Exhibit Guidelines

Display Design and Evaluation

- The exhibit must not exceed dimensions of 76 cm deep and 122 cm wide. Build the exhibit no higher than 122 cm. No overhang is allowed. If the scientific apparatus exceeds the height limit, use photographs to show what has been done. No part of the project may be placed on the floor.

- Construct your own exhibit; teachers and parents are to provide only the necessary guidance, encouragement, and constructive criticism.

- Keep the title of your project brief, captivating, and prominently visible on the exhibit. It may contain no more than 45 characters and spaces. Titles in excess of 45 characters will be shortened to fit into available space on the entry form.

- Determine the best way to present the research. The presentation may include graphs, charts, PowerPoint presentations, and demonstration of design apparatus only (must meet safety inspection guidelines). Attach a copy of your Abstract, Safety Sheet, and Endorsement(s) (if necessary) to the front of your display board. These documents must be part of your display board and cannot be attached to the board with clips, block the view of posted information on the display board or overhang on any side of the display board. The Abstract and Safety Sheet can be reduced to one half of a page (when duplicating print at 65% reduction of original) for display. Less than 65% reduction is not acceptable.

- Exhibits must conform to size limitations. No easels or tripods are allowed on the floor around the exhibit. Floor-mounted exhibits will not be considered for competition.

- Exhibits must be constructed so that wall space is not required. All exhibits must be freestanding. Objects may not be attached to draperies or the exhibitor identification sign. No lighting of any type may be used to illuminate the exhibit. No items may be stored under the exhibit table.

- The City Science Fair Exhibits Committee will provide space on a table, a table covering, an identification sign, and an extension cord (if needed). The student must provide all other needs of his/her exhibit (for example, tape, staples...). The exhibit space can only accommodate a display of the following dimensions: 76 cm deep, 122 cm wide, and 122 cm high. No exceptions are made.

- All equipment and materials are exhibited during the fair at the risk of the exhibitor. The Science Fair Exhibits Committee, the CPS Student Science Fair, Inc., and the Museum of Science and Industry assume no responsibility for loss or damage to such equipment and materials. A security room is available for overnight storage of valuables.

- Normal wear and tear on exhibits is to be expected during the time the fair is open to the public. For this reason, each exhibitor is advised to protect his/her project as completely as possible. Valuable equipment should be fastened securely to prevent its removal and should be safely stored when the exhibitor is away from his/her project.

Presentation Tips

The exhibitor’s personal appearance adds to the attractiveness of the exhibit. Students should dress neatly and appropriately for the occasion.

- Be well versed in as many aspects of the project as possible.

- Be enthusiastic about the project.

- Prepare not only for direct questions pertinent to the research but also for related questions.

- Students who require a language interpreter or sign language interpreter are encouraged to seek the assistance of their sponsoring teacher in making arrangements to have one available during judging sessions. Arrangements for the use of a sign language interpreter can be made through the CPS Office of Diverse Learner Support & Services (773-553-1882). For information in obtaining a language interpreter contact the Office of Language and Cultural Education (773-553-1930). The research summary paper must be in English.
CPS Science Fair Endorsement Flow Chart

This flow chart does NOT include all the rules regarding requests for endorsements. Read the following sections for complete details.

Does your project involve the use of firearms or explosives?

YES

YOU MUST REQUEST A FIREARMS/EXPLOSIVES ENDORSEMENT AND SUBMIT IT WITH ALL REQUIRED MATERIALS IN A SINGLE PACKET. See pages 18 - 19 for the complete list of all materials.

NO

Does your project involve asking your friends or other people questions? Experiments on yourself? Experiments on people in any way?

YES

YOU MUST REQUEST A HUMANS-AS-TEST SUBJECTS ENDORSEMENT. Details on p. 12 Does the procedure cause any stress (physical or emotional) to the subject?

NO

Does your project involve non-human vertebrate endorsement? Details on p. 13 Does your project involve only non-manipulative observations of animals with bones?

NO

Does your project involve using any animals that have bones (except people)?

NO

Does your project involve bacteria? Viruses or any fungus?

YES

Does your project involve collecting microorganism samples from countertops, doorknobs, toilets, eating utensils?

NO

YOU MAY NOT CONDUCT THIS EXPERIMENT. Cultures of unknown bacteria, viruses or fungi may be very dangerous.

YES

YOU MUST REQUEST A RECOMBINANT DNA ENDORSEMENT. Details on p. 17 Are you working in a registered research laboratory under the guidance of a biomedical scientist trained in this field?

