

The OHIO ACADEMY of SCIENCE

1500 West Third Avenue Suite 228 • Columbus OH 43212-2817
Phone 614/488-2228 • Toll Free Outside of Area Code 614, if needed, 1-800-OHIOSCI • Fax 614/488-7629
Email oas@iwaynet.net • Website <http://www.ohiosci.org>

Fostering curiosity, discovery and innovation to benefit society.

Science Day Standards

These general Standards for Science Days
incorporate all actions of
the Junior Academy Council as of September 10, 2005.

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The Ohio Academy of Science
Science Day Standards

Rules for Student Research Projects

Student Research Plans

All student research projects require a research plan. Research plans and certain special protocols must be approved **before experimentation** if the student research projects involve one or more of the following:

- Human Subjects
- Nonhuman vertebrate animals including observation projects
- Potentially hazardous biological agents including microorganisms, recombinant DNA technologies, or human or animal fresh tissues, blood or body fluids
- Controlled substances and alcohol and tobacco
- Hazardous substances or devices including chemicals, equipment, firearms, radioactive substances and radiation

The Intel International Science and Engineering Fair forms [<http://www.sciserv.org/isef/document>] and procedures of a particular year must be used by all students who participate in District and State Science Days of the same year.

[Don't be confused by student research forms. Forms simply document basic processes in your research plan that students must follow for safe and successful science day projects. Let Merlin help you with the forms. Go to the Rules Wizard and follow the steps. See explanation of Web Wizard or go directly to the wizard. [<http://www.sciserv.org/isef/students/wizard/index.asp>]

Consent and Release Form Required

A Consent and Release Form [<http://www.ohiosci.org/Consent.pdf>] must be completed by all students and signed by parents to participate in District and State Science Days. This form must be sent to the District Science Day director with registration material and to The Ohio Academy of Science for State Science Day.

What are science days or science fairs?

Science days or science fairs are occasions for the display and evaluation of *student-originated, inquiry-based scientific research projects*. A successful science day program will achieve several student-learner objectives:

- Enhance self-concept
- Develop inquiry and problem-solving skills
- Develop creativity
- Improve organizational ability
- Develop both written and oral communication skills
- Improve in-depth knowledge of science

In published research (*Ohio J. Sci.* 96 (4/5):81-88, 1996), science projects were rated by teachers overwhelmingly and consistently positive on each of eight contemporary educational goals:

- Exploration of real world issues important to the student
- Hands-on/minds-on approach
- Scientific knowledge
- Scientific inquiry skills

- Higher order thinking skills
- Habits of mind
- Integration, and
- Social skills

Ranking vs. Criteria

[Except for the Buckeye Science Scholar Award at State Science Day and to fill quotas for participation in District and State Science Days] The Ohio Academy of Science does not rank students at local, District or State Science Days. Rather, judges for the Academy compare students against the judging criteria described below.

Adherence to the Standards by Teachers

Teachers promoting local student research projects and conducting local science days leading to District and State Science Days, are expected to have their students follow the official Science Day Standards outlined here. Included in these Standards are the Judging Criteria for both individual and team projects that teachers should use locally and that must be used at all District science days. **The Ohio Academy of Science discourages the assignment or use of special points or a scoring rubric unique to local science days, and does not permit their use by District or State Science Days.**

[The Academy has developed several publications such as the *Science Day Guide* that teachers should consult to promote the development of student research projects and local science days. Guidelines for District Science Day also are available.]

Instructions to Student Participants

Participation in a Science Day can be a rewarding experience. It offers an opportunity to learn and practice the principles of scientific research, an opportunity to meet others interested in scientific study, and a chance to earn recognition for academic excellence. Thus, those involved should not be limited to the gifted, although all should be made aware of the long and tedious work involved in scientific investigation. Accurate prediction of a student's potential is impossible until he or she has attempted a project a number of times. Most will not achieve perfection on the first attempt, but proficiency will come to those who are persistent.

