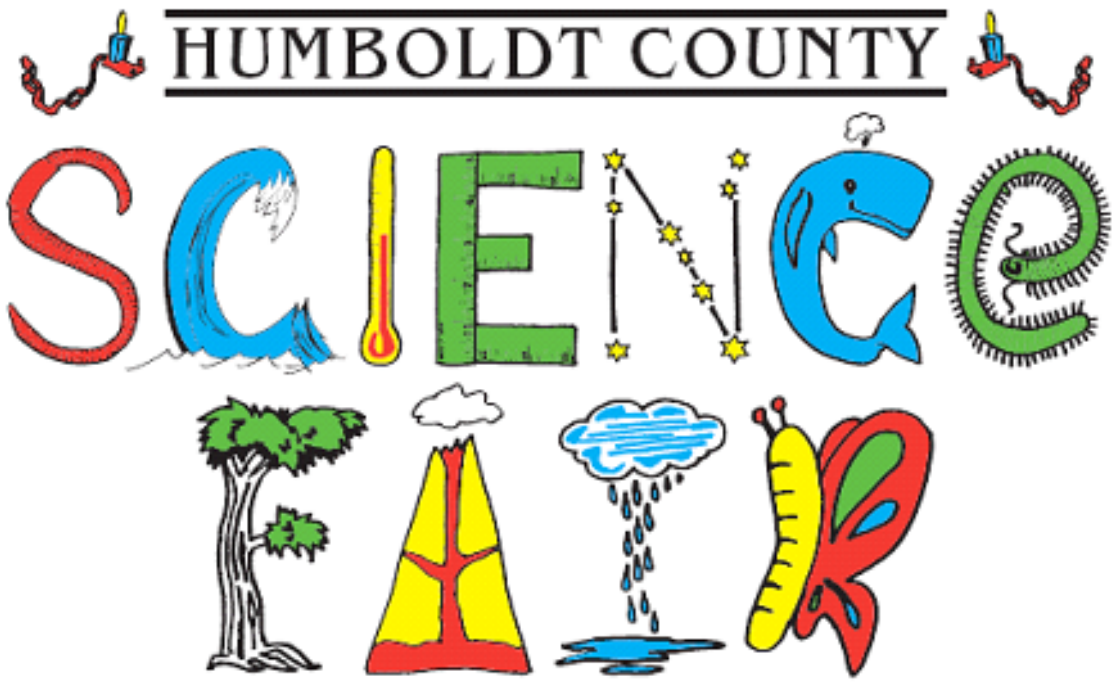
2025

Humboldt County Doris Niles Science Fair

Student Handbook & Rules

March 12-15, 2025



Rules, deadlines, and more fair details available at:

hcoe.org/science-fair

Rotary Club of Eureka

Humboldt County Office of Education

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Humboldt County Doris Niles Science Fair 2025

Student & Family Information

Dear Humboldt County Students and Families,

The Humboldt County Doris Niles Science Fair encourages and celebrates students' scientific curiosity and problem solving skills by inviting students to participate in either a competitive science fair project showcase for 4th-12th grade students or a non-competitive science poster showcase for TK-12 students. The main purpose of the science fair is to give students experience in applying scientific or engineering methods to a topic that is interesting to them. Some schools make time for students to work on a science fair project or poster in class; however, much of the work for individual projects is often done at home. This handbook will explain all the steps necessary to complete a science fair project or poster and go over important rules and regulations. Please review this handbook and speak with your school's science fair coordinator if you need any support or have any questions. The Humboldt County Doris Niles Science Fair is excited to help develop the scientific potential of Humboldt County students and to promote critical thinking in our next generation of science leaders!

Purpose of the Humboldt County Science Fair

- *To stimulate an active interest and joy in science in young people by engaging them in original investigations and the development of new insights.*
- *To foster school/community cooperation in developing the scientific potential and literacy of Humboldt County students.*
- *To support engagement in the Next Generation Science Standards (NGSS).*
- *To promote excellence in science learning, including recognition for engineering and investigation.*

Dates for the 2025 Humboldt County Doris Niles Science Fair

Friday, February 28……Deadline for projects and posters to be registered

Wednesday, March 12……Projects and posters dropped off at event

Thursday, March 13……..…..4th- 12th grade project judging

Friday, March 14……..…..School field trips & data entry

Saturday, March 15……...Community viewing & awards ceremony

Overview and Comparison of Project Types

Humboldt County Doris Niles Science Fair March 13-15th, 2025 Humboldt County Office of Education Sequoia Conference Center		
Non-Competitive Showcase	**Competitive Showcase**	
Tk-12th grade **Individual or Collaborative**	**4th-12th grade** **Individual or Group (Max 3)**	
Poster should communicate science learning from use of varied scientific approaches (i.e. observational study, citizen science etc.). Class submissions welcome.	*Experimental Project*	*Engineering Project*
Submission Requirements: **Poster**	Submission Requirements: **Logbook & display** (interview optional)	
Forms Required: **None**	Forms Required: **Research Approval Certificate**	
Dates to register: **Fri. 2/28/25** Date to submit digital file for free printing: **Fri. 2/28/25** Date to drop off: **Wed. 3/12/25** Date of viewing: **Sat. 3/15/25**	Dates to register: **Fri. 2/28/25** Date to drop off project: **Wed. 3/12/25** Date of judging: **Thurs. 3/13/25** Date of viewing: **Sat. 3/15/25**	
Not evaluated	Evaluated with Rubrics	
Can Qualify for State Science Fair: *No*	**Can Qualify for State Science Fair: *Yes***	

Humboldt County Doris Niles Science Fair 2025

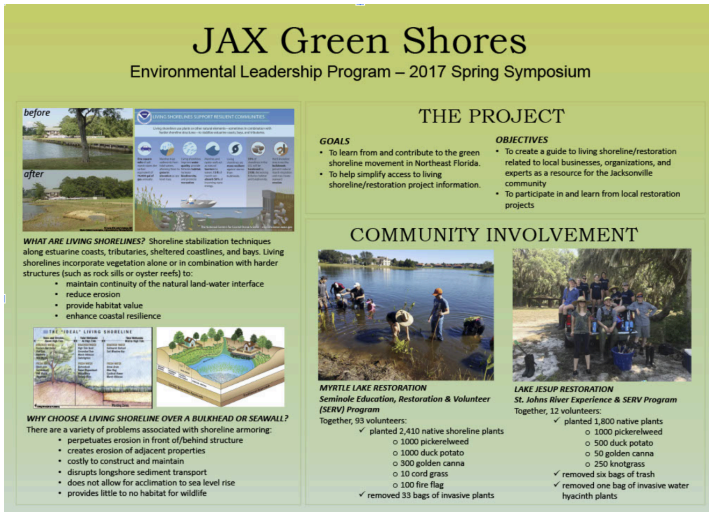
Student & Family Information

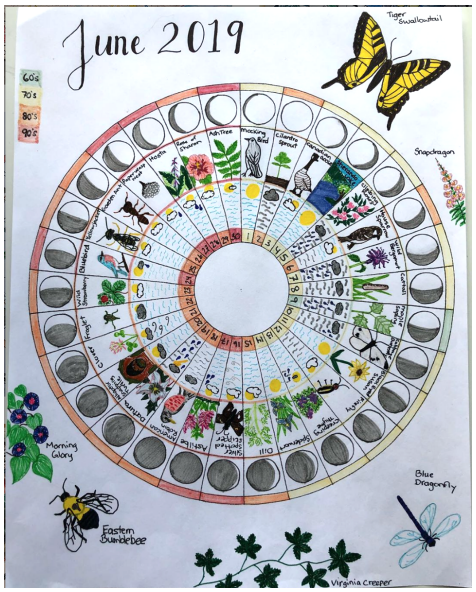
Poster Session (*Non-competitive* showcase)

Share the science you are learning!

Purpose: To increase participation and learning about the nature of science (how science works) in a "non-competitive" manner. For students and community members to see science as more than using experimental methods. This session promotes the display of scientific thinking in more diverse ways!

