Judging Guide

Loudoun County Regional Science & Engineering Fair

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Welcome

Loudoun County Public Schools (LCPS) extend a warm welcome to you. We hope you have a very interesting and rewarding visit at our Regional Science and Engineering Fair (RSEF). Student exhibits are judged in twenty-one categories, and awards are presented to the winners in each category. Judges select Finalist projects to represent Loudoun County at the Regeneron International Science and Engineering Fair (Regeneron ISEF).

Thank you for your involvement in our fair. With your support the Loudoun County Regional Science and Engineering Fair will be a continuing success and an enriching educational experience.

The purpose of our fair is

to stimulate student interest in science, technology, engineering & mathematics (STEM),

to encourage students to engage in research in STEM fields,

to provide students an opportunity to present their research to STEM professionals and the community, and

to give public recognition to students for their work.

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General Information

RSEF Exhibits

The project exhibits are organized by category. Project order is listed in the abstract book.

Approximately 248 projects are exhibited from Loudoun County high schools. Students set up their exhibits Tuesday evening, prior to the fair, between 6:00 and 8:00 pm. Exhibits are removed Thursday night following the Awards Ceremony.

As exhibits are set up, they are reviewed by the display and safety committee, checked for compliance with ISEF rules, and approved for competition in RSEF by the Fair Director. See the current ISEF Rules https://student.societyforscience.org/international-rules-pre-college-science-research for additional details on specific rules and guidelines.

RSEF Categories

Number	Category Name
100	Animal Sciences
200	Behavioral & Social Sciences
300	Biochemistry
400	Biomedical & Health Sciences
500	Biomedical Engineering
600	Cellular & Molecular Biology
700	Chemistry
800	Computational Biology & Bioinformatics
900	Earth & Environmental Sciences
1000	Embedded Systems
1100	Energy: Sustainable Materials and Design
1200	Engineering Technology: Statics and Dynamics
1300	Environmental Engineering
1400	Materials Science
1500	Mathematics
1600	Microbiology
1700	Physics & Astronomy
1800	Plant Sciences
1900	Robotics & Intelligent Machines
2000	Systems Software
2100	Technology Enhances the Arts
2200	Translational Medical Science

For detailed category descriptions visit the ISEF website at:
https://www.societyforscience.org/isef/categories-and-subcategories/

Project Numbering

For exhibition, all projects are given a number. The first series of numbers indicates the category & project number. For example, project **1303T10** is the third project in Environmental Engineering. The letters, **T** or **X**, in the project number indicate whether a project is a Team (**T**) project or an Individual (**X**) project.

Awards

The awards for the fair are in two groups: **RSEF Category Awards** and **Special Awards.**

RSEF Category Awards

Category awards are given in twenty-one categories. There are First, Second, and Third places awarded in each category. Honorable Mention awards may also be given. *ISEF Finalists* are chosen from the 1st place category winners.

The *ISEF Finalists* participate in the Regeneron International Science and Engineering Fair. This annual event takes place in May with more than 1700 high school participants from 70 nations.

Special Awards

Special awards are given by individuals, and local, state, and national organizations. The special award donors establish the criteria for their awards and often provide their own judges. Awards may include monetary gifts, treasury bonds, gift certificates, plaques, trophies, journal subscriptions, scientific equipment, tours of facilities, and unique opportunities for students.

Special Awards Selection

Special award judges should obtain the materials they need from the judges' area prior to entering the exhibit area. Special award judging begins at **8:15 am** after the judges' briefing.

Names of winners and prizes should be given to the awards coordinator in the judges' area by **12:45 pm**. Inform the awards coordinator if a representative is presenting the award at the awards ceremony.

Category Judging Criteria

Projects are judged based on the quality of the work done on a project in science, engineering or mathematics by a high school student, and that student's understanding of the project and their area of research.

A project should involve laboratory, field, or theoretical work, not just library research or gadgeteering.

