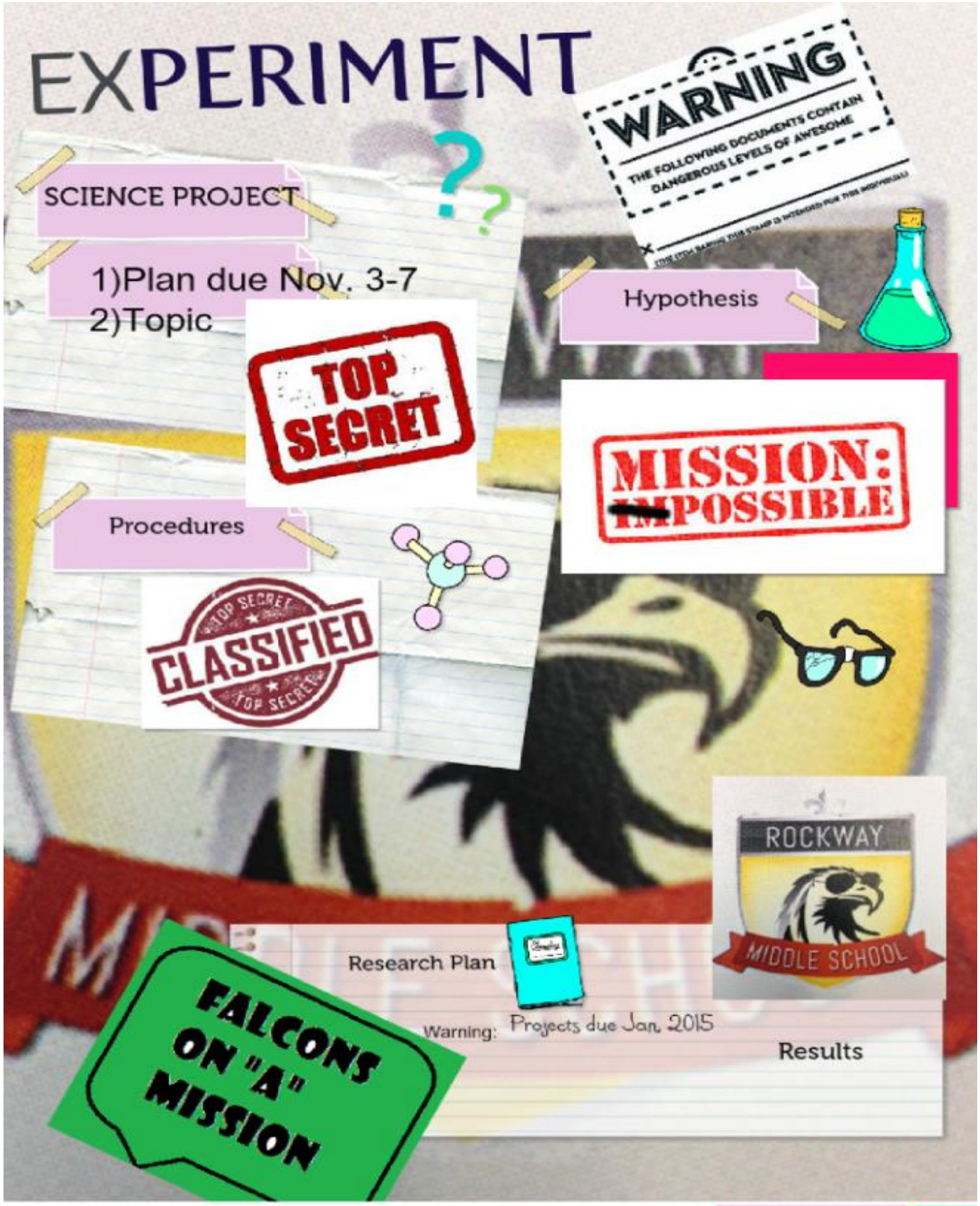
EXPERIMENT
WARNING
THE FOLLOWING DOCUMENTS CONTAIN DANGEROUS LEVELS OF AWESOME
SCIENCE PROJECT
1)Plan due Nov. 3-7
2)Topic
Hypothesis
TOP SECRET
MISSION: IMPOSSIBLE
Procedures
TOP SECRET
CLASSIFIED
TOP SECRET
ROCKWAY
MIDDLE SCHOOL
Research Plan
FALCONS ON "A" MISSION
Warning: Projects due Jan. 2015
Results

This Guide will help you and your parents/sponsor research, carry out and display a Science Project that can be either one of the following:

**A Controlled Experiment:**

Students are encouraged to design 'controlled' experiments, ones that allow them to set up a standard and then change only one variable at a time to see how that variable might affect the original condition tested as the standard. In designing this experiment, it is critical that only one variable – a condition that may affect the results of the experiment – is changed at a time. This makes the experiment a 'controlled' experiment.

