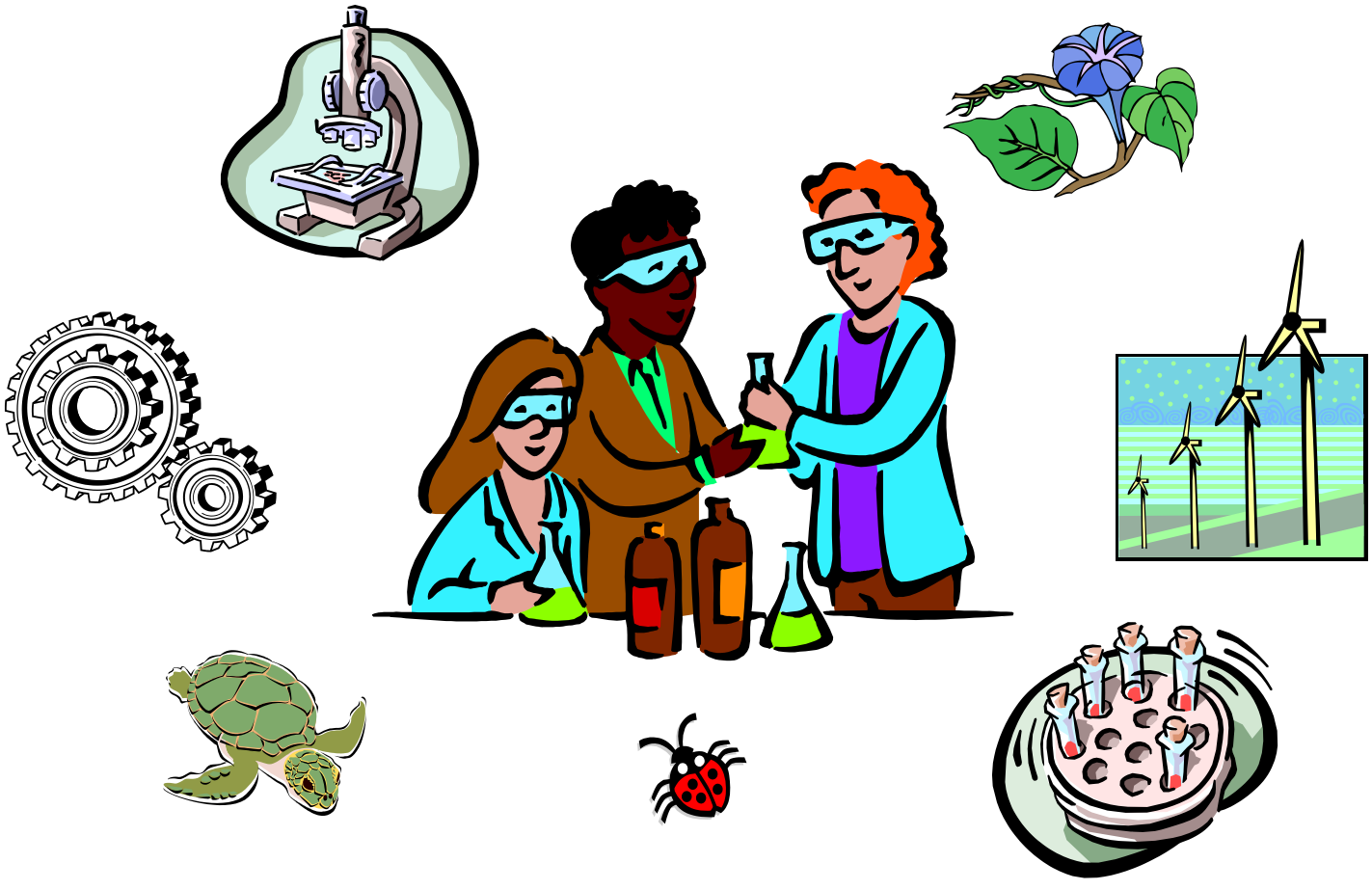
EXPERIMENT PROJECT

6TH – 12TH GRADE

Student Information Packet



long beach unified school district

SECONDARY

SCIENCE & ENGINEERING FAIR

STUDENT INFORMATION PACKET

Revised 2009, 2011, 2016

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SCIENCE & ENGINEERING FAIR STUDENT INFORMATION PACKET INTRODUCTION

You are surrounded by science. Everything uses some form of science to make it work. Even the chair you sit on was made by a person using tools to build it based on knowledge of science and technology. How did they know what shape to make the saw and how sharp the teeth needed to be to cut wood? How did they know to make one saw for wood and a different one for metal? Why does the wood-cutting saw have larger teeth than the metal-cutting saw?

Science is asking questions and finding answers. A science project, simply put, is the process of asking a question about something you are interested in, for which you don't already know the answer, and then hypothesizing (best-guessing) what the answer might be, researching for information on that topic, experimenting, inventing, surveying, etc., analyzing your results, and coming to a conclusion!

The purpose of a Science & Engineering Fair is to provide a focus for you, the student, to apply skills and concepts you have learned in science as well as in math, reading, writing, and technology. It gives you a place to use these skills creatively in your own way.

What your accomplishment will mean for you:

- ★ Developing self-reliance
- ★ Gaining self-confidence
- ★ Acquiring organizational skills
- ★ Knowing what the scientific method is and how it can help you.
- ★ Having your work viewed and recognized by your school and community

Everything you need to know about doing a great science project is inside this packet. You'll be discussing the contents in class. Approximately every two weeks between now and your school Science & Engineering Fair, your teacher will give you a **Student Timeline for Science & Engineering Fair Project** sheet to check your science project's progress. The timeline sheet is designed to keep you on target, and keep your teacher and parents informed so that they can help you if needed

You must keep this packet, timeline sheets, letters home to parents, and all other information in a separate folder. Your Science & Engineering Fair folder should be kept at home unless your teacher asks you to bring it to school.