NO

You do not need a recombinant DNA endorsement (to simply extract DNA from plant or animal sources)

YOU MUST REQUEST A MICROORGANISM ENDORSEMENT. Details on p. 15 You must work in a biosafety level 1 environment such as most school laboratories with the supervision of a trained supervisor. Does your project involve only microorganisms listed on page 77?

NO

YOU MUST REQUEST A HUMAN OR VERTEBRATE TISSUE ENDORSEMENT. Details on p. 16

Yes

Is the tissue from a biological supply house or catalog, hospital or laboratory? If using blood is it obtained from a blood bank, hospital or laboratory? If using teeth are they sterilized by a dentist?

NO

YOU MUST REQUEST A HUMAN OR VERTEBRATE TISSUE ENDORSEMENT. Details on p. 16

YOU MAY NOT CONDUCT THIS EXPERIMENT. Only tissues that are certified to not carry infectious agents may be used

NO

Is the tissue you will use... From a plant? Meat or meat products from a store or restaurant (and treated to inhibit bacterial growth)? Hair that has been naturally shed or cut? Fossilized tissue or an archaeological specimen?

NO

YOU MAY NOT CONDUCT THIS EXPERIMENT. All rDNA work must be done under scientist supervision and must not produce toxic genes

NO

You do not need any endorsements to conduct your project

2016 SCIENCE FAIR HANDBOOK 11
Safety in Experimentation

The safety of the student researcher, the test subjects (in cases of humans and vertebrate animals) and of the public are of paramount concern to Chicago Public Schools Student Science Fair, Inc. Projects using humans, vertebrates or potentially hazardous biological agents (including microorganisms, recombinant DNA, and and human or vertebrate tissue) raise the greatest risks. For this reason, the plans for such projects must be reviewed by a team of qualified scientists and science teachers before experimentation or design construction begins. The Scientific Review Committee (SRC) serves this purpose. Projects that violate any of the rules for use of humans, vertebrates, microorganisms, recombinant DNA, human or vertebrate tissue, or firearms will be disqualified from the CPS Student Science Fair.

The Endorsement Process

1. Plan the project, check the rules
It is the responsibility of the teacher/sponsor working with the student to evaluate the research plan for any possible risks involved in order to ensure the health and safety of the student researcher, the test subjects and the public. The rules and guidelines on the following pages guide the student’s project planning to produce a safe procedure for all concerned. These guidelines also help the student decide whether the project needs to be checked and approved (or endorsed) by the SRC. Projects (including use of humans, vertebrates, microorganisms, recombinant DNA, human or vertebrate tissue and firearms) most likely require an endorsement.

2. Request an endorsement = Ask for permission
To make sure the proposed project using humans, vertebrates or potentially hazardous biological agents is safe, the SRC needs to review the project details that pertain to safety risks and precautions BEFORE the student begins the experiment or design construction. On the endorsement request form the student explains the potentially hazardous aspects of the proposed project and what precautions are in place to prevent harm. Projects conducted under the supervision of a professor or scientist at a university, hospital or research facility must submit endorsements prior to beginning – must be received by SCR by October 16, 2015. Request for Use of Firearms Endorsement with all documents- must be received by the SRC by October 30, 2015. All endorsement requests which do not fall under the exception rule or use firearms must be received the SCR by November 13, 2015. Endorsements must be typed. Requests can be made in two ways. The endorsement requests can be accessed online at www.cssf.org, saved, printed, scanned and sent to the indicated email, or two copies of the completed typed request for endorsement form can be sent to the SRC committee member specified on the appropriate form (pages 63 - 76 of this handbook).

3. Review of the project plan
The SRC reviews the procedures and precautions on the request form. If the project is safe, the SRC will sign and stamp the form indicating they endorse the project. With this signature, the request form then becomes the endorsement. If the project is not safe the SRC will contact the student to notify him/her of the problem and that the project is not approved to begin experimentation or design construction. At this time the student and SRC can discuss safe alternatives. The student may then submit a new request for endorsement with the necessary revisions. The SRC will send back to the teacher/sponsor via GSR one of the two endorsements. The signed and stamped (in blue) endorsement must accompany the student’s Research Summary at all science fairs. The other copy will be kept in SRC records.

4. Endorsement, then experiment
When the student has the SRC’s signed and stamped endorsement the student may then begin the experiment or design construction as it has been assured to be safe for the student, the test subjects and the public.

