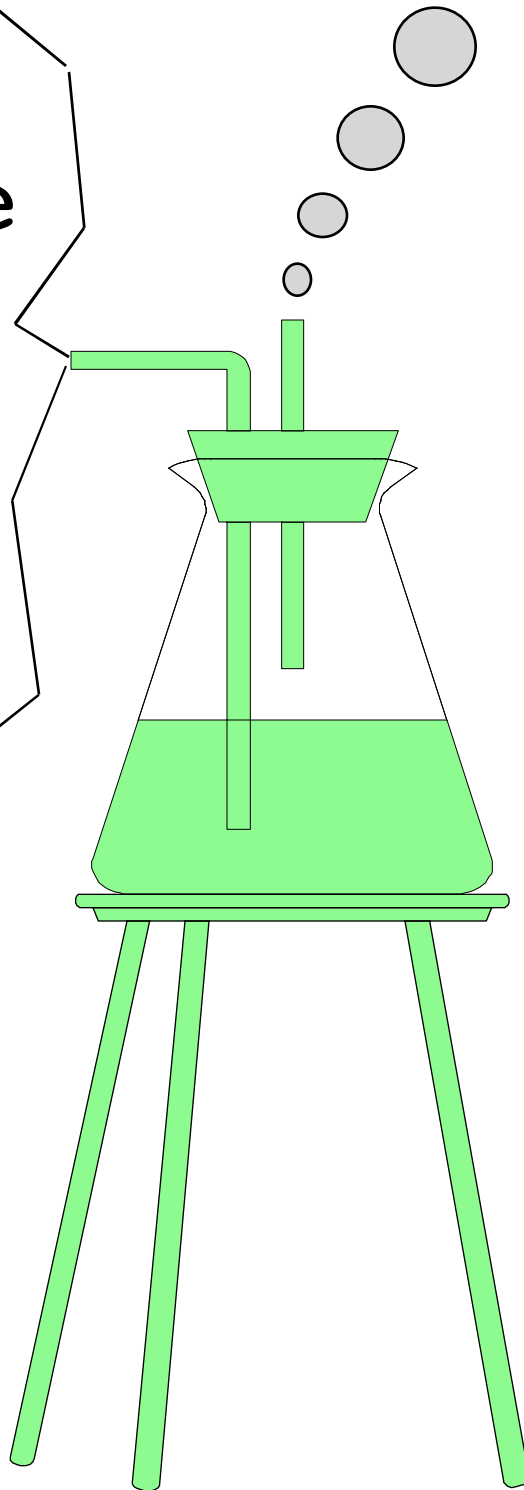


How To  
Prepare  
a  
Science  
Fair  
Project



This booklet belongs to: \_\_\_\_\_

## HOW TO PREPARE A SCIENCE FAIR PROJECT

### Stay Organized With a Schedule

This may be the first time you have attempted a long range project, so it is very important to prepare a schedule and stay organized. Science fair projects often require several weeks for completion. For that reason, organizational meetings are often set up months before the actual fair. Don't let a due date that is many weeks away throw your planning off; there are many things to do. Here is a suggested schedule that provides ample time to complete all phases of the project:

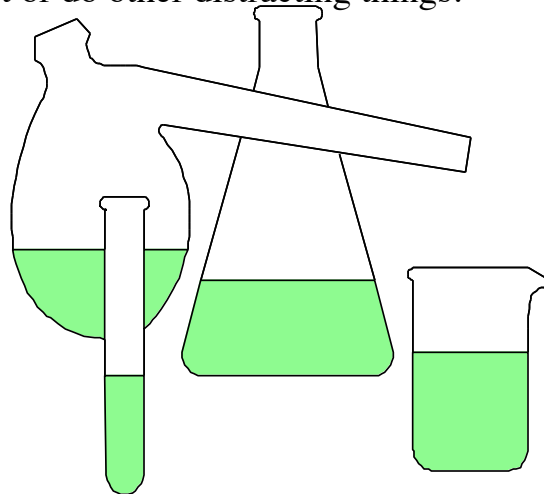
CHECK OFF	WEEK	WHAT YOU SHOULD BE DOING
[ ]	1 - 2	Identify your topic and establish a purpose.
[ ]	3 - 4	Use the library to research your topic.
[ ]	3 - 4	Plan experiment and collect supplies.
[ ]	5 - 6	Conduct your experiment and collect data and results.
[ ]	7	Analyze results and establish conclusion.
[ ]	8	Write the research paper and abstract.
[ ]	9 - 10	Build your display and practice presentation for judging.