When issues arise that are not covered in these standards, the student or teacher should seek guidance from the latest edition of the Rules for the Intel International Science & Engineering Fair. [See <http://www.sciserv.org/isef/document/> or obtain for \$1.25 from Science Service, 1719 N Street NW, Washington D.C. 20036]

Duration of Project

A student research project shall be used for only one year. It must not be repeated nor given to another person to represent his or her work. Each student may enter only one project which covers research done over a maximum of 12 continuous months between January of the year before the Science Day and May of the year of the State Science Day. A Project may continue only if it involves new or revised objectives, hypotheses or methods and presents substantially new or different results each succeeding year.

Grade Levels

Participants in local science days may be in any grade level. Each Junior Academy Council District Science Day has the option of accepting participants in grades 5-12 or grades 7-12. Participants in State Science Day are limited to grades 7-12.

Participants must earn a superior rating [36-40 points for individuals; 45-50 points for teams] to submit their projects to the next-in-line science day. District and State Science Days operate on a quota system that may further limit participation even if some students at a preceding science day receive a superior rating.

Eligibility for District Science Day

Students shall be admitted to only one District Science Day per year. District Science Days shall not accept duplicate projects from the same school. To be eligible for a District Science Day, a student shall earn a superior rating from participation in a local science day. A student in a school that does not have a local science day or a home schooled student shall earn a superior rating from participation in a local science day at any public or non-public school within their school district. If no science day exists within their school district, they may participate in a local science day in an adjacent school district.

Eligibility for District Science Day Under Extraordinary Circumstances

The intent of this policy is to accommodate extraordinary instances where it is not possible for a student to participate in a local science day. Using the judging criteria in the Science Day Standards, District Science Day directors shall determine the eligibility of the applicant to participate in the District Science Day in extraordinary instances:

1. where admission to a local science day is prohibited by public or non-public schools within their own district or in an adjacent school district or
2. where there is no local science day at a public or non-public school within his or her district or in an adjacent school district.

Students in groups (1) and (2) must include a complete project report and all plans and protocol forms with their application to a district science day. Two judges approved by the District science day director shall evaluate that report independently and blindly. The District science day director shall admit a student whose project meets basic criteria and research protocols required by the Science Day Standards adopted by the Jr. Academy Council.

Eligibility for State Science Day

The Junior Academy Council assigns State Science Day participation quotas for each District science day based equally on the percent superiors earned by projects of that district at the most recent State Science Day and on the number of District science day participants at the previous year's District science day. Team scores shall be converted to the 40-point scale. Projects of students that have received a superior rating at the District level will fill the District quotas to attend State Science Day by the following policy:

- 40 points grades 12 through 7
- 39 points grades 12 through 7
- 38 points grades 12 through 7
- 37 points grades 12 through 7
- 36 points grades 12 through 7

Lottery: If there are more student projects than spaces available within the quota, a lottery shall be used to determine the projects selected. E.g. if you have 20 7th graders

each with 37 points but only 10 slots you would hold a lottery to determine the 10 projects to fill the quota.

Alternates shall be selected according to the above policy too. The District quota shall be filled equally based on the above policy for both individuals and teams participating in the District Science Day. Duplicate projects from the same school will not be accepted.

Research Plans Required

All students who participate in District and State Science Days shall complete student research plans prior to beginning their experimentation or research trials. Modifications in the plans are permitted during the process of research. The modifications must be prepared and dated as a research plan. If the modifications involve new protocols that must be approved before experimentation, it must be approved before the student resumes experimentation. The initial research plan must be kept if any data obtained before the modification will be used in the final project.

