THE TWENTY-SEVENTH ANNUAL INLAND SCIENCE & ENGINEERING FAIR

REGULATIONS AND INFORMATION PACKET

National Orange Show
Damus Building
689 South E Street
San Bernardino, California
April 14-15, 2009

Registration Deadline:
March 19, 2009

CCSESA
California County Superintendents
Educational Services Association

RIMS Region
Riverside • Inyo • Mono
San Bernardino Counties

Presented By

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*** County registrations must be completed online March 2-13, 2009.**

The Inland Science and Engineering Fair is sponsored by the Riverside County Office of Education, Inyo County Office of Education, Mono County Office of Education and San Bernardino County Superintendent of Schools. These four (4) RIMS Region 10 counties:

- *Support the concept that the provision of science fairs stimulates student interest in science, engineering and problem-solving.*
- *Support the concept that science projects and science fairs promote proficiency in science standards.*
- *Support the concept that district science fairs are beneficial to science instruction and contribute to a higher level of participation in regional fairs.*

For additional information about the Inland Science and Engineering Fair or for assistance in developing a school or district science fair activity, contact:

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INLAND SCIENCE AND ENGINEERING FAIR

Suggested District Time Line for teachers/coordinators

Months of SEPTEMBER & OCTOBER:	**Schedule date of your school science fair (prior to March 2nd if possible)**
	Reserve space for your school's science fair.
	District representatives must attend Coordinator's Fall Orientation Meeting
Month of NOVEMBER:	**District representatives provide workshops for teachers.**
	Orient students to the components of a science fair project.
	Help students choose a suitable topic.
Month of DECEMBER:	**Help students write a project proposal.**
	Help students conduct library research.
Month of JANUARY:	**District representatives must attend January Coordinators' Meeting.**
	Help students contact professionals who can give them guidance and background.
	Help students develop a list of materials they need for projects.
	Discuss the nature of experimentation with students.
	Explain the difference between controlled and uncontrolled experiments.
	Review observing, measuring and data collection.
	Provide time, space, and guidance for experimentation.
	Make arrangements for regular (weekly) progress reports from students.
	Check to insure that projects conform to safety rules and proper animal care.
	Review exhibit construction with students.
	Review qualities of a good exhibit (construction, lettering, color, etc.).
	Conduct a "Parents' Night" to publicize Science Fair.
Month of FEBRUARY:	**Help students develop conclusions and write research papers.**
	Arrange for review of students' papers by language arts teachers.
	Publicize your fair to local newspapers, parents, local officials, board of education administrators, and faculty.
	Recruit Science Fair Judges.
LATE FEBRUARY / EARLY MARCH:	**Students develop final copies of research paper.**
	Review with students the criteria for successful oral presentations; let them practice in class.
	District Science Fair Day

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2009 Inland Science and Engineering Fair Time Line

On-Line Registration
March 2-13
Students or coordinators may register entries online anytime during these dates. Late registrations **will not** be accepted.

Science Fair
MARCH 19, 2009 (submitted from district coordinators)

Registrations
Green sheet, online applications with abstract (1 per student), payment, and list of students. No faxes please. Send to SBCSS, Attn: Dottie Bryant, 601 North E Street, San Bernardino, CA 92410

Elementary Project setup
Tuesday, April 14, 7-9 AM (Elementary students do not remain for interviews).
Students set up displays at the Damus Building, National Orange Show (see visitation map provided in Regulation Packet). (Students must participate under "Field Trip" requirements and provisions.)

Junior/Senior Project Set-up
Tuesday, April 14, 7:00-8:30 AM *
Juniors/Seniors set up displays in the morning and remain for orientation and interviews. Junior/Senior orientation begins at 8:30 a.m., interviews at 9:30 a.m. **Students may bring snacks**. Lunch is not provided, and junior/senior students are dismissed at 1:30 p.m.

Sweepstakes
6:00-7:30 PM Sweepstakes Judging

Public Viewing
Wednesday, April 15th, 9:00 AM - 9:00 PM - Damus Building
The Fair is open to visitation by individuals and groups. No fee is charged, but groups must reserve a time for visitation by calling (951) 826-6570. Supervision is required (no more than 8 students for each adult). Groups must be covered for insurance purposes by school or organization "Field Trip" forms.

Awards
Wednesday, April 15th
5:30 PM Elementary Division awards (4-5th grade).
7:30 PM Junior and Senior Division awards (6-12th grade).
9:00 PM Organizational meeting for State Science Fair nominees.

Project Removal
Wednesday, April 15th
Grades 4-5 **Immediately after Elementary Awards Ceremony (7:30 pm)**
Grades 6-12 **Immediately after Junior/Senior Awards Ceremony (9:00 pm)**
Displays must be removed by students immediately after the awards ceremony. Projects not removed will be discarded.

State Science Fair
May 18-19, 2009 (Tentative Schedule)
California Science Center, Los Angeles, for 6-12 graders receiving nominations at the Inland Science and Engineering Fair.
Monday, 2:00-5:00 PM - Student set-up of displays.
Tuesday, 8:00 AM - Judging begins.

*** NOTE: New this year "All Juniors/Seniors Interviews will begin at 9:30 a.m".**

STUDENT'S GUIDE TO PARTICIPATION

Congratulations!

You have just made an important decision. You are about to take part in one of the most rewarding and exciting learning experiences available to students—the Science and Engineering Fair.

What is a Science and Engineering Fair?

A Science and Engineering Fair is a competition of student science projects held each year at your school, in your district, in your county, and in the state of California.

What will taking part mean to you?

Participating in a science fair means that you will have the opportunity to:

- Develop and display a science project of your choice
- Share your creative abilities, knowledge, and interests with other students
- Meet and talk with scientists in your field of interest
- Be recognized and feel satisfaction for a job well done
- Compete for awards which range from certificates, ribbons, trophies, and medals to industry tours, cash prizes, and scholarships

What is a science project?

A science project is an active "fun" approach to science, something you do rather than something you only read about or watch someone else do.

A science project is an investigation of a question about a science topic that interests you. The difference between this kind of project and other ways of working on a problem is the use of a systematic plan called the Scientific Method.

What is the Scientific Method?

The Scientific Method is a way of working on a problem using a series of related steps. In brief, these steps are as follows:

Step 1: Identify and state the problem (usually as a **question**) and purpose of the investigation.

Step 2: **Research** the question—find out what is known about the problem from reading and by talking with experts.

Step 3: Form a **hypothesis**—write a statement expressing your opinion about the question.

