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CONTACT INFORMATION

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Assistant
831-466-5802

Visit our website:
http://science.santacruz.k12.ca.us
Eligibility Rules

Project Allotments
The allotment for Primary and Elementary Schools is limited to a maximum of 10 projects. Junior High, Middle, and High Schools are allowed open enrollment.

Limitations
1. Each student may enter only one project in the Santa Cruz Science & Engineering Fair.
2. Each project may have one, two, or three team members.
3. Team projects are placed in competition with individual projects in the same categories.
4. Judges have a higher level of expectation for team projects equal to the number of students on the team.
5. All work must be done by the student(s).
6. All project entries must be registered by the first Friday in February. Register on-line at http://science.santacruz.k12.ca.us
7. All projects must meet all county, state, federal, and international rules and regulations.
8. All projects must pass the Santa Cruz County Scientific Review Process.
9. Special projects must get prior approval from their sponsoring teacher and submit a Certificate of Compliance prior to the registration deadline. See pages 9-10 for details.

Scientific Review Committee
All applications and project summaries must meet with the approval of the Scientific Review Committee (SRC). The Scientific Review Committee is a team of highly qualified scientists, medical professionals, engineers, and educators. The job of the SRC is to review projects for safety, appropriate content, and compliance with all rules and regulations. Students are notified when changes are recommended or required.

Ethics Code
“Scientific fraud and misconduct is not condoned at any level of research or competition. Plagiarism, use or presentation of other researcher’s work as one’s own and fabrication or falsification of data will not be tolerated. Fraudulent projects will fail to qualify for competition in affiliated fairs or the ISEF.” (International Rules for Precollege Research, Science Service).

Qualifications for entry to the Santa Cruz Science & Engineering Fair
- Students must attend an educational institution recognized by the State of California within Santa Cruz County.
- Students must be enrolled in grades K-12 at the time of qualifying for the fair.
- Student projects must be approved and recommended by a teacher or assigned school representative.

Divisions are assigned by grade level
- Primary Division Grades K-3
- Elementary Division Grades 4-5
- Junior Division Grades 6-8
- Senior Division Grades 9-12
**How to Get Started**

<table>
<thead>
<tr>
<th>Explore</th>
<th>Explore a variety of resources for meaningful project ideas: research books, periodicals, Internet, community concerns, local environmental issues, look in your backyard, and garage. Explore your personal interests. The more interested you are in your subject, the more meaningful the subject matter, the more likely you are to succeed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual or team project</td>
<td>You may choose to work as an individual or a member of a team of 2 or 3 students. Note that judges have a much higher level of expectation for team projects. Get your parent’s and teacher’s permission before choosing a team project.</td>
</tr>
<tr>
<td>Start!</td>
<td>Read, research and search for ideas. Outline the <strong>PROJECT PLAN</strong>. Write an <strong>INTRODUCTION</strong>: Write a statement of purpose. Write an investigative question. Write a hypothesis that provides a basis for further investigation.</td>
</tr>
<tr>
<td>Organize</td>
<td>The key to success is good organization. Use a calendar to organize your time. Work backward from the due date. Use a checklist to keep track of project accomplishments. Log all school projects, extracurricular activities and personal commitments on your project calendar.</td>
</tr>
<tr>
<td>Design your procedure</td>
<td>List <strong>MATERIALS</strong> and <strong>METHODS</strong> used in your experiment. Identify and control your variables. Repeat the experiment many times to validate your results.</td>
</tr>
<tr>
<td>Experiment</td>
<td>Record all results and observations in a <strong>LABORATORY NOTEBOOK</strong>. Design charts and graphs that help you analyze and display your data.</td>
</tr>
<tr>
<td>REACH A CONCLUSION</td>
<td>Write an explanation of your results. Relate conclusions to your hypothesis. Write a conclusion statement and discuss whether or not you met your project objectives.</td>
</tr>
<tr>
<td>Write a report</td>
<td>Write a science report. <strong>SCIENCE REPORTS SHOULD BE WORD PROCESSED.</strong></td>
</tr>
<tr>
<td>Create a display</td>
<td>Design a 3-panel board. Outline the science fair report and display results. Design a display or model of the experiment.</td>
</tr>
</tbody>
</table>
| Finish | REGISTER FOR THE SCIENCE & ENGINEERING FAIR ON-LINE at [http://science.santacruz.k12.ca.us](http://science.santacruz.k12.ca.us)
Prepare a presentation by assembling the **PROJECT BASICS** (see page 6). |
### Project Calendar