A student research plan shall include the name and address of each student involved in the research, the teacher's name or name of research supervisor, whether the project is a continuation of work or a new project, where the work will be done (home, school, research institution, industry, or in the field), project title, research question(s) or problem, hypothesis, experimental methods or procedures, and at least five major references specifically applicable to the proposed research; e.g., science journal articles, books, or internet sites. For internet sites, research plans must cite the complete URL, a title of the report, the name of the author if known, and the date of the publication or update of the site.

If the proposed research involves vertebrate animals, then the research plan must (1) provide a detailed justification for their use, (2) briefly discuss non-vertebrate alternatives and (3) give an additional animal care reference for the species you are using.

Rules for Student Research Projects That Require Special Protocols or Adult Supervision

These projects include those associated with:

- Human Subjects
- Nonhuman vertebrate animals including observation projects
- Potentially hazardous biological agents including microorganisms, recombinant DNA technologies, or human or animal fresh tissues, blood or body fluids
- Controlled substances and alcohol and tobacco
- Hazardous substances or devices including certain chemicals, equipment, firearms, radioactive substances and radiation

The Intel International Science and Engineering Fair forms [<http://www.sciserv.org/isef/document>] and procedures must be used. These rules require adherence to special student research protocols and supervision, including **prior approval of student research projects by local scientific review committees** or, in the case of human subjects, institutional review boards. **Local schools must appoint and manage these committees.** Depending upon the project(s), committee members must have sufficient professional expertise by way of education and experience to review both human subjects and non-human vertebrate projects. **When in doubt, review all projects.**

Seek Advice

Teachers, other professionals, scientific organizations, industries, and parents can and will give much valuable aid if the request is made in the proper way. Reasonable response time, courtesy and consideration coupled with sincere expressions of appreciation will eliminate many of the rough spots for a young scientist. Remember, others may advise and give aid, but they must not do any work for the participant.

Mentors and Advisors

Mentoring of students and professionals alike is common and expected in the world of science, engineering and technology. A mentor facilitates the design, the development and execution of the project either electronically or in person. An advisor reads and approves the procedure written by the student. Although The Ohio Academy of Science expects all students to use advisors and/or mentors for projects, a project entered into a science day activity must be researched and developed by the student participant(s). The Academy cautions judges that a student's access to mentors may be limited. The Academy directs that judges shall not bias their ratings either for or against students with or without mentors.

Team Projects

Team Projects shall be accepted at all District Science Days. A revised 50-point rating scale [see table below] will be used to evaluate team projects. Individual and team projects shall be considered equally when District science day directors select projects to fill quotas to attend State Science Day.

A team shall consist of a maximum of three students. A District science day may allow a maximum of two students per team due to local limitations. In addition, teams may not have more than three members at a local science day and then eliminate members to qualify for District or State Science Day. In a given academic year, a team project cannot be converted to an individual project or vice versa. In a subsequent academic year, a continuing project may add or delete members as long as at least one student from the original project is retained and the maximum number of team members is not exceeded. In a subsequent academic year, a continuing team project may be converted to an individual project or vice versa.

All currently active team members must be present to be judged at District and State Science Days or the project will be disqualified. All team members are required to belong to the same school and same grade brackets (a) grades 5-6, (b) grades 7-8, and (c) grades 9-12. Each team shall appoint a team leader to coordinate the work and act as the primary spokesperson. However, each member of the team should be able to serve as spokesperson, be fully involved with the project, and be familiar with all aspects of the project. The final work should reflect the coordinated efforts of all team members.

A supplemental sheet of the contribution each member made toward the team project shall be signed by each member and shall be displayed with the project and included in the research notebook, project report and with applications to attend District and State Science Days. Full names of all team members must appear on the abstract and registration forms. The judges should ask each team member for a one or two sentence description of what they consider to be their most important contribution.

Sampling and the Use of Statistical Analysis

Projects must provide adequate sampling and analyze results using statistics. This may require a great deal of time and many trials. Due to the nature of projects, it is not possible to state minimums. Consult your advisor, mentor, science or mathematics teachers, or someone familiar with statistics for further information.