- Open to Grades **TK-12th**
- Encourages imaginative and creative posters that **display and communicate** scientific learning, ideas and collaborations.
- An opportunity for students to communicate their scientific learning through varied methods, such as **observational studies, BioBlitzes, community or citizen science, STEAM projects, Traditional Ecological Knowledge , etc.**
- One poster can be the work of an individual, small group, or whole class.
- Humboldt County Science Fair will offer a free printed 11x17 poster for any entry! Deadline for entry to have a poster printed from a digital file is February 28th! https://forms.gle/WP1k1LZzJAvyYyoe7
- Poster can be any size, but it must be 2-dimensional and able to be hung on a wall. Handwritten and hand drawn work is welcome!
- Students are invited to come stand by their posters during public viewing on Saturday, March 15th to share their thinking and learning. Time to be announced.
- More information about how to make a Science Poster is linked here: Science Posters for Kids and Tips for Older Students. Examples:





Humboldt County Doris Niles Science Fair 2025

Student & Family Information

Types of Science Fair Projects (*Competitive* Showcase)

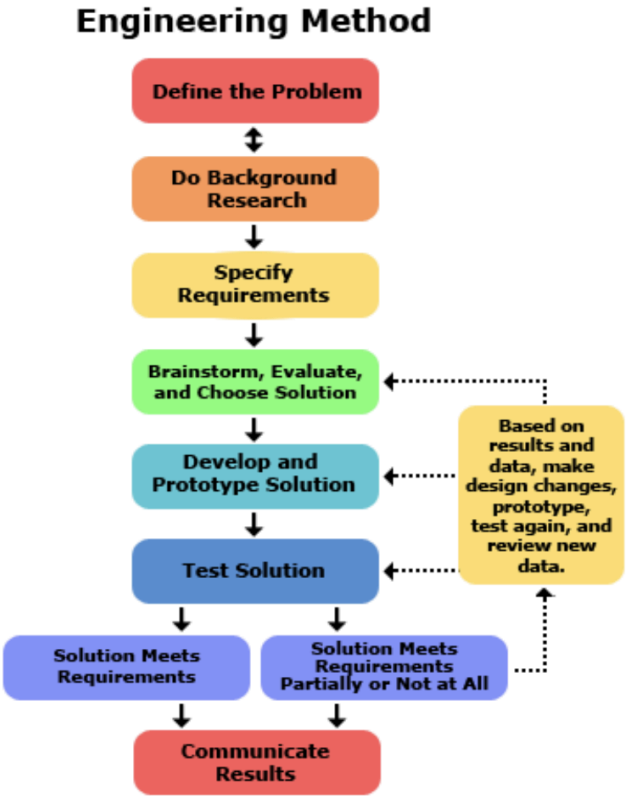
What is an experimental project?

A scientific **experimentation** project is an attempt to answer a question or solve a problem by **creating and conducting an experiment**, analyzing and interpreting the data, and **forming a conclusion based on the evidence** from your experiment.

Science Buddies (2018). Comparing the Engineering Design Process and the Scientific Method. Retrieved from: https://www.sciencebuddies.org/science-fair-projects/engineering-design-process/engineering-design-compare-scientific-method

What is an engineering project?

An engineering project begins by **defining a problem**, doing background research to find out the requirements to **select a solution**, developing a prototype, and testing if your design best meets the requirements, and then writing about the result



Science Buddies (2018). Comparing the Engineering Design Process and the Scientific Method. Retrieved from: https://www.sciencebuddies.org/science-fair-projects/engineering-design-process/engineering-design-compare-scientific-method

Experimental and Engineering Projects entered into the traditional *competitive* Science Fair require both a logbook and a display.

A poster entered into the *non-competitive* Poster Session *does not* require a logbook.

Student & Family Information

Experimental Project Steps (Competitive showcase)	*Detailed Help for Each Step*
★Question or Purpose of your Experiment The problem or question you are interested in answering with your experiment. ★Origin of Idea What made you want to conduct this experiment? Where did this idea come from? Why do you think it is an important investigation to conduct?	Finding your Question
★Background Research & Bibliography: Before you start your project, you will want to conduct research to find out what is already known about your topic. Ideally you will write down notes from at least 3 varied sources. Books, websites, and interviews with experts are great sources. Don't forget: record your sources for a bibliography! **Extra: NoodleTools website info	Background Research Plan Finding Information
★Hypothesis: A hypothesis is an idea that can be tested through experimentation. It is not a prediction (i.e. the expected outcome of an experiment) or an educated guess. It is a statement that answers your question with an explanation that comes from your research and can be tested in your experiment. Write a hypothesis for your idea and a prediction for the outcome of your experiment.	Hypothesis
★Materials: List everything that you will use to conduct your experiment including the specific amount and types of materials. When recording measurements, indicate units.	Materials List
★Procedure: A step-by-step plan or list of instructions in numerical order that you will follow to test your hypothesis. Make sure your instructions are clear enough that anyone could read it and perform your experiment in the exact same manner.	Procedure
★Variables: While identifying variables in your experiment is required for 6th-12th graders, it is great if 4th-5th graders get comfortable identifying them as well. An experiment usually has three types of variables: controlled, independent, and dependent.	Variables
★Data & Results: When you start your experiment, record all of the data you collect. It is good practice **to do at least 3 trials** for your experiment to make sure your answer was not caused by an uncontrolled variable (accident or something you haven't thought of). It is also helpful to find the AVERAGE of your 3 trials. You can record your data in a table using numbers, drawings, or descriptions. DON'T FORGET TO TAKE PICTURES OF YOUR EXPERIMENT! These are great to include on your project display. You can also make a GRAPH to display your data in a way that helps show patterns.	Conducting an Experiment Data Analysis & Graphs
★Conclusions & Real World Application: Your conclusion should include: 1) If your hypothesis was supported or not (claim). 2) What evidence from the data proves your conclusion. 3) Reasoning (process of making clear how your evidence supports your claim about your hypothesis) to support your conclusion. Include a description about how your experiment relates to the field of study and will be helpful in the real world with your conclusion or in a separate section. Explain what you learned and further ideas for experimentation related to the conclusion.	Conclusions

Student & Family Information

Engineering Project Steps (Competitive showcase)	*Detailed Help for Each Step*
★Define a Need/Problem: Begin by writing a need for something you want to construct and to explain its purpose. It could be for a problem that needs to be solved or a situation that needs improvement. Write it so the need is clearly understood. The goal of this engineering project is to design and construct a prototype for someone to use to perform a useful function. Example: "The goal of this project is to design, build, and test a way to minimize waiting time at stop lights in the city."	Defining a Need or Problem
★Background Research & Bibliography: Before you start your project, you will want to conduct research to find out what is already known about your topic. Ideally you will write down notes from at least 3 varied sources. Books, websites, and interviews with experts are great sources. Don't forget: record your sources for a bibliography! **Extra: NoodleTools website info	Background Research Plan Finding Information
★Design Requirements: Next, you need to establish the requirements needed for the development of the prototype to decide how it will be built. Typical requirements relate to shape, size, weight, appearance, physical features, performance, use, cost, time and money. Another part of the design requirements is to tell the prototype expectations and how it will be tested to meet the desired expectations.	Design Requirements
★Brainstorm, Evaluate, & Choose the Best Solution: There are always many good possibilities for solving design problems. Good designers try to generate as many possible solutions as they can.Look at whether each possible solution meets your design requirements. Some solutions probably meet more requirements than others. Reject solutions that do not meet the requirements. Draw each design of the prototype with labeled parts. Show two or three ideas before choosing one & say why you chose that one.	Brainstorm Solutions Choose the Best Solution
★Build the Prototype: →**List of materials:** Make a list of all the materials and equipment you will use for building the prototype. Any materials that are measured should have the measurements listed. →**Step-by-step procedure:** Write a step-by-step procedure you will follow to build the prototype. Write it in the order you want to follow. Be very descriptive in your writing. →**Build the prototype**	Prototyping
★Test & Redesign: *This is a major part of the project! Keep notes of the changes & results!* →**Testing and data recording:** Test the prototype to see if it works according the design requirements. Write down what is actually happening during the testing. Testing the prototype two or three times to make sure the test data is accurate. →**Data is analyzed if redesigning is necessary:** Analyze the data. See if the results match the design requirements. If not, redesigning is necessary. → **Redesign:** Make adjustments by redesigning parts of the prototype that need adjusting. You need to show the adjustments with diagrams and labeling. Keeping accurate notes of the changes is very important in this part of the engineering project.Retesting is always necessary after redesigning has occurred. When you are retesting, you need to write down data as to what is happening. →**Write a Conclusion:** Write about what you learned using the design process and how you might improve your prototype in the future. Talk about how the information can be applied to real life.	Test & Redesign

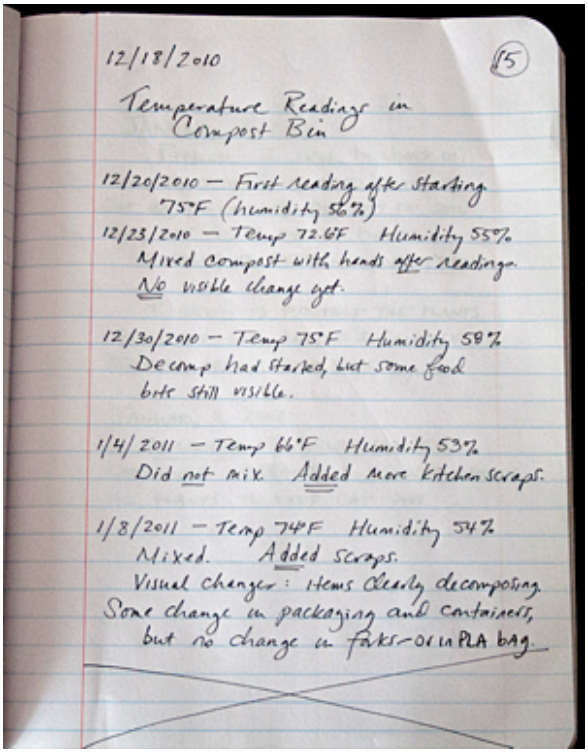
Student & Family Information

Logbooks (*Competitive* Showcase)

The logbook has detailed notes of every step of the project from beginning to end. You must complete an original logbook to make your **thinking** throughout the project **visible**. Writing in the logbook shows evidence that you did your own work and it shows the *quality* of your critical and academic thinking skills. Logbooks can be handwritten or digital. Spelling does NOT count in the logbook.

