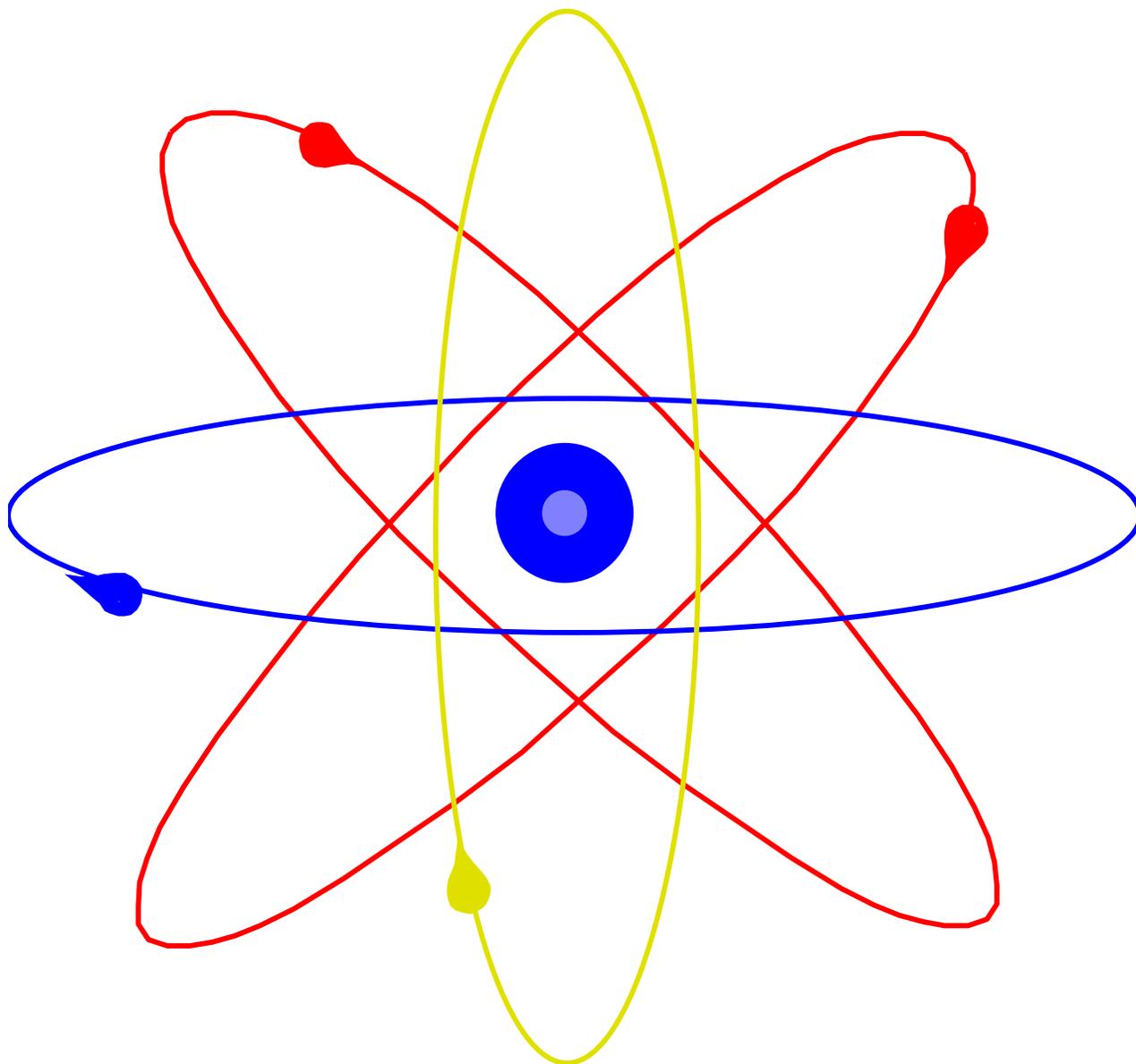


# PAGE COUNTY SCIENCE FAIR HANDBOOK



# PAGE COUNTY SCIENCE FAIR HANDBOOK

## *Welcome*

This booklet is your ticket to a good project. This book walks you through the steps of a good Science fair Project; it explains how to use the Scientific Method to experiment; it offers more than 30 project ideas; **and** it contains tidbits of **FREE** advice from science teachers. What more could you ask for except a project handed to you on a silver platter? So, find a topic of interest and experiment!!