(An Example of a Four Week Project Plan)

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Research Project Ideas and Pick a Project.</td>
<td>Intro: • Purpose • Investigative Question • Hypothesis</td>
<td>List Materials</td>
<td>Methods: Write the steps of the method.</td>
<td>Set up laboratory/science notebook.</td>
<td>Date: _____</td>
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<td>Date: _____</td>
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<tr>
<td>Week 2</td>
<td>Begin experimentation and data collection.</td>
<td>Continue to experiment and collect data.</td>
<td>Continue to experiment and collect data.</td>
<td>Continue to experiment and collect data.</td>
<td>Continue to experiment and collect data.</td>
<td>Date: _____</td>
</tr>
<tr>
<td>Date: _____</td>
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<td>Date: _____</td>
<td>Date: _____</td>
</tr>
<tr>
<td>Week 3</td>
<td>Complete data analysis and draw conclusions.</td>
<td>Write a Conclusion statement.</td>
<td>Reproduce charts and graphs for display board and report.</td>
<td>Write rough draft of report.</td>
<td>Edit first draft of report.</td>
<td>Date: _____</td>
</tr>
<tr>
<td>Date: _____</td>
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<td>Date: _____</td>
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<td>Date: _____</td>
<td>Date: _____</td>
</tr>
<tr>
<td>Week 4</td>
<td>Complete final draft, print report and display materials.</td>
<td>Prepare 3-panel display board. Set up your display model.</td>
<td>Prepare oral presentation and Practice Interview.</td>
<td>Review final checklist. Proofread all work.</td>
<td>Prepare project for safe transport to the Fair.</td>
<td>Date: _____</td>
</tr>
<tr>
<td>Date: _____</td>
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<td>Date: _____</td>
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</tbody>
</table>

### SPECIAL NOTES FOR CREATING YOUR SCIENCE FAIR PROJECT CALENDAR PLAN

1. Develop your own project planning calendars.
2. Enter the final project due date for your school science fair, first.
3. Work backward from the due date. Organize your time. Set dates for completion of each step in the process.
4. Some experiments run for several weeks; others can take up to several months of time or more. Plan for the unexpected.
5. Enter other assignment due dates that will fall during this time. Include special events, activities and personal time commitments.
6. Start your experiment early to allow for multiple tests and trials. Allow time for error correction and changes to the plans.
Project Basics

Laboratory Notebook
The lab notebook is a student journal. It includes dates, times, activities, notes, drawings, and observations. Each student on a team should keep his/her own lab notebook. Lab notebooks should be well organized and reflect student work. The lab notebook is a rough draft and handwritten.

Science Report
Write a science report based on the scientific method used in the experiment. Each science report should have a cover, title page, and table of contents. The introduction should include a purpose or goal statement, investigative question, and hypothesis. Provide a detailed list of materials and steps in the procedure. Include graphs, charts, maps, photographs, diagrams, and labeled drawings. Write a conclusion and summary statement. Insert a bibliography and appendix at the end of the report. Students should also acknowledge those who were helpful during the course of the study.

Display Board
The display board is a three-panel board. It must be sturdy and free-standing. Students may purchase a three-panel board or construct their own. The display should reflect the major steps in the scientific method. Include photographs, charts, graphs, diagrams, and graphics. The display board should represent the highlights and scientific method used in your project.

Model
The display model represents the experiment or investigation. Keep it simple and display the essential elements of the project. Students may display models, supplies, and equipment.

Interview/Oral Presentation
The interview is an essential element in the evaluation of the science fair project. Be prepared to answer a variety of questions and discuss the scientific concepts that support the study. Students should dress for a formal interview. The dress code is business casual.
1. Students must be present at their displays during scheduled interviews to be eligible for awards. See Display Regulations on page 8.