Almost all scientific research involves statistics. A scientist should not draw a conclusion based on a single measurement or observation. Scientists usually repeat the same measurement three or more time and use statistics to express its reproducibility or significance. If the term “significant” is used, then the actual statistical test of significance must be stated. Other scientists may repeat the research to see if they can replicate your results. Sampling of subjects is of utmost importance. Students doing behavioral studies using vertebrates should learn what is the minimum number of subjects needed for adequate sampling. In project abstracts and reports always state the number of trials or the population samples as (N=number).

Research Notebook

Students doing research projects are required to keep a bound research notebook from the very beginning of gathering ideas and references from which information will be obtained to write the research plan and eventually write a research report. Record the date on the page every time you record something in the notebook. When you begin your experimentation, be sure to record experimental setups and conditions, observations, measurements, calculations, graphing results, discussions of the results and conclusions. Include other records such as photographs and notes of discussions with your supervisor, advisor or mentors. Your judge may ask to see the records you have of your research.

Importance of Documentation of Original Ideas

Keeping a good research notebook is extremely important for students and for professional scientists especially if they ever apply for a patent. Record any original thoughts, concepts or procedures in the bound notebook, with numbered pages. Sign and date those pages and have an adult witness sign and date the page(s) to attest to the event. Use or disclosure of this written record may be required if you ever apply for a patent and may help assure your claim of originality.

Research Report Required

Each project must include a research report covering in detail all of the work, references consulted, and acknowledgment of assistance received. The experimental data, statistics, notes, and computations should be recorded in a research notebook. The report should include a description of the work, the results, and the conclusions. This report should follow an accepted form of technical reporting and be checked for correct punctuation, spelling, and grammar preferably by an English teacher. If possible, the report should contain illustrations in the form of photographs, sketches, graphs, data tables or charts that contribute to the effectiveness of the material presented. The Ohio Academy of Science recommends the following format for sections of the research report:

- Title page including the date and name of student
- Table of contents [optional for reports fewer than 10 pages]
- A single paragraph abstract with project title and name of student (250 words or fewer)
- Introduction-(background, problem and hypothesis)

- Methods and materials used to study problem
- Results including an analysis of collected data with graphs, tables, photographs and diagrams to illustrate investigation
- Discussion including conclusions and implications for further research.
- References or Literature Cited. **Do not use the term bibliography.** Technically a bibliography is an exhaustive list of perhaps thousands of references on a limited topic and is not used in most scientific reports.

Abstract

Abstracts of 250 or fewer words are required and must be submitted with applications for both District and State Science Days. The abstract must contain a heading that includes a project title and name(s) of the author(s). The heading does not contribute to the word count.

The purpose of an abstract is to provide a summary of the project that will inform interested individuals of the contents. The wording must be written in a manner that any scientifically minded individual, who may not be familiar with the topic, can quickly understand the project's important points.

Summarize in a few sentences:

1. Background information necessary to understand the project and its importance
2. The problem that was investigated and the hypothesis
3. Outline of the materials and methods used in the actual experimentation
4. Summary of the results obtained from experimentation
5. The conclusions drawn from results
6. The importance or potential applications that the research offers

Do not be concerned with including all of the details in the abstract. The key point to remember when writing an abstract is to keep the wording brief and concise. Use complete sentences. Avoid personal pronouns like "I" and "My." Abstracts should provide only information essential to understand the project's basic points and importance. Omit needless words, especially adjectives and adverbs that have no statistical reference or validity.

Oral Presentation

He or she must be able to give a clear and concise oral presentation of his/her project, to answer questions, and to define any terms used. This brief oral presentation should completely summarize the project. The quantity and quality of knowledge attained will be evaluated by this speech. If a question is not clear, the participant should ask the judge to rephrase it. Although the student participant should practice his or her presentation several times, he or she should not attempt to memorize a formal speech.