The annual Page County Middle School Science Fair will be held this year at Luray Middle School on Saturday, February 5, 2011. There will be two major changes in the fair this year. The first is that Science Projects will no longer be done as part of the science class. All entries will be completely voluntary. Extra Credit may be given for projects entered into the fair. Entry forms are available on the Page County Public Schools Website or from your child's science teacher. The forms should be filled out and turned in before beginning a project. The forms must be returned to your child's science teacher by January 21, 2011.

The second change is that the whole event will take place in one day and students must be present to be interviewed by the judges about their projects. Only the participants will be allowed into the judging area during set-up and judging. Winners will still advance to the JMU Regional Science Fair based on their placement in the Fair.

The day will run as follows:

8 – 9	Registration and set-up
9 – 12	Judging
1 – 2	Open House
2 – 3	Awards Ceremony

If you have any questions about the Science Fair, please contact your child's science teacher.

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## *The Scientific Method*

### **Step 1-**

Purpose- This is where you state the problem you wish to solve or investigate.

### **Step 2-**

Hypothesis- After stating the problem, you need to make a hypothesis concerning the problem. A hypothesis is your “educated” guess as to what the problem’s answer will be. We say educated because you are to do some reading on your topic and use any knowledge you already possess on the topic. The hypothesis may prove correct or incorrect for this investigation. The success of the project is whether you can explain what happened.

### **Step 3-**

Experiment & Observe- This is the stage where you set up your actual experiment or test to prove or disprove your hypothesis. You will need to carefully observe the results and collect all important data.

### **Step 4-**

Analysis & Interpretation- The fourth step is analysis and interpretation of the data you have collected from step three. This step may involve organizing the information into a chart, designing a graph, or both. You must also decide what the data shows in preparation for step 5.

### **Step 5-**

Drawing Conclusions- This is the final step in the Scientific Method. This is where you test your hypothesis to see if you were correct. Do Not Panic if you were wrong. You did not fail as long as you can explain why you got a different result than what was anticipated! Understanding your experiment is the key to success.

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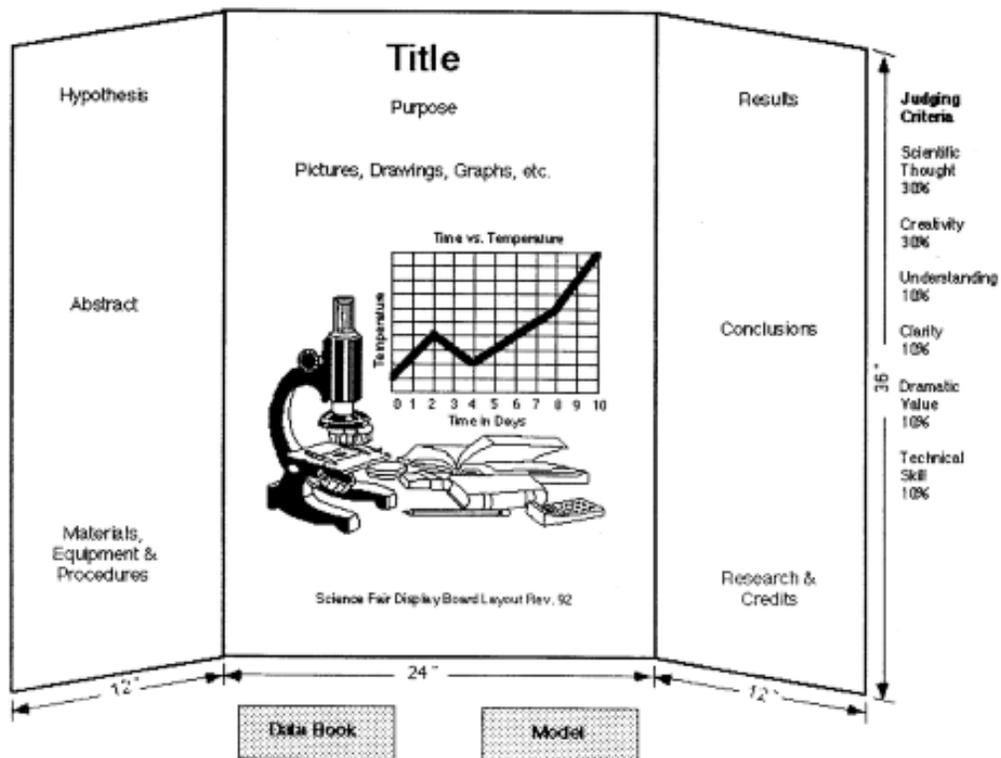
## *Steps to Follow*