You will find the Science & Engineering Fair to be an exciting and rewarding experience. Let's make this year's fair the best ever!

HELPFUL HINTS FOR STUDENTS

- Start EARLY; don't wait until the last two weeks before it is due.
- Plan it out. It will be much more fun if you spread the time out over several days per week or several weekends, and you won't have to race to get it done!

  It might look like this:

  Week 1 – Decide on your PROBLEM – what you want to solve.

  Week 2 – Conduct your preliminary research by reading information about your topic, visiting libraries, universities, making contact with other sources, and checking out web sites.

  Week 3 – Work the "steps" of your project.

  Week 4 – Think about the results and make your charts or graphs.

  Week 5 – Write your report.

  Week 6 – Make your display.

- The goal is that you learn to use "the scientific method" or "the engineering design process" through direct experience.
- Check with your parent or teacher if you want to use a web site for research. Not all web sites give correct information. *Remember:*
  - Anyone can create a web site; this does not mean its information is correct!
  - Make sure the web site is run by a large, recognized group such as a college or organization.
  - DOT "org", "gov" or "edu" are generally trustworthy for accuracy of content.
- What is an acceptable Science & Engineering Fair project?
  - Something that answers a question to which you do not know the answer
  - Something you can figure out yourself
  - Something you can change somehow, add another variable, and then predict the outcome. That's an experiment!
- What is NOT an acceptable Science & Engineering Fair project?
  - Reproducing results found on the web is *not* an experiment; it's a reproduction.
  - A demonstration is not an experiment (i.e., volcano).

EXPERIMENTAL PROJECT

DEVELOPING A SCIENCE & ENGINEERING FAIR EXPERIMENTAL PROJECT USING THE SCIENTIFIC METHOD

For 6th through 12th Grade

Conducting an experiment means you will use the **The Scientific Method** as outlined below to solve a problem for which you do not know the answer. Each step of The Scientific Method is essential. Read the **Secondary Experiment Written Report Content** page in this packet before beginning your Science & Engineering Fair project experiment.

I. QUESTION / PROBLEM

State the problem as *one sentence in the form of a question*. Choose a topic in which you are interested in learning more about.

II. PRELIMINARY RESEARCH

Conduct your research at city and college libraries, interview at least one expert in the field, make contact with other resources and people for information, and watch science DVDs/videos. Incorporate prior knowledge.

III. HYPOTHESIS: Form a hypothesis as a one-sentence statement.

The hypothesis is an educated guess – your best guess based on your preliminary research – which answers your question/problem.

IV. EXPERIMENTATION

- **A. Materials:** Plan, collect, and list the materials you will need for your experiment. Be specific about what and how much you use. It is best to borrow, make, or use inexpensive materials.
- **B. Procedure:** Plan and keep track of the steps of your procedure carefully and thoroughly. Diagrams are a must. Conduct your experiment.
- **C. Observe and record data:** Plan how you will record your data. Observe and record what happens during your experiment. Include dates, times, names, responses, measurements, locations, and problems you had.
- **D. Results:** Summarize findings in the form of data tables, graphs, and drawings. Write a narrative explanation of your findings.

V. CONCLUSION

The **conclusion** answers the hypothesis. It is usually two to three sentences and answers the questions: What did you learn from your experiment? Was your hypothesis proven? Why or why not?

SECONDARY EXPERIMENT
WRITTEN REPORT CONTENT

6th - 12th Grade

Scientists always report their research and experiments so that others may benefit from this new knowledge. Some research is reported through published papers while other work is presented at conventions, on TV, or through the Internet. *Your* research will be presented through your written report, a project display, and an oral presentation.

❑ ABSTRACT

The abstract is a concise summary of your whole project. Others can read the abstract if they do not have time to read your full report. The abstract must *not* be more than one page long. It includes your problem, hypothesis, research, experimentation, and conclusion. You will write the abstract *after* your report is complete.

❑ TITLE PAGE

The title page belongs *after* the abstract. The project title must be centered on the page. See the **Written Report Format** sheet for information that needs to be in lower right corner.

❑ PURPOSE

In one short paragraph, tell why you did your project on the topic you chose.

❑ ACKNOWLEDGEMENTS

On one page, say "thank you" to all the people who helped you with your project. Include any family members, teachers, or experts who assisted you with information, materials, or equipment, or participated in some way in your experiment.

❑ TABLE OF CONTENTS

Divide your Table of Contents into sections as indicated on the **Written Report Format** sheet**.** Put the actual page numbers at the bottom of each page *after* you have finished the final copy of your report.

❑ PROBLEM

State the problem in the form of a one-sentence question. Be specific.
Your page numbering begins here.

❑ PRELIMINARY RESEARCH

This section is a summary in essay form of the information you collected about the history and general background needed by the reader to understand your project. It should include any previous research on your topic. Use notes from books, journals, the Internet, magazines, and interviews. If you are required to cite sources within this section, see **Written Report Format for Citing Scientific Research Sources.**

❑ HYPOTHESIS

The hypothesis is an educated guess, based on your preliminary research, which answers the problem or question. The hypothesis is a statement which is generally one sentence long.

WRITTEN REPORT CONTENT continued:

❑ EXPERIMENTATION

Describe the experiment is used to test your hypothesis.

- **MATERIALS**
  Be very specific when listing the materials you used during your experiment. If someone wanted to duplicate your experiment he or she would have to know exactly what to use and how much is needed.