2. Students’ original laboratory notebook must be present for judging.

3. Project displays must adhere to Santa Cruz County, state, federal laws for public safety. Projects must sustain their own weight.

4. No hazardous materials may be exhibited at the project display. This includes, but is not limited to acids, unsecured glassware, mercury (including glass thermometers), hazardous microbes, carcinogenic, and radioactive material, open flames and unsealed food which may attract pests.

5. Displays may not contain any living organism including all animals, plants, and studied collections of microscopic life forms such as bacteria, fungi, and molds. The display of preserved animals is not permitted. Projects may not display photographs of procedures detrimental to the health and well being of vertebrate animals. Photographs of surgical procedures may not be exhibited.

6. No electrical power will be provided. No gas or water outlets are provided.

7. All projects must clearly distinguish between the work of the student participant and the work of others. Students participating in a research opportunity in industry, a university, hospital or institution other than their school must display only their research. Students must clearly specify the assistance received and the role and contributions of others in the project. It is required that such projects be accompanied by a letter from the principle research director indicating the level of his/her involvement in the student project. This letter should be included in the project notes.

Note:
The Santa Cruz Science & Engineering Fair reserves the right to disqualify any project due to poor quality, incompleteness, or inappropriate project content.
Display Regulations

READ THE DISPLAY REGULATIONS CAREFULLY.

Determine the best way to display your project within the limitations of space and permissable materials allowed for display. Whenever possible use photographs and illustrations to graphically display the most meaningful parts of your science fair project.

**Display size limitations:**

- Maximum width: 4.0 feet (122 cm)
- Maximum depth: 2.5 feet (76 cm)
- Maximum height: 6.5 feet (198 cm)
The following codes apply to all student research projects. Project advisors must acknowledge on the Certificate of Compliance that the student has complied with all research regulations.

**For All Projects Involving Humans as the Subject of Research**

The Code of Federal Regulations 45 CFC 46, 46.102 defines “Human Subject,” which means a living individual about whom an investigator (whether professional or student) conducting research obtains (1) data through intervention or interaction with the individual, or (2) identifiable private information. In order for the obtaining of private information to constitute research involving human subjects, the identity of the subject must be readily associated with the information.

“Minimal Risk” means that the risks of harm anticipated in the research are not greater, considering probability and magnitude, than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests.

Examples of unacceptable risk include: (1) ingestion or physical contact with any potentially hazardous materials including toxic chemicals, known or suspected pathogens or carcinogens, or exposure to ionizing radiation; (2) intentionally inducing emotional stress through questioning or invasion of privacy; (3) physical stress to pregnant women or anyone suffering debilitating physical illness; and (4) psychological stress to the mentally handicapped or those suffering psychiatric disorders. This list is intended to be illustrative, not exhaustive.

**For All Projects Involving Tissue Samples or Bacteria**

Live tissue samples must be taken either from a continuously maintained tissue culture line already available to institutional researchers, or from animals already being used in an ongoing institutional research project.

Students may not be involved in the direct acquisition of these samples from living human or vertebrate animals.

Any culturing of micro-organisms (bacteria, molds, algae, archaea, protzoa) from any environmental source must be handled at a Bio Safety Level 1 (BSL-1), or higher, rated facility. BLS-1 rated facilities include facilities that teach microbiology (high schools, colleges, or microbiological testing labs.) Work is done on an open bench or in a fume hood. Standard microbiological practices are used when working in the laboratory. Decontamination can be achieved by treating with chemical disinfectants or by steam autoclaving. Lab coats are required and gloves recommended. The laboratory work is supervised by an individual with general training in microbiology or a related science. If the cultured microorganism poses a possible (or unknown) risk to personnel, a BSL-2 rated lab environment is required.

*Note: Any culturing of food-grade microbiological organisms (Baker’s/Brewer’s yeast, lactobacillus) that does not involve genetic manipulation is exempted.