Expectations of Physical Display

A display consists of one lightweight, usually tri-fold, single-sided poster board with appropriate information (including graphs, data tables, drawings, sketches, diagrams or photographs), extra copies of an abstract for judges, project research notebook, research reports, research plans and documentation of research protocols. Displays at District and State Science Days are strictly poster format only. Each project shall be limited to one, single-sided poster board. This means that the physical models, samples of research materials and/or purely advertising/decorative items (whether glued or affixed in any

manner to the poster or not) cannot be displayed and shall not be brought to District and State Science Days.

Table-top display dimensions shall not exceed 36" (91 cm) wide by 30" (76 cm) deep. The top of the display shall not be more than 85" (216 cm) above floor level or 55" (140 cm) above a 30" high table. Free-standing floor projects are not permitted at District and State Science Days. Extension of a project beyond the stated limits will result in dismantling or severe modification of the display, and **may disqualify** the student's participation. Note that the physical display size at District and State Science Days is smaller than the size allowed at the International Science and Engineering Fair.

Use of Kits

Although the use of "kit" models is discouraged, such models may be used if they make a definite contribution to the research approach. Models made by students are preferred since they have a much greater instructional value and demonstrate that the participant has had a proportional gain in knowledge. Models, samples from a research project, or research equipment may not be displayed at District or State Science Days. You may use only drawings, sketches, diagrams or photographs.

Equipment

Use commercial equipment especially when it would be impossible to conduct the research without it. However, if such equipment is used, the participant must be prepared to describe its operation, function and the reason(s) for its use. Research equipment may not be displayed at District and State Science Days. You may use only drawings, sketches, diagrams or photographs.

Neat Displays

Displays should be neat, attractive, and stable but readily portable. Refrain from using metal, plywood, pegboard, Masonite™, string, wire, thin tape, metal or plastic pipe, flimsy construction materials or props. Light weight, tri-fold foam core or poster board, for example, joined securely with tape or Velcro™ strips makes a lightweight yet rigid, readily portable display. Avoid the use of small print, indefinite colors, and crowded elements. These detract from the effectiveness of the project.

Avoid Vague or Cute Project Titles and Trick Names

Project titles should be succinct, descriptive of the project and reflect the research objective or question. Project titles should enable the reader to determine what was studied in the project. Often colonated titles work well for student research projects. Colonated titles use one to five short, attractive words first, followed by a colon and an added descriptive phrase.

[For example: *Artificial wetlands: A model for microbial sequestration of copper; Battle of the brains: Which gender has the most effective short-term memory?; Bottled spring water: Can you taste the difference?; Breaking the mold: The effects of pozzolanic admixtures on the compressive strength of concrete; Bursting the bubble: Antibacterial soap vs. regular soap; Corrosion: The effects of certain liquids on metals; Cryogenics: Determination of the cell membrane breaking point; Feathers, fur or fat: which will keep an animal the warmest?; Golf balls: Rebound height vs. distance; Get a grip: Hand grip strength versus forearm circumference; Handedness: why we choose our left or right hand]*

Do not use short, vague, trick, pet, "cute or comic" names for project titles, experimental organisms, or specimens. Identify research subjects or individuals in sampled populations by letters or numbers.

Safe Project Displays

Project displays shall not involve materials or elements that might be dangerous to exhibitors, judge or onlookers. Explosives, toxic elements, injurious chemicals or gases, open flames, or any unprotected moving parts, etc. may be necessary in the research project. The experimenter should always exercise the greatest care and conduct these phases of the work under qualified supervision and follow all protocols required by the Rules of the Intel International Science and engineering fair. However, these materials or elements cannot be on the display poster, on the display table, or under the table, at a science day.