- **PROCEDURE**
  List the steps of the procedure used during the experiment in a detailed and thorough manner. Include dates, times, and locations of the experiment. Charts, maps, diagrams, and photos are helpful.

- **OBSERVE AND RECORD DATA**
  Write about your observations and your recorded data regarding what happened during the experimentation process. Include dates, times, names, responses, measurements, locations, and problems you had.

- **RESULTS**
  The results are a summary of your data. Summarize findings in the form of readable and understandable data tables, graphs, and drawings. See **Examples of Data Tables and Graphs.** Write a narrative explanation of your findings. At the end of your narrative explanation, analyze why you got the results you did. Include all possible variables and errors that may have affected your results.

❑ CONCLUSION

The conclusion answers the hypothesis. It should not add to or take away from the problem or hypothesis. In two to three sentences, answer questions such as: What did I learn from my experiment? Was my hypothesis proven? Why or why not?

❑ APPLICATION / REFLECTION

Explain how your project findings apply to society and/or you personally. Reflect on and write about the benefits of doing the science project.

❑ SOURCES / BIBLIOGRAPHY

List all books, articles, pamphlets, and other communications or sources that you used for writing your preliminary research section. You must have at least five sources, only one of which may be an encyclopedia. College libraries, as well as city libraries, should be used. Interviews with experts in your field of study are encouraged. See **Written Report Format for Sources / Bibliography.**

Rewrite your paper several times to correct errors.
Have someone you trust proofread your report before you make the final copy.

BOXED *topics are part of the rubric criteria for judging. The other parts are used only for grading the written report by the teacher.*

SECONDARY EXPERIMENT
WRITTEN REPORT FORMAT

Each line with a box (❑) in front of it begins a new page in the report.

❑ Abstract

❑ Title page

Title *in middle of page*

In lower right-hand comer:
Last Name, First Name
Grade ___
Period ___
Teacher Name
School Name
Date (include year)

❑ Purpose
❑ Acknowledgements
❑ Table of Contents (with page numbers)
❑ Question / Problem (page numbering starts here)
❑ Preliminary Research
❑ Hypothesis
❑ Experimentation
- Materials
- Procedure
- Observe and Record Data
- Results

❑ Conclusion
❑ Application / Reflection
❑ Sources / Bibliography

OTHER POINTS TO REMEMBER:

- ✓ Type or write on one side of paper.
- ✓ Do not put pages in plastic.
- ✓ Make two copies of your original report: Original to teacher, one copy you keep, second copy to use on display board (if you wish).
- ✓ Put report in a store-bought folder with three brads or rings.
- ✓ Put name, subject, period, date, and teacher's name on front of the folder in *upper right-hand corner.*

1. **The ORIGINAL report goes inside the report pocket on the display board.**
2. **A COPY should be kept at home or on the computer.**

WRITTEN REPORT FORMAT FOR CITING SCIENTIFIC RESEARCH SOURCES

(When used within the report)

Citations are similar to footnotes in English or history papers but are much easier to include. Citations are included only in the Preliminary Research. Scientific citations are placed *within* the paper itself, not at the bottom of the page. Citations are placed *at the end* of a sentence or paragraph that contains the information you gathered from another source.

Rule 1: Cite all sources that refer to information on your species, experiment, or study site.

Rule 2: Cite all sources that back up your conclusions.

Rule 3: Cite anything that brings in a fact not directly taken from your own personal observations or experiment.

Rule 4: When in doubt, cite!

EXAMPLES OF PROPER CITING

(author, date)

White sharks are known to be maneaters (Halstead, 1954)**.** They are the only shark that regularly preys on marine mammals for food. Some scientists believe that great whites attack humans by mistake: the silhouette of a surfer paddling on a surfboard may be mistaken for a seal sunning on the surface (Ellis, ed., 1987).

(editor, date)

VARIATIONS IN SCIENTIFIC CITATIONS

One Author	Example	*(last name only, date)* (Bronowski, 1973)
Two Authors	Example	*(both last names only, date)* (Walker and Maben, 1980)
Three or More Authors	Example:	*(all last names only, date)* (Cochran, Wiles, and Kephart, 1975)
No Authors	Example:	*(abbreviated title, date)* (Insects of Guam, 1942)
Only an Editor	Example:	*(last name only, abbreviation for editor, date)* (Ellis, ed., 1987)
Citing an Expert You Have Spoken to or Corresponded with	Example:	*(last name, "personal communications")* (Collins, pers. commun.)

WRITTEN REPORT FORMAT FOR SOURCES / BIBLIOGRAPHY

Entries in a Sources / Bibliography section of a report are alphabetized by the last name of the author and the date is placed directly afterwards. An entry for which the author is unknown, such as a newspaper article or an unsigned review, is alphabetized by the first word of the title, excluding the articles *A*, *An*, and *The.* Always double-space and *indent the second and succeeding lines of each reference.* Do not number your references and if you have two or more references by the same author, alphabetize them starting with the most recently written paper.

Books

One Author

(last name) (initial) (date) (title) (city) (publisher)
Bronowski, J. 1973. The Ascent of Man. Boston: Little & Brown, Inc. 376 pp.
(total # of pages only)

By Editor

(editor)
Ellis, R. (ed.) 1987. Sharks. New York: Wiley, 256 pp.