More detailed information can be found on the International Science and Engineering Fair website:
https://student.societyforscience.org/international-rules-pre-college-science-research?pid=312

**For All Projects Using Any Live Vertebrate Animals or Invertebrates, Excluding Humans**

The State of California Education Code 51540:

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

(a) Be experimentally medicated or drugged in a manner to cause painful reactions or induce painful or lethal pathological conditions. (b) Be injured through any other treatments, including, but not limited to, anesthetization 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. The provisions of this section are not intended to prohibit or constrain vocational instruction in the normal practices of animal husbandry.

Note: Complete the Certificate of Compliance only if your project qualifies as a special project. Download a copy of the certificate of compliance at science.santacruz.k12.ca.us
Scientific Review (SRC) Preapproval Requirements

Does your project involve any of the following?

**HUMAN SUBJECTS** ...asking your friends or other people questions? experiments on yourself? experiments with people in any way?

**HUMAN OR ANIMAL TISSUE** ...anything coming from a human or animal body? cheek cells or other cells? teeth? bone? fluids such as blood, saliva or urine?

**rDNA** ...DNA from one organism inserted into the DNA of another organism?

**NON-HUMAN VERTEBRATE ANIMALS** ...your pet? any other animals that have bones (except people)? E-mail npfeiffer@santacruzcoe.com for assistance with experimental design.

**PATHOGENIC AGENTS** ...mold or other fungus? bacteria? viruses? anything that might make you sick? cultured samples collected from the environment?

**CHEMICALS** ...any chemical such as household cleaning agents, solvents, metals, organic chemicals or ethidium bromide?

**CONTROLLED SUBSTANCES** ...prescription drugs? alcohol, wine or beer? cigarettes or other tobacco? gunpowder? any product which the student may not legally purchase?

**HAZARDOUS OR DANGEROUS EQUIPMENT** ...model rockets? lasers? UV light? radiation? guns or gunpowder? anything else that might be considered dangerous or hazardous?

You do not need SRC preapproval. Submit your online registration + Student Permission Form.

You must get approval from a sponsoring teacher before you begin your research. A Certificate of Compliance Form must be submitted by the registration deadline. For more information, visit: http://science.santacruz.k12.ca.us

You do not need SRC preapproval. Submit your online registration + Student Permission Form.
### Project Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Sciences</td>
<td>Study of animals and animal life, including the study of the structure, physiology, development, and classification of animals. Animal ecology, physiology, animal husbandry, cytology, histology, entomology, ichthology, ornithology, herpetology, etc.</td>
</tr>
<tr>
<td>Behavioral and Social Sciences</td>
<td>The study or study of the thought processes and behavior of humans and other animals in their interactions with the environment studied through observational and experimental methods.</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>The study of the chemical substances and vital processes occurring in living organisms; the processes by which these substances enter into, or are formed in, the organisms and react with each other and the environment.</td>
</tr>
<tr>
<td>Cellular and Molecular Biology</td>
<td>The study of the structure and formation of cells.</td>
</tr>
<tr>
<td>Chemistry</td>
<td>The science of the composition, structure, properties, and reactions of matter, especially of atomic and molecular systems.</td>
</tr>
<tr>
<td>Computer Science</td>
<td>The study of information processes, the structures and procedures that represent processes, and their implementation in information processing systems. It includes systems analysis and design, application and system software design, programming, and datacenter operations.</td>
</tr>
<tr>
<td>Earth and Planetary Science</td>
<td>The study of sciences related to the planet Earth (geology, minerology, physiography, oceanography, meteorology, climatology, speleology, seisimology, geography, atmospheric sciences, etc.)</td>
</tr>
<tr>
<td>Engineering: Electrical and Mechanical</td>
<td>The application of scientific and mathematical principles to practical ends such as the design, manufacture, and operation of efficient and economical structures, processes, and systems.</td>
</tr>
<tr>
<td>Engineering: Materials and Bioengineering</td>
<td>The application of scientific and mathematical principles to practical ends such as the design, manufacture, and operation of efficient and economical machines and systems.</td>
</tr>
<tr>
<td>Energy and Transportation</td>
<td>The study of renewable energy sources, energy efficiency, clean transport, and alternative fuels.</td>
</tr>
<tr>
<td>Environmental Management</td>
<td>The study of managing human interaction with the environment.</td>
</tr>
<tr>
<td>Environmental Sciences</td>
<td>The analysis of existing conditions of the environment.</td>
</tr>
<tr>
<td>Mathematical Sciences</td>
<td>The study of the measurement, properties, and relationships of quantities and sets, using numbers and symbols. The deductive study of numbers, geometry, and various abstract constructs, or structures. Mathematics is very broadly divided into foundations, algebra, analysis, geometry, and applied mathematics, which includes theoretical computer science.</td>
</tr>
<tr>
<td>Medicine and Health Sciences</td>
<td>The science of diagnosing, treating, or preventing disease and other damage to the body or mind.</td>
</tr>
<tr>
<td>Microbiology</td>
<td>The study of micro-organisms, including bacteria, viruses, prokaryotes, and simple eukaryotes and of antibiotic substances.</td>
</tr>
<tr>
<td>Physics and Astronomy</td>
<td>Physics is the science of matter and energy and of interactions between the two. Astronomy is the study of anything in the universe beyond the Earth.</td>
</tr>
<tr>
<td>Plant Sciences</td>
<td>Study of plant life. Ecology, agronomy, horticulture, forestry, plant taxonomy, physiology, pathology, plant genetics, hydroponics, algae, etc.</td>
</tr>
</tbody>
</table>