Disqualification
Projects that violate any of the rules for use of humans, vertebrates, microorganisms, recombinant DNA, human or vertebrate tissue, or firearms will be disqualified from the CPS Student Science Fair. The purpose of the endorsement process is to detect and resolve unsafe projects and rule violations BEFORE a student puts anyone at risk. If your project needs an endorsement and does not have one it will not be allowed to participate in Science Fair. Should an unendorsed project mistakenly progress through a school fair or Regional Network Fair, it will not be allowed to be exhibited at the City Science Fair.
SAFETY SHEET
The Illinois Junior Academy of Science

Directions: The student is asked to read this introduction carefully, fill out the bottom of this sheet. The science teacher and/or advisor must sign in the indicated space. By signing this sheet, the sponsor assumes all responsibilities related to this project.

Safety and the Student: Experimentation or design may involve an element of risk or injury to the student, test subjects and to others. Recognition of such hazards and provision for adequate control measures are joint responsibilities of the student and the sponsor. Some of the more common risks encountered in research are those of electrical shock, infection from pathogenic organisms, uncontrolled reactions of incompatible chemicals, eye injury from materials or procedures, and fire in apparatus or work area. Countering these hazards and others with suitable controls is an integral part of good scientific research. In the chart below, list the principal hazards associated with your project, if any, and what specific precautions you have used as safeguards. Be sure to read the entire section in the Policy and Procedure Manual of the Illinois Junior Academy of Science entitled "Safety Guidelines for Experimentation" before completing this form.

<table>
<thead>
<tr>
<th>Possible hazards</th>
<th>Precautions taken to deal with each hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Please check off any other possible endorsements needed. Include these documents in your paper and on your board.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Checkboxes marked:]

- [ ] Human as Test Subjects – for any projects involving humans—even surveys.
- [ ] Microorganism-for any projects involving bacteria, viruses, yeasts, fungi or protozoa
- [ ] Non-Human Vertebrates -for any projects involving fish, amphibians, reptiles, birds or mammals
- [ ] Tissue Culture-for any projects involving growing eukaryotic tissues or cell cultures
- [ ] Recombinant DNA-must be conducted in a registered research laboratory under professional supervision
- [ ] Use of Firearms – including all required documents
- [ ] Letter from institution where research was done or IJAS SRC-if an exception to the IJAS rules has been granted.

SIGNED

Student Exhibitor(s)

SIGNED

Sponsor *

*As a sponsor, I assume all responsibilities related to this project.

This Sheet Must Be Typed and This form must be displayed on the front of the exhibitor's display board. It may be reduced to half a sheet of paper; 8.5 inches (vertical) X 5.5 inches (horizontal). Print at 65% reduction.
Reference List Format

The correct style to use for citing references in the Reference List section is discussed in detail in the most current Publication Manual of the American Psychological Association, 6th Edition (APA style). Be careful to follow the exact punctuation, indentation, and format shown in the samples. The Reference List must be double-spaced. Note: If using the APA Publication Manual, all example references are single-spaced to save space in the Publication Manual. The Reference List should be alphabetized according to the first letter of each entry. Entries should be formatted using a hanging indent. Entries should begin flush left and the second and all subsequent lines should be indented. Italics are preferred over the use of underlining. The abbreviation for Page(s), p. or pp. is not used except in references to newspapers. Electronic sources must provide the date the information was retrieved, and also the name and/or address of the source.

The following are examples of how to cite a reference in the Review of Literature

1. One method of citing a direct quote in the research paper should be in the form: She stated, “The placebo effect, which had been verified in previous studies, disappeared when behaviors were studied in this manner” (Miele, 2001, p.276), but she did not clarify which behaviors were had been studied.

2. A paraphrasing of the text should be in one of the following forms: as Smith (2002) demonstrated... as has been demonstrated (Smith, 2002).

Sources of Information

▼ Books

Book - One author:


Book - Multiple authors:

When a work has between two and six authors, cite all authors. When a work has more than six authors cite the first six authors followed by "et al." to indicate the remaining authors.


Book - Corporate author:


Book - Edited volume:


Book - No author:


Book - Work in an anthology:


▼ Journals-Magazines-Newspapers

Articles in journals or magazines with continuous pagination:


Articles in journals or magazines with non-continuous pagination:
Because pagination begins anew with each issue of the journal, it is necessary to include the issue number in italics followed by the volume number in parentheses, if applicable. Note that there is a comma between the issue number and the page numbers, but no comma between the italicized volume number and the issue number.