Ideally, a logbook is:

- A BOUND notebook, (a bound or spiral composition book or a 3-ring binder).
- A written, pictorial, and/or graphical record (or journal) of EVERYTHING you do concerning your Science Project.
- A CHRONOLOGICAL record of every DATED entry. This can be done on each page when you work on it .
- The place to put copies of all PERMITS and CERTIFICATES which give permission for experiments with animals, humans, or specific study sites. It is easiest to find them if they are stapled or taped to the *front inside cover* of the logbook.
- **6th-12th graders also need to include an ABSTRACT in the front of their logbook.**
    - See page 24 for an abstract form and example. Here is a helpful link on how to write an abstract: Writing an Abstract
- All records should be in YOUR OWN HANDWRITING, unless you have something generated on a computer that is pasted into the logbook DATED ON THE APPROPRIATE DAY.
- Adding a TABLE OF CONTENTS and LABELS for each section is a helpful way for things to be found easily. They are not necessary, but if you want, you can *number each page as you write on it*, and then fill in your Table of Contents when you have completed your work.
- Accommodations can be made based on student needs. Talk to your school Science Fair Coordinator!



Student & Family Information

Project Display (*Competitive* Showcase)

*Grades **4-5** Display Specifications*

All displays should include:

- ★ **Labels** with
  - Name (on **back** of display)
  - School (on **back** of display)
  - Grade Level (on **front** of display)
  - Project ID (save spot to post project ID on **front**)
- ★ **Purpose or problem**; If experiment, hypothesis included
- ★ **Methods and procedures**
- ★ **For experiments:** results in the form of observations, graphs, charts or written explanations; For demonstrations: models, collections or diagrams
- ★ **Conclusions**

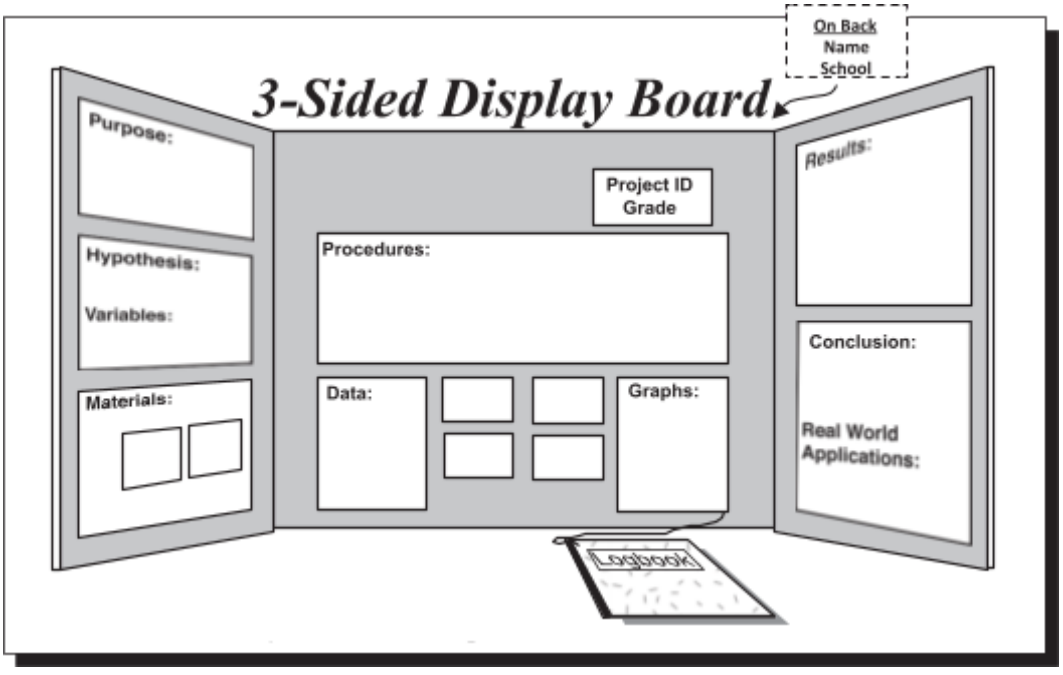
*Grades **6-12** Display Specifications*

All displays should include:

- ★ **Labels** with
  - Name (on **back** of display) and School (on **back** of display)
  - Grade Level (on **front** of display)
  - Project ID (save spot to post project ID on **front**)
- ★ **Purpose or problem**
- ★ **Hypothesis**
- ★ **Methods and procedures**
- ★ **Variables to be controlled and to be manipulated**
- ★ **Observations in the form of graphs and/or charts**
- ★ **Conclusions**

Display Options

Students can display their project using a **3-sided Display Board**.



Student & Family Information

Project Judging (*Competitive* showcase)

- **Display Judging** - 4th through 12th grade students' engineering and science investigations will be judged against the standards outlined in the judging rubrics on pages 25-32. Students are encouraged to review these standards **before** beginning work on their projects. Medals, rosettes, and ribbons will be awarded to students based on scores generated from these rubrics.
- **Interviews (newly required)**- All 4th-12th students will be interviewed by their school's Science Fair Coordinator, and the interview will be uploaded to STEM Wizard so judges can view it.
    - Each school's Science Fair Coordinator will interview each student & upload the video when they register the project. All students will answer the same questions. The videos should be made in one take and be unedited. **Interview videos should be about 2-4 minutes with a maximum of 4 minutes.**
    - **Interview Questions:**
        - Can you tell me about your project? **NO names/school info in videos!**
        - What did you learn, and was there anything that surprised you?
        - What challenges did you have, and how did you deal with them?
        - If you were going to do this project again, what might you do differently?

Awards

- The following ribbons are awarded based on the number of points earned:

★*Science Fair* ★*Honor* ★*Excellence*

- 1st, 2nd, and 3rd place medals and Honorable Mention rosettes are awarded for the top projects at each grade level. Winners will be identified by Saturday, March 15, 2025 & recognized at the Humboldt County Doris Niles Science Fair Awards Ceremony.

Special Recognition Awards *(Subject to change yearly)* Each year special recognition awards are awarded. Some past examples of awards include:

Dr. Doris Niles Perpetual Trophy – 4th-5th grades A trophy will be presented to a young student of promise, and their name will be added to the perpetual plaque displayed at the Humboldt County Office of Education.	**California Native Plant Society (CNPS) – 4th-12th grades** A prize of $50 and a 1 year membership to CNPS will be awarded for the best project investigating native plants.
North Coast Unified Air Quality Management District 4th-12th grades An award will be presented to a Grand Prize winner. They will also present a commemorative plaque.	**Redwood Regional Audubon Society – 4th-12th grades** The Society awards a student with a membership to the Audubon Society and a $50 award for the study of wild birds.
North Group Sierra Club – 4th-12th grades A prize will be awarded to 2 students for projects best related to environmental protection.	**Friends of the Arcata Marsh – 4th-12th grades** A prize will be awarded to 2 students for the best projects related to wetlands.
California Association of Professional Scientists (CAPS) 7th-12th grades A $50 savings bond will be presented to an "Outstanding Young Scientist.	**Professional Engineers in California Government (PECG) 6th-12th grade** PECG awards a cash prize and certificate that will be presented to a Grand Prize winner and runner ups..

Rules and Regulations

I. Eligibility for Competitive Showcase

A. Students in **grades 4 through 12** attending a public or private school in Humboldt County which has filed an "Intent to Participate" form are eligible to enter.

B. All projects must be entered by a School Science Fair Coordinator. Students and parents cannot enter projects directly to the County Science Fair. Each project must be entered separately.

C. The School Science Fair Coordinator will be responsible for reviewing all entries from his or her school to ensure compliance with County regulations.

II. Entry

All project entries should be submitted by your school's Science Fair Coordinator on the Google Doc form. (*Link to access the form will be emailed to Science Fair Coordinators.*)

Approval Research Form for ALL projects:

- *To be eligible to enter the Humboldt County Science Fair,* **ALL students must fill out a Research Approval Form** *for their project.*
- *Any student wishing to do projects involving* ***humans, human tissue, animals, or hazardous substances*** *are required to complete the approval process outlined in these rules* ***prior to beginning any work****.*
- **All Projects must have Approval forms** filled out and placed in front of log book.

III. Entry Numbers

Only **one** project per student may be submitted.

- Schools with an enrollment of 150 students or more may send up to 20 projects to the County Science Fair.
- Schools with an enrollment of 149 or less students may send up to 10 projects to the County Science Fair.
    - Additional entries may be possible. For more information, please contact Sarah Hughes, Humboldt County Science Fair Coordinator, at **sciencefair@hcoe.org.**

Entry Deadline: Friday, February 28, 2025, by 5:00 p.m.

IV. Project Categories

All projects require a Research Approval Certificate.