Note that the above categories with large numbers of entries may be further divided into sub-categories to balance the competition.
How to Succeed

What the Judges Look for in a Good Science Project

- Quality work
- Projects that show students understanding of their work
- Access to sophisticated equipment and endorsements from professionals do not guarantee the best quality
- It's okay if a student disproves the hypothesis

High marks go to

- Genuine scientific or engineering breakthroughs
- Discovering knowledge not readily available to the student
- Correctly interpreting data
- A clever experimental apparatus
- Repetitions to verify experimental results
- Predicting and/or reducing experimental results with analytical techniques
- Experiments applicable to the “real world”
- Ability to clearly portray and explain the project and its results

Low marks go to

- Ignoring readily available information (e.g., not doing basic library research)
- An apparatus (e.g., model) that is not useful for experimentation and data collection
- Improper use of jargon, not understanding terms; not knowing how equipment or instrumentation works
- Presenting results that were not derived from experimentation (e.g., literature search)
- Complex projects that are not understood by the students
What is the Criteria for Judging Science & Engineering Fair Projects?

Scientific Thought: Was there a procedural plan for obtaining a solution? If controls were necessary, did the student recognize their need and were they correctly used? Are there adequate data to support the conclusions?

Non-Inquiry Based Projects: Does the project have a clear objective? Is the solution workable, acceptable to the potential user, and economically feasible? Has the solution been tested for performance under the conditions of use?

Creativity and Engagement:
- Problem is either original or takes a new or unusual approach to an old problem.
- The project appears to represent the student’s own understanding and work.
- Student displays engagement with data and considers multiple implications of results. For example: notices unusual data, alters design of experiment to accommodate unexpected data, asks and answers additional questions beyond original hypothesis.
- Student can interestingly and logically explain absent or unusual results.

Skill and Thoroughness:
- Student records and analyzes data in an orderly way, averages like data, shows range of data, and calculates statistical significance as appropriate to data and student’s age.
- Mathematical or observational skills are evident.
- Student demonstrates special skill in construction or use of equipment.
- All parts of notebook, report, and display are clearly labeled.

Presentation and Analysis:
- The purpose, procedures, and conclusions are clearly outlined.
- Lettering, signs, and diagrams are neat and accurate.
- Student uses bar graphs, line graphs, or other tables and diagrams appropriately (understands difference between continuous and discontinuous variables).
- The display is self-explanatory, with minimum redundancy.
- Conclusions are logical and based on the data collected.
- Student understands the hypothesis cannot be “proved right” and understands that negative results (that disprove the hypothesis) are valid.
- Student can orally summarize results in one or two sentences.
- Student recognizes shortcomings of approach, if any, and can suggest improvements.