Step 4: Plan an **experiment** that will test your hypothesis. Your experiment should contrast a control group or situation with a test group or situation. Describe how you will do the experiment (your procedure or **method**). List your materials. The order in which you do the experiment is termed your protocol.

Step 5: Do the experiment—record all your information, observations, measurements, charts, and graphs in a notebook or journal. Display your **data** as graphs, histograms, or charts.

Step 6: State your **conclusions**—tell what happened in the experiment, whether your experiment proved or disproved the hypothesis. (Your experiment does not have to prove it correct or true!) Did your experiment suggest some other experiment to be tried?

Words underlined above may be topic headings on your display. Example of how to apply the Scientific Method:

1. I am interested in how the Mendelian ratio determines the color of flowers of pea plants. My reading suggests that hydrocarbons (gasoline) in the environment alter normal genetic behavior.
2. My question develops: Does the presence of gasoline in the environment alter the Mendelian ratio? I can not answer this question directly but I can do an experiment which will test my opinion about this question. My opinion (or hypothesis) is: hydrocarbons in a plant's environment will change the expression of the Mendelian ratio. I can design an experiment to test this hypothesis.
3. My experiment will be to grow pea plants in an atmosphere that is rich in gasoline fumes (test group). I will grow other pea plants in a similar situation with no fumes (control group). In both control and test groups, all other facts or variables will be the same.
4. I do the experiment (often several times), making observations (measurements, written descriptions) at frequent and regular intervals. These data are recorded in a notebook or journal. Graphs are prepared from the data tables and both are used to form a conclusion about my hypothesis. Is another question or experiment suggested by what I have done?
5. Finally, I prepare a Summary Statement or Abstract (in perhaps 200 words) about my experiment, conclusion, and the importance of my work.

Will you have to do an experiment to qualify for the Science and Engineering Fair?

There are many ways to participate in the Science Fair. Ask your teacher for suggestions to get you started. If you would like to compete in the regional or the state fair, your project must show that you can use the Scientific Method.

Generally, this means you must do an experiment. The Mathematics & Software category does seek to provide additional rewards for other creative abilities. Even here a project is stronger if the Scientific Method has been used to organize or communicate the content of your project.

How do you communicate your project to others?

A Science Fair project is really made of three parts:

1. **The Problem, your Research Plan, and Experiment.** This is all the work that you do to investigate your question. This is a measure of your thinking. This is what the judges want to find out about. This is what you want to communicate about.

2. **The Written Record.** You must include a journal containing an explanation of the problem and all records of your experiment. Careful record keeping is considered a mark of a good scientist. The judges will carefully examine your notebook.

3. **The Display.** Your display should show your understanding and application of the Scientific Method. If you use a three panel display, the steps of the method may be read on the panels, from top to bottom, from left to right, with a statement of the problem at the top left, and the conclusion at the bottom of the right panel.

INLAND SCIENCE AND ENGINEERING FAIR

GENERAL REGULATIONS

1. Construction must be durable with all parts firmly attached. No attachment to walls will be allowed. Provisions should be made to support the back of the exhibit. Maximum size is:

   Table Project: 122 cm wide X 76 cm ft. deep X 198 cm ft. tall (4 ft. wide X 2.5 ft. deep X 6.5 ft. tall)
   Floor Project: 122 cm wide X 76 cm ft. deep X 274 cm ft. tall (4 ft. wide X 2.5 ft. deep X 9 ft. tall)
   No items may be displayed outside the 4'x 2.5' footprint, e.g. no equipment may be set up in front of the table.

2. No living or non-living plants, mold, viral or bacterial materials may be on display.

3. Open flames will not be permitted in the display. No gas, water, or extension cords will be provided.

4. A student may participate in only one project (for example, a student may not enter an individual and a team project and may not enter two team or two individual projects). Teams are limited to 2-3 students within their division. No limit is placed on the number of team projects per district, but each team project uses one of your district's allocations. Projects may only be grouped as follows: 4th and/or 5th , 6-8, or 9-12. (a project completed by both 4th and 5th grade students will be judged as a 5th grade project). Students must be from the same district.

5. All experimental work must be completed by the student. Adults may supply materials, advice, and consultation. (Districts & schools should not advance projects to the Inland Science Fair that do not meet this requirement.)

6. The Science Fair Committee reserves the right of refusal of an exhibit that it deems unsafe, unsuitable for public exhibition, or in direct conflict with California Education Code. This includes, but is not limited to, any projects that display or discuss subjects that require parental consent and/or rights of review.

7. All projects must be pre-approved by the student's teacher and begun at any time during the year preceding the pre-registration date. A previously investigated topic may continue under investigation, but data previously displayed must be treated as "research." New data must be generated, displayed, and conclusions drawn based on this data.

8. Displays entered in the Inland Science and Engineering Fair must have been selected at a local school system science fair or selection process.

9. The Science Fair Committee and all cooperating groups will assume no responsibility for loss or damage to any exhibit or part thereof. Students assume responsibility for all displayed equipment. It is recommended that valuable components including original notebooks or data not be left on public display.

10. All regulations conform to the recommendations of the California Education Code. Their enforcement is required for all projects and participants.

TOBACCO, ALCOHOL, AND CONTROLLED SUBSTANCES

1. No project may use consumable alcohol, tobacco or illegally obtained narcotics and/or controlled substances. This includes surveys that compare use of the above substances; (e.g. smokers vs. non-smokers).

2. Controlled Substances (drugs, chemicals, anesthetics, etc., the use of which is regulated by the Comprehensive Drug Abuse Prevention and Control Act of 1970) must conform to existing local, state, and federal laws. Such substances may not be exhibited at the Fair.

SAFETY RULES

1. Electrical materials must be in keeping with standard safety laws and practices. Displays will be inspected for compliance.

2. Wiring, switches and the metal parts of high voltage circuits must be located out of reach of observers and must include an adequate overload safety device. Wiring must be properly insulated and fastened.

3. High voltage equipment must be shielded with grounded metal box or be caged to prevent accidental contact.

4. Approved connecting cords of the proper load-carrying capacity must be used for 110-volt operation of lights, motors, transformers, and other equipment. (Cords are not provided. If you need electricity for your projects, bring extension cords.)

5. Standard switches must be used for 110-volt circuits. Open knife switches or bell ringing push buttons are not acceptable for circuits exceeding 12 volts.

6. Batteries with open top cells (wet cell batteries) are not permitted.

7. Electrical connections in 110-volt AC must have an Underwriters Laboratories approved cord (of proper load-carrying capacity) at least two meters long and equipped with a standard grounded plug.