Expectations of Display: Present Results

Students are expected to present the **results** of research. **They are not expected to perform, demonstrate or repeat an experiment for judges or visitors.** Students should have already done an experiment or conducted many research trials and thus have adequate results in the form of charts, graphs, data tables, and a research notebook—all recorded with dates—which should be with the project display. Equipment used in research is not needed for a presentation and must be left in the laboratory or at home. Use photographs or drawings of equipment on the poster boards, in the technical report and in the research notebook to document and explain the equipment used. Items on the display backdrop, or poster boards, should be used as visual cues to keep the student's oral presentation to the judges on track or to refer to when responding to questions. The whole project, in simple form, should be visible on the poster boards. Abstracts, a research notebook, technical reports, and additional data should be in folders or for immediate reference.

Computer Simulation

Battery-powered computers may be used only for simulation, modeling, animation or data display integral and essential to understand, analyze or interpret the project results and not for general PowerPoint™ or other visual or sound presentations. Electricity will not be provided.

Items Allowed at Project with the Restrictions Indicated

Posters should display an abstract and data tables, diagrams, charts, photographs and graphs that summarize results. Research notebooks, research reports, research plans and documentation of research protocols are **expected** and may be in notebooks or folders on the table for use by science day officials and judges. Information such as postal, web and e-mail addresses, telephone and fax numbers is allowed only for the exhibitor. The only photographs or visual depictions of identifiable or recognizable people allowed are photographs of the exhibitor, photographs taken by the exhibitor (with permission of individuals received), or photographs for which credit is displayed (such as from magazines, newspapers, journals, etc.).

Battery-powered computers may be used only for simulation, modeling, animation or data display integral and essential to the project results and not for general PowerPoint™ presentations.

Items not allowed at Project Display

If an item is not listed in the paragraphs above it is **not permitted** at District or State Science Days. Scientific equipment and supplies, other apparatus or research paraphernalia are not permitted at a display at District or State Science Days. [See <http://www.ohiosci.org/not.htm>]

Instruction to Judges

The attitudes and conduct of the judges determine the success of any Science Day activity. Therefore, it is vital that each judge understands thoroughly his or her duties and obligations. He or she should also have knowledge of all the requirements of the participants. All judges need to have a genuine interest in young people combined with a desire to offer encouragement and guidance in their efforts to pursue learning in the various fields of science.

- Students shall have an opportunity to present their project to two judges, one of whom (where possible) should be a K-12 teacher. This may be achieved as a team of judges or separately, with the scores averaged. Although judges should discuss the performance of the student, each judge shall score independently of the other judge and shall not reveal the scores to the other judge(s) or to the student. Only fair officials may inform the student of the scores or ratings after judging.
- Judges should introduce themselves upon approaching a student and attempt to establish a friendly rapport to help reduce the participant's tension.
- The student participant should first be asked to give his/her oral presentation of the project and then to answer questions about his/her work on the specific problem. It is also proper to ask questions within the discipline or subject matter involved at the student's level of learning.
- The participant should be put at ease, especially one who appears nervous during questioning. Judges should take an active part in the evaluation; silence may be interpreted as disinterest or boredom, which can have a very discouraging effect on the participant.
- Judges should feel free to question the participant on the materials and tools used, the methods of construction, terms used, the sources of information, and the amount and type of assistance enlisted in the preparation of the project.
- Judges are required to check through the abstract and research paper to determine their quality. A check of the references will assist in making a fair determination of the scope and depth of the literature research. The quantity and quality of the references should be taken into account to evaluate the student's research methodology.
- Judges should determine the span of sustained interest in the particular field of science, as well as the approximate amount of time spent in developing the project being evaluated. Some premium should be granted for considerably extended interest and effort to encourage this quality of persistence.

- Judges should note the number of subjects or specimens used. Is the number adequate to generalize to the larger group what the sample is intended to represent?
- Grade level of the student should be considered.
- **Discussion and final scoring of the project should be at a considerable distance from the participant, since disclosure of scores is delayed until judging is completed.** Do not hurry a judgment. Comments (1) indicating reasons for the rating and (2) making suggestions for improvement shall be written on the scorecard to be returned to the student after the event.