2 Authors, Local Agency

Walker, R. G., and A. Maben. 1980. The Feeding Ecology of Bats.
Guam Div. Aquatic & Wildlife Resources. Mangilao, Guam. 44 pp.
(agency) (city) (country) (total # of pages)

Magazines and Scientific Journal Articles

3 Authors, Journal Article

(last name, first initial, then first initial, last names) (date) (title)
Cochran, J. A., Wiles, G. *and* D. Kephart 1975. "Money, Banking, and the Economy". Fortune 34 (4): 47-55.
(vol.) (no.) (exact pages)

No Author, Scientific Bulletin

"Insects of Guam". 1942. Bernice P. Bishop Museum, Honolulu Bull. 17.
(title) (date) (publisher) (bulletin # only)

Newspapers

Basic Entry

(author) (exact day) (title)
Kristof, Nicholas D. 3 Jan. 1985: "Oil Futures Plunge on OPEC Doubt."
New York Times, Dl3.
(publisher) (section #)

Encyclopedia, Dictionary, Atlas

Article Within Encyclopedia

(author) (date) (title) (specific pages within)
Halstead, B. 1954. "Poisonous & Dangerous Marine Animals". Pp. 105-115 in Encyclopedia Britannica Vol. 93 (C. Brown, ed.), New York: Academic Press.
(encyclopedia) (volume) (editor) (city) (publisher)

Dictionary Entry

"Advertisement." Webster's Third International Dictionary. (Because the number of the edition appears in the title, the date is not necessary.)

Atlas Entry

"Hidden Face of the Moon." Times Atlas of the World. 1981 ed.

Nonprint Sources

Video / Film

(director) (date) (title) (actors)
Shatner, William, dir. 1989. Star Trek V: The Final Frontier. With William Shatner, Leonard Nimoy, and DeForest Kelley. Paramount Studios, Hollywood.
(studio) (city)

Computer Materials

Computer Software

(title) (date) (version) (publisher) (city) (format)
SimEarth. l990. Version 2.0. Sunburst Software, Green Valley, CA. CD or DVD

Web Sites

(title) (date) (source)
"How to Produce Award-winning Science Projects". 2005. Nat. Assoc. of Biology Teachers Bulletin Board, NABT.edu.
(Internet address)

Citing "personal communications" with an Expert

(in person, on the phone, in letters or on the Internet)

(full name and title) (date interviewed)
Collins, Dr. Charles 2009. Prof. of Biology, Calif. State Univ., Long Beach, CA
(address of work or home)

EXAMPLES OF DATA TABLES AND GRAPHS

DATA TABLES

Experimentation that produced data in the form of numbers (quantitative data) must be placed in data tables. Data tables are needed in reports so that you can display your observations (data) in a clear, organized form. Several data tables may be included on one page, as long as the format is clear and easy to read.

Data tables should be created on computers. Each table's columns need headings above them (titles). Any units needed (centimeters, seconds, grams, etc.) should appear in the labels, not within the table itself. Rows may also need labels to identify a variable.

Titles for data tables should go *at the top* of each table and include a specific description of the kind of data the table contains. In formal reports, each title should also include the date and location where the data was collected. High school reports working with specific animals or plants should include the scientific as well as the common name. Always remember to underline or put into italics all scientific names.

Table 1. Earth's human population since 1 A.D.

YEAR	POPULATION (in billions)
1	0.25
1600	0.45
1700	0.59
1800	0.90
1900	1.55
2000	6.10

Table 2. The number of brine shrimp found in sections of tubing after the shrimp were exposed to differences in light, pH, or temperature, on October 2, 2009 at Poly High.

VARIABLES	SECTION 1	SECTION 2	SECTION 3	SECTION 4
LIGHT	5 (brightest)	15	68	50 (darkest)
pH	13 (pH 5.5)	37 (pH 6.7)	76 (pH 7.8)	65 (pH 8.6)
TEMPERATURE (°C)	68 (coldest)	64	32	44 (warmest)
CONTROL	23	34	21	37

GRAPHS

Graphs are a perfect way to visually present your data. A data table will show your results in numbers, but is often uninteresting or difficult to interpret. A graph can take the same data, make it eye-catching and easily show large differences in your results. Graphs show comparisons between two or more groups or differences between variables.

A graph cannot stand alone - it must be preceded by a data table. The data table contains exact details from an experiment that a graph often cannot show. They complement each other: one gives the details, one displays the trends.

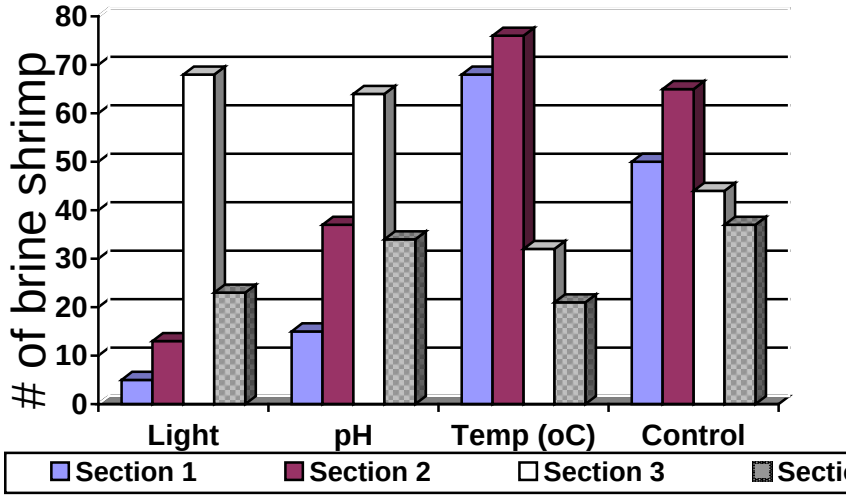
Label both the X and Y axes and include any units necessary (grams, centimeters, etc.). Data from ***dependent variables*** (data that vary as the experiment continues) are placed on the Y axis. Data from ***independent variables*** (data that do not vary during the experiment, such as the days of the week,

experimental group numbers, and time periods) are placed on the X axis.