## HOW TO PREPARE A SCIENCE FAIR PROJECT

### Seven Steps To Prepare a Science Fair Project

- 1. SELECTING A TOPIC:** Choose something you're interested in and something you want to learn more about. Talk to teachers, parents, or librarians for ideas. A hobby might lead to a good topic. Don't forget to look through science books, magazines, or visit museums or zoos for ideas.
- 2. RESEARCH:** After the topic has been selected, start the research process. Encyclopedias will provide an overview of your topic, but go beyond that and collect information from books and magazines. Contact experts or companies that might be able to supply information. Don't forget to check the internet.
- 3. PURPOSE AND HYPOTHESIS:** The purpose is a description of what you will do. The hypothesis is an educated explanation as to what you think will happen.
- 4. EXPERIMENT:** Plan and organize an experiment. Perform the experiment under controlled conditions. Keep careful records in a special notebook that is used only for this paper.
- 5. RESEARCH PAPER:** This report will provide interested readers with a comprehensive look at your topic and research. It includes information collected during your research as well as a complete description of your experiment, data, and conclusions. Don't forget the one page summary called an abstract.
- 6. EXHIBIT:** This is the visual presentation of your project, so prepare it carefully. Use graphs, charts, and clear bold lettering to highlight this display.
- 7. JUDGING:** Plan how you want to explain your project to the judges. Look neat, speak clearly, and don't fidget or do other distracting things.



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### HOW TO PREPARE A SCIENCE FAIR PROJECT Getting The Info

Once you've identified your topic, the next step is to conduct your research. You want to collect as much information as possible. Begin by getting an overview of your topic. Encyclopedias contain general information about many topics and are a good starting point. However, they should be used only to get a general idea. Most libraries have a computerized system that allows you to type in a topic and then it searches its database to identify available books and magazines on the subject.

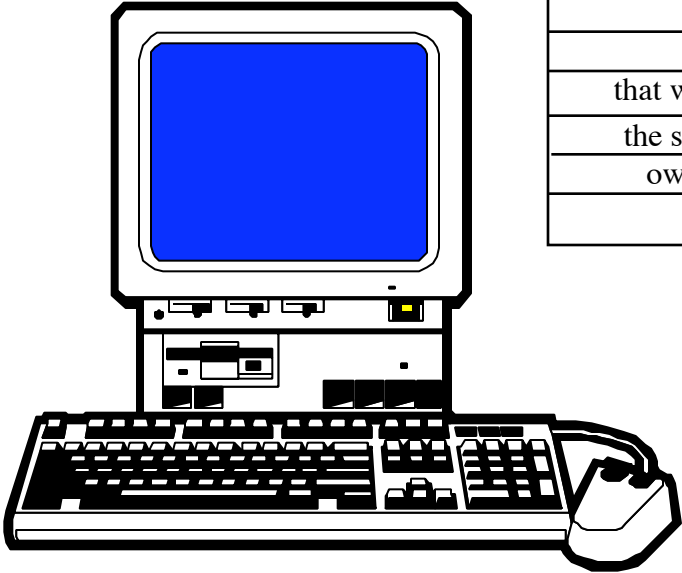
When you find a book on your topic, don't feel you have to read the whole thing. Look at the table of contents and the index for information related to your subject. Check the book's bibliography for other sources you may wish to review.

When collecting information from books and magazines, use index cards. Put only one idea on a card and be sure to include information for your bibliography. You'll need to list the title of the article, the name of the magazine or book, the author, the issue, the date, and the publisher.

The Internet can be an excellent resource of ideas and information. (Look at the Bibliography page in this booklet to see what information you will need when siting an Internet site).

Index Cards can be very helpful for note taking.