1. Choose a problem to solve.
2. State your problem as a specific question.
3. Research your problem.
4. Form your hypothesis.
5. Plan your project.
6. Make a list of all the materials you will need.
7. Collect all your materials.
8. Conduct your experiment several times (10 is not too many).
9. Record the data.
10. Organize the data in a more orderly form.
11. Draw conclusions from the data.
12. Prepare your report, graphs, drawings, and diagrams.
13. Construct your science fair display.

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## Science Fair part IV

Create a display of the science fair project. Complete all entry forms and enter the display in the science fair. Do not put raw data on the display board. The information should be laid out in a visually pleasing manner, generally conforming to the diagram below. The data book (which is a complete record of the science project) should be included with the display board. A model may or may not be present. It is unacceptable to display: living organisms, dried plant material, taxidermy specimens or parts, preserved vertebrate or invertebrate animals, human or animal food, human or animal parts (except: teeth, hair, nails, dried animal bones, histological dry mount sections, and wet mount tissue slides), soil or waste samples, chemicals including water, poisons, drugs, controlled substances, hazardous substances, dry ice, sharp items, flames or flammable materials, empty tanks, batteries with open top cells, awards, medals, business cards, flags, photographs or other visual presentations depicting vertebrate animals in other-than-normal conditions. Maximum allowed ISEF display is 76 cm deep by 122 cm wide by 274 cm high including the table.



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## **Science Fair Categories**

1. Behavioral & Social Science
2. Biochemistry & Microbiology
3. Botany
4. Chemistry
5. Computer Science & Math
6. Earth & Space Science
7. Engineering
8. Environmental Science
10. Medicine & Health
12. Physics
13. Zoology
14. Consumer Projects

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## Science Fair Project Judging Criteria

### Scientific Thought (30 points)

- Does the project follow the scientific method? (hypothesis, method, data, conclusion)
- Is the problem clearly and concisely stated?
- Are the procedures appropriate, organized, and thorough?
- Is the information collected accurate and complete?
- Does the study illustrate a controlled experiment that makes appropriate comparisons?
- Are the variables clearly defined?
- Does the project show the child is familiar with the topic?
- Does the project represent real study and effort?

### Creative Ability (30 points)

- How unique is the project?
- Does the exhibit show original thinking or a unique method or approach?
- Is it significant and unusual for the age of the student?
- Does the project demonstrate ideas arrived by the child?

### Understanding (10 points)

- Does the project explain what the student learned about the topic?
- Did the student use appropriate literature for research?
- Is a list of references or bibliography available?
- In the exhibit, did the student tell a complete and concise story, and answer some questions about the topic?

### Clarity (10 points)

- Did the student clearly communicate the nature of the problem, how the problem was solved, and the conclusion?
- Are the problems, procedures, data, and conclusions presented clearly, and in a logical order?
- Did the student clearly and accurately articulate in writing what was accomplished?
- Is the objective of the project likely to be understood by one not trained in the subject area?

### Dramatic Value (10 points)

- How well did the student design and construct the exhibit?
- Are all of the components of the project well done? (exhibit, paper, abstract, log of work)
- Is the proper emphasis given to important ideas?
- Is the display visually appealing?
- Is attention sustained by the project and focused on the objective?

### Technical Skill (10 points)

- Was the majority of the work done by the student, and was it done at home or in school?
- Does the project show effort and good craftsmanship by the student?
- Has the student acknowledged help received from others?
- Does the written material show attention to grammar and spelling?
- Is the project physically sound and durably constructed? Will it stand normal wear and tear?
- Does the project stand by itself?