What Should You Do?
- Prepare a brief oral summary of the important points in the project.
- Prepare several short capsule descriptions of important aspects of your project.
- Be prepared to discuss the scientific concepts that support your research study.
- If yours is a team project, one person should act as the team spokesman at the beginning and present the oral summary. This summary should include the rationale for the project being a group, rather than an individual enterprise and how each member contributed. Each member of the group should be fully knowledgeable about the project and be prepared to then discuss his/her part.

What Should You Expect the Judges to Do?
- You will be interviewed by at least one judge for your category who will spend about 5 minutes discussing your project with you. It is difficult to space these interviews equally, so don't get discouraged if there is a long wait between judges. Don't worry about comparing the number of your judges with your neighbors. You, or they, may be getting Special and Recognition Awards interviews.
- Many judges prefer to learn about your project by asking questions. Be prepared for them to interrupt your presentation. Judges may wish to discuss the underlying scientific concepts supporting your experiment and research study. Be prepared to engage in formal and informal discussions about your science project.
CATEGORY AWARDS
The Santa Cruz County Science & Engineering Fair holds an Awards Ceremony each year to honor top projects in the Elementary, Junior, & Senior Divisions. Projects in these divisions will be interviewed, scored, and ranked by category judges using the Judges Scoring Sheet. First through Third Place will be awarded on top projects within each category and division. All Primary Division projects will be interviewed, but will not be scored or ranked. All K-3 grade students receive a “Project of Merit” ribbon at the Fair.

PROJECTS OF THE YEAR AWARDS
A Special committee of judges reviews the top projects in every category to select the Santa Cruz Science & Engineering Fair Projects of the Year. In the case of awards given to a team project with two or more students named as co-authors, any cash award is divided equally among each co-authors.

The Best Overall Project in the Senior Division is eligible to attend the International Science and Engineering Fair (ISEF). If the recipient of this award is unable to attend ISEF, the next highest scoring senior project will be given the honor to attend the ISEF event.

The Santa Cruz County Science & Engineering Fair Overall Winner and Overall Runner Up in the Elementary, Junior, and Senior Divisions are presented with cash awards.

CALIFORNIA STATE SCIENCE FAIR TEAM
A special committee of judges selects the top Junior and Senior Division projects that will represent Santa Cruz County at the California State Science Fair. CSSF is held at the California Science Center in Los Angeles, California. If the recipients of these awards are unable to attend CSSF the next highest scoring junior or senior projects will be given the honor of attending the CSSF event.

SPECIAL AWARDS
Special Awards judges award cash prizes, special gifts and certificates of recognition for a wide variety of special projects. Some of the Special Awards include: Seagate Technology Grand Prize Awards; and awards from the National Oceanographic Atmospheric Association; Association for Women Geoscientists; Armed Services; Plantronics; Santa Cruz Mineral & Gem Society; Yale Science & Engineering Association; and other ISEF-affiliated organizations.
Project Checklist

☐ LABORATORY NOTEBOOK
   Handwritten journal, observations and data in rough draft format

☐ SCIENCE/ENGINEERING PROJECT REPORT
   ☐ Cover
   ☐ Title Page
   ☐ Table of Contents
   ☐ INTRODUCTION:
      ☐ Statement of Purpose, Investigative Question, and Hypothesis
      Or, Statement of Goals, Objectives, and Hypothesis
   ☐ PROCEDURE:
      ☐ Materials (written as a list)
      ☐ Methods (written as steps)
   ☐ RESEARCH: Include appropriate research to support statement of purpose or goals.
   ☐ DATA & RESULTS: Charts, graphs, diagrams and graphics; statement of findings as they relate back to the hypothesis.
   ☐ CONCLUSION: Statement of conclusions and discussion of how the conclusions relate to the project objectives. Answer the question: Were the project objectives met?
   ☐ BIBLIOGRAPHY: Credit all references used in this investigation.

☐ DISPLAY BOARD
   ☐ Introduction
   ☐ Methods and Materials
   ☐ Data and Results
   ☐ Conclusion
   ☐ Photographs and Graphics

☐ MODEL
Display models, supplies and equipment in compliance with the safety rules and regulations of the Fair. Choose display materials that represent the purpose and design of your science fair project.