Graphs must be properly titled. The **formal title** for a graph goes ***at the bottom*** of the graph and like a data table, includes a description of the kind of data the table contains. In formal reports, each title should also include the date and location where the data was collected.

An Example of a BAR GRAPH

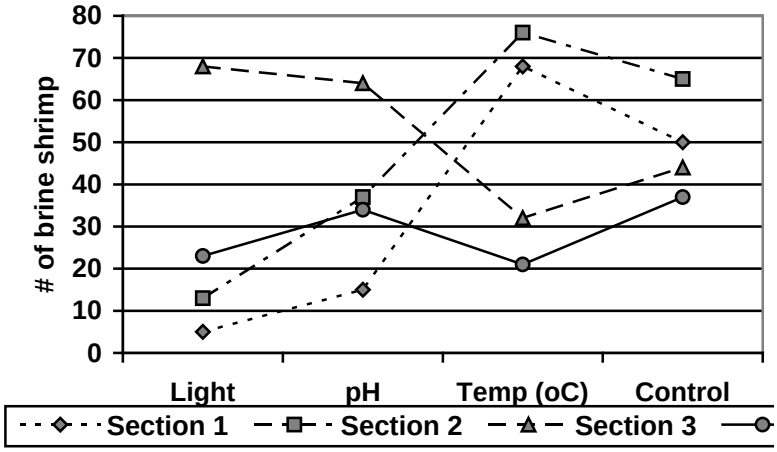
(Three variables and the control are graphed)



The number of brine shrimp preferring various levels of light, pH, and temperature. (See Table 1 for details.)

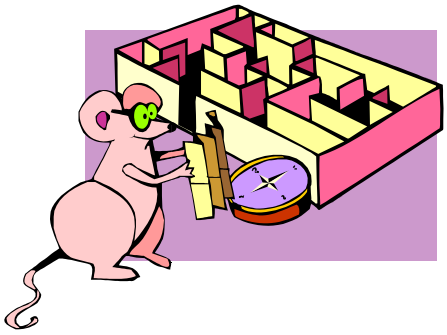
An Example of a LINE GRAPH

(Three variables and the control graphed)



The number of brine shrimp preferring various levels of light, pH, and temperature. (See Table 1 for details.)

NOTE: The preceding examples show three variables graphed. It is suggested that you use only one variable in your experiment unless you have teacher permission. Also, the preceding examples are of a bar and line graph. As you know, there are other types of graphs that you have seen or made in science and other classes. You may select the type of graph(s) you would like to use in your written report.



SECONDARY EXPERIMENT DISPLAY INFORMATION

BACKBOARD MATERIALS

The backboard must be sturdy and stand by itself on a table. Foam core-board and cardboard are the best materials. If you need to cut through the sides of your core-board to make "wings", do not cut all the way through.

COLORS

If you need to paint your backboard, enamel paint works best. Do not use water-based paint. Contact paper may also be used. Use a minimum of three contrasting colors on your board.

LETTERING

Your title and subtitles may be computer-generated or cut from construction paper. Do not freehand the letters. The title letters should be 3-4 inches high. The subtitle letters should be 1-2 inches high. The subtitles, which are mandatory on the display board, are: **Problem, Hypothesis, Procedure, Results and Conclusion**. All items on the display must be glued to the board. Do not use pins, tacks, staples, or tape.

DRAWINGS, PHOTOS AND GRAPHS

Drawings and photos are most useful on the display. Drawings should be drawn in pencil first and then retraced. Drawings should be in color and outlined in thin black felt tip pen. Graphs and charts must be used in the results section. They may be computer-generated. All graphs and charts must have explanatory titles. Graph axes must be labeled.

If you have a camera, you should photograph your **experiment's** progress. A photo of you with your experimental set up is encouraged. All photos must be titled.

DISPLAY DIMENSIONS

1. When backboard (display portion) is flat, it should be 48 inches wide.
2. Side panels ("wings") should be l2 to l8 inches.*
3. Height should be no more than 48 inches.