- **Life Science - Animals** - zoology, anatomy, physiology, biology, psychology, sociology, behavioral studies, and personal preference surveys.
- **Life Science - Botany** - plants, fungi, molds, bacteria.
- **Earth/Space Science** - minerals, rocks, volcanoes, crystals, geology, weather, gravity, astronomy, stars, and planets.
- **Math/Engineering/Inventions** - pure and applied math, geometry, probability, number theory; engineering shapes and structures to test physical laws, projects in which a potentially useful product is created.
- **Physical Science** - including studies involving **matter** (i.e. changes of state, evaporation, etc.), **chemistry** (i.e. chemical reactions, effects of chemicals on living organisms, etc.), **force and motion** (i.e. simple machines, friction,etc.) and **energy** (i.e. electricity, magnetism, waves, etc.).
- **Consumer Science is NOT** an accepted category for the Humboldt County Science Fair. Families & teachers are encouraged to redirect student interest in product comparisons to studies of scientific principles. For example, “Which Brand of Golf Ball Goes Farthest?” could become “What Properties Have the Greatest Effect on the Distance a Golf Ball Will Travel; Weight, Size, Surface Texture, etc.?”, which would then be in the Physical Science category.
- Projects with an **environmental emphasis** may occur in all categories. **They should be entered into the category which is the primary focus of the study.** For example, water pollution studies should be placed in Earth Science, energy conservation in Physical Science, effects of acid rain on plant growth in Life Science - Botany, etc.
- ***Students may not use any illegal drugs, alcohol, marijuana, tobacco, vaping products, firearms, or dangerous weapons OF ANY KIND for a Science Fair project investigation.***
- Students have the option to display their work on a poster or to prepare a slideshow computer presentation.

Note: Science Fair officials reserve the right to remove any exhibit or any portion of an exhibit that is objectionable.

V. Types of Projects Recommended

A. Students in grades **TK-3** may enter:
   a. Science Posters (non-competitive)

B. Students in **grades 4 -12** may enter:
   a. Experiments (competitive):
      i. Students in these grades must follow scientific or engineering methodology.
      ii. Original, innovative research will be judged higher than projects simply following experiments found in other sources.
   b. Science Posters (non-competitive)

VI. Team Projects

A. Students in all grades may work on a project individually or with a partner or partners. **Three students maximum per team.** Team projects may be entered in any category. There is no separate category for team projects. It is important to note, however, that:
   a. Criteria for judging projects in this category will include evidence of equal contribution by each student
   b. each student working on the project MUST have his/her own logbook
   c. if students are of different ages, the project will be entered in the grade level of the eldest child

VII. Two-Year Projects

A. Two-year projects will be admissible only if a new question is asked or an extension beyond the previous year's work is apparent.
B. The logbook from the original project must be displayed.
C. The project must be prominently labeled "Two-Year Project" and first year results must be indicated separately from second year results.

VIII. Project Removal

A. It is the School Science Fair Coordinator's responsibility to make certain all projects from his or her school are **removed and returned to students** after the Humboldt County Science Fair's Awards Ceremony on Saturday, March 16th.
B. Projects ***may not*** be removed before the awards ceremony.

IX. Use of Animals in Science Fair Projects

Animals covered by the regulations below include vertebrates (mammals, reptiles, amphibians, birds, fish) and invertebrates (insects, crustaceans, mollusks, etc.); wild animals including game species, and domestic animals including family pets.

There can be *no exceptions* to the following requirements.

A. Approval Procedures

1. Students with projects involving **an experiment or observation** of any living animal must have a qualified Research Advisor who will be responsible for the safe treatment of any animal subject.

2. **Before any work on the project begins**, the student ***must*** make an appointment to meet with a Research Advisor. This person will review all regulations and advise the student on the safe treatment of animals involved in the project. They will also **complete Part 1 of the *Humboldt County Science Fair Research Approval Certificate on Page 21***.

3. Research Advisors must have the following educational background:

    a. For projects involving **vertebrate animals,** the Research Advisor must have a **doctoral degree in science or medicine** (D.V.M., Ph.D., M.D.). It is recommended that Research Advisors review regulations in the federal Animal Welfare Act of 1966 with students (copies of relevant sections are available from the County Science Fair Coordinator).

    b. For projects involving **invertebrates**, the Research Advisor must have an educational background in science education. It is recommended this person be the School Science Fair Coordinator or the student's classroom teacher.

4. Projects involving **observations of wild animals or the collection or display of any wild animal part**, must have clearance for the project from a **Department of Fish and Game Control Officer**. This approval may be obtained by telephone. Students must have a *Research Approval Certificate* indicating the name of the person providing approval, his/her title and the date of the telephone conversation. This documentation must be displayed in their digital logbook presented at the time the project is submitted. (See rules specific to wild animals following this section.)

5. At the initial meeting, students must provide the Research Advisor with all of the following:

    a. a written description of procedures they plan;

    b. a copy of these Humboldt County regulations; and

    c. a copy of the *Research Approval Certificate.*

6. A responsible adult must meet with the student and the Research Advisor. This person must agree to supervise the student's work on the project to ensure compliance with the animal care instructions provided by the Research Advisor. This adult supervisor must also sign Part I and Part II of the *Research Approval Certificate*.

7. A copy of the *Research Approval Certificate* **MUST** be present when the project is turned in. (Points will be deducted if not found.)

8. Any project not conducted in conformity with these rules and the Humane Laws of California will not be allowed to compete.

B. Wild Animals

1. Under **Department of Fish and Game Regulations (Section 3005.5)**, any animal found in the wild is ***protected.*** It is, therefore, illegal for students to capture or confine any wild mammal, bird, fish, reptile, amphibian or invertebrate animal for the purpose of a Science Fair project. It is also important that teachers and students are aware:

    - Section 3039 states: it is illegal to sell or to purchase **any part of any animal found in the wild.** This includes feathers or other body parts from any migratory bird or the carcass, skin or other parts of non-game animals including, ***but not limited to,*** endangered species.

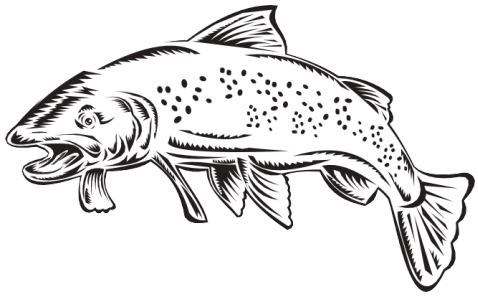
    - The only exceptions to this regulation are:
        1. fur from mammals taken legally under the authority of a trapping license;
        2. parts of **domestically reared** game birds; and
        3. shed antlers from **domestically reared** animals.

- Students should also be aware these protections extend to **marine life**. The collection of tide pool animals is prohibited except for those species subject to sport regulations. In the case of these animals, students must obey all Fish and Game sport regulations on limits, opening and closing dates, specific locations and required licenses.

- Game species that are hunted are subject to sport fishing and/or hunting limits and regulations and require the appropriate licenses, proof of which must be included with the student's logbook.

1. Care should be taken to return animals to their native habitat and to avoid releasing non- native species into a non-suitable environment.

2. Projects using any animal parts (teeth, stomachs, hides, etc.) must have written documentation indicating the source of the animal parts.



C . State Law

1. California State Law and the California Education Code require:

   a. **The comfort of all animals used in any project shall be a prime concern**. Animals MUST be obtained from a reliable source and the following basic needs MUST be assured: appropriate, comfortable quarters; adequate food and water; cleanliness and humane treatment; exercise when required for the species of animals used. Students MUST make arrangements to provide these basic needs at all times, including weekends, vacations, and holiday periods.

   b. No vertebrate animal will be subjected to any procedure or condition, including nutritional deficiency experiments, which results, ***either by intention or negligence,*** in pain, distinct discomfort, abnormal behavior, injury, or death.

   c. No surgery, including biopsy, will be performed on any living animal.

   d. When planning the project, the student MUST arrange for the humane disposition of all animals involved after the project is completed. This may be done by placing them in an environment where they are assured of continued humane care or by releasing undomesticated species into a suitable wildlife environment. Students MUST NOT perform euthanasia on vertebrate animals under any circumstances. A complete account of the final disposition of all animals used MUST be included in the final report of all projects involving living animals.

Rules and Regulations

a. The basic aim of any project involving living animals should be to increase the knowledge and understanding of life processes. It should not include the demonstration or development of surgical techniques. All projects involving animals must, therefore, have a clearly defined objective which requires the use of animals to demonstrate a biological principle or to answer a specific question.

b. Students are strongly urged to select invertebrate animals, plants, or tissue cultures. Invertebrate animals are especially suitable because of their wide variety and availability in large numbers.

c. California humane Laws specifically forbid the mistreatment or neglect of animals, including animals used in schools and school-sponsored activities. Students, teachers, and supervisors must know and obey these laws. Any student research involving animals MUST COMPLY with the requirements of the California Education Code stated here:

HUMANE TREATMENT OF ANIMALS, State of California Education Code Title 2, Division 2, Part 28, Chapter 4, Article 5, Section 51540.

In the public elementary and high schools or in public elementary and high school-sponsored activities and classes held elsewhere than on school premises, live vertebrate animals shall not, as part of a scientific experiment for any purpose whatsoever:

- *be experimentally medicated or drugged in a manner to cause painful reactions or induce painful or lethal pathological conditions; or*
- *be injured through any other treatments, including, but not limited to, anesthetizing or electric shock.*

Live animals on the premises of a public elementary or high school shall be housed and cared for in a humane and safe manner.