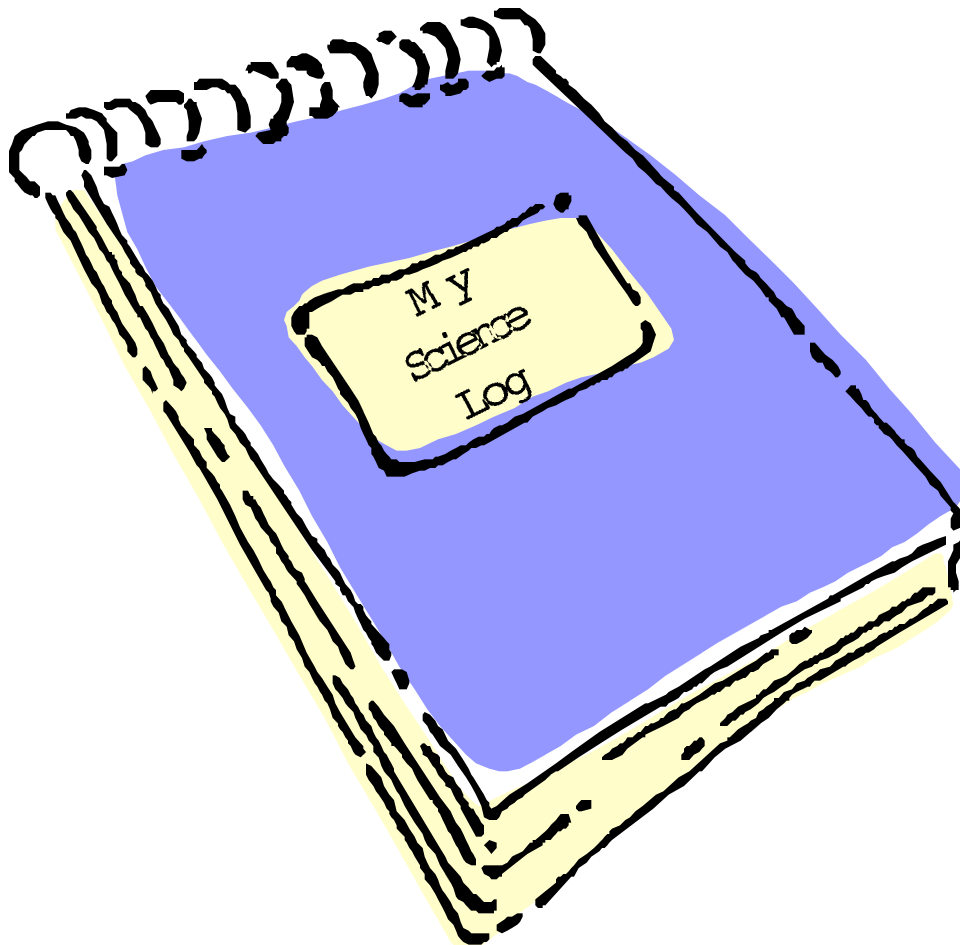
<u>Title of Article, Name of Magazine, Author,</u>
<u>Issue, and Publisher</u>
Only one idea per card -
that will help you to avoid copying from
the source. You must put things in your
own words unless you use quotation
marks.



**HOW TO PREPARE A SCIENCE FAIR PROJECT****Recording Observations and Data**

Use a separate notebook for recording all measurements and observations. Record information on a daily basis and consider the following things:

- Make sure that accurate metric measurements are given in your data. Give masses in grams, volumes in milliliters, and linear measurements in centimeters.
- It is better to have too much data than not enough so keep a lot of notes.
- When making an observation, write down the date and time.
- Keep track of the materials used, their quantities and cost.
- Consider taking photographs to be used in your research paper or as part of your display.

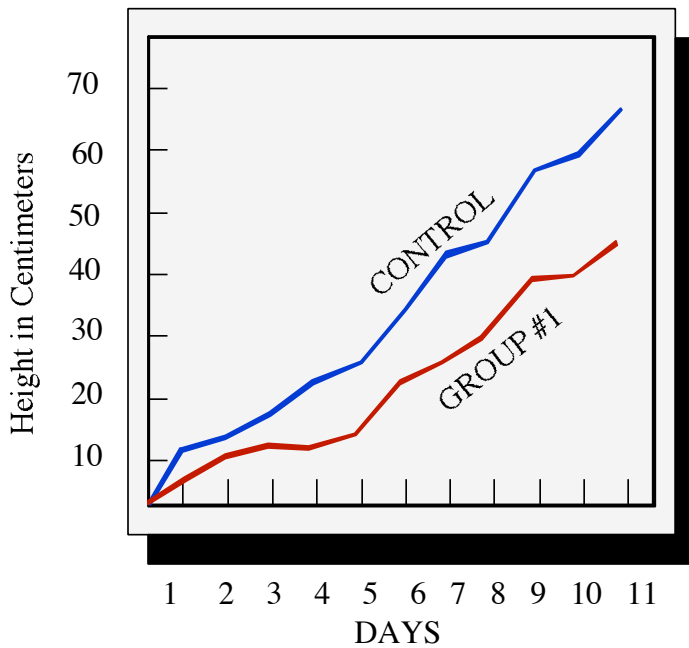
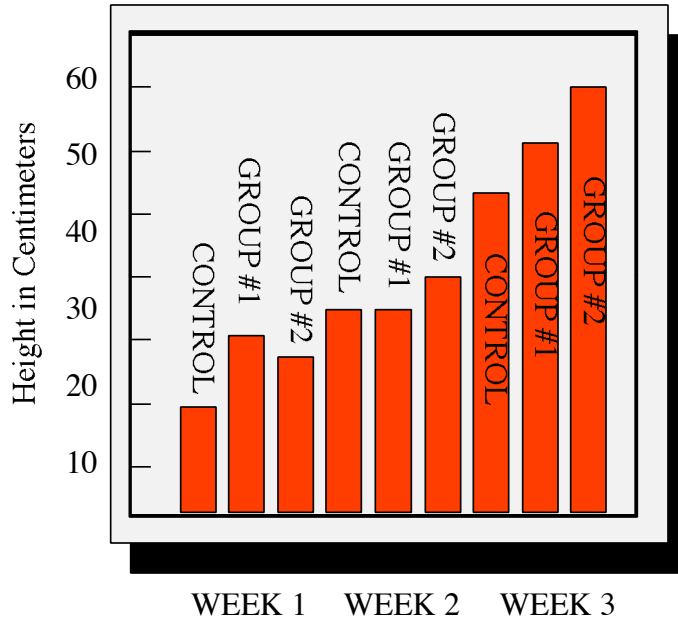