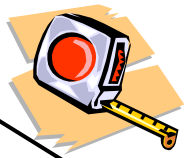
REPORT POCKET

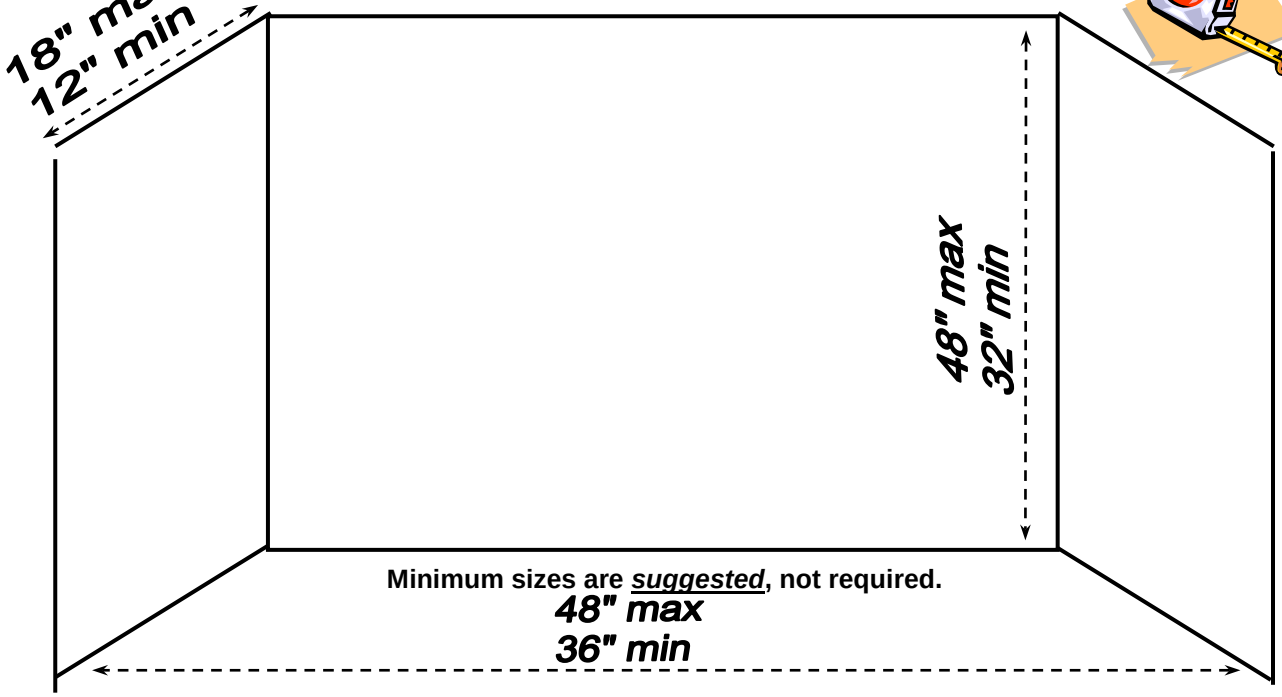
There must be a "pocket" on the display to hold your report.

When you have decided what you are going to put on the backboard (display), lay the unglued display on the floor and look at it carefully. Have family and friends look at it and ask their opinions. Then, you should glue everything into place. Examples of displays will be shown and discussed in class.

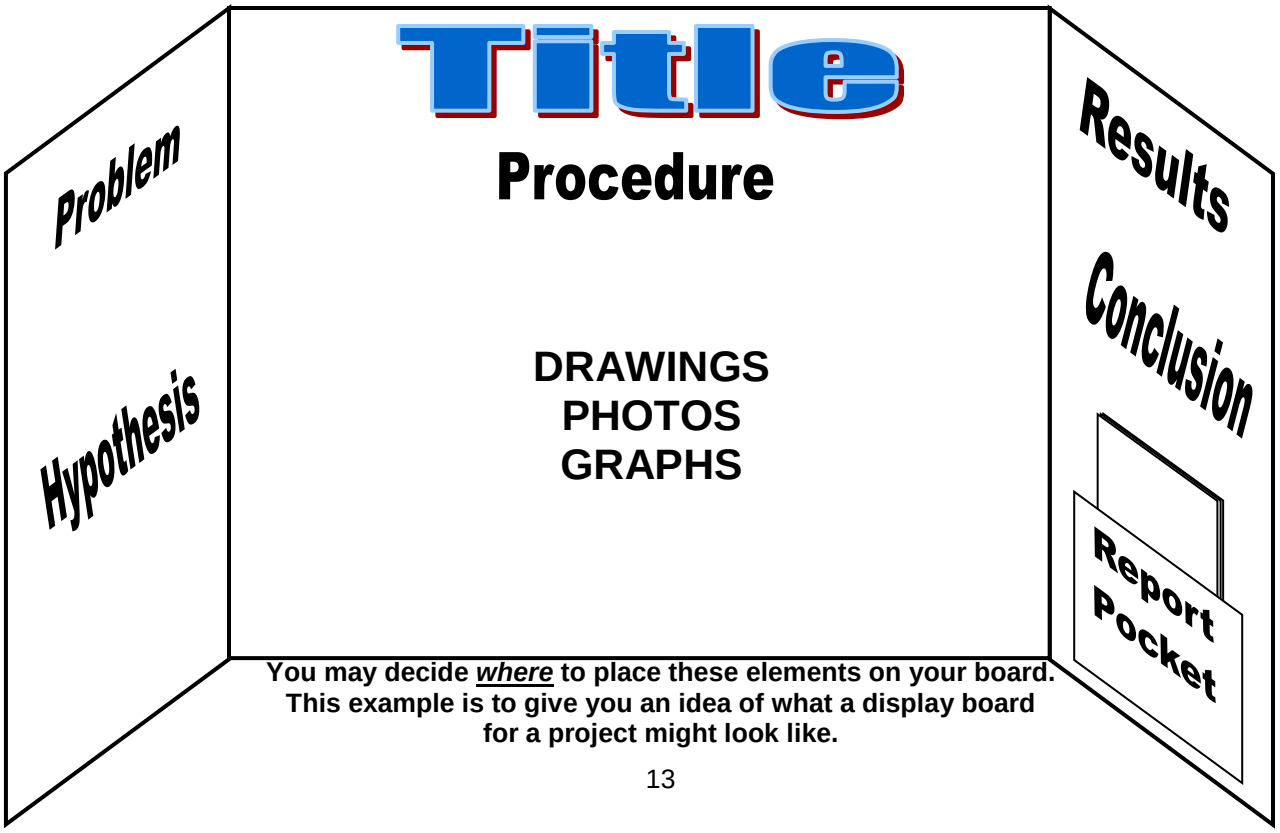
DISPLAY SIZE & SET-UP

FOR SCHOOL SITE AND LBUSD SCIENCE & ENGINEERING FAIRS





Minimum sizes are *suggested*, not required.



You may decide *where* to place these elements on your board. This example is to give you an idea of what a display board for a project might look like.