Rules and Regulations

X. Use Of Human Subjects in Science Fair Projects

These rules apply to all projects involving human subjects in any of the following:

- physical activity
- blood testing
- tasting or sampling of food or drink
- surveys of opinions or behaviors

A. Research Advisors

1. In order to protect the health, safety and legal rights of human subjects, the student conducting the project must have a Research Advisor approve his/her plans ***prior*** to any work with human subjects. The Advisor will meet with the student and a responsible adult who will supervise student work. Qualifications for Research Advisors vary with the type of project as follows:

a. If the project involves:

1) a physical activity ***in any way beyond the scope of any subject's everyday life*** (running endurance trials, sitting in hot tubs of different temperatures, studying test performance after sleep deprivation, etc.)

2) work with human blood; and/or

3) the ingestion of a food, drink or any other substance ***in any way beyond the scope of any subject's everyday life…***

…the Research Advisor must be a medical doctor (M.D.).

b. If the project involves:

1) the ingestion of a food, drink or any other substance ***completely within*** the scope of any subject's everyday life;

2) a physical activity ***completely within*** the scope of any subject's everyday life (i.e. Does color affect taste? Do different ages have different food preferences? Measuring changes in height before and after sleep, etc.); and/or

3) the collection of information through a questionnaire or survey...

…the Research Advisor must be the School Science Fair Coordinator or the School Site Administrator.

2. At the initial meeting, students must provide the Research Advisor with all of the following:

   a. a written description of procedures they plan;

   b. a copy of these Humboldt County regulations pertaining to human subjects;

   c. a copy of the *Humboldt County Science Fair Research Approval Certificate*; and

   d. the form to be sent to parents for their approval of their child's participation in the project.

3. The Advisor will complete Part 1 of the *Research Approval Certificate.* A ***copy*** of this Certificate must be placed in the logbook.

4. Research Advisors must assure that each individual human subject will not be exposed to any risk of possible injury either physical, psychological, or social as a consequence of participation in a science fair project.

B. Parent Permission

1. **Written permission approving any activity (including tasting or completing surveys or questionnaires) by a student "subject" must be obtained from the parent or guardian <u>prior</u> to the student engaging in the activity. These permission forms must be kept on file, and a copy must be included in the student's logbook.** Simple notification of the questionnaire to be administered is not sufficient.

2. California Education Code 51513 requires that parents receive notification and provide written authorization prior to student participation in the types of activities mentioned above. The intent of this Section is to protect family privacy and personal beliefs; nonetheless all surveys including those, for example, with questions about television viewing habits, birth weights, etc. must comply with this requirement for parental pre-approval.

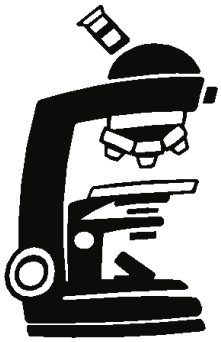
C. Surveys

1. See parent permission requirements in Section B.

2. The **data collected from surveys** must be presented in such a way that no one can identify the individual who completed a specific survey, including the student administering the survey.

D. Additional Restrictions

1. **No bio-medical deprivation studies** involving human subjects will be allowed.



2. Any human **blood samples** used in the project must follow safety procedures for the handling of bloodborne pathogens as stated in the California Occupational Safety and Health Standards, Section 5193. Copies of these guidelines are available from the Humboldt County Science Fair Coordinator. Written documentation that blood samples are free of HIV and Hepatitis B, must be presented with the *Project Entry Form*. Testing may be done at the Humboldt County Health Department or other medical laboratory.

3. The **exhibition of human parts** is prohibited except for teeth, hair, and nails. Slides or other samples of human tissue professionally encased by a scientific supply company may be displayed provided proof of source is pictured on the project or in logbook.

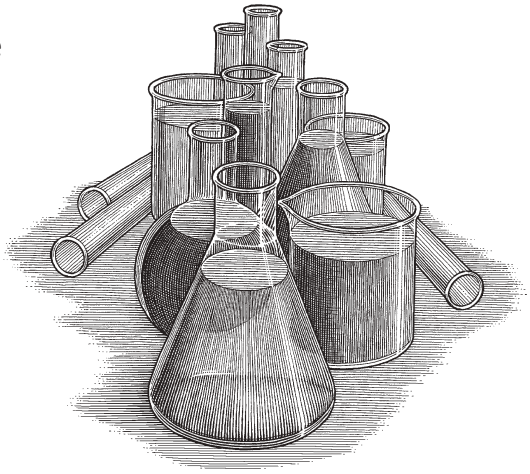
XI. Use of Plants

Care must be taken that no rare or endangered plant species be collected or disturbed for a Science Fair project.

XII. Use of Firearms and Weapons in Science Fair Projects is not permitted.

XIII. Use of Hazardous Substances in Science Fair Projects

Students intending to work with substances that may be hazardous must follow the rules below. For the purposes of the County Science Fair, any product labeled “Danger, Caution or Warning” will be considered a hazardous substance. Students using products of this type must submit their experimental methods to the School Science Fair Coordinator for approval. The School Science Fair Coordinator will advise the student of safe handling procedures, safe concentrations of chemicals, concerns about fumes or if eyewear is required for safety. Teachers, students and parents should be aware that many chemicals and commercial products commonly used in the home may pose potential health hazards.



A. Research Advisors

1. To ensure the safety of the student and any people or animals in the vicinity of the project, students using hazardous materials in their projects must have a Research Advisor approve his/her plans **PRIOR** to beginning work on the project. Research Advisors for such projects **must be the School Science Fair Coordinator.** The Advisor will meet with the student **and a responsible adult** who will personally supervise **all** student work involving the substance.

2. Students must provide the Research Advisor with all of the following:
    a. a written description of procedures;
    b. a copy of these Humboldt County regulations pertaining to the use of hazardous substances;
    c. a copy of the *Humboldt County Science Fair Research Approval Certificate;* and
    d. a copy of the Materials Safety Data Sheet (MSDS) for any hazardous substance with a label including the words ‘danger’, ‘caution’, or ‘warning’ if the substance is used in the Science Fair project.

3. The Research Advisor must:
    a. research the potential hazard and safety guidelines identified on the MSDS for each substance;
    b. inform the Adult Supervisor of potential risks associated with the substance to be used; and
    c. complete the mandatory *Research Approval Certificate.* A copy of this Certificate must be placed in the logbook.

PLEASE NOTE: Research Approval Certificates are **MANDATORY** for **ALL** projects.

B. Materials Safety Data Sheets (MSDS)

Materials Safety Data Sheets are required for all hazardous substances purchased from scientific supply companies (as identified by the General Industry Safety Order 5194). A copy of the MSDS sheet can be obtained at the store where the item was purchased or by writing to the address of the manufacturer of the product.

Copies of any MSDS needed must be included in the student's logbook.

C. Illegal Drugs, Alcohol, Tobacco, Firearms, & Weapons

Students may not use any illegal drugs, alcohol, marijuana, tobacco, vaping products, firearms, or dangerous weapons OF ANY KIND for a Science Fair project investigation.

Humboldt County Science Fair

RESEARCH APPROVAL CERTIFICATE

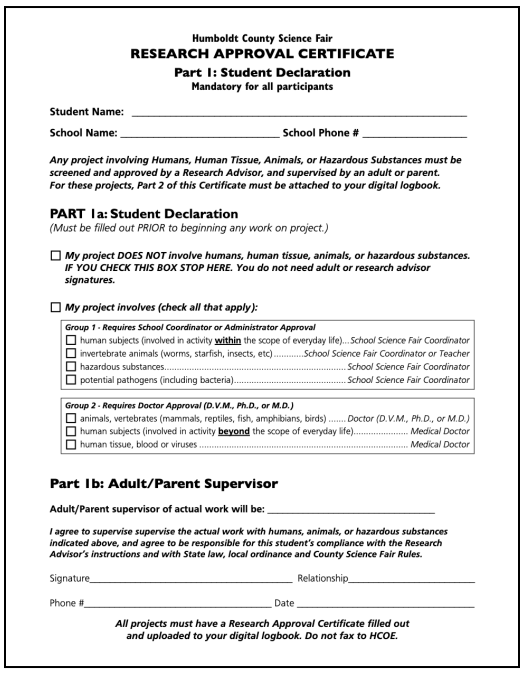
Humans, Human Tissue, Animals, or Hazardous Substances

The Research Approval Certificate is now a two-part form of fillable PDFs that can be downloaded from the Science Fair Website or using the links/QR codes below. Completed certificates must be in the front of the logbook.

Part 1: ALL PROJECTS must include Part 1 of the Research Approval Certificate in their logbook.

Part 2: In addition, projects that involve humans, human tissues, animals or hazardous substances must:

- have a parent supervisor's signature on Part 1, and;
- include Part 2, signed by the appropriate Research Advisor.



Humboldt County Science Fair
RESEARCH APPROVAL CERTIFICATE
Part 1: Student Declaration
Mandatory for all participants

Student Name: _____

School Name: _____ School Phone # _____

Any project involving Humans, Human Tissue, Animals, or Hazardous Substances must be screened and approved by a Research Advisor, and supervised by an adult or parent. For these projects, Part 2 of this Certificate must be attached to your digital logbook.

PART 1a: Student Declaration
(Must be filled out PRIOR to beginning any work on project.)