☐ INTERVIEW
Prepare an oral presentation that introduces and gives an overview of your science fair project. Design practice questions and rehearse your answers. Think about what you want judges to notice and remember about your project. Be prepared to discuss the scientific concepts related to the science project.

☐ APPLICATION FORMS
   ☐ Online Registration
   ☐ Project Abstract
   ☐ Certificate of Compliance for Special Projects (if applicable)
   ☐ Student Permission Form

☐ ACKNOWLEDGEMENTS
Acknowledge those who helped you. Give credit to teachers, parents, mentors, and institutions who helped you with your project.

The deadline for on-line registration is the second Friday in February. Register on-line at http://science.santa cruz.k12.ca.us
Online Registration is required for all students whose projects are eligible to compete in the Santa Cruz County Science & Engineering Fair. (See Eligibility Rules pg 3).

Online registration will be available on our website

http://science.santacruz.k12.ca.us

beginning December 1st and closing on the first Friday in February.

- **ALL STUDENTS** must complete an online application to register for the Santa Cruz Science Fair.
- **EVERY TEAM MEMBER** needs to submit an online application that includes an abstract, project title, and team member names.
- **EACH APPLICANT**, including each member of a team, must submit a signed permission form from a parent or guardian.

Have your parent or guardian sign the permission form and mail or fax it, and all required forms, to:

Santa Cruz Science Fair
Santa Cruz County Office of Education
400 Encinal Street
Santa Cruz, CA 95060

*Mark your envelope attention: “Coordinator”*

**FAX: 831-466-5846**

No applications will be accepted after the first Friday in February.
An abstract is a BRIEF summary (fewer than 300 words) of the purpose of your project, your experimental/design procedure, key findings or data, and significant conclusions that can be drawn from the evidence you have collected. Your abstract is very important. Your judges will receive your abstract in advance of the Fair so they can preview your work.

Project Abstract Outline

1. Objective or Goal
   A.) State the goal or purpose of the project.
   B.) State the objective or investigative question.
   C.) State the hypothesis.

2. Materials and Methods
   A.) List the materials and amounts used in the design and testing procedures.
   B.) List the steps of the procedure.
   C.) Briefly describe your experiment.

3. Results
   Summarize the results of your experiment and indicate how they pertain to your objective.

4. Conclusion
   Indicate whether your results support your hypothesis or enable you to attain your objective. Discuss briefly how information from this project expands our knowledge about the category subject.

5. Help Received
   Give the names of mentors, institutions and people who helped with the project. Indicate the level of support you received from each person who helped with the project.
Example Project Abstracts

Project Title: **Bacteria in Milk, Less Is Best**

**Objective:** The objective is to determine which type of milk has the most bacteria; soy, pasteurized, or raw. I think raw milk has the most bacteria, then pasteurized milk and soy milk.

**Methods:** Each type of milk was poured into two test tubes, one as the control, the other the test sample with methylene blue added. The milk in the test tubes was heated to 98 degrees Fahrenheit and maintained at that temperature for eight hours. The heat was then turned off and the milk in the test tubes was allowed to cool to room temperature. From the start of the heating of the milk in the test tubes, the test tubes were examined every fifteen minutes for two hours, and then every hour up to nine hours of elapsed time. After 9 more hours, the test tubes were examined every hour up to 26 hours of elapsed time. The observations were recorded as they were observed.

**Results:** The raw milk began to change when ½ hour to 3 hours had elapsed, and had the most significant change after the heat was turned off. The pasteurized milk began to change after 1-4 hours, and displayed some change. The soy milk did not change until after 6 hours had elapsed, and did not change much over the 26 hour time frame of the experiment.

**Conclusion:** My hypothesis was correct; the raw milk had the most bacteria, then the pasteurized milk. The soy milk had the least amount. The soy milk had the least bacteria because it is made from soybeans. Pasteurized milk and raw milk are from cows, and cows develop more diseases because they are living animals. The pasteurized milk goes through a pasteurization process which kills much of the bacteria in it. The raw milk does not receive any special treatment. Bacteria grow best between 80 degrees and 98 degrees Fahrenheit. This explains why the raw milk had the most significant bacteria growth as it cooled from 98 degrees to room temperature (about 70 degrees Fahrenheit).