SECONDARY EXPERIMENT

DISPLAY LABELS

PROBLEM

HYPOTHESIS

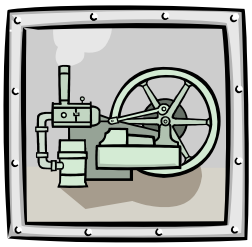
PROCEDURE

RESULTS

CONCLUSION

REPORT

DISPLAY ITEMS



Part of your display should include something that represents the project and should be placed in front of or on the display board. Depending on the type of project you do, the display items may or may not be the focus of the display.

If you cannot decide what to use to represent your project, brainstorm with family, friends, and classmates. Keep in mind that the items you choose will set the tone for your display and must be approved.

No part of your display may pose a safety hazard. Do not include harmful chemicals, bacterial cultures, sharp objects, or any source of heat or flames. No live or preserved animals are allowed at the LBUSD district-level Science & Engineering Fair, at the Los Angeles County Fair, or at the California State Fair.

Some examples of display items are listed below:

- **Equipment or materials** you have built or used as part of your project or experiment (i.e., an incubator, variously shaped kites, a solar oven, a microscope with slides, etc.)
- **Models**
- **Artistic representations** of your topic (i.e., a large paper maché nose for an odor project, toothpick bridges for a physics project, or a collage of leaves for a plant project)
- **Samples or specimens**
- **Simulated items** such as photos, video, and audio taken while working on your project or during your experiment. (Keep in mind that use of extension cords requires special permission.)

There are endless possibilities. Be creative! Put on your thinking cap!

Science & Engineering Fair *Experimental Projects* (6th – 8th Grade)

Rubric for School Site Science & Engineering Fair

	Attempted **1 point**	Proficient **3 points**	Advanced Proficient **5 points**
Problem *(Double Points)* **(x2)**	States the problem as a question that is vague, or as a statement, or addresses an issue to which the student already knows the answer. Shows limited or no connection to a valid scientific or mathematical concept.	States problem as a question, and represents a genuine learning opportunity for the student. Generally addresses a valid scientific or mathematical concept.	States problem as a question, provides evidence that it comes from the student's personal interests or experiences, and represents a genuine learning opportunity for the student. Specifically addresses a valid scientific or mathematical concept, or has a beneficial application to some aspect of society.
Preliminary Research	Uses limited sources from only one type of information resource (e.g., text, encyclopedia, businesses, magazines, catalogs, internet, or interviews), or uses some resources that are not reputable sources. Fails to connect the research to the problem, or material is copied rather than written in the student's own words.	Uses three or more reputable sources, cited correctly. Cites more than one type of information resource. Makes a general connection between the research and the problem in the student's own words.	Uses five or more reputable sources, cited correctly. Cites at least four types of information resources. Makes a clear connection between each source and the problem in the student's own words.
Hypothesis *(Double Points)* **(x2)**	Hypothesis is either not testable or does not connect to the stated problem, or shows no connection to the preliminary research.	Hypothesis is complete (in one sentence), testable, addresses the stated problem, and shows some connection to the preliminary research.	Hypothesis is complete (in one sentence), testable, and clearly addresses the stated problem. Shows a direct connection to their preliminary research.
Procedure & Materials	Experiment is not relevant to the hypothesis or is only performed once. The procedures outlined are seriously incomplete or not sequential, or materials list is missing or incomplete.	Experiment is adequate to test the hypothesis, but may leave some unanswered questions. Performs experiment one or more times. Procedures are outlined in a step-by-step fashion, but there may be 1 or 2 gaps that require explanation. Major materials are listed.	Experiment is a well-constructed test of the hypothesis and is performed several times. Procedures are outlined in a step-by-step fashion that could be followed by anyone without additional explanations. All relevant materials are listed.
Results *(Double Points)* **(x2)**	Does not summarize data clearly. The relationship between the variables is unclear or not discussed. Makes no predictions about what might happen if part of the experiment were changed to better test the hypothesis or answer a further question.	Summarizes the data in a way that clearly describes what was discovered using graphs or charts. Mentions at least one relationship between the variables and gives some analysis of trends/patterns. May attempt predictions about what might happen to the results if part of the experiment were changed to better test the hypothesis or answer a further question.	Summarizes the data in a way that clearly describes what was discovered using graphs or charts. Discusses relationships between the variables and thoroughly analyzes trends/patterns. Makes well-reasoned predictions about what might happen if part of the experiment were changed to better test the hypothesis or answer a further question.
Conclusions	Conclusion does not answer the problem, or does not refer back to the hypothesis, or contradicts the evidence collected.	Conclusion addresses the problem, states if the hypothesis was supported or rejected, and gives some explanation why.	Conclusion completely answers all aspects of the problem, states if the hypothesis was supported or rejected, and clearly cites evidence to explain why.
Visual Quality of Display	Project has limited eye appeal or is not easily readable at approximately two feet distance. The project has limited organization, or contains confusing visuals, or contains major language or spelling errors.	Project is appealing and readable at approximately 2 feet distance. It is organized and clear, uses understandable visuals and/or models, and contains few language and spelling errors.	Project is appealing and neat, and is readable at approximately 2 feet distance. It is well organized and clear, makes striking use of inventive or amusing visuals and/or models, and uses language and spelling flawlessly.

(Projects will receive between 10 and 50 points when all rubric criteria have been addressed.)