### HOW TO PREPARE A SCIENCE FAIR PROJECT

#### Graphs and Charts

Your daily log of observations will be the best means for sharing the data and information collected during the experiment. Charts and graphs will provide a fine way to share data in an easy to read and understand fashion. There are different kinds of charts and graphs. Here are some examples:

## BAR GRAPH



## LINE GRAPH

## HOW TO PREPARE A SCIENCE FAIR PROJECT

### A Controlled Experiment

To conduct a scientific investigation, care must be taken to follow experimental procedures. You must design an experiment to test your hypothesis. When planning your experiment, remember to keep everything the same except for the single variable being tested. A variable is something that can be changed in the experiment. It is what you are testing. Everything else must be the same and only one variable or condition is altered or changed. A control group should be used when conducting an experiment. This group receives the same attention as the test groups; however, it will not be influenced by the variable the other groups are testing.

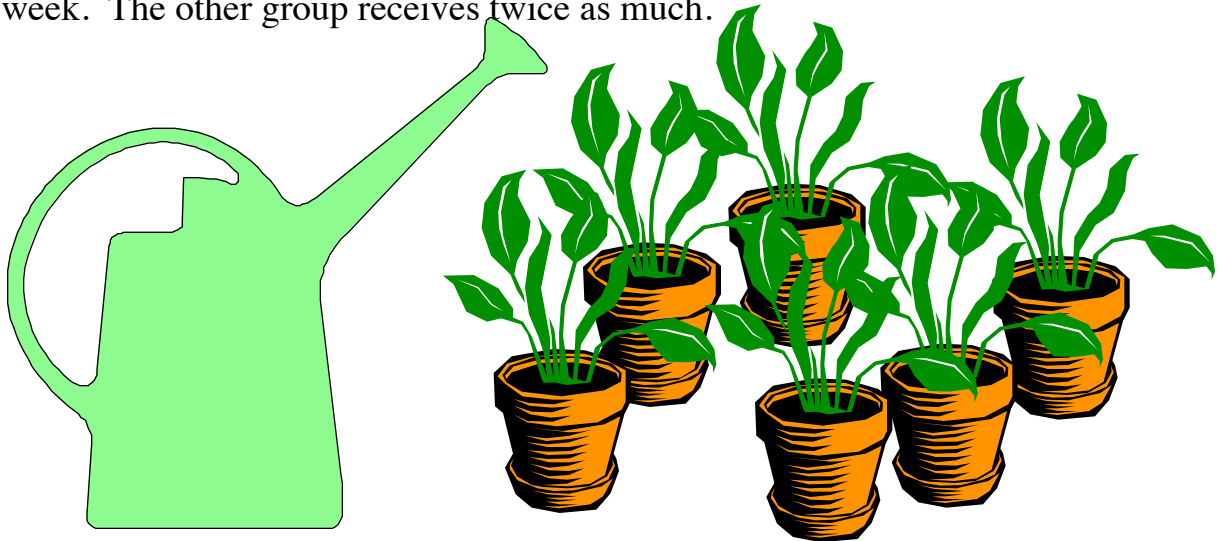
Here is an example:

**PURPOSE:** How the amount of fertilizer used will affect plant growth.

**HYPOTHESIS:** Increased dosages of fertilizer will cause greater growth in tomato plants.

The test variable will be the amount of fertilizer used. So all other variables and conditions must stay the same. That means the following:

1. The seeds must all come from the same package and should be randomly selected.
2. All seeds must be planted in the same sized pots with similar soil.
3. All plants must receive exactly the same amount of water and light.
4. The temperature should be the same for all test plants.
5. More than one plant should be used in each test group.
6. Set one group as the **CONTROL GROUP**. This group is not given any fertilizer.
7. Set up two other test groups. One receives a certain amount of fertilizer each week. The other group receives twice as much.



## HOW TO PREPARE A SCIENCE FAIR PROJECT

### The Abstract and Research Paper

It is important to be able to share your project with others. One way to share information is in written form. Here are some guidelines for writing the abstract and research paper.