*People need to know how to store milk and when it is safe to consume it. If a person is concerned about bacteria content it is helpful to be aware of the bacteria content between the different types of milk.*

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Project Title: **How Water Erosion Affects Dirt and Sand on Hillsides**

**Objective:** To learn how much soil can be carried away by water from a hillside.

**Methods:** 1 large sheet of wood; 2 long pieces of wood; miter box; Saw; Power Drill; Hot Glue Gun & Glue; Spray paint; Screws; Square; Tape measure; Grass seed; Paint pan; Sand; Dirt; Buckets; Water; 16 ounce container; 3 Tupperware bowls; Stopwatch; Spatula; Shovel; Pie tins; Wire Hole poker; Measuring cups. **Method:** Build a model hillside with 3 slots. Pack each slot with a soil type. Pour 16 ounces of water over the soil types: sand, plain dirt and planted grass. Vary the length of pouring; 20 seconds; 40 seconds; 60 seconds.

**Results:** Water, 20 seconds: Plain soil: I had to get the dirt out from the Tupperware bowls and the bottom of the hillside and drain off all the water. I put my dirt into pie tins. I drained off more water. Then I measured the dirt in a measuring cup. There was 3/4 cups of sand lost. Grass Soil: There was no dirt runoff. Water, 40 seconds: Plain soil: lost 3/4 cup. Sand: lost 3 1/2 cups. Grass Soil: There was no dirt runoff. Water, 60 seconds: Plain soil: While the water was running down the dirt on this test I saw a channel start to form and pick up a lot of soil in the run-off, lost 1 1/3 cups. Sand lost 3 1/4 cups. Grass Soil, no runoff.

**Conclusion:** I think my experiment went really well. I had a lot of fun building my model hillside. My hypothesis; Sand will be most affected by water erosion was correct. Observing hillside erosion I learned it is important to also watch how water travels downhill, it can cause a large increase in erosion if water can form a channel or stream. The grass was the least effected by erosion. I do not want a beach house.

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Project Title: **Autonomous Solar-Powered Boat for Algae Control**

**Objective:** The warmer weather and current drought in California can stimulate a rapid growth of algae, or algal bloom. This process is also accelerated by the contamination of nitrates and phosphates in fertilizer runoff (cultural eutrophication) that drains to the water supply, depletes the aquatic life of dissolved oxygen, and causes high levels of water turbidity. The purpose of this project is to build an autonomous solar-powered boat to control algal blooms in a more environmentally and cost-effective way (chemical-free and not labor-intensive).

**Methods:** I built a device that transmits 40 kHz ultrasonic sound waves via a transducer to break the algae vacuole. Then, I tested the device by measuring the amount of chlorophyll before and after the device’s treatment using a spectrophotometer. The chlorophyll level was determined by measuring the absorbance and percent transmittance of light of eight samples at various wavelengths (410 to 650 nanometers) daily for 9 days. I mounted the device on a solar-powered catamaran made of PVC and ABS plumbing pipes. This autonomous boat, navigating using infrared and ultrasonic sensors, detects obstacles and automatically changes direction, like the Roomba vacuum cleaner.

**Results:** After calculating the average rate of change in percent transmittance as compared to the control, the eight samples showed an overall increase of up to 87.29% in average percent transmittance (and decrease in absorbance) at 410 nanometers.

**Conclusion:** The results show that as the transducer was used, less algae (or less chlorophyll) was present in the samples. The autonomous solar-powered boat can be a natural alternative to chemicals in controlling algal blooms. It can further be adapted to measure the amount of chlorophyll, pH, dissolved oxygen, and temperature and can be used in monitoring ponds, lakes, pools, and aquaculture.
Getting to the Science & Engineering Fair at Plantronics in Santa Cruz, near the intersection of Hwy 1 + Hwy 9
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