☐ ***My project DOES NOT involve humans, human tissue, animals, or hazardous substances. IF YOU CHECK THIS BOX STOP HERE. You do not need adult or research advisor signatures.***

☐ ***My project involves (check all that apply):***

Group 1 - Requires School Coordinator or Administrator Approval
- ☐ human subjects (involved in activity **within** the scope of everyday life)...*School Science Fair Coordinator*
- ☐ invertebrate animals (worms, starfish, insects, etc).....*School Science Fair Coordinator or Teacher*
- ☐ hazardous substances.....*School Science Fair Coordinator*
- ☐ potential pathogens (including bacteria).....*School Science Fair Coordinator*

Group 2 - Requires Doctor Approval (D.V.M., Ph.D., or M.D.)
- ☐ animals, vertebrates (mammals, reptiles, fish, amphibians, birds) .....*Doctor (D.V.M., Ph.D., or M.D.)*
- ☐ human subjects (involved in activity **beyond** the scope of everyday life).....*Medical Doctor*
- ☐ human tissue, blood or viruses .....*Medical Doctor*

Part 1b: Adult/Parent Supervisor

Adult/Parent supervisor of actual work will be: _____

I agree to supervise supervise the actual work with humans, animals, or hazardous substances indicated above, and agree to be responsible for this student's compliance with the Research Advisor's instructions and with State law, local ordinance and County Science Fair Rules.

Signature_____ Relationship_____

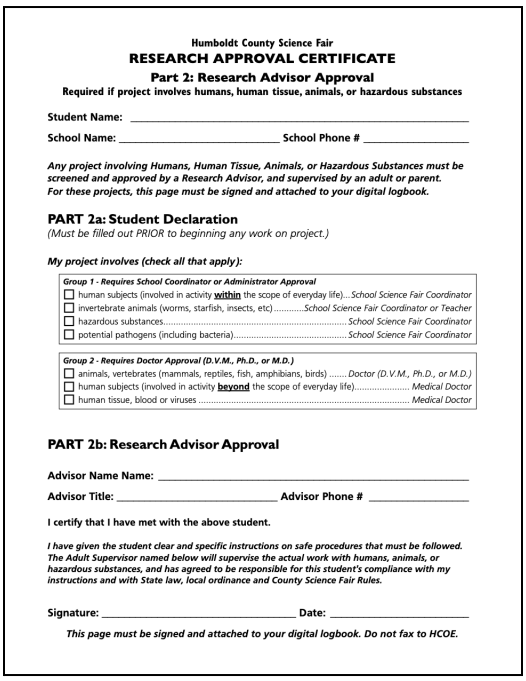
Phone #_____ Date _____

All projects must have a Research Approval Certificate filled out and uploaded to your digital logbook. Do not fax to HCOE.

PART 1

Student Declaration

hcoe.org/science-fair/rac-1



Humboldt County Science Fair
RESEARCH APPROVAL CERTIFICATE
Part 2: Research Advisor Approval
Required if project involves humans, human tissue, animals, or hazardous substances

Student Name: _____

School Name: _____ School Phone # _____

Any project involving Humans, Human Tissue, Animals, or Hazardous Substances must be screened and approved by a Research Advisor, and supervised by an adult or parent. For these projects, this page must be signed and attached to your digital logbook.

PART 2a: Student Declaration
(Must be filled out PRIOR to beginning any work on project.)

My project involves (check all that apply):

Group 1 - Requires School Coordinator or Administrator Approval
- ☐ human subjects (involved in activity **within** the scope of everyday life)...*School Science Fair Coordinator*
- ☐ invertebrate animals (worms, starfish, insects, etc).....*School Science Fair Coordinator or Teacher*
- ☐ hazardous substances.....*School Science Fair Coordinator*
- ☐ potential pathogens (including bacteria).....*School Science Fair Coordinator*

Group 2 - Requires Doctor Approval (D.V.M., Ph.D., or M.D.)
- ☐ animals, vertebrates (mammals, reptiles, fish, amphibians, birds) .....*Doctor (D.V.M., Ph.D., or M.D.)*
- ☐ human subjects (involved in activity **beyond** the scope of everyday life).....*Medical Doctor*
- ☐ human tissue, blood or viruses .....*Medical Doctor*

PART 2b: Research Advisor Approval

Advisor Name: _____

Advisor Title: _____ **Advisor Phone #** _____

I certify that I have met with the above student.

I have given the student clear and specific instructions on safe procedures that must be followed. The Adult Supervisor named below will supervise the actual work with humans, animals, or hazardous substances, and has agreed to be responsible for this student's compliance with my instructions and with State law, local ordinance and County Science Fair Rules.

Signature: _____ **Date:** _____

This page must be signed and attached to your digital logbook. Do not fax to HCOE.

PART 2

Research Advisor Approval

hcoe.org/science-fair/rac-2

Humboldt County Science Fair

RESEARCH APPROVAL CERTIFICATE

Part 1: Student Declaration

Mandatory for all participants

Any project involving Humans, Human Tissue, Animals, or Hazardous Substances must be screened and approved by a Research Advisor, and supervised by an adult or parent. For these projects, Part 2 of this Certificate must be attached to your logbook.

PART 1a: Student Declaration

(Must be filled out PRIOR to beginning any work on project.)

☐ ***My project DOES NOT involve humans, human tissue, animals, or hazardous substances. IF YOU CHECK THIS BOX STOP HERE. You do not need adult or research advisor signatures.***

☐ ***My project involves (check all that apply):***

Group 1 - Requires School Coordinator or Administrator Approval

- ☐ human subjects (involved in activity **within** the scope of everyday life)... *School Science Fair Coordinator*
- ☐ invertebrate animals (worms, starfish, insects, etc) ..... *School Science Fair Coordinator or Teacher*
- ☐ hazardous substances..... *School Science Fair Coordinator*
- ☐ potential pathogens (including bacteria)..... *School Science Fair Coordinator*

Group 2 - Requires Doctor Approval (D.V.M., Ph.D., or M.D.)

- ☐ animals, vertebrates (mammals, reptiles, fish, amphibians, birds) ..... *Doctor (D.V.M., Ph.D., or M.D.)*
- ☐ human subjects (involved in activity **beyond** the scope of everyday life)..... *Medical Doctor*
- ☐ human tissue, blood or viruses ..... *Medical Doctor*

Part 1b: Adult/Parent Supervisor

Adult/Parent supervisor of actual work will be: _____

I agree to supervise supervise the actual work with humans, animals, or hazardous substances indicated above, and agree to be responsible for this student's compliance with the Research Advisor's instructions and with State law, local ordinance and County Science Fair Rules.

Signature_____ Relationship_____

Phone #_____ Date _____

All projects must have a Research Approval Certificate filled out and attached to your logbook. Do not fax to HCOE.

Humboldt County Science Fair

RESEARCH APPROVAL CERTIFICATE

Part 2: Research Advisor Approval

Required if project involves humans, human tissue, animals, or hazardous substances

Any project involving Humans, Human Tissue, Animals, or Hazardous Substances must be screened and approved by a Research Advisor, and supervised by an adult or parent. For these projects, this page must be signed and attached to your logbook.

PART 2a: Student Declaration

(Must be filled out PRIOR to beginning any work on project.)

My project involves (check all that apply):

Group 1 - Requires School Coordinator or Administrator Approval

- ☐ human subjects (involved in activity **within** the scope of everyday life)... *School Science Fair Coordinator*
- ☐ invertebrate animals (worms, starfish, insects, etc) ..... *School Science Fair Coordinator or Teacher*
- ☐ hazardous substances..... *School Science Fair Coordinator*
- ☐ potential pathogens (including bacteria)..... *School Science Fair Coordinator*

Group 2 - Requires Doctor Approval (D.V.M., Ph.D., or M.D.)

- ☐ animals, vertebrates (mammals, reptiles, fish, amphibians, birds) ..... *Doctor (D.V.M., Ph.D., or M.D.)*
- ☐ human subjects (involved in activity **beyond** the scope of everyday life)..... *Medical Doctor*
- ☐ human tissue, blood or viruses ..... *Medical Doctor*

PART 2b: Research Advisor Approval

Advisor Name Name: _____

Advisor Title: _____ Advisor Phone # _____

I certify that I have met with the above student.

I have given the student clear and specific instructions on safe procedures that must be followed. The Adult Supervisor named below will supervise the actual work with humans, animals, or hazardous substances, and has agreed to be responsible for this student's compliance with my instructions and with State law, local ordinance and County Science Fair Rules.

Signature: _____ Date: _____

This page must be signed and attached to your logbook. Do not fax to HCOE.

Abstract Form

6^{th} – 12^{th} grades

An abstract is a brief summary of your work. A good abstract will tell the readers what you set out to do (the question you addressed, or the problem you tried to solve), what you accomplished, and why you believe it is important. The judges will be interested in seeing a short description of your results or conclusions in the abstract.

Example:

My project was to determine if surface finish has an effect on the drag of a model rocket. Five model rockets with identical size and shape, but different surface preparations, were constructed. One rocket was left with an unfinished surface, three had surfaces finished to various degrees of smoothness, and the fifth rocket had its surface sealed, primed, sanded, and covered with clear gloss.