Daily Newspaper article:

Daily Newspaper article (no author):

Articles in weekly periodicals:

Articles in monthly periodicals:

▼ Other Sources

Encyclopedia:
New York: Americana Corporation.

Entry in an Encyclopedia:

Encyclopedia article, CD-ROM:

Basic form
Author/editor (if given). (Date). Title of material accessed. In Source. Retrieved Publication medium, edition or version (if relevant). Location: Name of Producer.

Example with author:

Example without author:

Film or videotape:
(Available from the American Psychological Association, 750 Second Street, Boston, MA 73002-4224).

Interviews – Published:
Interviews- Unpublished:
Unpublished interviews do not need a reference page entry because they are what the Publication Manual of the APA calls "personal communications" and so "do not provide recoverable data."


Recording:

Electronic Sources
Electronic formats can be found at: http://www.apa.org/science/pubs.html

World Wide Web, Home page/Secondary page:

Basic form
Author/editor (if known). (Revision or copyright date, if available). Title of page. Publication, Page number(s). Retrieved Date, from Protocol: Site/Path/File

Example

Periodical – Electronic:

Basic form

Journal article - Electronic:

Basic form
Author. (Date). Title. Journal Title, volume, paging. Retrieved Date, from URL

Example

Magazine article - Electronic:

Basic form
Author. (Date). Title. Magazine Title, volume (if given), paging. Retrieved Date, from URL Protocol: Site/Path/File

Example

Daily Newspaper article – Electronic:

Basic form
Author. (Date). Title. Newspaper Title. Retrieved Date, from URL Protocol: Site/Path/File

Example
Newsgroup article - Electronic:

Basic form
If the author's name is available list it last name first. If only a screen name is available, use the screen name. Provide the exact date of posting. Follow the date with the subject line of the message. Do not italicize it. Provide any identifier for the message in brackets after the title. Finish the reference with Message posted to followed by the address of the newsgroup. Note that the protocol is news.

Example

Personal communication - Electronic:

Basic form
Communicator (personal communication, Date)

Example
Omar, B.W. (personal communication, June 5, 2005)

APA Resource Websites
These materials will introduce you to APA documentation, step-by-step instructions, Format, Citations, and Reference Lists.
http://www.apastyle.org/learn/quick-guide-on-references.aspx#Websites
http://www.stylewizard.com/apa6index.html
http://www.noodletools.com
http://www.easybib.com
http://www.rapidcite.com
http://www.citationmachine.net
http://www.cws.illinois.edu/workshop/writers/citation/apa/index.html
http://owl.english/purdue.edu/
http://www.zotero.org/
http://citationmachine.net/index2.php
The Effects of Sunlight on Plants

(title)

Botany

(category)

Experimental Investigation

(type of investigation)

Signature of Sponsoring Teacher

Signature of School Science Fair Coordinator

John Smith
1234 Main Street
Chicago, IL 60601
Riverside School
Grade 9
CHECKLIST FOR THE PHYSICAL ARRANGEMENT OF THE SCIENCE PROJECT PAPER
(Abstract, Safety Sheet, Endorsements, & Research Summary)
ALL ITEMS MUST BE TYPED

☐ ABSTRACT
  ☐ Paper and a copy must be displayed on front of display board
  ☐ Three (3) paragraphs with headings: Purpose, Procedure, and Conclusion
  ☐ Typed single-spaced, 200 words or less
  ☐ Check appropriate box - either Experimental or Design Investigation
  ☐ Exhibit number in the upper right corner if going to the city fair

☐ SAFETY SHEET
  ☐ Paper and a copy must be displayed on front of display board
  ☐ Lists possible hazards, precautions described
  ☐ If no hazards were possible a statement indicating this is included
  ☐ Signed by student and sponsor
  ☐ Exhibit number in the upper right corner if going to the city fair

☐ APPROPRIATE ENDORSEMENTS AND ATTACHMENTS (If applicable)
  ☐ Paper and a copy must be displayed on front of display board
  ☐ Endorsement signed and stamped by the Scientific Review committee member
  ☐ Signed by student and sponsor
  ☐ All pages of completed endorsement and proper documentation is attached, if necessary
  ☐ ISEF approval forms - if applicable
  ☐ Exhibit number in the upper right corner if going to the city fair

☐ TITLE PAGE OF RESEARCH SUMMARY
  ☐ Formatted as on page 56 and indicate type of investigation either Experimental or Design
  ☐ Approval signed by both the sponsor and school coordinator
  ☐ Exhibit number in the upper right corner if going to the city fair