Judges are asked to remember they are *not grading* students' work. Instead, they are allowing each student to demonstrate what they learned. This means judges should:

- encourage a response, rather than interrogate, and
- highlight strengths, rather than find fault.

Projects should be compared with other projects in the same category.

Judges should remember that these are high school students' projects and not those of a Ph.D. candidate or science professional.

While experimentation is the most often considered model of science research, there are other examples that are just as valid in making contributions to science and are encouraged and valued by LCPS. These include[1]:

Theoretical – Theoretical models examine observations and data within a context with the intention of developing new theoretical assumptions. These may use mathematical or statistical analyses to explore a question. The result of theoretical science research is often new predictions or hypotheses that can be further tested.

Observational/field – Experimental research allows for isolating variables, but in nature, variables do not act in isolation. Therefore, it is important to examine how an intact system would function. Observational/field studies gather data on specific activities that are not found in a controlled laboratory environment. Observational/field studies are often used in natural science fields such as ecology, environmental sciences, epidemiology, anthropology, or animal behavior.

Secondary – Secondary research involves the use of data sets that may be available through a variety of sources (previous studies, public data, etc.). In some instances, the data is collected continuously (census data, weather data) for non-research purposes. This data can be used to explore new and unique questions.

Computational – This field of science research uses mathematics and operations science to design computational models, which can be converted into practical applications. These are also known as design models.

[1] Goudi, J.& G. Thomas. 2004. Nature of Research. In M. Shapiro (Ed.), *Guiding Student Research: Making Research Happen in Your School* (pg 21-28). National Consortium for Specialized Secondary Schools of Mathematics, Science and Technology (NCSSSMST).

LCPS values both **basic research** (investigations exploring an understanding of the natural world with no apparent application to solving an identified problem) and **applied research** (investigations exploring a question that addresses an identified problem or concern). Therefore, students may or may not have identified how the information connects to a potential problem. However, students doing basic research should discuss future questions and research in relation to what is and is not known.

The LCPS RSEF follows the judging criteria established by the Regeneron ISEF https://www.societyforscience.org/isef/grand-award/criteria/

Students are encouraged to design their posters in a clear and informative manner to allow pre-interview evaluation and to enable the interview to become an in-depth discussion. Judges should examine the student notebook and, if present, any special forms such as Form 1C (Regulated Research Institution/Industrial Setting) and Form 7 (Continuation of Projects).

Creativity: A creative project demonstrates imagination and inventiveness. Such projects often offer different perspectives that open up new possibilities or new alternatives. Judges should place emphasis on research outcomes in evaluating creativity.

Presentation/Interview: The interview provides the opportunity to interact with the finalists and evaluate their understanding of the project's basic science, interpretation and limitations of the results and conclusions.

If the project was done at a research or industrial facility, the judge should determine the degree of independence of the finalist in conducting the project, which is documented on Form 1C.
If the project was completed at home or in a school laboratory, the judge should determine if the finalist received any mentoring or professional guidance.

If the project is a multi-year effort, the interview should focus ONLY on the current year's work. Judges should review the project's abstract and Form 7 (Regeneron ISEF Continuation Projects) to clarify what progress was completed this year.

Please note that both team and individual projects are judged together, and projects should be judged only on the basis of their quality. However, all team members should demonstrate significant contributions to and an understanding of the project.

Judging Criteria for Science Projects

I. Research Question (10 pts)
___ clear and focused purpose
___ identifies contribution to field of study
___ testable using scientific methods

II. Design and Methodology (15 pts)
___ well-designed plan and data collection methods
___ variables and controls defined, appropriate and complete

III. Execution: Data Collection, Analysis and Interpretation (20 pts)
___ systematic data collection and analysis
___ reproducibility of results
___ appropriate application of mathematical and statistical methods
___ sufficient data collected to support interpretation and conclusions