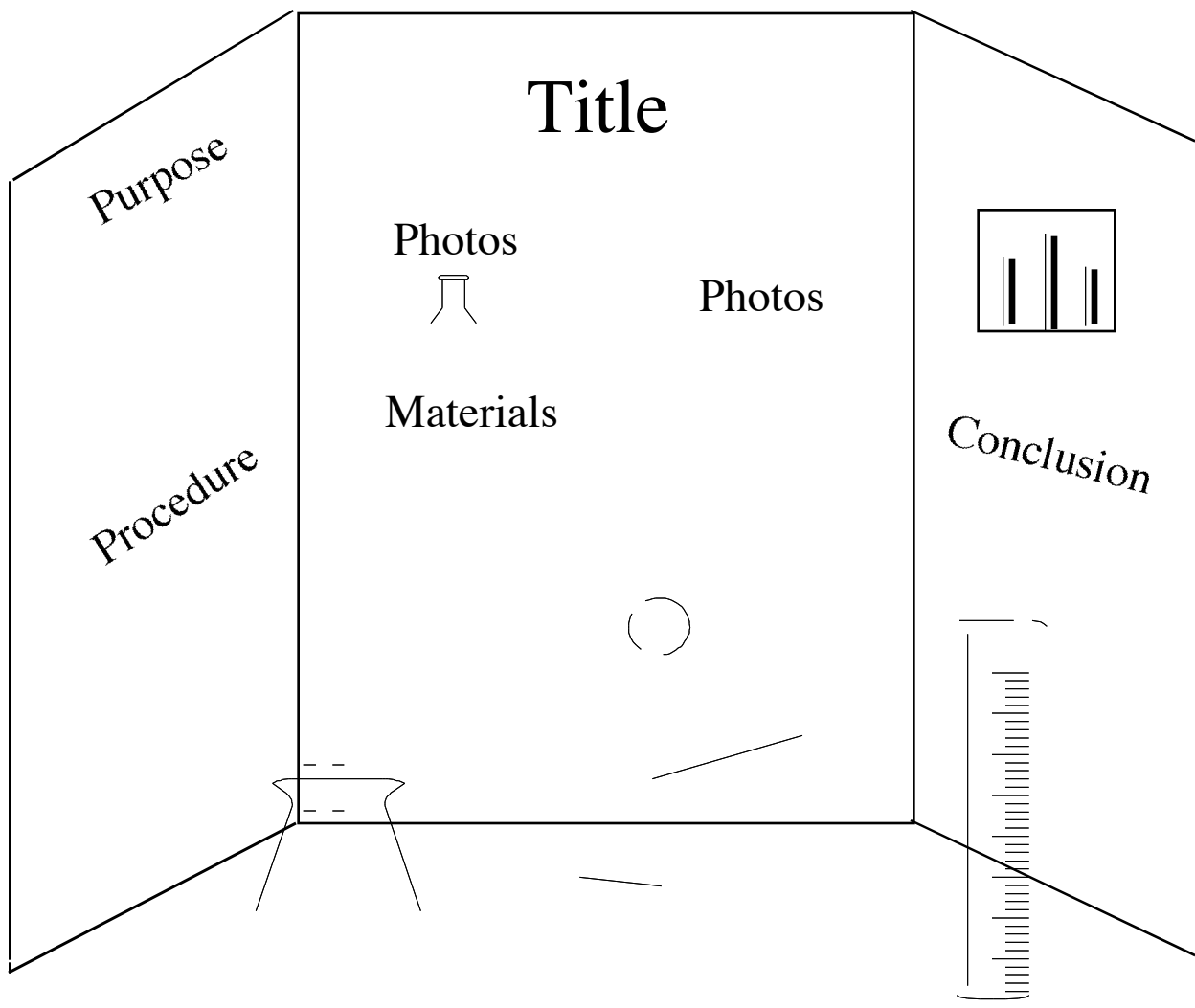
1. The abstract is a one-page summary of your work. It should include:
  - a) a statement of purpose,
  - b) a brief description of the procedure,
  - c) a conclusion based on results collected.
  
2. The research paper should be typed with double spacing. It should include:
  - a) title page which should include your topic, your name, school's name, grade, sponsor, city, state, and zip code.
  - b) table of contents.
  - c) purpose - This is a statement of what you plan to do. It can include a hypothesis or educated guess as to what you think the outcome will be.
  - d) acknowledgements - In this section you can identify people who have helped you.
  - e) review of literature - Here you describe the work and findings of others related to your topic.
  - f) materials and methods of procedure - Describe the materials you used and then provide a step-by-step explanation of how you conducted the experiment. Include drawings or photographs to help clarify your procedures.
  - g) results - The outcome of your experiment and the data collected is shared in graphs, charts or as a daily log of observations.
  - h) conclusion - In this section you will interpret your findings and results. Refer back to your purpose and indicate whether or not your findings support your hypothesis.
  - i) bibliography - List the books, magazines, pamphlets, or other communications you used to research your topic.

## HOW TO PREPARE A SCIENCE FAIR PROJECT

### The Exhibit or Display

This is a visual way to communicate to others so take your time and do a good job.