Results: The rocket with the clear gloss finish consistently reached the highest altitudes of all 5 rockets, while the unfinished rocket consistently reached the lowest altitude.

Conclusions: My conclusion is that surface finish has an important role in model rocket drag and rockets with carefully prepared surfaces will reach higher altitudes.

A copy of this form must be placed in the front of the logbook.

Rubrics

Experimental Project Rubric (4th-12th grade)

All projects must clearly distinguish between your work and thoughts and the work and thoughts of others. Students participating in a research opportunity in industry, a university, hospital, or institution other than their school, must explain what is their research in the log book vs. information given by professionals. Higher points will be awarded for depth of scientific thinking and thoroughness of descriptions.

	Exemplary	Accomplished	Developing	Beginning
Research Question and Hypothesis 12 total points	RQ is descriptive and authentic and offers a **unique** contribution to the field of study. RQ is testable.	RQ is descriptive and connects to a field of study. RQ is testable.	RQ is identified and may connect to a field of study. RQ may be answered with or without testing (i.e. observational study)	RQ is identified. RQ may be answered without testing (i.e. observational study).
	4	3	2	1
	Hypothesis is **testable** and proposes a tentative **explanation** for the RQ based on research and/or prior knowledge. A **prediction** is made about the experimental outcome.	Hypothesis proposes a tentative **explanation** for the RQ. A **prediction** is made about the experimental outcome.	A **prediction** is made about the experimental or study outcome based on research and/or prior knowledge.	A **prediction** is made about the study outcome.
	4	3	2	1
	**Evidence in logbook* Project question & design demonstrate complexity and rigor (i.e.could be demonstrated by multiple trials, larger sample size, amount of data, longitudinality, fabrication of testing apparatus etc.)*	**Evidence in logbook* Project question & design are thorough and appropriate, some areas approach complexity and rigor.*	**Evidence in logbook* Project question & design are simple (i.e.may be demonstrated by one trial, small sample size, replicated design etc.)*	**Evidence in logbook* Project question & design may replicate or heavily borrow from common or popular projects and/or uses a simple design.*
	4	3	2	1
	Notes: *Depth and breadth of research question (RQ) and hypothesis should take into consideration the students grade level. A hypothesis is an idea about how something works (tentative explanation) that can be tested using experiments. A prediction says what will happen in an experiment if the hypothesis is correct.*			

Experimental Design 12 total points	**Imaginative and/or unique** design identifies and **defines** variables and controls and should yield valid, reliable, and accurate data. Controls are relevant to experiment.	Design identifies and **defines** variables and controls and should yield accurate data. Controls are relevant to experiment.	Design **identifies** variables and controls and may yield accurate data.	Design **identifies** an experimental group or groups and may yield accurate data.
	4	3	2	1
	Number of trials is considered and **explained**. Data collected will serve as a **basis** for evidence to answer RQ.	Number of trials is considered. Data collected will serve as a **basis** for evidence to answer RQ.	Number of trials is considered. Data collected **relates** to the answer RQ.	Data collected **relates** to the RQ.
	4	3	2	1
	Methods are systematic and can be replicated, are step by step, and easy to understand. Methods include **explanation** of data analysis.	Methods can be replicated, are step by step, and/or easy to understand. Methods include a **description** of data analysis.	Methods are generally described and outlined. Methods focus on data collection and may **mention** data analysis.	Methods are generally described. Methods focus on data collection.
	4	3	2	1
	Notes: *Variable sampling techniques, data collection, and data analysis methods are appropriate for the problem and grade level of the student. Any level of assistance that a student receives should be clearly identified by the student. Data analysis can include logical reasoning, mathematics, or computation.*			
Conclusion 12 total points	Data is **interpreted** and logical conclusions are **drawn and justified** using evidence (relevant data) from the study.	Data is **interpreted** and logical conclusions are **drawn** using evidence (relevant data) from the study.	Data is **described**. Conclusions, if drawn, generally relate to data in study.	Data may be **identified**. Conclusions, if drawn, simply relate to data in the study or to the field of study in general.
	4	3	2	1
	Conclusions **directly address** the RQ and hypothesis.	Conclusions **connect** to the RQ and hypothesis	Conclusions **generally relate** to RQ and hypothesis or prediction.	Conclusions connect to the field of study or other areas of interest
	4	3	2	1

Conclusion (continued)	How conclusions relate to the field of study and/or real world applications is **explained and described.** Learning from project completion is **explained and described**.	How conclusions relate to the field of study and/or real world applications is **described**. Learning from project completion is **described.**	How conclusions relate to the field of study and/or real world applications is **identified**. Learning from project completion is **identified**	How conclusions relate to the field of study or real world application *may be* **simply identified**. Learning from project completion *may be* **identified.**
	4	3	2	1
	Note: *Students interpret data after data analysis to identify patterns or relationships especially related to the RQ. Interpretation of data is appropriate for a student's grade level (i.e. middle and high school students may consider limitations in their data analysis such as measurement error, but this is not expected of younger students). A data description would be restating data rather than finding patterns or meaning (interpretation).*			
Logbook (Communicating Scientifically) 16 points total	Original scientific thinking and process is communicated in detail and is **descriptive and thorough.** Thoughts, ideas, observations, revisions and actions are included.	Scientific thinking and process is communicated in detail and is **descriptive.** Thoughts, ideas, observations, revisions and actions are included.	Scientific thinking and process is communicated and is **descriptive.** Some thoughts, ideas, observations, revisions and actions are included.	Scientific thinking and process is communicated**.** Some thoughts, ideas, observations, revisions and actions are included.
	4	3	2	1
	Research notes and bibliography with at least 3 **varied** sources (i.e. interview, website). Research explicitly guides project, including interpretation of data and development of conclusion	Research notes and bibliography with **3 sources** (i.e. websites) Research guides project.	Research notes and bibliography, **some sources** noted. Research may guide project.	Research notes and/or bibliography may be included. Research may guide project.
	4	3	2	1
	Entries include **clearly** labeled and **organized** data tables with raw data and trials. IV, DV groups and controls or constant factors are **clearly labeled or identified.**	Entries include labeled data tables with raw data and trials. IV, DV groups and controls or constant factors are **labeled or identified**.	Entries include data tables with **most** raw data and **most** trials. IV, DV groups and controls or constant factors **may be labeled or identified in some entries**.	Entries include raw data. IV, DV groups and controls or constant factors **may be labeled or identified in some entries**.
	4	3	2	1

Logbook (continued)	Entries are **clearly** labeled and **logically** organized. Dates are present for **all** work.	Entries are labeled and are organized. Dates are present for **most** work.	**Most** entries are labeled and organized. Dates are present for **some** work.	**Some** entries are labeled. **A few** dates are present.
	4	3	2	1
	***Notes**: Variables can be abbreviated with IV = Independent Variable and DV= Dependent Variable.* *Highlighted sections relate to 6th-12th grade projects only.*			
Display **(Communicating Scientifically)** 12 total points	Study sections are identified and **logically** organized. Text is appropriate for **communicating scientifically** and vocabulary is specific to the field of study.	Study sections are identified and organized. Text is appropriate for **communicating scientifically** and vocabulary is specific to the field of study.	Study sections are identified. Text is **descriptive** and errors do not detract from meaning or understanding.	Study sections are included. Text is **general** and errors do not detract from meaning or understanding
	4	3	2	1
	Patterns and **relationships** are revealed from data represented in tables and graphical displays. Data displays **clearly support** the conclusion.	Patterns are revealed from data represented in tables and graphical displays. Data displays **support** the conclusion.	Results are displayed visually and/or numerically and **generally support** the conclusion.	Results are displayed visually or numerically with unclear connections to the conclusion.
	4	3	2	1
	Independent and imaginative approach uses color for emphasis and visuals that **add to depth and clarity of conclusion.**	Independent and imaginative approach uses color for emphasis and visuals that **promote understanding of the conclusion**.	Imaginative approach uses color and/or visuals that **relate to the conclusion.**	Approach uses color and/or visuals that may **relate to the conclusion or field of study.**
	4	3	2	1
	***Notes:** "Independent" is defined as independent from adult support. Some projects may be collaborative among students. Visual displays can include but are not limited to drawings, photos, flowcharts, graphs, and/or diagrams (schematics) that reveal patterns, explain ideas, and show relationships. Communicating scientifically includes communicating clearly and persuasively student generated ideas.*			

Rubrics

Engineering Design Project Rubric (4th-12th grade)

All engineering projects must clearly distinguish between your work and thoughts and the work and thoughts of others. Students participating in an engineering opportunity in industry, a university, hospital, or institution other than their school, must explain what are their ideas in the log book vs. information given by professionals. Higher points will be awarded for depth of scientific thinking and thoroughness of descriptions.