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## ❖ Intel ISEF Display and Safety Regulations ❖

### ■ Unacceptable for Display (Not allowed on project or in booth)

- 1) living organisms
- 2) dried plant materials, unless sealed in acrylic or other similar material
- 3) taxidermy specimens or parts
- 4) preserved vertebrate or invertebrate animals
- 5) human or animal food
- 6) human/animal parts or body fluids ( blood, urine)  
(Exceptions: teeth, hair, nails, dried animal bones, histological dry mount sections, and completely sealed wet mount tissue slides)
- 7) soil or waste samples
- 8) laboratory/household chemicals including water  
(Exceptions: amounts integral to an enclosed apparatus or water supplied by the Display and Safety Committee)
- 9) poisons, drugs, controlled substances, hazardous substances or devices (for example, firearms, weapons, ammunition, reloading devices)
- 10) dry ice or other sublimating solids (solids which vaporize to a gas without passing through a liquid phase)
- 11) sharp items ( for example, syringes, needles, pipettes)
- 12) flames or highly flammable display materials
- 13) empty tanks that previously contained combustible liquids or gases, UNLESS certified as having been purged with carbon dioxide
- 14) batteries with open top cells
- 15) awards, medals, business cards, flags, etc., EXCEPT the current year ISEF medal may be worn during judging.
- 16) personal photographs, accomplishments, acknowledgments, addresses, and phone and fax numbers are not permitted on handouts but may be included in research/data book.
- 17) photographs or other visual presentations depicting vertebrate animals in surgical techniques, dissections, necropsies, other lab techniques, improper handling methods, improper housing conditions, etc.

### ■ Acceptable for Display Only (cannot be operated)

- 1) projects with unshielded belts, pulleys, chains and moving parts with tension or pinch points
- 2) class III and IV lasers

### ■ Acceptable for Display and Operation (with restrictions)

- 1) Class II lasers:
  - a) must be student-operated.
  - b) posted sign must read "Laser Radiation: Do Not Stare Into Beam."
  - c) must have protective housing that prevents access to beam.
  - d) must be disconnected when not operating.
- 2) Large vacuum tubes or dangerous ray-generating devices must be properly shielded.
- 3) Pressurized tanks that contained noncombustibles may be allowed if properly secured.
- 4) Any apparatus producing temperatures that will cause physical burns must be adequately insulated.
- 5) High-voltage (over 12 volts) equipment must be shielded with a grounded metal box or cage to prevent accidental contact.
- 6) High-voltage (over 12 volts) wiring, switches, and metal parts must have adequate insulation and overload safety devices and must be inaccessible to others.
- 7) To reach electrical outlets, those requiring 125/220-volt AC electrical circuits must provide an extension cord which is no more than nine-feet in length. All cords must have sufficient load-carrying capacity and must be approved by Underwriters Laboratories.
- 8) Electrical connections in 125/220-volt circuits must be soldered or made with UL approved connectors. Wires must be insulated. (Maximums are 500 watts @ 130 VAC/ 60 hertz. or 250 watts @ 220 VAC/ 60 hertz).
- 9) Bare wire and exposed knife switches may be used only in circuits of 12 volts or less; otherwise, standard enclosed switches are required.
- 10) Handouts to judges and the public must be limited to one copy of the official abstract.

#### Maximum Size of Display at the Intel ISEF

- 76 cm (30 in) deep
- 122 cm (48 in) wide
- 274 cm (108 in) high including table

Notes: 1) Fair-provided tables will not exceed a height of 91 cm (36 in). 2) Backboards are not provided at the Intel ISEF. 3) Display area consists of a draped table and curtained back.

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## Project Ideas

### Biology

1. What affect do colored lights have on plant growth?
2. What is the reaction of mealworms to various surfaces: color, texture, temperature, etc...
3. Determine which fruits or vegetables contain the most moisture by slicing them and weighing them periodically as they dry out.
4. What is the best fertilizer for bean plants?
5. What are the affects of temperature on the growth of microorganisms in water?
6. Use microorganisms to test for pollution.
7. Determine the environmental effects on yeast budding by manipulating one variable while keeping all other variables constant.
8. Can mice distinguish color?
9. Which grows faster: finger nails or toe nails?
10. Which grows faster: body hair or scalp hair?
11. How are the feeding patterns affected by the availability of food in regards to a small pet? See if a gerbil will eat more food by weight if the food is given once, twice, three times, or in a constant unlimited supply.
12. Which stains tooth enamel more: artificially sweetened drinks or naturally sweetened ones?
13. How does temperature affect the production of yogurt?
14. What is the effect of different temperatures on the growth of yeast?
15. Which type of food preservative is most effective in retarding decay?