Be sure to check with your teacher or sponsor about the rules for dimensions of the exhibit. Most exhibits will have three sections and be expected to stand on their own. Displays are often placed on card tables so there will be limits to their size. Use sturdy material, such as plywood, masonite, or heavy cardboard, for the backboard. Use hinges or strong tape to hold the three sections together.



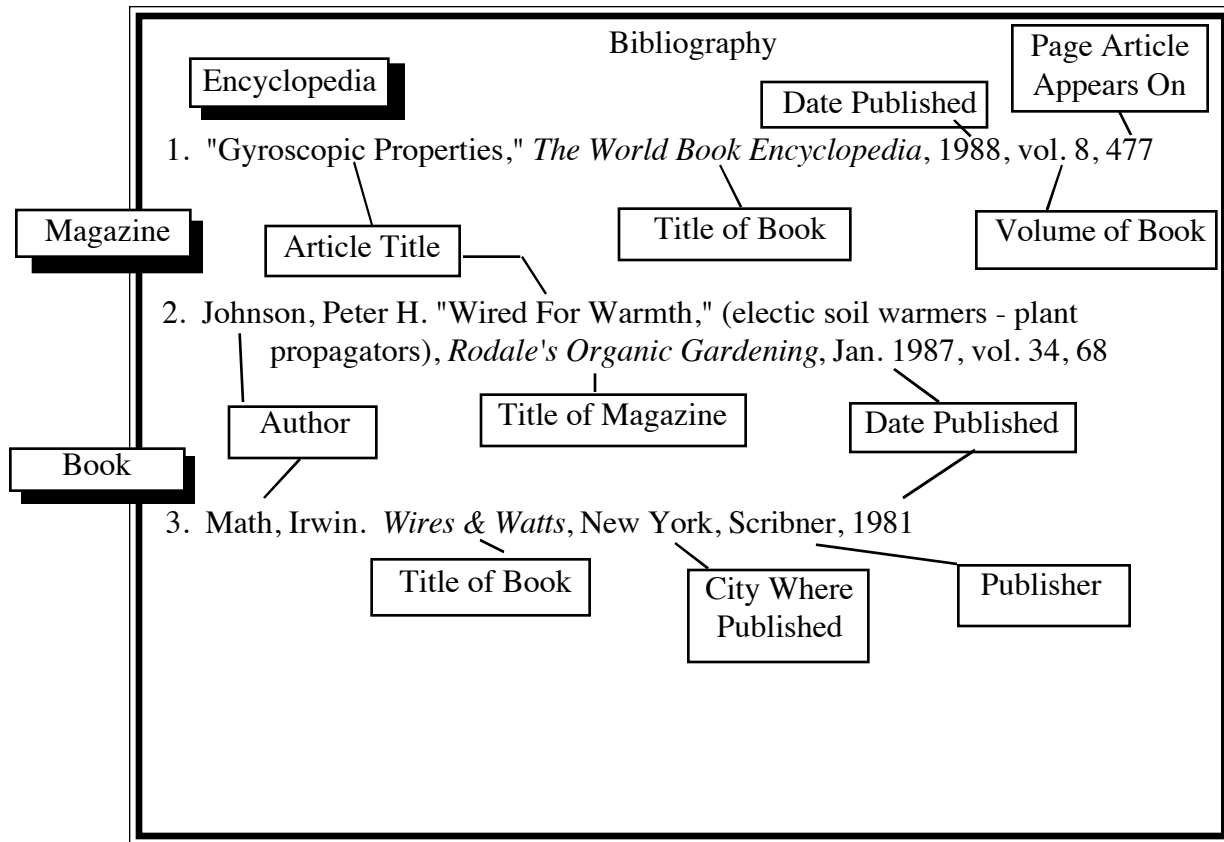
### HOW TO PREPARE A SCIENCE FAIR PROJECT Developing a Bibliography

A bibliography is a listing of the resources and references used during the research of your project. It should include information about the magazines and books you used. That information is organized so that interested readers could seek out and find the books and articles you refer to.

In the case of a book, you must supply the title of the book, its author, publishing company, the city where the publishing company is located, and the date the book was published.

For a magazine article you must supply the title of the article, the author, the magazine it appeared in, the date of the magazine issue, the volume of the magazine, and the pages the article appeared on.

Here is an example of a bibliography:



## HOW TO PREPARE A SCIENCE FAIR PROJECT

### Presentation to Judges

This is an important part of your project so take the time to plan and practice the presentation you will make to the judges. Plan in advance what you want to say but don't memorize your presentation. Write key phrases or ideas on index cards and use them as a reference but don't depend heavily on them.

Here is an approach you may wish to use for making your oral presentation.