Science & Engineering Fair *Experimental Projects* (6th – 8th Grade)

Targets for an Excellent Science & Engineering Fair Project

	Advanced Proficient 5	"TRANSLATED"
Problem *(Double Points)* **(x2)**	States problem as a question, provides evidence that it comes from the student's personal interests or experiences, and represents a genuine learning opportunity for the student. Specifically addresses a valid scientific or mathematical concept, or has a beneficial application to some aspect of society.	Ask a real question where you don't know the answer. Make it practical.
Preliminary Research	Uses five or more reputable sources, cited correctly. Cites at least four types of information resources. Makes a clear connection between each source and the problem in the student's own words.	Research thoroughly. Connect the research to your question.
Hypothesis *(Double Points)* **(x2)**	Hypothesis is complete (in one sentence), testable, and clearly addresses the stated problem. Shows a direct connection to their preliminary research.	Try to answer the question using your research.
Procedure & Materials	Experiment is a well-constructed test of the hypothesis and is performed several times. Procedures are outlined in a step-by-step fashion that could be followed by anyone without additional explanations. All relevant materials are listed.	Plan an experiment to answer your question. Repeat it enough times to be sure of your answer. List all the steps and materials needed.
Results *(Double Points)* **(x2)**	Summarizes the data in a way that clearly describes what was discovered using graphs or charts. Discusses relationships between the variables and thoroughly analyzes trends/patterns. Makes well-reasoned predictions about what might happen if part of the experiment were changed to better test the hypothesis or answer a further question.	Show what happened in your experiment. Use pictures, graphs, and words to make it really clear. Explain what made a difference and what didn't. * What change might make the experiment a better test?
Conclusions	Conclusion completely answers all aspects of the problem, states if the hypothesis was supported or rejected, and clearly cites evidence to explain why.	Use your data to answer your original question. Explain why your hypothesis was right or wrong.
Visual Quality of Display	Project is appealing and neat, and is readable at approximately 2 feet distance. It is well organized and clear, makes striking use of inventive or amusing visuals and/or models, and uses language and spelling flawlessly.	Make your project fun to look at with pictures and colors. Use large, clear lettering. Check grammar and spelling.

Science & Engineering Fair *ExperimentalProjects* (9th – 12th Grade)

Rubric for School Site Science & Engineering Fair

	Attempted **1 point**	Proficient **3 points**	Advanced Proficient **5 points**
Problem *(Double Points)* **(x2)**	States the problem as a question that is vague, or as a statement, or addresses an issue to which the student already knows the answer. Shows limited or no connection to a valid scientific or mathematical concept.	States problem as a question, and represents a genuine learning opportunity for the student. Generally addresses a valid scientific or mathematical concept.	States problem as a question, provides evidence that it comes from the student's personal interests or experiences, and represents a genuine learning opportunity for the student. Specifically addresses a valid scientific or mathematical concept, or has a beneficial application to some aspect of society.
Preliminary Research	Uses limited sources from only one type of information resource (e.g., text, encyclopedia, businesses, magazines, catalogs, internet, or interviews), or uses some resources that are not reputable sources. Fails to connect the research to the problem, or material is copied rather than written in the student's own words.	Uses three or more reputable sources, cited correctly. Cites more than one type of information resource. Makes a general connection between the research and the problem in the student's own words.	Uses five or more reputable sources, cited correctly. Cites at least four types of information resources. Makes a clear connection between each source and the problem in the student's own words.
Hypothesis *(Double Points)* **(x2)**	Hypothesis is either not testable or does not connect to the stated problem, or shows no connection to the preliminary research.	Hypothesis is complete (in one sentence), testable, addresses the stated problem, and shows some connection to the preliminary research.	Hypothesis is complete (in one sentence), testable, and clearly addresses the stated problem. Shows a direct connection to their preliminary research.
Procedure & Materials	Experiment is not relevant to the hypothesis or is only performed once. The procedures outlined are seriously incomplete or not sequential, or materials list is missing or incomplete.	Experiment is adequate to test the hypothesis, but may leave some unanswered questions. Performs experiment one or more times. Procedures are outlined in a step-by-step fashion, but there may be 1 or 2 gaps that require explanation. Major materials are listed.	Experiment is a well-constructed test of the hypothesis and is performed several times. Procedures are outlined in a step-by-step fashion that could be followed by anyone without additional explanations. All relevant materials are listed.
Results *(Double Points)* **(x2)**	Does not summarize data clearly. The relationship between the variables is unclear or not discussed. Makes no predictions about what might happen if part of the experiment were changed to better test the hypothesis or answer a further question.	Summarizes the data in a way that clearly describes what was discovered using graphs or charts. Mentions at least one relationship between the variables and gives some analysis of trends/patterns. May attempt predictions about what might happen to the results if part of the experiment were changed to better test the hypothesis or answer a further question.	Summarizes the data in a way that clearly describes what was discovered using graphs or charts. Discusses relationships between the variables and thoroughly analyzes trends/patterns. Makes well-reasoned predictions about what might happen if part of the experiment were changed to better test the hypothesis or answer a further question.
Conclusions	Conclusion does not answer the problem, or does not refer back to the hypothesis, or contradicts the evidence collected.	Conclusion addresses the problem, states if the hypothesis was supported or rejected, and gives some explanation why.	Conclusion completely answers all aspects of the problem, states if the hypothesis was supported or rejected, and clearly cites evidence to explain why.
Visual Quality of Display	Project has limited eye appeal or is not easily readable at approximately two feet distance. The project has limited organization, or contains confusing visuals, or contains major language or spelling errors.	Project is appealing and readable at approximately 2 feet distance. It is organized and clear, uses understandable visuals and/or models, and contains few language and spelling errors.	Project is appealing and neat, and is readable at approximately 2 feet distance. It is well organized and clear, makes striking use of inventive or amusing visuals and/or models, and uses language and spelling flawlessly.

(Projects will receive between 10 and 50 points when all rubric criteria have been addressed.)