must complete this form, prior to experimentation. The signature of the student or students and the sponsor indicates that the project was done within all IJAS rules and regulations. Failure to comply with these rules will mean the disqualification of the project at the state level. This form must follow the Safety Sheet in the project paper.

1. This area of science may involve many dangers and hazards while experimenting. It is the sole responsibility of all teacher(s)/sponsor(s) to teach students proper safety methods and sterile techniques.
2. The Illinois Junior Academy of Science prohibits the use of primary cell cultures taken from humans or other vertebrate animals in any project because of the danger from unknown viruses or other disease-causing agents that may be present. Established tissue culture cell lines that are characterized as requiring biosafety level 1 (BSL1) procedures and precautions may be obtained from reputable suppliers and used in proper research settings. Cell lines requiring biosafety level 2 (BSL2) procedures and precautions for use must have approval from IJAS prior to use OR be used in an established research facility.
3. Experiments using tissue culture cell lines must be conducted in a laboratory such as a science classroom or research facility.
4. Projects involving tissue culture should be done with the help of a professional and should comply with the standards and principles for biological safety.
5. Experiments using tissue culture, including the culture of insect cells, with viruses and/or recombinant DNA must also follow the rules and regulations for these agents; one endorsement sheet detailing use of these agents together is acceptable.
6. All cultures should be destroyed by methods such as autoclaving or with a suitable NaOCl (bleach) solution before disposal.

The signatures of the student or students and sponsor below indicate that the project conforms to the above rules and all of those in the IJAS Policy and Procedure manual.

Fill out all boxes in the chart below:

Published name of cells or tissue used	
List the location where the lab work was conducted.	
Source from where the cells or tissues were obtained	
Cell disposal method used	
Were there any violations of IJAS Safety Rules that were either approved by the IJAS SRC or by a qualified institution?	_____If yes, check here and include the letter from the IJAS SRC or the qualified institution where the project was conducted.
Brief description of how cells were used	
Safety precautions taken	

I/We the student(s) who conducted this project have followed each of the steps listed above and have used all of the safety precautions stated.

Signature(s)____Date___________

I, the sponsor of this project take responsibility for the instruction of the student on safety precautions and/or verified the safety credentials of any institution with which they worked.

Signature___________________________________*E-mail*___________________________Date________

Microorganism Endorsement
2014-2026

The Illinois Junior Academy of Science

Students and sponsors doing a microorganism project must complete this form, prior to experimentation. The signature of the student or students and the sponsor indicates that the project was done within these rules and regulations. Failure to comply with these rules will mean the disqualification of the project at the state level. This form must follow the Safety Sheet in the project paper and on the project board.

1. It is the sole responsibility of all teacher(s)/sponsor(s) to teach students proper safety methods and sterile techniques.
2. The Illinois Junior Academy of Science prohibits the use of primary or secondary cultures taken from humans or other vertebrate animals in any project because of the danger from unknown viruses or other disease-causing agents that may be present. Pure cultures of microorganisms known to inhabit vertebrate animals may be obtained from reputable suppliers and used in proper settings.
3. Microorganism experiments must be conducted in a laboratory such as science classroom or research facility.
4. Projects involving viruses and recombinant DNA should be done with the help of a professional and should comply with the National Institutes of Health (NIH) Guidelines unless the project is limited to a kit obtained from a legitimate supply house.
5. All cultures should be destroyed by methods such as autoclaving or with a suitable NaOCl (bleach) solution before disposal.
6. All rules within the IJAS Policy and Procedure Manual are followed.

Complete all boxes of the following chart.

Genus and species of organism(s) being used.	
List the location where the lab work was conducted.	
Name of the reputable source that supplied the organism(s).	
Method of disposal of the organism(s) being used.	
Were there any violations of IJAS Safety Rules that were either approved by the IJAS SRC or by a qualified institution?	_____If yes, check here and include the letter from the IJAS SRC or the qualified institution where the project was conducted.
Describe the use of microorganisms in this project.	
Other precautions taken to ensure microorganisms are used safely in this investigation.	

I/We the student(s) who conducted this project have followed each of the steps listed above and have used all of the safety precautions stated.

Signature(s)____Date____________

I, the sponsor of this project take responsibility for the instruction of the student on safety precautions and/or verified the safety credentials of any institution with which they worked.

Signature___________________________________*E-mail*__________________________Date_________