1. Greet the judges and introduce yourself.
2. Give them a copy of your abstract and research paper.
3. Give the title of your project, your grade, school, and sponsor (teacher).
4. Tell how you became interested in this topic.
5. Give some background information about the topic.
6. State the purpose of your investigation.
7. Discuss your review of literature.
8. Describe, in a step-by-step fashion, the procedure you followed for conducting your investigation. Point to sections of your display and refer to charts, graphs, and photographs. If you have equipment on display, allow the judges to examine it.
9. Explain the results of your experiment and be sure to discuss controls and variables. Remember to keep all measurements in metric units.
10. Identify the conclusions that you could logically draw from the experiment.
11. Discuss any future plans you may have to continue research or experimentation related to your topic. Include a few statements about any changes you made in your scientific approach during your early investigation.
12. Ask the judges if they have any questions. Remember, if you don't know an answer, say so and indicate you will look into it. If judges insist on asking questions in unrelated areas, redirect the conversation back to your specific topic.
13. Thank the judges for their time and any suggestions they may have offered to improve your project.

Good manners, nice clothes, and enthusiasm for what you're doing will help to impress the judges. Here are some tips:

1. Wear nice clothes.
2. Be polite and practice good manners.
3. Make good eye contact with your judges and be sure to give each judge your attention. Don't just look at one.
4. Stand up straight and to the side of your exhibit.
5. Speak with enthusiasm, clarity, and assuredness.
6. Don't do anything to distract the judges.
7. Relax, smile and have FUN.

**FORM A: TOPIC SELECTION**

Due Date: \_\_\_\_\_

Student's Name \_\_\_\_\_

Grade: \_\_\_\_\_ Category: \_\_\_\_\_

Topic Title: \_\_\_\_\_

**FORM B: HYPOTHESIS**

Due Date: \_\_\_\_\_

Student's Name \_\_\_\_\_

Grade: \_\_\_\_\_ Category: \_\_\_\_\_

Topic Title: \_\_\_\_\_

Hypothesis: \_\_\_\_\_

**FORM C: REVIEW OF LITERATURE**

Due Date: \_\_\_\_\_

Student's Name \_\_\_\_\_

Grade: \_\_\_\_\_ Category: \_\_\_\_\_

What books and magazines have you consulted? \_\_\_\_\_

List your bibliography: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**FORM D: DESCRIPTION OF EXPERIMENT**

Due Date: \_\_\_\_\_

Student's Name \_\_\_\_\_

Grade: \_\_\_\_\_ Category: \_\_\_\_\_

Topic Title: \_\_\_\_\_

What materials will your experiment require? \_\_\_\_\_

\_\_\_\_\_

How will you set up the experiment and keep it scientific? (Use the back of this form)

# **ABSTRACT FORM**

**STUDENT'S NAME** \_\_\_\_\_

**GRADE** \_\_\_\_\_ **SCHOOL** \_\_\_\_\_

**CITY** \_\_\_\_\_

**SPONSOR** \_\_\_\_\_

**CATEGORY** \_\_\_\_\_

**TITLE** \_\_\_\_\_

**( Type the abstract—single spaced—include three paragraphs: Purpose, Procedure, and Conclusion)**

## IDEAS FOR SCIENCE FAIR PROJECTS

- What is the best home insulator?
- Regeneration in planaria.
- Colors' effect on heat absorption.
- Wing design for balsa planes.
- What is the best chemical battery?
- How can you prevent iron from rusting?
- Electroplating.
- Distillation of alcohol.
- Building a homemade hygrometer.
- Conductivity of various substances.
- Comparison of reaction time.
- Effects of temperature on density.
- Effects of ultraviolet light on bacteria.
- Kite design with respect to aerodynamics.
- ph comparison of antacids.
- What is the best design for reduced wind drag?
- Does color affect memory?
- What is the best smoke detection system?
- Does sound affect plant growth?
- Mineral content of drinking water.
- Probability.
- Percent of body fat.
- Taste sensitivity of smokers and non-smokers.
- Which bleach works best?
- Testing for nutrients.
- How does lack of sleep affect behavior?
- Design of robotic equipment.
- Testing for ESP.
- Earthworm distribution in a field.
- How different paints hold up to weathering.
- Social behavior of ants.
- Best nose cone shape for model rockets.
- Is it possible to learn while sleeping?
- Does temperature affect crystal growth?
- Making fabrics fire resistant.
- Getting the viscosity of a liquid using a sphere.
- How acids affect metals.
- Which detergent works best.
- Designing a solar engine.
- Which is better—front or rear wheel drive?
- Does oil stain or oil paint provide better protection?
- Does cigarette smoke affect house plants?
- Solar distillation.
- Porosity of soils.
- Sugar content of food.
- Effect of light on reproductive growth of paramecia.
- Comparison of blood pressure variation.
- Effects of fertilizer on earthworms.
- Plant tolerance to salt.
- Fat content of margarine.
- What material is best for road construction?
- How does television viewing affect behavior?
- Are rats social animals?
- How are seeds affected by radiation?
- Suspension bridge design.
- Flammability testing of household goods.
- Color preference of gerbils.
- Effects of junk food on mice.
- Paper recycling.
- Temperature's effect on seed germination.
- Which soil type is best for plant growth?
- Design of a color blindness test.
- Purifying water.
- Spider web construction.
- Comparison of biodegradable detergents.
- Airplane wing design for greatest lift.
- Does magnetism affect seed germination?
- Does TV change kids' moods?
- Optical illusions.
- Search for the best natural filter for ground water.
- Desalting water.
- What are the spectra of elements and compounds?