Summary of Judging Ethics

Judges shall:

- Have no prior involvement with project
- Adhere to Academy guidelines
- **Avoid discussion of ratings with others prior to public release**
- Listen carefully to student's complete presentation
- Be exceptionally courteous to all students
- Judge students against CRITERIA not against other students
- Consider age and grade level
- Evaluate theoretical and applied projects without bias toward either
- Provide written, constructive criticism and suggestions for improvement
- Not photograph students or projects during judging
- Seek written permission from students to photograph them
- Return judging cards to science day officials if (1) you know the student, (2) the project is out of your area of expertise or (3) there are language issues that impair communication

Judging

Individual Projects

Criteria	<u>Ratings</u>			
	Superior	Excellent	Good	*Satisfactory
Knowledge Achieved	10-9	8-7-6	5-4-3	2-1
Effective use of Scientific Method	10-9	8-7-6	5-4-3	2-1
Clarity of Expression	10-9	8-7-6	5-4-3	2-1
Originality and Creativity	10-9	8-7-6	5-4-3	2-1
Range of scores	40-36	35-24	23-12	11-4

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*There is no "Satisfactory" Rating given at State Science Day.

Team Projects

Criteria	<u>Ratings</u>			
	Superior	Excellent	Good	*Satisfactory
Knowledge Achieved	10-9	8-7-6	5-4-3	2-1
Effective use of Scientific Method	10-9	8-7-6	5-4-3	2-1
Clarity of Expression	10-9	8-7-6	5-4-3	2-1
Originality and Creativity	10-9	8-7-6	5-4-3	2-1
Teamwork	10-9	8-7-6	5-4-3	2-1
Range of scores	50-45	44-30	29-15	14-5

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*There is no "Satisfactory" Rating given at State Science Day.

Minimum number of points for each rating:

Individual Projects:

Superior 36, Excellent 24, Good 12, Satisfactory 4 (Not given at State Science Day).

Team Projects:

Superior 45, Excellent 30, Good 15, Satisfactory 5 (Not given at State Science Day).

All students at local, District or State Science Days shall have an abstract and a written report, which documents that the student has searched relevant literature, stated a question and/or tested a hypothesis, collected and analyzed data, and drawn conclusions. For a superior rating, an individual student shall receive a minimum of 36 points, or 45 points for a team, based on the criteria of (1) knowledge achieved, (2) effective use of scientific method, (3) clarity of expression, and (4) originality and creativity. A fifth criterion, teamwork, consisting of a maximum of 10 points, shall be applied to team student research projects. Thus, a team research project needs a minimum of 45 points for a superior award.

The following paragraphs interpret the various criteria on which the student's project or exhibit will be judged.

A. Knowledge Achieved (considering student's age and grade level)

- Has there been a correct understanding and use of scientific terms?
- Is there evidence of an acquisition of in-depth knowledge through the research or has he or she merely acquired a manipulative technique?
- Does he or she show evidence of knowing what the underlying principle(s) is?
- In brief, has he or she actually learned scientific content through his/her study and research?
- Mentoring of students and professionals alike is common and expected in the world of science, engineering and technology. Although The Ohio Academy of Science expects all students to use advisors and/or mentors for projects, a project entered into a science day activity must be researched and developed by the student participant(s). The Academy cautions judges that a student's access to mentors may be limited. The Academy directs that judges shall not bias their ratings either for or against students with or without mentors.

B. Effective Use of Scientific Method

- Does the student have a clear-cut idea of the purpose of his/her project, or is it something thrown together and manipulated? While the mere assembly of a "kit" is frowned upon, there can be a definite research approach wherein there may be an effective use of scientific method (s). However, it should not be the principal element of the project.
- Is he or she aware of other approaches or theories relative to this problem or project?
- Is there evidence of both contemporary literature search and actual experimental research with results?
- Has he or she been thorough and have there been prolonged or sustained experimentations?
- Has he or she observed any basic phenomena?
- Has he or she experimented sufficiently to have collected an appropriate amount of data?
- Has he or she analyzed observations or results in a logical manner and drawn valid conclusions?
- Has he or she used an adequate sample to be able to generalize?