8. Devices (vacuum tubes, lasers, etc.) that generate dangerous rays must be properly shielded.

9. Only Class I and Class II (not Class III or Class IV) lasers may be operated at the Fair.

10. Lasers must have a protective housing or barricade preventing human access to the beam during operation; be disconnected from the power source when not being operated; be operated only by the exhibitor; and when displayed, include a sign reading: **LASER RADIATION: DO NOT STARE INTO BEAM!**

11. Research involving gasohol / alcohol production must conform to U.S. Department of the Treasury, Alcohol and Tobacco Trade Bureau regulations. Permits must be acquired prior to the production of any alcohol in the project. Regulations and permit applications may be found at the government website at http://www.ttb.gov/industrial/small_alcohol_fuel_plant_packet.shtml. Copies of all permits must be present with the project. If you have questions, you may call their offices at 877/882-3277 or 513/684-7150.

12. Fire regulations prohibit the use of highly flammable or combustible materials in project displays.

13. No dangerous or combustible chemicals may be exhibited.

14. Chemicals listed in Appendix C, pages 138-139 of the "Science Safety Handbook for California Public Schools (current edition) may only be used under the direct supervision of a qualified teacher/advisor. No project that uses a chemical with a hazard rating of five or with asterisks will be allowed to participate in the Inland Science Fair.

15. Projects that do not comply with current California Code sections (Penal, and Health and Safety) will not be allowed in the Inland Science Fair. Examples include, but are not limited to, sealed devices containing **dry ice (CO_2)** or other chemically reactive substances assembled for the purpose of causing an explosion by a chemical reaction; or rocket-propelled projectile or similar devices with an engine greater than 0.60 inch in diameter.

16. Projects involving the discharge of single or multiple projectiles through mechanical, chemical, or electromagnetic means may not be displayed at the Fair. Examples include, but are not limited to, archery tackle, airguns, firearms of any type, and electromagnetic railguns, etc.

HUMAN SUBJECTS AND LIVE VERTEBRATE ANIMALS

1. If applicable, Certification of Humane Treatment of Live Vertebrate Animals or Certification of Compliance of Research Involving Human Subjects or Certificate of Tissue Samples must be submitted with your application to your district coordinator. Personal and school identification, including photographs, must be concealed.

2. Human parts other than teeth, hair, nails, histological sections, and liquid tissue slides (properly fixed and acquired) may not be exhibited.

3. Photographs or other visual presentations of surgical techniques, dissections, autopsies, and/or laboratory techniques depicting vertebrate animals in other than normal conditions may not be displayed.

4. Live vertebrate animals may not be displayed during the Fair. (Students conducting projects involving live vertebrate animals must provide a completed Certificate of Humane Treatment of Live Vertebrate Animals, see page 22.)

5. State of California Education Code Title 2, Division 2, Part 28, Chapter 4, Article 5 (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 or any purpose whatsoever:
    a. Be experimentally medicated or drugged in a manner to cause painful reactions or induce painful or lethal pathological conditions.
    b. Be subjected to surgery or sacrifice, including embryos.
    c. Be injured through any other treatments including, but not limited to, anesthetization or electrical 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.**

Projects That Required Certification By A Biomedical Scientist:

1. All recombinant DNA research must be carried out in accordance with current NIH Guidelines for Research Involving Recombinant DNA Molecules. Only research normally conducted without containment in a microbiological laboratory and performed under the supervision of an appropriately qualified scientist will be permitted. The facilities to be used must be described in the research plan. Research requiring containment is prohibited.
2. It is permissible for the student and designated adult supervisor to consult with a biomedical scientist to obtain detailed instructions and guidance in techniques to be used by the student under the direct continuous supervision of a designated adult supervisor (for research not conducted in the biomedical scientist's lab). In this instance the designated adult supervisor will be required to certify in writing jointly with the biomedical scientists.
3. Either the biomedical scientist or adult supervisor must provide continuing supervision to assure compliance with the protocol. (see page 27)
4. Major deviations from the approved protocol may be implemented only with the written approval of the biomedical scientist, but may never violate California Education Code.
5. The biomedical scientist or adult supervisor must be in the same locality as the student for the duration of the experimental work except for short trips. This means that a project started in one city may not be continued in another unless an alternate designated adult supervisor, approved by the biomedical scientist prior to the continuation of the experimental work, agrees to supervise the project.
6. A biomedical scientist is defined as one who possesses an earned doctoral degree in science or medicine and who has current working knowledge of the techniques to be used in the research under consideration.
7. A designated adult supervisor is defined as an individual who has been properly trained in the techniques and procedures to be used in the investigation. The biomedical scientist must certify that the designated adult supervisor has been so trained.

Inland Science and Engineering Fair Categories

Elementary Division (4-5)

(Separate awards are given for each grade level, except for team projects which are judged at the highest grade level represented in the project.) Team projects, which are produced collaboratively with two to three students in any of the eight areas of science listed below, are judged along with the individual projects in the same category.

1. **Behavior Science - (01)**
   Studies of behavior, conditioned responses, learning, psychiatry or psychology in humans and other animals.

2. **Biology Animals - (02)**
   Studies of vertebrate or invertebrate zoology.

3. **Biology/Other Kingdoms - (03)**
   Studies of plants, fungi, protists and bacteria.

4. **Chemistry - (04)**
   Studies of the chemical and physical properties of organic and inorganic materials.

5. **Consumer Science - (05)**
   Examination, comparison, analysis, testing of manufactured devices or trade name chemicals, materials, etc. Product quality, safety and consumer satisfaction.

6. **Earth Sciences - (06)**
   Studies of geology, meteorology, oceanography, astronomy and space science.

7. **Environmental Education - (07)**
   Projects using biological systems/organisms to study the impact of natural and man-made changes on our environment.

8. **Math - (08)**
   Studies in geometry, topology, number theory, statistics, computer graphics, artificial intelligence, and modeling or simulations.

9. **Physics - (09)**
   Studies of electricity, magnatism, aerodynamics, energy, physical properties of matter and applied mechanics.