	Exemplary	Accomplished	Developing	Beginning
Design 12 total points	**Original and/or unique** problem is **clearly defined** (i.e.what is the problem, who has it, why it's important to solve).	**Practical** problem is **clearly defined** (i.e.what is the problem, who has it, why it's important to solve).	Problem is **defined** (i.e.what is the problem, who has it, why it's important to solve).	Problem is **generally defined** (i.e.what is the problem, who has it, why it's important to solve).
	4	3	2	1
	Criteria (i.e. requirements) for proposed solution are defined. Solution is **unique**. Constraints (i.e. limitations) for proposed solutions are **explained**.	Criteria (i.e. requirements) for proposed solution are defined. Constraints (i.e. limitations) for proposed are **explained**.	Criteria (i.e. requirements) for proposed solution are **listed or generally defined**. Constraints (i.e. limitations) are **listed or generally explained**.	Criteria (i.e. requirements) for proposed solution are **listed or generally defined** ***OR*** Constraints (i.e. limitations) are **listed**.
	4	3	2	1
	**Evidence in logbook* Project problem & design demonstrate complexity and rigor (i.e.could be demonstrated by multiple trials, larger sample size, amount of data, longitudinality, fabrication of testing apparatus etc.)*	**Evidence in logbook* Project problem & design are thorough and appropriate, some areas approach complexity and rigor.*	**Evidence in logbook* Project problem & design are simple (i.e.may be demonstrated by one trial, small sample size, replicated design etc.)*	**Evidence in logbook* Project problem & design may replicate or heavily borrow from common or popular projects and/or uses a simple design.*
	4	3	2	1
	Notes: *Depth and breadth of engineering design should take into consideration the student's grade level.*			
Solution: Develop and Test 12 total points	Prototype solution demonstrates intended design. Prototype has been tested in **multiple conditions/trials**.	Prototype solution demonstrates intended design. Prototype has been tested in **multiple conditions/trials.**	Prototype solution may demonstrate intended design. Prototype has been **tested.**	Prototype solution may demonstrate intended design. Prototype may be **untested** or testing is general or unclear.
	4	3	2	1

Solution: Develop and Test (continued)	Testing procedures are systematic **and** can be replicated. Design changes are explained and **clearly related** to data collection during tests. Equipment and materials are used **ingeniously.**	Testing procedures are systematic **and/or** can be replicated. Some design changes are **described or explained**. Equipment and materials are used as **intended**.	Testing procedures are described.	Testing procedures may be described, but unclear.
	4	3	2	1
	Prototype solution demonstrates engineering skill (i.e. final design is **markedly** improved from process of testing **and** data analysis).	Prototype solution demonstrates engineering skill (i.e. final design is improved from process of testing **and** data analysis).	Prototype solution demonstrates **developing** engineering skill (i.e. final design is improved from process of testing **or** data analysis).	Prototype solution demonstrates **beginning** engineering skill (i.e. final design **may be** improved).
	4	3	2	1
	Notes: Any level of assistance received is clearly identified.			
Conclusion 12 total points	Data is **interpreted** and logical conclusions are **drawn and justified** using evidence (relevant data) from testing.	Data is **interpreted** and logical conclusions are **drawn** using evidence (relevant data) from testing. Conclusions **connect** to the RQ and hypothesis.	Data is **described**. Conclusions, if drawn, generally relate to data from testing. Conclusions **generally relate** to RQ and hypothesis or prediction.	Data may be **identified**. Conclusions, if drawn, simply relate to data in the study or to the field of study in general. Conclusions connect to the field of study or other areas of interest.
	4	3	2	1
	Conclusions **directly address** the final solution and are **compared** to research done prior to testing.	Conclusions **connect to** the final solution and are **compared** to research done prior to testing.	Conclusions **generally relate to** the final solution and **may be compared** to research done prior to testing.	Conclusions, if drawn, connect to the field of study or other areas of interest rather than testing or prior research.
	4	3	2	1
	Learning from project completion is **explained**. Product or process has a **strong potential** to eventually become feasible economically and ecologically.	Learning from project completion is **described.** Product or process has the **potential** to eventually become feasible economically and ecologically.	Learning from project completion is **identified.** Product or process **may have the potential** to eventually become feasible economically and ecologically. **More testing** is needed.	Learning from project completion may be **identified.** Product or process is **hypothetical**, may need **more testing and developmen**t to become feasible economically and ecologically.
	4	3	2	1

Conclusion (continued)	***Note:*** *Students interpret data after data analysis to identify patterns or relationships especially related to the final solution. Interpretation of data is appropriate for a student's grade level (i.e. middle and high school students may consider limitations in their data analysis such as measurement error, but this is not expected of younger students). A data description would be re-stating data rather than finding patterns or meaning (interpretation)*			
Logbook (Communicating Scientifically) 16 points total	Engineering process is communicated in **detail and is descriptive and thorough.** There is evidence of exploration of alternatives to proposed solution**.** **Detailed descriptions** of thoughts, ideas, observations, revisions and actions are included.	Engineering process is **descriptively** communicated**.** There is evidence of exploration of alternatives to proposed solution**.** **Descriptions** of thoughts, ideas, observations, revisions and actions are included.	Engineering process is communicated**.** Thoughts, ideas, observations, revisions and actions are included.	Engineering process is **simply** communicated**.** **Some** thoughts, ideas, observations, revisions and actions are included.
	4	3	2	1
	Research notes and bibliography; at least 3 **varied** sources (i.e. interview, website, book). Research explicitly guides project, including interpretation of data and development of conclusion	Research notes and bibliography; **3 sources** (i.e. websites). Research guides project.	Research notes and bibliography; **some sources** noted. Research may guide project.	Research notes and bibliography, **some sources** noted. Research may guide project.
	4	3	2	1
	Steps of the development of a prototype/model/solution are **described in detail** (i.e. words **and** drawings, diagrams, and/or schematics).	Steps of the development of a prototype/model are **described.**	Most steps of the development of a prototype/model are generally **described**.	Most steps of the development of a prototype/model are **identified** (i.e. listed).
	4	3	2	1
	Entries include **clearly** labeled and **organized** data tables with raw data and trials. Entries are **clearly** labeled and **logically** organized. Dates are present for **all** work.	Entries include labeled data tables with raw data and trials. Entries are labeled and are organized. Dates are present for **most** work.	Entries include data tables with **most** raw data and **most** trials. **Most** entries are labeled and organized. Dates are present for **some** work.	Entries include some raw data and/or trails. **Some** entries are labeled. **A few** dates are present.
	4	3	2	1

	***Notes**: Entries and logbook in its entirety demonstrate a clear degree of independence (i.e. student is working independently using research and testing to make decisions). All adult input is noted and described.*			
Display **(Communicating Scientifically)** 12 total points	Parts of the engineering process are identified and **logically** organized. Text is appropriate for **communicating scientifically** and vocabulary is specific to the field of study.	Parts of the engineering process are identified and organized. Text is appropriate for **communicating scientifically** and vocabulary is specific to the field of study.	Parts of the engineering process are identified. Text is **descriptive** and errors do not detract from meaning or understanding.	Some parts of the engineering process are included. Text is **general** and errors do not detract from meaning or understanding
	4	3	2	1
	Patterns and **relationships** are revealed from data represented visually (i.e flowcharts, schematics, etc.) **and** descriptively (i.e. written, graphs etc.). Data displays **clearly support** the design of the final solution.	**Patterns** are revealed from data represented visually (i.e flowcharts, schematics, etc.) **and/or** descriptively (i.e. written, graphs etc.). Data displays **support** the design of the final solution.	**Results** are displayed visually and/or descriptively. Data displays **generally support** the design of the final solution.	**Results** are displayed visually or numerically with unclear connections to the design of the final solution.
	4	3	2	1
	Independent and imaginative approach uses color for emphasis and visuals that **add to depth and clarity of the selection of the final solution.**	Independent and imaginative approach uses color for emphasis and visuals that **promote understanding of the final solution.**	Imaginative approach uses color and/or visuals that **relate to the final solution.**	Approach uses color and/or visuals that may **relate to the final solution or field of study.**
	4	3	2	1
	***Notes:** "Independent" is defined as independent from adult support. Visual displays can include but are not limited to, drawings, photos, flowcharts, or schematics that reveal patterns and show relationships. Descriptive displays describe the data in writing, using graphs, etc.). Communicating scientifically includes communicating clearly and persuasively generated ideas.*			

Notes to Judges

- Projects are judged only on the criteria in the rubric and NOT compared to other projects. Calibration increases fairness, not a curve.
- The quality of the student's thought and work matters, not the *amount* of work; team projects are judged like other projects -- it is the quality of thought and work that matters, not the amount.
- A less sophisticated project that the student understands gets higher marks than a more sophisticated project that is not understood;
- Access to sophisticated lab equipment and endorsements from professionals does not guarantee a high quality project; consider did the student understand the science and/or engineering?
- The student may end up disproving the objective or hypothesis of the experiment. That is the process of science and learning! This should not impact student scores.

Exemplary scores go to:

- Genuine scientific breakthroughs / novel ideas
- Discovering knowledge not readily available to the student
- Finding important patterns when interpreting data
- A clever experimental apparatus and design
- Repetition of trails to verify experimental results
- In engineering categories, when project is applicable to the "real world"
- Ability to clearly portray and explain the project and its findings

Beginning marks go to:

- Ignoring readily available information (e.g. library research is not reported)
- Using an apparatus (e.g. model) that may not be useful for experimentation and data collection
- Demonstrating a beginning understanding may include misrepresentation of terminology, scientific language or an incomplete understanding of how equipment or instrumentation works
- Presenting results that were not derived from experimentation (e.g. literature search)