C. Clarity of Expression

- Can he or she orally explain the project concisely and answer questions well? Try to weigh evidence of a student's nervousness. Listen carefully to a student's presentation for understanding of scientific principles or relevance to actual, unique results derived from experimentation.
- Has the participant expressed himself or herself well in all written material, such as the abstract and research report? Ask student about words or terminology in the abstract or report to validate that he or she clearly understands their use and that he or she actually wrote the report. Ask what specific knowledge or information came from specific references.
- Is the physical display neat and sufficiently definitive to act as a stand-alone summary of the student's entire project?
- Note misspelled words and weak or imprecise grammar.
- Does the research report include a literature review, experimental data, statistics, results, and conclusions? Does it follow an accepted form of technical reporting?

D. Originality and Creativity

- It is true that the approach may not be new to the judge, but is the problem or the approach to the problem developed in a particularly significant or unique manner?
- Has he or she a new approach to an old subject?
- Has he or she a unique presentation or organization of materials?
- The assembly of a "kit" may not be original or creative but again, it may be a new and unique approach to a problem and may economize on time and effort.

- Is there evidence of initiative? Place a premium on the ingenious uses of available materials. Collections and manufactured apparatus can be creative if they are assembled and used to achieve, show, or support a stated purpose or provide effective comparison with previously collected or published data.

E. Teamwork

- Team Projects shall be accepted at all District Science Days. A revised 50-point rating scale (see table above) shall be used to evaluate team projects.
- A team consists of a maximum of three students. A District science day may allow a maximum of two students per team due to local limitations.
- All team members must be present to be judged at District and State Science Day or the project will be disqualified.
- All team members are required to belong to the same school and same grade brackets (a) grades 5-6, (b) grades 7-8, and (c) grades 9-12.
- Each team should appoint a team leader to coordinate the work and act as spokesperson. However, each member of the team should be able to serve as spokesperson, be fully involved with the project, and be familiar with all aspects of the project. The final work should reflect the coordinated efforts of all team members.
- A supplemental sheet of the contribution each member made towards the team project must be signed by each member and must be included in the project display and in the research notebook.
- Full names of all team members must appear on the abstract and registration forms.
- The judges should ask each team member for a one or two sentence description of what they consider to be their most important contribution.

Uniform Procedures for Rejudging at Local and District Science Days

Teachers promoting local student research projects and conducting local science fairs or science days leading to District Science Days and to State Science Day are expected to have their students follow the official Science Day Standards outlined herein. Included in these Standards are the following Rejudging Criteria for both individual and team projects that teachers should use locally and that must be used at all District and State Science Days.

- Two judges will judge each project for The Ohio Academy of Science ratings.
- If each judge grants a total score within any one rating category (Superior, Excellent, Good, or *Satisfactory), that specific rating (Superior, Excellent, Good, or Satisfactory) will be granted to the student and no rejudging is permitted.
- Rejudging is automatic and is permissible **only if all three** of the following conditions apply:
 - the judges' final ratings are in different categories,
 - the average of the judges' scores is in the lower category, and
 - if the judges differ in their total points by more than five points.

*Satisfactory category is not used at State Science Day

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These general Standards for Science Days incorporate all actions of the Junior Academy Council as of September 10, 2005.

Please direct questions to:
The Ohio Academy of Science
1500 West Third Ave. Suite 228
Columbus, OH 43212-2817
Phone (614) 488-2228
FAX (614) 488-7629
Email oas@iwaynet.net
Website for Standards: <http://ohiosci.org/sds.htm>