☐ TABLE OF CONTENTS
  ☐ Project title and exhibitor's last name typed at the top left corner
  ☐ Pagination is accurate

☐ ACKNOWLEDGMENTS
  ☐ Credit is given to those who have helped with the research

☐ PURPOSE AND HYPOTHESIS
  ☐ States precisely what the investigation was attempting to discover
  ☐ Hypothesis is present

☐ REVIEW OF LITERATURE
  ☐ Provides information that supports the hypothesis and if necessary, the procedure
  ☐ Provides adequate background information about the topic
  ☐ Use of third person is evident
  ☐ Logical and/or related grouping of information
  ☐ Accurate spelling, grammar, quotations and citations and page set-up
  ☐ Parenthetically cited.
☐ MATERIALS AND METHODS OF PROCEDURE
☐ All equipment and materials are listed
☐ Drawings and photographs are present if they enhance and clarify the project
☐ Step-by-step, chronological procedures are present and replicable
☐ A control or comparison group is present and appropriate
☐ Number of trials within each test group is adequate
☐ Control of variables is evident

☐ RESULTS
☐ All data is presented, including results inconsistent with the hypothesis, if applicable
☐ Data and calculations are clear and accurate
☐ Data is quantitative and correct units of measurement (metric) are used
☐ Data is organized into clear & informative tables or charts with accompanying graphs
☐ Effect of experimental error was estimated and considered

☐ CONCLUSIONS
☐ Evaluation and interpretation of data is present
☐ Refers back to purpose and hypothesis
☐ Answers the original question
☐ Is valid and limited to the results of the experiment

☐ REFERENCE LIST
☐ References in this list are actually cited in the paper
☐ References from a variety of at least 12 sources and are current (copyright within the last seven years)
☐ Reference list is alphabetical
☐ Proper APA format is used for all references
☐ Titled “Reference List” or “References Cited” not “Bibliography”

☐ NUMBER OF PAPERS REQUIRED
☐ Nine (9) copies of the Science Project Paper are needed to register for the City Science Fair

☐ OTHER REQUIREMENTS
☐ Science Project Paper clearly and concisely explains the project in short, simple sentences
☐ Project title & exhibitor’s last name typed at top left corner of all pages after Table of Contents
☐ Typed double-spaced, one inch margins on all sides, single-sided
☐ All pages are numbered and referenced in the Table of Contents
☐ Standard type font and size (ex. Times New Roman 12- point font)
☐ Science Project Paper (Abstract, Safety Sheet, and Research Summary) is no more than 30 pages (33 if an endorsement is included)
☐ Paper is well typed, with correct spelling, grammar, punctuation and consistent point of view
☐ Indicate Experimental or Design Investigation on all forms and pages were required
Estimating Experimental Error

Science is all about measurement. In fact, you could define science as a system for measuring the world around you and drawing conclusions from those measurements. It is a fundamental scientific truth that no measurement is ever 100% accurate. There is always some error. When designing an experiment, it is important to understand where measurement errors are likely to occur and how to reduce them as much as possible. Measurement errors may come from the person doing the measuring, from variables, or from unidentifiable random error. In order to draw valid conclusions from measurement data, a scientist must understand how measurement error affects those conclusions.

Here’s a simple example:
You are trying to determine whether two metal rods expand by different amounts when heated. You design an experiment to measure the expansion of these rods. You take three measurements and calculate the average expansion for each rod. Here is the data (in micrometers):

<table>
<thead>
<tr>
<th></th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>AVG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal Rod #1</td>
<td>558</td>
<td>542</td>
<td>568</td>
<td>556</td>
</tr>
<tr>
<td>Metal Rod #2</td>
<td>543</td>
<td>551</td>
<td>556</td>
<td>550</td>
</tr>
</tbody>
</table>

After looking at this data, you might be tempted to conclude that Rod #1 expands more than Rod #2. Would your conclusion change if you knew that your measurement error for the experiment was $\pm 5$ micrometers? Let’s take a look... If that error ($\pm 5$) is applied to the two averages, you would have a range instead of a single value. These ranges would be:

- **Metal Rod #1** Average: $556 \pm 5 \longrightarrow \text{Range: 551 – 561}$
- **Metal Rod #2** Average: $550 \pm 5 \longrightarrow \text{Range: 545 – 555}$

If you were to plot these ranges on a number line, you would see that they overlap... the “true” expansion of Rod #1 could be as low as 551 while the “true” expansion of Rod #2 could be as high as 555. In other words, you cannot conclude, based on the data you collected, that there is any difference in the expansion of the two rods. The difference that you do see in the data is due to chance, not to any real difference in the metals.