Junior & Senior Division (6-12)

Students in Junior Division (grades 6-8) and Senior Division (grades 9-12) may compete in the following categories:

Category	Examples	Related Categories
1. Aerodynamics/ Hydrodynamics (Junior Division Only): Studies of aerodynamics and propulsion of air, land, water, and space vehicles; aero/ hydrodynamics of structures and natural objects. Studies of the basic physics of fluid flow.	Effect of Dimples on Golf Ball Flight; Airfoil Stall Characteristics; Effect of Fins on Water Rocket Stability; Low Drag Launch Lug for Model Rockets.	Ballistics studies comparing other than different shapes or surface textures belong in Materials Science or Applied Mechanics. Senior Division projects appropriate for this category belong in Applied Mechanics.
2. Applied Mechanics & Structures: Studies concerning the design, manufacture, and operation of mechanisms, including characteristics of materials, dynamic response, and active/ passive control. Testing for strength and stiffness of materials used to provide structural capability; studies and testing of structural configurations designed to provide improved weight and force loading or stiffness capabilities. Senior Division only: includes aerodynamics, hydrodynamics, and fluids projects.	An Underwater Glider for Marine Exploration; Measurement of CD Variations; Tensile Strength of Composite Materials; Bridge Design; Can Foam Make Steel Stronger?; How Does Arch Curvature Affect Strength? How Do Different Foundations Stand Up to Earthquakes? Sr. Div: "Arrow" Dynamics; Measuring the Effect of Aerodynamic Design on Vehicular Drag.	Junior Division aerodynamics/ hydrodynamics projects belong in Aerodynamics/ Hydrodynamics. Engineering studies of soil stability during earthquakes belong in Earth Sciences.
3. Behavioral & Social Sciences: Studies of human psychology, behavior, development, linguistics, and the effects of chemical or physical stress on these processes. Experimental or observational studies of attitudes, behaviors, or values of a society or groups within a society, and of the influences of society on group behavior. Includes gender and diversity studies, anthropology, archaeology, and sociology. Studies may focus on either normal or abnormal behavior.	A Study of the Senses in Stress Management; Racial Awareness in Infants; AIDS Awareness in Teens; The Effect of Authority Figures on Group Decision Making.	Animal behavior projects belong in Zoology or Mammalian Biology. Junior Division projects studying memory, learning, and sensory perception belong in Cognitive Science.
4. Biochemistry/ Molecular Biology: Studies at the molecular, biochemical, or enzymatic levels in animals (including humans), plants, and microorganisms, including yeast. Studies of biological molecules, e.g., DNA, RNA, proteins, fats, vitamins, nutrients.	Lipooxygenase Influence on Lipofuscin Granule Formation in Bananas; Effects of P1 Precursors on Virus Growth; What Sugars Do Yeast Use? Catalyzed Reactions of Enzymes; Isolation of Pre-mRNA Mutants in Saccharomyces cerevisiae; Determination of Ascorbic Acid Concentration in Orange Juice Using a Redox Reaction; Effects of Food Preparation on Vitamins.	Studies of the physical properties of biochemicals such as oxidation-reduction reactions belong in Chemistry. Functions of major organ systems belong in Mammalian Biology or Zoology.

Junior & Senior Division (6-12)

Students in Junior Division (grades 6-8) and Senior Division (grades 9-12) may compete in the following categories:

Category	Examples	Related Categories
5. Chemistry: Studies in which chemical and physico-chemical properties of nonbiological organic and inorganic materials (excluding biochemistry) are observed.	Isolation, Purification, and Specific Rotation Determination of Ricinoleic Acid; Conductivity of Electrolytes; Does Water Purity Affect Surface Tension?	Chemical studies of metabolic processes (e.g. fermentation and/or yeast), processes mediated by biochemical intermediates (e.g. enzymes), or biological organic molecules belong in Biochemistry. In the Junior Division, projects that deal with the characterization of chemical products in everyday life belong in Materials Science or Product Science (Physical).
6. Cognitive Science (Junior Division Only): Studies of learning, memory, and perception in humans, using human or animal models for human processes. Studies of the effects of chemical or physical stress on cognition. Includes projects on subliminal perception, optical illusions, recall and observations (e.g. reliability of eyewitnesses), and the interaction of different senses.	Does Age Affect Implicit Learning?; The Effectiveness of Flash Cards vs. Computer Scripts; Optical Illusions; Subliminal Persuasion by Television; Eyewitness Identifications; Effect of Curcumin on Memory.	Senior Division projects appropriate for this category belong in Behavioral and Social Sciences.
7. Earth & Planetary Sciences: Studies in geology, seismology, engineering geology, atmospheric physics, weather, physical oceanography, marine geology, coastal processes, and comparative planetology. Studies of the effects of human activity on naturally occurring physical phenomena.	Gravity Current Velocities; Beach Sand Fluctuations and Cliff Erosion; Dependence of Liquefaction upon Soil Composition; Solar Activity and Refraction Properties of the Ionosphere.	Studies concerning pollution caused by human activity belong in Environmental Engineering/Science. Earthquake engineering projects (other than soil stability) belong in Applied Mechanics & Structures.
8. Electronics & Electromagnetics: Experimental or theoretical studies with electrical circuits, computer design, electro-optics, electromagnetic applications, antennas and propagation, and power production.	Satellite Reception Without a Dish; The Gauss Rifle; Transmission of Information by Laser; Effect of Solar Power; Are Maglev Trains Practical?	Projects that merely use electronics to study something else (e.g. hearing in birds) belong in another category (Zoology in this example).

Junior & Senior Division (6-12)

Students in Junior Division (grades 6-8) and Senior Division (grades 9-12) may compete in the following categories:

Category	Examples	Related Categories
9. Environmental Engineering: Projects which apply technologies such as recycling, reclamation, restoration, composting, and bioremediation which could benefit the environment and/or the effects of pollution on the environment.	Newspapers as Mulch; Oil Control; Water Hyacinth: Primary Water Treatment?; What Soil Conditions Best Control Soil Erosion While Assisting Growth?; Designing a New Home Sewer System.	In the Senior Division this category includes projects that fit into the Environmental Science category described below.
10. Environmental Science (Junior Division Only): Projects surveying, measuring, or studying the impact of natural and man-made changes on the environment. Examples include: floods, fires, biohazardous spills, acid rain, earthquakes, air pollution, and water pollution.	The Effects of Fires on Flora and Fauna; Rebirth after the Wild Fires; How Does Water Quality Affect the Abundance and Diversity of Microinvertebrates; Bacteria Pollution in Our Beaches; Does Fire Stimulate Plant Growth?	Studies performed within a normal physiological range under a sustained environment to examine the effect of substances or conditions on living things belong in the relevant basic science category (e.g., Plant Biology, Mammalian Biology, Zoology, etc.).
11. Mammalian Biology: Studies of growth and developmental biology, anatomy, and physiology in mammals. Studies of the behavior of all mammals (excluding humans) in their natural habitats (or reproductions of them).	Effect of Age on Aerobic Abilities; Peripheral Vision; Correlation of Strength with Gender; Effect of Vaccination on Antibody Development in Neonatal Bovines.	Projects studying physiology of birds, insects, etc. belong in Zoology. Studies of the effect of chemicals on a physiological function may belong in Pharmacology. Studies in which mammals serve as a model for human learning belong in Cognitive Science (Jr) or Behavioral & Social Sciences (Sr).
12. Materials Science (Junior Division Only): Studies of materials characteristics and their static (not in motion) physical properties. Includes measurements and comparisons of materials durability, flammability, and insulation properties (thermal, electrical, acoustic, optical, electromagnetic, etc.).	Which Metal Conducts the Most Heat? What Is the Effect of Duct Tape as an Insulation Material? Sun Protection on the Courts: A Test of Colors and Materials in Tennis Clothing; Which Building Material Disrupts a Wireless Connection the Least?	Studies of fundamental properties of matter (e.g. specific heat) belong in Physics. Studies comparing and testing natural and manmade products for effectiveness in intended use in real-world, consumer-oriented applications belong in Product Science (Physical).
13. Mathematics & Software: Studies in geometry, topology, real and complex analysis, number theory, algorithm analysis and optimization, artificial intelligence, computability, computer graphics, modeling and simulation, programming environments and languages.	Maximally Dispersed Points on a Sphere; Computer Modeled Evolution; Knot Mathematics; Coupled Chaotic Systems and Stability; Mathematical Optimization of Multiple Precision Multiplication; Partitions of Positive Numbers; Neural Network Model of Vision.	Projects using mathematics or computers as a tool in the study of a different subject belong in that category. Studies that merely model or simulate biological or physical systems usually belong in this category. Computer hardware projects (e.g., comparing algorithm speed on different hardware platforms) belong in Electronics & Electromagnetics.

Junior & Senior Division (6-12)

Students in Junior Division (grades 6-8) and Senior Division (grades 9-12) may compete in the following categories:

Category	Examples	Related Categories
14. Microbiology: Studies of epidemiology, genetics, growth, physiology, pharmacology, and toxicology of bacteria, fungi, protists, algae, or viruses.	Studies of Light Producing Bacteria; Effect of Light Before and After UV Damage to E. coli.	Projects using bacteria as a tool to study another subject belong in that subject. Projects studying yeast and fermentation belong in Biochemistry. Studies of the effectiveness of natural and commercial products killing bacteria (etc.) belong in Product Science (Biological).
15. Pharmacology/ Toxicology: Studies of the effects of drugs, chemicals, and other factors (e.g. biological, physical, electromagnetic) at the cellular or higher levels on plants and animals.	Vitamin Deficiencies; Copper Toxicity of Marine Embryos; The Effects of Petroleum Contaminated Water on Aquatic Plants; Effect of Caffeine on Daphnia; Effect of Insecticides on Mosquitoes; The Effects of Intermittent and Constant EMFs on Drosophila.	Projects which study the effect of fertilizers on plant growth belong in Plant Biology. Toxicology studies on microorganisms belong in Microbiology. In the Junior Division, studies of the toxic effects of environmental changes on biological systems belong in Environmental Science.
16. Physics & Astronomy: Studies of the physical properties of matter, light, acoustics, thermal properties, solar physics, astrophysics, orbital mechanics, observational astronomy, and astronomical surveys. Computer simulations of physical systems are appropriate in this category.	Emissivity as a Function of Geometry; Do High Temperature Superconductors have a First Order Phase Transition?; Chaotic Pendulum; Photometric Detection of an Extrasolar Planetary Transit; Jupiter's Decametric Emission; Solar Activity and Geosynchronous Satellites.	Studies of the physical properties of other planets themselves (as opposed to their orbits) belong in Earth Sciences. Antennas (i.e., rf electromagnetic propagation studies) belong in Electronics & Electromagnetics. Junior Division projects otherwise appropriate for this category may belong in Materials Science.
17. Plant Biology: Studies of the genetics, growth, morphology, pathology, or physiology of plants.	The Effects of Organic and Inorganic Fertilizers on Plant Growth; Effect of Rhizobium on Legume Plants (Pisum); Transpiration of Plants Under Different Light Sources.	Studies which use plants to restore the environment may belong in Environmental Engineering. Studies of the effect of chemicals other than fertilizers on plants belong in Pharmacology. In the Junior Division, studies using plants which involve environmental changes may belong in Environmental Science.

Junior & Senior Division (6-12)

Students in Junior Division (grades 6-8) and Senior Division (grades 9-12) may compete in the following categories:

Category	Examples	Related Categories
18. Product Science (Biological) (Junior Division Only): Comparison and testing of natural and man-made products for quality and/ or effectiveness for intended use in real-world consumer-oriented applications. This category is reserved for experimental methods involving biological sciences and processes.	Natural vs. Pharmaceutical Antibiotics; Does Garlic Inhibit the Growth of Oral Bacteria? Antibacterial Soap vs. Antibacterial Gel: Cause for Concern?	Studies of biological organisms and processes not related to a consumer product application belong in their respective Life Science Category.
19. Product Science (Physical) (Junior Division Only): Comparison and testing of natural and man-made products for quality and/ or effectiveness for intended use in real-world consumer-oriented applications. This category is reserved for experimental methods involving non-biological, physical sciences and processes.	Water Absorption in Eight Selected Hardwoods With and Without Sealants; Best Plywood for Homemade Skateboards; Cotton, Linen, Wool: Which One Lasts Longer?; Fire Resistance of Roofing Materials; Which Laundry Detergent Works the Best? Shock Attenuation in Baseball Helmets; Effective Sound Barrier Materials.	Studies of basic material characteristics and physical properties not related to a consumer product application belong in Materials Science (Junior Division only).
20. Zoology: Studies of growth and developmental biology, anatomy, and physiology in animals other than mammals. Studies of the behavior of all animals (excluding mammals) in their natural habitats (or reproductions of them).	Hot Fish, Cold Fish: Respiration in Goldfish; Hearing and the Dominance Hierarchy of Crickets; Effect of Gravity on Living Organisms; Invertebrates in Kelp Holdfasts; Auditory Stimuli in Interganglial Neurons of Acheta domesticus; Bird Responses to Boar Rootings.	Studies of mammals belong in Mammalian Biology. Studies in which animals serve as a model for human behavior belong in Behavioral Sciences.