### Chemistry

1. Determine how the freezing or boiling point of water is affected by the addition of various solids such as sand, salt, sugar, or others.

### Physics

1. Use pairs of different materials to determine which ones when rubbed together produce static electricity.
2. Investigate heat energy output of fuels by measuring the change in water temperature when equal amounts of fuel are used to heat water.
3. What kind of metal conducts heat the best?
4. How does the wattage of light bulb affect energy use?
5. What is the best insulator: pink fiberglass, wool, feathers, or some other material?

### Earth & Space Science

1. Determine which liquids evaporate fastest.
2. Determine the acidity of local bodies of water and attempt to determine why they may differ.
3. Construct and test different methods of purifying water.

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## Project Ideas (Continued)

### Consumer Science

1. Which household cleanser is most effective on molds and mildews?
2. The cleanest water fountain in the school.
3. The effect of color on food palatability.
4. Which paper towels absorb the best?
5. Which batteries last the longest?
6. What detergents biodegrade the best?
7. What detergents clean the best?
8. What nails have the best holding power in wooden boards?
9. Which area of the county, town, neighborhood, or home collects the most grams of dust in a month?
10. Which detergent makes the most bubbles?
11. Which brand or type of glue holds boards together best?

### Social Science

1. The effects of music on concentration.
2. Who can memorize a list of numbers better? male Vs female, lefties Vs righties, Cowboy fans Vs Redskin fans, blue eyes Vs brown eyes, married Vs single, age Vs youth, first born Vs second born, etc...
3. Lefties Vs Righties: Do they view optical illusions differently?

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## Appendix A

This section contains all of the forms that need to be filled out **prior** to starting a project. Below is a list of the forms included and the person who is responsible to fill them out. The forms in **bold** print are required for all student entries. Please direct any questions to your child's science teacher.

**Page County Science Fair Entry Form** – Required from all students. This form can be found on the next page of this document.

The following forms will need to be filled out only for special projects concerning humans, vertebrate animals, or other potentially harmful or delicate subjects:

Form 2 - This form is only for special cases. Your teacher will tell you if you need to have this form filled out by a Qualified Scientist.

Form 4 - This form must be completed by anyone doing a project involving humans. Copies of this form serve as permission forms for the human subjects.

Form 5A - This form is to be filled out only by those doing experiments on animals with a backbone.

These forms are available online at [www.sciserv.org/isef](http://www.sciserv.org/isef)

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1. Name: \_\_\_\_\_ Grade Level: \_\_\_\_\_

2. Name: \_\_\_\_\_ Grade Level: \_\_\_\_\_

3. School: \_\_\_\_\_ Category: \_\_\_\_\_

4. Science Teacher: \_\_\_\_\_

5. Project Title: \_\_\_\_\_

6. Question being tested: \_\_\_\_\_

7. Hypothesis: \_\_\_\_\_

8. Describe the procedures that will be used to test this project:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

9. Bibliography (at least 3 sources): \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

10. When will this project be started? \_\_\_\_\_

11. When will this project be finished? \_\_\_\_\_

12. If your project is about humans, vertebrate animals, microorganisms, or other potentially hazardous or dangerous objects; please contact your science teacher for more information and to find out which other forms will be necessary. All of the forms and descriptions are located at [www.societyforscience.org/isef](http://www.societyforscience.org/isef) .

13. I understand the ISEF rules and the risks that are possible in this research plan.

a. Student's Signature \_\_\_\_\_ Date: \_\_\_\_\_

b. Parent's Signature \_\_\_\_\_ Date: \_\_\_\_\_

## Categories

1. Behavioral & Social Science
2. Microbiology
3. Plant Science (Botany)
4. Chemistry
5. Math & Computer Science
6. Earth & Space Science
7. Engineering
8. Environmental Science
9. None
10. Medicine, Health, & Nutrition
11. None
12. Physics
13. Animal Science (Zoology)
14. Consumer Science
15. Team Projects