What if the measurement error for the experiment was $\pm 2$ micrometers? The ranges would then be:

- **Metal Rod #1** Average: $556 \pm 2 \longrightarrow \text{Range: 551 – 558}$
- **Metal Rod #2** Average: $550 \pm 2 \longrightarrow \text{Range: 545 – 552}$

In this case, the ranges do not overlap. You can conclude with some confidence that the two metal rods do, in fact, expand differently when heated.

Here are some questions you may wish to consider when designing your science fair project:

- **How can I improve the precision of my data?**
- **How can I improve the accuracy of my data?**
- **Is there too much variability in my data?**
- **Can I reduce my measurement error by: Collecting more data? Exercising better control of the measurement process? Exercising better control of the experimental variables?**

The following websites provide more information on estimating experimental error:

Science Buddies - summarizing your data
http://www.sciencebuddies.org/science-fair-projects/project_data_analysis_summarizing_data.shtml

Science Buddies - variation and standard deviation

IIT IPRO Science Fair Extravaganza at http://sciencefair.math.iit.edu/analysis/
Correct SI Metric System Usage

SI is the symbol for the Système International d'Unités, the modernized version of the metric system that the USA and other nations have agreed to use. (Do not abbreviate it as S.I.)

This list is provided to point out the correct way to use the metric system and to show many of the incorrect examples of its usage that may be given on package labels and in other printed matter. These correct ways to use SI are set by the international standards that define the SI.

General Guidelines:

1. The short forms for SI units (such as mm for millimeter) are called symbols, not abbreviations.
2. SI symbols never end with a period unless they are the last word in a sentence.
   - **RIGHT:** 20 mm, 10 kg
   - **WRONG:** 20 mm., 10 kg.
3. SI symbols should be preceded by digits and a space must separate the digits from the symbol.
   - **RIGHT:** It was 300 mm wide. The millimeter width was given.
   - **WRONG:** It was 300 mm wide. The mm width was given.
4. Symbols always are written in the singular form (even when more than one is meant).
   - **RIGHT:** 1 mm, 500 mm, 1 kg, 36 kg
   - **WRONG:** 500 mms, 36 kgs
   - **BUT:** It is correct to pluralize written-out metric unit names: 25 kilometers, 250 milliliters
5. The symbol for a compound unit that is a quotient of two units is indicated by a solidus or by a negative exponent.
   - **RIGHT:** km/h or km·h⁻¹
   - **WRONG:** kmph or kph (do not use p as a symbol for “per”)
   - **BUT:** It is correct to say or write “kilometers per hour”.
6. The meaning of an SI symbol can be changed when substituting a capital letter for a lower case letter.
   - **RIGHT:** mm (for millimeter, which means 1/1000 of a meter)
   - **WRONG:** MM or Mm (M is the prefix for mega, which means one million; a megameter is a million meters)

Note: A 5K race would be a five Kelvin race, while a 5k race would be a five kilo race, neither of which would be accurate. Kilometer should be pronounced KILL-oh-meet-ur, not KILL-AHM- it-ur.

The information above was adapted from the U.S. Metric Association Website, http://www.metric.org. Students are encouraged to visit this Website for more information.