CALIFORNIA STATE SCIENCE FAIR
2009 APPLICATION ACCEPTANCE CRITERIA
(District Coordinator/Teacher Information)

Submission of an Application to the California State Science Fair does not guarantee acceptance to the fair. The Fair has always rejected applications on the basis of inappropriate content and for violations of Fair regulations. Projects which are substandard (poor quality) or incomplete will also be rejected. The basis for this judgement of quality is exclusively the Application Form and Project Summary on its reverse side, particularly the Project Abstract. The California State Science Fair does not consider other submitted materials or awards won at affiliated fairs.

The following is the official list of acceptance criteria:

1. Acceptance to present a project at the California State Science Fair requires the approval of an Application submitted by the student(s).
2. Applications without a Project Abstract will be rejected without recourse to appeal. Each student on a team project must complete his/her own personal Application, but the Project Abstract need only be supplied by one member of the team. As long as the Abstract is provided by at least one member, other members of the team may choose to provide or omit the Abstract without penalty.
3. Abstracts must demonstrate a level of knowledge and investigation that is appropriate or the grade of the student and discipline and which is beyond what is considered common knowledge. In other words, the investigations must demonstrate knowledge that is not found in middle or high school textbooks.
4. Abstracts must communicate ideas effectively, use standard English, and be legible.
5. The methodology and experimental design should be appropriate for the student's grade and discipline, and should include the following where appropriate:
   ~ experiments are appropriate to achieve the stated objective;
   ~ the sample size and/or number of trials is sufficient for projects where replication is necessary to establish validity;
   ~ the statistical analysis is appropriate for the student's grade and discipline; the conclusion is relevant to the stated hypothesis.
6. Projects which are merely demonstrations, display collections, and literature searches are generally not acceptable. In order to be acceptable, the student must use the demonstrations, collection, or search results, to extract new information not previously known to the student.
7. Applications may be rejected for failing to satisfy the rules of the Fair.
8. The Application fees are not refundable if the application is rejected.
9. All rejected Applications will be reviewed by the Directors of Judging and are subject to appeal (with the exception of those applications which do not contain an Abstract).

Students, parents, and advisors should be aware that these acceptance criteria are not intended to limit the number of participants but rather, by requiring higher standards for project abstracts, to improve the quality of the Fair and to ensure that all participants are able to effectively communicate their pro-jects to the judges. Only a small percentage of Applications have ever been identified as likely to be rejected. Every Application so identified this year will be contacted in a timely manner.

AWARDS FOR PARTICIPATION IN THE INLAND SCIENCE AND ENGINEERING FAIR

1. The most valuable aspect of the Fair may well be the opportunity to meet and share experiences with students and judges possessing similar interests.

2. Gold, silver, and bronze medals will be awarded in each category for each division. Sweepstakes trophies in each division may be awarded, as deemed appropriate by the judges. **All decisions are final.**

3. Special achievement awards will be provided by representatives of agencies and are awarded by criteria established by the agencies. Special achievement awards are independent of selections made by the Inland Science and Engineering Fair judging process.

4. Judges provided by the Inland Science and Engineering Fair shall select projects (in keeping with state criteria) to receive a "Recommendation for Advancement." This award will be an authorization or recommendation to participate in the California State Science Fair (CSSF). A regional recommendation is required for CSSF participation. Projects nominated for participation in the California State Science Fair will be forwarded by the directors of the Inland Science and Engineering Fair upon recommendations by the judges. **All decisions of the committee are final.**

INSTRUCTIONS FOR APPLICATION

DEADLINE FOR STUDENTS: March 13, 2009
DEADLINE FOR COORDINATORS: March 19, 2009

Students must register online between March 2-13, 2009. Students may obtain the website address from their district coordinator. All information must be completed accurately, and all forms applicable to your project must be included. Applications are to be signed and given to district coordinators who, in turn, will submit all applications to the county office. Keep a copy for your records. **Coordinators, faxed applications are not acceptable.** Applications may be sent by messenger or overnight mail, provided they are received by the application deadline.

Team Projects

Each member of the team must complete a separate application, taking care to list the same project title, and check the "Team Project" box in addition to the category box on the Project Summary as well as list the other members of their team on the front side of the application. All members of the team should submit their applications together.

Some Key Points

Name: Your name as you wish it to be listed in the Inland Area Science and Engineering Fair Program. Use correct capitalization and small letters for first and last names.

Address: Your mailing address. If your mail is delivered to a post office box, use that address.

Home Phone: If your application is incomplete or rejected, we would like to contact you as soon as possible.

School Your school's name is listed in the brochure and should be clear.

District: Do not abbreviate your district's name as many of them will be the same.

County: Use the following capitalized abbreviations for the county in which you reside: RV=Riverside; IN= Inyo; MO=Mono; SB=San Bernardino

Project Title: Do not abbreviate unless necessary, but please avoid extremely long titles. Your title need not be the same as it was in your qualifying fair, but must be the same as it will appear on your display at the Inland Area Science and Engineering Fair.

Requirements: Indicate whether you have a floor display or a table top project. If you do not indicate a choice, you will be assigned a table top space. If you need an extension cord you must bring your own (100 foot extension cord is recommended) and you must bring duct tape to safely secure the extension cord. **The Fair has no extension cords available.**

Certifications: If your project involves the use of human or animal tissue(s), live vertebrate animals, or human subjects, complete the Certification Form and submit to your district coordinators.

Signatures: Both you and a parent or guardian must sign and date the form when indicated. Your district Science Fair Coordinator must sign and date the form, certifying that your project complies with the rules and regulations. Your district coordinator must certify that you are eligible to enter the Inland Area Science and Engineering Fair.

Note: Applications must be received as a packet containing all completed forms from a district with a completed green transmittal sheet. NO individual applications will be accepted.

SAMPLE -- DO NOT USE

XYZ DISTRICT FIELD TRIP PERMISSION FORM

I/We give _____ permission to attend
student name

the Inland Area Science and Engineering Fair on April 14-15, 2009. It is understood that this is a board approved field trip as set forth in XYZ Board Policy. The event will be held at the National Orange Show Event Center in San Bernardino.

You must use your own form, but it is very important that the dates April 14-15, 2009 are used. Students must set-up projects on the 14th and remove projects after the award's ceremony on the 15th. The form should be signed and dated by both the parent/guardian and the district school representative. It is highly recommended that you also include a consent to treat medical emergencies form as well.

_____ _____
Parent(s)/Guardian(s) Date

_____ _____
District or School Representative Date

INLAND SCIENCE AND ENGINEERING FAIR
CERTIFICATION OF HUMANE TREATMENT OF LIVE VERTEBRATE ANIMALS

Name of Student _____

Project Title _____

Any student research involving animals MUST COMPLY with the requirements of the California Education Code stated below and Regulation #5 of the Inland Science and Engineering Fair.