## SCIENCE FAIR CRITERIA SHEET

**Directions:** Use this sheet to help you decide what areas of your science fair project still need attention. Have your parents assist in filling out this form. Use the following point scale:

- 5 well done and complete
- 4 almost complete
- 3 needs improvement
- 2 lacking
- 1 not done

- \_\_\_\_\_ 1. ABSTRACT – 3 parts: purpose, procedure, and conclusion – typed and easy to read.
- \_\_\_\_\_ 2. RESEARCH PAPER – title page, table of contents, purpose, acknowledgments, review of literature, materials and procedures, results, conclusions, bibliography.
- \_\_\_\_\_ 3. EXHIBIT – attractive, self-standing with proper dimensions, and clear bold lettering.
- \_\_\_\_\_ 4. ORAL PRESENTATION – well planned and rehearsed.
- \_\_\_\_\_ 5. TOPIC – not too broad or complicated, yet displaying a sufficient degree of difficulty.
- \_\_\_\_\_ 6. CREATIVITY – unique design, project has pizzazz!
- \_\_\_\_\_ 7. CONTROLLED EXPERIMENT – all factors are kept the same except for the one factor or variable being tested.
- \_\_\_\_\_ 8. VALIDITY OF RESULTS AND CONCLUSIONS – measurable results supported by enough trials.
- \_\_\_\_\_ TOTAL POINTS

- 35- 40 Everything looks great - bring on the fair.
- 30-34 Some additional time and work required,
- 35-29 Get cracking; there's work to do and soon.
- Below 25 Check with teacher or sponsor immediately.

# JUDGES' SCORE SHEET

Student's Name \_\_\_\_\_

Grade \_\_\_\_\_ School \_\_\_\_\_

Category \_\_\_\_\_

Title of Project \_\_\_\_\_

(circle score next to each category - 10 is highest)

**1. Knowledge Gained**            1    2    3    4    5    6    7    8    9    10  
(Has the student acquired knowledge doing this project?)

**2. Information**            1    2    3    4    5    6    7    8    9    10  
(Is the information collected through research valid and appropriate to the grade level?)

**3. Scientific Approach**            1    2    3    4    5    6    7    8    9    10  
(Was a scientific approach and controlled variable used in conducting the experiment?)

**4. Collection of Data**            1    2    3    4    5    6    7    8    9    10  
(Were measurements accurately taken and given in metric units?)

**5. Conclusions**            1    2    3    4    5    6    7    8    9    10  
(Were stated conclusions logical and valid?)

**6. Written Work**            1    2    3    4    5    6    7    8    9    10  
(Was the abstract present and the research paper organized and complete?)

**7. Oral Presentation**            1    2    3    4    5    6    7    8    9    10  
(Was it well planned and interesting?)

**8. Exhibit**            1    2    3    4    5    6    7    8    9    10  
(Was it visually appealing, neat, and attractive?)

**9. Effort**            1    2    3    4    5    6    7    8    9    10  
(Was the degree of individual effort demonstrated?)

**10. Creativity and Originality**            1    2    3    4    5    6    7    8    9    10  
(Does the project show creative approach or thought in design or presentation?)

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- Outstanding 95-100
- First 90- 94
- Second 80-89
- Third 70-79
- Honorable Mention - 1-69

Total score \_\_\_\_\_ Place \_\_\_\_\_

\_\_\_\_\_  
Judges' Signatures

Name \_\_\_\_\_

Date \_\_\_\_\_

## HOW TO PREPARE A SCIENCE FAIR PROJECT

### Video Quiz

**Directions:** Use this sheet to write your answers to the questions asked at the end of the video. Use the back if necessary.

1. In most scientific investigations, a control group is required, What is the purpose of the control group?
2. What are variables?
3. If you were doing an experiment to determine the effects of x-rays on seed germination, what variables would you need to keep the same for all test groups?
4. In the effects of x-rays on the seed germination experiment, what would be the variable being tested?
5. A dentist might allow you to use his x-ray machine to expose the seeds to different amounts of x-rays. How would you set up the experiment?
6. Why have three or more test items or subjects in each test group?
7. What are the three things most science fairs require of each project?
8. What is an abstract and what purpose does it serve?
9. When using index cards for your oral presentation, why is it a good idea to write single words or short phrases instead of your entire speech?
10. What is a hypothesis?