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<table>
<thead>
<tr>
<th></th>
<th>▼ For</th>
<th>▼ Correct Usage</th>
<th>▼ Incorrect Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>kilometer</td>
<td>km</td>
<td>Km, km., KM, kms, K, k</td>
<td></td>
</tr>
<tr>
<td>meter</td>
<td>m</td>
<td>M, m.</td>
<td></td>
</tr>
<tr>
<td>millimeter</td>
<td>mm</td>
<td>Mm, mm., MM</td>
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</tr>
<tr>
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<td>L or l</td>
<td>L., l.</td>
<td></td>
</tr>
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<td>mL, ml, mL, ml, mls</td>
<td></td>
</tr>
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</tr>
<tr>
<td>gram</td>
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<td></td>
</tr>
<tr>
<td>microgram</td>
<td>μg</td>
<td>mcg</td>
<td></td>
</tr>
<tr>
<td>hour</td>
<td>h</td>
<td>hr, hrs, HR, h, HR, HRS.</td>
<td></td>
</tr>
<tr>
<td>second</td>
<td>s</td>
<td>sec, S, SEC, sec, s, S.</td>
<td></td>
</tr>
<tr>
<td>cubic centimeter</td>
<td>cm³</td>
<td>cc</td>
<td></td>
</tr>
<tr>
<td>kilometer per hour</td>
<td>km/h</td>
<td>KPH, kph, kmph, km/hr</td>
<td></td>
</tr>
<tr>
<td>kilohertz</td>
<td>kHz</td>
<td>KHz, KHZ, Khz</td>
<td></td>
</tr>
<tr>
<td>megahertz</td>
<td>MHz</td>
<td>MHZ, Mhz</td>
<td></td>
</tr>
<tr>
<td>hectopascal</td>
<td>hPa</td>
<td>HPA, Hpa, Hpa, mb</td>
<td></td>
</tr>
<tr>
<td>kilopascal</td>
<td>kPa</td>
<td>KPa, KPA, Kpa</td>
<td></td>
</tr>
<tr>
<td>degree Celsius</td>
<td>°C</td>
<td>C, deg CS</td>
<td></td>
</tr>
<tr>
<td>kelvin</td>
<td>K</td>
<td>°K, deg K</td>
<td></td>
</tr>
</tbody>
</table>
# CHICAGO PUBLIC SCHOOLS STUDENT SCIENCE FAIR JUDGING RUBRIC FOR EXPERIMENTAL PROJECTS

## (A-G) SCIENTIFIC METHOD: Overall Impression of Project (53 point maximum)

<table>
<thead>
<tr>
<th>A</th>
<th>Knowledge Gained</th>
<th>8 or 7 or 6</th>
<th>Exhibits a thorough presentation and/or correct responses to questions. The student has acquired scientific skills.</th>
<th>5 or 4 or 3</th>
<th>Is somewhat familiar with topic area but cannot answer all questions effectively. Demonstrates minimal acquired scientific skills.</th>
<th>2 or 1 or 0</th>
<th>Demonstrates little of no knowledge gained nor scientific skills.</th>
<th>Points Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Scientific Approach</td>
<td>8 or 7 or 6</td>
<td>Has a well defined problem and uses a logical, orderly method for solving the problem. Problem was solved using scientific principles.</td>
<td>5 or 4 or 3</td>
<td>Has an adequately defined problem OR attempted to follow scientific method, but not both.</td>
<td>2 or 1 or 0</td>
<td>Little or no evidence of scientific method used.</td>
<td>Points Awarded</td>
</tr>
<tr>
<td>C</td>
<td>Experimental Approach: Variable</td>
<td>8 or 7 or 6</td>
<td>Single variable was tested for each experimental group; all other variables were controlled or accounted for.</td>
<td>5 or 4 or 3</td>
<td>Attempt was made at controlling variables but not all variables were accounted for.</td>
<td>2 or 1 or 0</td>
<td>Variables were not controlled.</td>
<td>Points Awarded</td>
</tr>
<tr>
<td>D</td>
<td>Experimental Approach: Control Group</td>
<td>8 or 7 or 6</td>
<td>Method was appropriate and effective. A control or comparison group was in evidence.</td>
<td>5 or 4 or 3</td>
<td>Method was inappropriate, but an attempt for control or comparison was made.</td>
<td>2 or 1 or 0</td>
<td>Experimentation was not performed (i.e., was a demonstration or exhibit). No control group was present.</td>
<td>Points Awarded</td>
</tr>
<tr>
<td>E</td>
<td>Reliability Of Data</td>
<td>7 or 6</td>
<td>Data collected is numerical and metric, if applicable. Repeated trials provide for more than adequate data. Data is reliable.</td>
<td>5 or 4 or 3</td>
<td>Data collected is numerical and metric, if applicable OR data collected is adequate, but not both.</td>
<td>2 or 1</td>
<td>Little or no data collected.</td>
<td>Points Awarded</td>
</tr>
<tr>
<td>F</td>
<td>Validity of Conclusion</td>
<td>7 or 6</td>
<td>Conclusion is consistent with data and/or observations. Conclusion is based on data collected.</td>
<td>5 or 4 or 3</td>
<td>Conclusion is present but inconsistent with data.</td>
<td>2 or 1</td>
<td>No conclusion or no valid conclusion present.</td>
<td>Points Awarded</td>
</tr>
<tr>
<td>G</td>
<td>Estimating Experimental Error</td>
<td>2</td>
<td>Measurement error affecting the conclusion has been considered.</td>
<td>1</td>
<td>Some measurement error affecting the conclusion has been considered.</td>
<td>0</td>
<td>Experimental error has not been considered.</td>
<td>Points Awarded</td>
</tr>
<tr>
<td>H</td>
<td>Originality</td>
<td>5 or 4</td>
<td>Demonstrates a novel approach and/or idea.</td>
<td>3 or 2</td>
<td>Some creativity and/or originality demonstrated.</td>
<td>1 or 0</td>
<td>No originality demonstrated.</td>
<td>Points Awarded</td>
</tr>
</tbody>
</table>