HUMANE TREATMENT OF ANIMALS, State of California Education Code Title 2, Division 2, Part 28, Chapter 4, Article 5 (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 or 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 practice of animal husbandry.

"Experiments involving any procedures which are not in violation of the "painful reaction" or "injured" restrictions of the California Education Code and are not in violation of Inland Science and Engineering Fair Rule #5 are permitted if certified by a qualified biomedical scientist prior to the beginning of the investigation. It is permissible for the student and designated adult supervisor to consult with a biomedical scientist to obtain detailed instructions and guidance in the techniques to be used by the student under the direct continuous supervision of the designated adult supervisor (for research not conducted in the biomedical scientist's lab). In this instance the designated adult supervisor will be required to certify in writing jointly with the biomedical scientist. Either the biomedical scientist or adult supervisor must provide continuing supervision to assure compliance with the protocol. Major deviations from the approved protocol may be implemented only with the written approval of the biomedical scientist. The biomedical scientist or designated adult supervisor must be in the same locality as the student for the duration of the experimental work except for short trips. This means that a project started in one city may not be continued in another unless an alternate designated adult supervisor, approved by the biomedical scientist prior to the continuation of the experimental work, agrees to supervise the project. A biomedical scientist is defined as one who possesses an earned doctoral degree in science or medicine and who has current working knowledge of the techniques to be used in the research under consideration. A designated adult supervisor is defined as an individual who has been properly trained in the techniques and procedures to be used in the investigation. The biomedical scientist must certify that the designated adult supervisor has been so trained. For additional information see pages 78-80 in the "Science Safety Handbook for California High Schools."

RESEARCH PLAN

Purpose of Project: _____

Starting Date: _____

Site at which investigation will take place:

Name _____

Address _____

Inland Science and Engineering Fair
Certification of Humane Treatment of Live Vertebrate Animals (continued)

Live vertebrate animals to be used:

a) **Genus, species, and common name** _____

b) **Number of animals** _____

c) **Animals obtained from** _____

List objectives of the experiment and describe fully the methods and techniques involved. When the use of electrical current, laser beams, sound stimuli or other artificial stimuli are an integral part of the Research Plan, they must not exceed the normal tissue tolerances for the species concerned (as indicated in the Biology Data Handbook, 2nd Edition; editors, P.O. Altman and S.S. Dittmer; publisher, Federation of American Societies for Experimental Biology).

_____

_____

_____

_____

Describe proposed methods of animal care:

a) **Cage size** _____

b) **Number of animals per cage** _____

c) **Temperature range (maximum and minimum) degree Celsius of room where animals are to be kept** _____

d) **Frequency of feeding and watering** _____

e) **Frequency of cleaning cage** _____

f) **Type of bedding to be used** _____

g) **Where will animals be housed?** _____

h) **Where will animals be returned when research is complete?** _____

_____

Name of animal care supervisor _____

Name of biomedical scientist _____

Name of designated adult supervisor _____

Signature of student _____

THE FIRST TWO CERTIFICATIONS MUST BE COMPLETED FOR ALL PROJECTS INVOLVING LIVE VERTEBRATE ANIMALS

CERTIFICATIONS

CERTIFICATION BY TEACHER/ADVISOR I agree to sponsor the student named above and assume responsibility for compliance with the existing rules and regulations pertaining to experiments with animals.

Signature _____

Name (type or print) _____ Date _____

Institution _____ Title _____

Institution Address_____ Phone _____

Home Address _____

Home Phone _____

CERTIFICATION BY ANIMAL CARE SUPERVISOR of compliance with California Education Code. (Must be completed prior to receipt of animals by the student.)

I certify that I have reviewed and approved the Research Plan and will supervise and accept primary responsibility for the quality of care and handling of the live vertebrate animals used by the designated student. I further certify that I am knowledgeable in the proper care and handling of experimental animals and meet prevailing animal supervisory requirements.

Signature _____

Name (type or print) _____ Date _____

Institution _____ Title _____

Institution Address_____

Telephone Number _____

Home Address_____

Home Telephone Number_____

Source of My Authority/Expertise_____

NOTE: Complete this page if your project involves experimentation with live vertebrate animals or animal parts in a research or clinical facility where the use of anesthetics, drugs, or euthanasia becomes necessary.

CERTIFICATION BY BIOMEDICAL SCIENTIST (if required) of compliance with California Education Code and Rule #5 of the General Regulations for the Inland Science and Engineering Fair. (Must be completed prior to the start of the project.)

I certify that I have read the General Regulations for the Inland Science and Engineering Fair; that I have reviewed and approved the Research Plan; that if the student or designated adult supervisor is not trained in the necessary procedures, I will ensure his/her training; that I will assure that the requirements of the California Education Code are fully met; that I will provide advice and supervision personally or through a designated adult supervisor throughout the project; and that I am a qualified scientist with an earned doctoral degree (Ph.D., M.D., D.V.M.) and a working knowledge of the techniques to be used by the students in this research.

Signature _____

Name (type or print) _____ Date_____

Institution_____Title_____

Institution Address_____

Telephone Number_____

Home Address_____

Home Telephone Number _____

Source of My Authority/Expertise_____

CERTIFICATION BY DESIGNATED ADULT SUPERVISOR (if required) I certify that I have been trained in the techniques to be used by this student; that I have read the General Regulations for the Inland Science and Engineering Fair; and that I will provide direct supervision for the research.

Signature _____

Name (type or print)_____ Date _____

Institution_____Title _____

Institution Address _____

Telephone Number_____

Home Address _____

Home Telephone Number _____

Source of My Authority/Expertise _____

A SURVEY MUST BE ATTACHED TO THIS FORM

INLAND SCIENCE AND ENGINEERING FAIR
CERTIFICATION OF COMPLIANCE OF RESEARCH INVOLVING HUMAN SUBJECTS

Projects involving human subjects may have additional requirements that are being considered by the state.

Name of Student _____

Project Title _____

Because federal regulations have become increasingly more rigid, students must plan carefully before undertaking research which involves the use of human subjects in either behavioral or biomedical studies. This will protect subjects from unnecessary exposure to physical or psychological risks and experimenters and schools from legal complications.

A **human subject** is legally defined as a person about whom an investigator (professional or student) conducting scientific research obtains (1) data through intervention or interaction with the person or (2) identifiable private information.

A **subject at risk** is legally defined as:
Any individual who may be exposed to the possibility of injury, including physical, psychological or social injury, as a consequence of participation as a subject in any research.