IV. Creativity (20 pts)
___ project demonstrates significant creativity in one or more of the above criteria

V. Presentation (35 pts)
a. Poster (10 pts)
___ logical organization of material
___ clarity of graphics and legends
___ supporting documentation displayed

b. Interview (25 pts)
___ clear, concise, thoughtful responses to questions
___ understanding of basic science relevant to project
___ understanding interpretation and limitations of results and conclusions
___ degree of independence in conducting project
___ recognition of potential impact in science, society and/or economics
___ quality of ideas for further research
___ for team projects, contributions to and understanding of project by all members

Judging Criteria for Engineering Projects

I. Research Problem (10 pts)
___ description of a practical need or problem to be solved
___ definition of criteria for proposed solution
___ explanation of constraints

II. Design and Methodology (15 pts)
___ exploration of alternatives to answer need or problem

___ identification of a solution
___ development of a prototype/model

III. Execution: Construction and Testing (20 pts)
___ prototype demonstrates intended design
___ prototype has been tested in multiple conditions/trials
___ prototype demonstrates engineering skill and completeness

IV. Creativity (20 pts)
___ project demonstrates significant creativity in one or more of the above criteria

V. Presentation (35 pts)

a. Poster (10 pts)
___logical organization of material
___clarity of graphics and legends
___ supporting documentation displayed

b. Interview (25 pts)
___ clear, concise, thoughtful responses to questions
___ understanding of basic science relevant to project
___ understanding interpretation and limitations of results and conclusions
___ degree of independence in conducting project
___ recognition of potential impact in science, society and/or economics
___ quality of ideas for further research
___ for team projects, contributions to and understanding of project by all members

Sources of Help
Obviously, no project can be creative and original in all aspects, and in addition, judges must keep in mind that they are dealing with high school students. Student projects should be judged in high school-level terms.

All professionals receive help in some way; therefore, a student should not be penalized for receiving help from others. But credit for creative ability and originality should be given in regard to the student's own contributions.

For example, did the student get an idea for their project from a textbook suggestion for research, from a summer mentor, teacher or other professional? Or did the student develop the idea alone, as a result of reading or work done? If the student developed the idea without help, it would be considered more creative.

Some data are impossible for students to collect themselves because of a variety of constraints. Therefore, students should not be penalized for not physically collecting data. It is important to consider this when students are relying on data obtained through external sources. For instance, historical data can be a useful source of information for answering research questions, but the time

constraints of RSEF projects make it unrealistic for students to personally collect this type of data. Additionally, resource limitations make it difficult for high school students to have access to some types of research instruments. Much like scientists in the same situation, students may need to send collected materials to companies that specialize in a particular test or technique to complete their project. In all cases, students should be able to justify, analyze and explain the results, and limitations of data obtained regardless of the origin of the data.

Judging Procedures

Upon arrival, judges should sign-in and meet at their assigned category table. Judges should wear RSEF name badges during the fair.

There are three judging phases

a **morning session** in which all projects are surveyed, and students are interviewed,

a **midday session** which includes lunch and selection of the category and special award winners, and

an **afternoon session** in which category chairs select the *ISEF Finalists*.

All category judges participate in the morning and midday sessions.

Category chairs participate in all judging phases (morning, midday, and afternoon)**.**

Category Chairs

The category chair has the general responsibility of judging projects, interviewing students, and keeping the judging group on schedule to meet the **12:45 PM** deadline. In addition, category chairs serve on the committee to select the *ISEF Finalists*.

Remember the fair is not only a competition, but also an educational and motivating experience. Students enjoy talking to the judges, and consider it the high point of their experience at the fair.

Judges represent scientific authority to the students they are evaluating. Interaction with students should be positive and professional. Judges should encourage students to continue their scientific pursuits.

Always give credit to the student for the effort expended. Never tear down, treat lightly, or display boredom toward any project.

All awards are announced at the RSEF Awards Ceremony. Judges are asked to keep the names and schools of the award winners confidential.

Please do not discuss judging with students, chaperones, or others not a part of the judging panel. We do not want students to overhear critical comments that judges might make to each other.