## (I & J) Display: (8 point maximum)

| I  | Information | 4 | Gives complete explanation of the project. Display includes graphics, charts, or pictures. | 3 or 2 | Adequate information if present, but not thorough. | 1 or 0 | Missing pertinent information. | Points Awarded |
| J  | Artistic Qualities | 4 | Backboard is neat, organized, and appealing. | 3 or 2 | Backboard is neat, but not well organized. Spelling errors are present. | 1 or 0 | Backboard was carelessly prepared, sloppy. | Points Awarded |

## (K & L) Oral Presentation: (8 point maximum)

| K  | Presentation Quality | 4 | Clear presentation; concisely summarizes the project. Information is relevant and pertinent. | 3 or 2 | Information given is adequate, but presentation is difficult to follow. | 1 or 0 | Information jumbled, irrelevant; presentation unclear. | Points Awarded |
| L  | Dynamics | 4 | Speaks fluently with good eye contact; polite, dynamic, and interested in their project. | 3 or 2 | Student was polite and interested in their project. Moderate eye contact, relied heavily on note cards. | 1 or 0 | No eye contact, read from note cards. Did not seem interested. | Points Awarded |

Student(s):  
Project Number:  
Total of A-L =  
(Transfer total to other side, top right.)
| M | Abstract | 3 | Abstract present; contains a summary of the purpose, procedure, and conclusion. | 2 or 1 | One or two parts of the abstract is/are missing. | 0 | Abstract is missing. | Points Awarded |
| N | Safety Sheet | 2 | Safety sheet is present and all safety hazards have been identified. | 1 | Safety sheet is present, but not all hazards have been identified. | 0 | Safety sheet is not present. | Points Awarded |
| O | Title Page/Table Of Contents | 2 | Both are present. | 1 | One is missing. | 0 | Both are missing. | Points Awarded |
| P | Purpose and Hypothesis | 2 | The problem has been defined and a prediction has been made. | 1 | The problem has been defined, but a prediction has not been made. | 0 | Neither the problem or a prediction are present. | Points Awarded |
| Q | Review Of The Literature (R. of L.) | 5 or 4 | Review of Literature is thorough, adequately cited within R. of L., and pertinent to topic using APA format. | 3 or 2 | Review of Literature is adequate and pertinent, but citations are inadequate, and/or did not follow APA format. | 1 or 0 | Little or no use of citations and/or material is irrelevant to topic. | Points Awarded |
| R | Materials | 2 | Materials are listed and measurements are in metric, if applicable. | 1 | Not all materials are listed or measurements are not in metric, where applicable. | 0 | No materials are listed. | Points Awarded |
| S | Procedure | 2 | Procedure is easily followed; all steps included. | 1 | Procedure is present, but not complete or confusing. | 0 | Procedure is missing. | Points Awarded |
| T | Results | 4 or 3 | Results are organized in tables or graphs; easily read by someone not familiar with the work. Data is quantitative; explanations are given when needed. | 2 or 1 | Results are less organized, not quantitative, difficult to understand. | 0 | Results are not present. | Points Awarded |
| U | Conclusion | 3 | A concise evaluation and interpretation of the data and/or results; referred to purpose and hypothesis. | 2 or 1 | Conclusion is present, but is not consistent with data collected. | 0 | No conclusion present. | Points Awarded |
| V | Reference List | 3 | Quality and quantity of sources is adequate for topic. Sources listed are cited within R. of L. using APA format. | 2 or 1 | Quality and quantity of sources is less than adequate, or sources nor all cited within R. of L., or APA format was not followed. | 0 | No literature cited present. | Points Awarded |
| W | Conventions | 2 | Good grammar and spelling are evident. | 1 | Some spelling and grammar mistakes are evident. | 0 | Numerous spelling and grammar mistakes are present. | Points Awarded |

Student(s): __________________________________________ Project Number: _______ Please transfer total points to the Scantron sheet. Total Points= _______ Maximum 99