Students using human subjects must comply with all regulations that reflect the will of society and plan proper methodology for the protection of those subjects. It is essential that they be alert to humane concerns at all times.

The following steps must be taken before any student begins research involving subjects:

1. The student completes the "Research Plan" section of this form and submits it to the sponsoring teacher.
2. The sponsoring teacher reviews the "Research Plan" and determines if **ANY POTENTIAL** physical psychological, or social risk is involved (as defined in **subject at risk** above).
   a) If none is apparent, the teacher signs the certification. (No additional certification is necessary.)
   b) If any question exists, the student must redesign the experimental study or plan a different study.

NOTE: Any project involving human subjects that is developed with the advice and assistance of personnel at a medical/scientific organization must comply with any regulations of that organization requiring approval of its Institutional Review Board and Informed Consent Certification.

RESEARCH PLAN

Describe proposed experimental procedures:

Inland Science & Engineering Fair
Certification of Compliance of Research Involving Human Subjects (continued)

Explain why human subjects are proposed for this experimentation:

Describe and assess any potential risk (physical, psychological, social, legal or other):

Describe the potential benefits to the individual or society:

Signature of Student _____ **Date** _____

CERTIFICATION

CERTIFICATION BY TEACHER/ADVISOR of compliance with federal regu-lations for the protection of human subjects in behavioral and biomedical research. (**Must** be completed **before** the start of experimentation.)

I certify that, upon reviewing this research plan, I found that the experimental procedures constitute no physical, social, or psychological risk to either experimenter or subjects.

I agree to supervise this experimentation and will ensure that it is conducted in a humane, risk-free manner.

Signature _____

Name (type or print) _____

Title _____

Institution _____ Phone _____

Institution Address _____

Home Address _____

Home Phone _____ Date _____

Source of My Expertise/Authority_____

Note:
This form, properly completed, must be part of the carefully planned procedures of any experiment involving human subjects. It must accompany any such project exhibited at, or presented for, any public display with the Inland Science and Engineering Fair.

INLAND SCIENCE AND ENGINEERING FAIR

CERTIFICATION OF TISSUE SAMPLE SOURCE

This form must be completed for all projects using tissue(s), organ(s), human part(s), or animal parts, including blood.

Name of Student _____

Project Title _____

When live or preserved tissue samples or parts of human or vertebrate animals are obtained by the student from an institution or biomedical scientist, a statement signed by the adult providing the tissue is required. Students may **NOT** be involved in the direct acquisition of these samples from living human or other vertebrate animals.

Live tissue samples must be:

a) from a continuously maintained tissue culture line already available to institutional researchers, OR
b) from animals already being used in an on-going institutional research project. .

RESEARCH PLAN

1. **Tissue(s), organ(s), or part(s) used:** _____ _____ _____

   Tissue sample is from:
   _____ Human source_____Vertebrate animal source

   Genus, species and common name _____

2. **Starting Date:** _____

3. **Purpose of Project:** _____ _____

   _____ _____

   _____ _____

4. **List objectives of the experiment and describe fully the methods and techniques involved:**

   _____ _____

   _____ _____

   _____ _____

   _____ _____

Signature of Student _____ **Date**_____

Inland Science and Engineering Fair
Certificate of Tissue Sample (continued)

CERTIFICATION

Institution or company that is source of Tissue Sample:

Name _____

Address _____

_____

I certify that the above listed materials were provided by me or my institution and that the student listed was **NOT** involved in the direct acquisition of the samples provided or purchased.

_____ _____
Signature Title

_____ _____
Date Telephone Number

PROJECT ABSTRACT EXAMPLES

Your abstract is important. Your judges will receive this abstract in advance of the Fair so they can preview your work. Your judges will be able to better understand your work and prepare for your interview if you follow these samples or use similar formats.

What Makes Good Electrical Conductors?

Grades 4-5

Objectives/Goals: The objective of my project is to determine which materials make the best electrical conductors.

Methods and Materials: I used wood, plastic, copper, steel, tin, and grass as my materials to be tested. I also used a volt/ohms meter and the test probes to make my measurements.

Results: The meter I used showed the metals to all be excellent conductors and that the plastic and wood did not conduct an electrical current.

Conclusions: My conclusion is that the metals I tested are excellent conductors of electrical current and that neither wood or plastic conducts electricity.

The Effect of Surface Finish on Rocket Drag

Grades 6-12

Objectives/Goals: My project was to determine if surface finish has an effect on the drag of a model rocket. I believe that a model with a smooth surface will have lower drag and will reach higher altitudes.

Methods and Materials: Five model rockets with identical size and shape, but different surface preparations, were conducted. 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 to 600 grit, painted, and covered with clear gloss. The rockets were ballasted to weigh the same and flown 10 times each with B5-4 motors.

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.

JUDGING CRITERIA

(adapted from California State Science Fair)

Project Number								
Originality: - 20% Original ideas and the creative use of resources are usually impressive. This orginality may be in the scientific concept, a new approach to solve an old problem, or a new interpretation of data. However, an original project must be well executed. Original projects are those that go beyond the textbooks and explore new ground and innovative techniques.								
Comprehension: - 30% Comprehension is the understanding and appropriate use of scientific theory, terms, techniques and methodologies. Students should have a depth of knowledge about the scientific and engineering principles and practices, which can be shown by the ability to extrapolate what was learned from the project to the subject in general. Depth includes understanding the basic science behind the project topic, comprehension at a finer level of detail, and awareness of the influence that the project has on related material in the subject topic.								
Organization & Completeness: - 30% The project should have a well-defined goal or objective. The materials, methods, and experimental design should be sufficient to answer all the appropriate questions. A second component of organizations is thoroughness, which includes not only the issue of how well the original questions have been addressed, but also the issue of how fully questions arising during the project have been addressed. It is the duty of all scientists to provide evidence in support of their claims. The burden of proof does not rest with the observer. Without supporting results or data, the science project is not a completed work.								
Effort & Motivation: - 10% The amount of time a student has spent doing the actual science project and the amount of time the student has spent reading and learning the subject should both be considered. While motivation and effort are not the same, the amount of effort that goes into a project is usually an indication of a student's motivation. It is important to know if a student enjoyed the experience and is interested in learning more.								
Clarity: - 10% Written and oral communications skills are very important in science and engineering. Ideas should be clearly presented and easy to understand. The experiments should have well-defined goals which indicate clear understanding of the basic science. A well-written abstract, easy to follow visual aids, and clear and concise answers all add to the quality of a project.								
Total:								