Feel free to discuss with RSEF participants what they might do to expand their topic for future research.

Judging Overview & Schedule

March 15, 2024 **Virtual Project Display Opens** (virtual elements are open for judges review)

March 19, 2024 ***Evening of Set-Up*** *(John Champe High School gym, 6:00-8:00 pm)*

March 20, 2024 ***Day of Fair*** *(John Champe High School gym)*

Morning Session

7:00 – 8:00 am **Judges Registration, Project Preview** (*High School Aux Gym)*

Judges may preview the exhibits in the gym before judging officially begins. Judges register, receive judging packets, and meet at their assigned category table. Breakfast is served.

8:00 – 8:15 am **Judges Briefing**

The briefing includes a review of the schedule, judging procedures, and exhibit layout.

8:15 – 9:00 am **Judging (***High School Main Gym)*

Students are not present at exhibits.

Judges should examine exhibits in their assigned category and discuss them with other members of their team.

Remember projects should be judged compared to other projects in the same category.

9:00 – 11:45 am **Student Interviews**

Students are present at their projects.

Every student should be interviewed.

Students will have nametags, so judges can communicate with them on a first-name basis.

Try to spend the same amount of time on each student interview.
One or two judges may interview students at the same time.
Questions should be based on the RSEF judging criteria.
Please do not fill out your judging form in front of the students.

All judging forms and written comments should be turned in to the awards coordinator.

Midday Session

11:45 am – 12:45 pm **Lunch and Award Selection**

Lunch is served in the aux gym.

Prior to category judges meeting, the category chair should verify that all judges have interviewed each exhibitor in the category.

During this time all judging decisions should be finalized. 1st, 2nd, 3rd and Honorable Mention awards should be determined.

All judging forms should be turned into the category chair. **The names of all winners are needed by 12:45 pm.**

All special awards must be turned into the awards coordinator by 12:45 pm.

Afternoon Session

12:45 – 1:15 pm **Category Chairs *ISEF Finalist* Selection Briefing**

1:15 – 3:30 pm **Category Chairs Select *ISEF Finalists***

Category chairs meet in the judges' area and proceed to the main gymnasium to interview 1st Place category award winners to select the *ISEF Finalists.* These winners compete in the Regeneron International Science and Engineering Fair.

Please be sure to turn in all **judging forms** and other materials at the conclusion of judging.

March 21, 2024 Public Opening & Awards Ceremony (John Champe High School)

Evening

4:30 – 9:00 pm **Exhibits Open to the Public**

6:00 – 7:00 pm Students are present at their project display

7:00 pm **Awards Ceremony** *(High School Auditorium)*

All judges are invited to attend the awards ceremony. Special award judges are also invited to present their awards.

Sample Judging Form

Category: 700 Chemistry Judge:_____

Project Number	Student Last Name	Project Title	Research Question/Problem 10	Design and Methodology 15	Execution 20	Creativity 20	Presentation 35	Total	Comments
701X09	Amoud	Oxidation Time of Metals with Coatings Through Iron Nails							
702T10	Belcher and Chang	The Relationship Between Cooked and Raw Vegetables and Vitamin C Levels							
703X09	Davis	Photochemical Reactions and Inhibitors							
704X10	Gonzales	The Effect of pH Levels on the Kinetics of the Oxidation of Copper.							

Thank You

The Loudoun County Regional Science and Engineering Fair (RSEF) would like to thank the Loudoun County School Board and LCPS principals, teachers and staff for supporting our fair. Their support benefits many LCPS students and enables us to send students to compete at the Regeneron International Science and Engineering Fair (ISEF) held annually in May.

Thanks to all science and library staff for assistance given to students throughout the research process.

Thanks to the host school for their generous accommodations.

We would also like to thank all judges for the time and effort they put into our fair.

Special thanks go to our donors and award sponsors for their considerate and generous awards.

Finally, thanks go to the parents of our students for their continued support.