**Non Inquiry Based Research**

Find the rubrics for Research Paper: at:

**http://science.dadeschools.net/scienceFair/researchPapers.html**

**Engineering Projects (Inventions or Improvements on an existing item)**

"Scientists try to understand how nature works; engineers create things that never were." An engineering project should state the engineering goals, the development process and the evaluation of improvements. Engineering projects may include the following:

Define a need or "How can I make this better?"

Develop or establish design criteria (could be more than one)

Do background research and search the literature to see what has already been done or what products already exist that fill a similar need? What makes them good and/or weak?

Prepare preliminary designs and a materials list. Consider costs, manufacturing and user requirements.

Build and test a prototype of your best design. Consider reliability, repair and servicing.

Retest and redesign as necessary. Product testing

Present results

**Computer Science Projects**

These often involve creating and writing new algorithms to solve a problem or improve on an existing algorithm. Simulations, models or 'virtual reality' are other areas on which to conduct research.

**Mathematics Projects**

These involve proofs, solving equations, etc. Math is the language of science and is used to explain existing phenomena or prove new concepts and ideas.

**Ideas Online:**

*If you obtain any information from any website it must be cited in your bibliography.

**Bibliography Citation maker:** http://www.easybib.com/

http://school.discoveryeducation.com/sciencefaircentral/

http://www.all-science-fair-projects.com/

http://www.ipl.org/div/projectguide/

http://homeworkspot.com/sciencefair/

http://www.chem4kids.com

http://www.sciencepage.org/scifair.htm

http://sciencefairproject.virtualave.net

http://www.sciencebob.com/lab/sciencefair/resources.html

**MDCPS Resources for Science Fair:**

http://science.dadeschools.net/scienceFair/resources.html

**Parents and Students are encouraged to visit the following websites:**

**http://science.dadeschools.net/scienceFair/default.html**

**http://rockway.dadeschools.net**

# Choose your Topic Area

| ANIMAL SCIENCES | BEHAVIORAL & SOCIAL SCIENCES | BIOCHEMISTRY | CELLULAR & MOLECULAR BIOLOGY |
|---|---|---|---|
| Animal Husbandry<br>Development<br>Ecology<br>Pathology<br>Physiology<br>Populations Genetics<br>Systematics<br>Other | Clinical & Developmental Psychology<br>Cognitive Psychology<br>Physiological Psychology<br>Sociology<br>Other | General Biochemistry<br>Metabolism<br>Structural Biochemistry<br>Other | Cellular Biology<br>Cellular and Molecular Genetics<br>Immunology<br>Molecular Biology<br>Other |
| **COMPUTER SCIENCE** | **EARTH & PLANETARY SCIENCE** | **ENGINEERING** | **ENGINEERING** |
| Algorithms, Data Bases<br>Artificial Intelligence<br>Networking and Communications<br>Computational Science, Computer Graphics<br>Computer System, Operating System<br>Software Engineering.<br>Programming Languages<br>Other | Climatology, Weather<br>Geochemistry, Mineralogy<br>Paleontology<br>Geophysics<br>Planetary Science<br>Tectonics<br>Other | Electrical & Mechanical<br>Electrical Engineering, Computer Engineering, Controls<br>Mechanical Engineering, Robotics<br>Thermodynamics, Solar<br>Other | Materials & Bioengineering<br>Bioengineering<br>Chemical Engineering<br>Civil Engineering, Construction Eng.<br>Industrial Engineering, Processing<br>Material Science<br>Other |
| **ENVIRONMENTAL MANAGEMENT** | **ENVIRONMENTAL SCIENCES** | **MATHEMATICAL SCIENCES** | **MEDICINE & HEALTH SCIENCES** |
| Bioremediation<br>Ecosystems Management<br>Environmental Engineering<br>Land Resource Management, Forestry<br>Recycling, Waste Management<br>Other | Air Pollution and Air Quality<br>Soil Contamination and Soil Quality<br>Water Pollution and Water Quality<br>Other | Algebra<br>Analysis<br>Applied Mathematics<br>Geometry<br>Probability and Statistics<br>Other | Disease Diagnosis and Treatment<br>Epidemiology<br>Genetics<br>Molecular Biology of Diseases<br>Physiology and Pathophysiology<br>Other |
| **PHYSICS & ASTRONOMY** | **PLANT SCIENCES** | **ENERGY & TRANSPORTATION** | **CHEMISTRY** |
| Astronomy<br>Atoms, Molecules, Solids<br>Biological Physics<br>Instrumentation and Electronics<br>Magnetics and Electromagnetics<br>Nuclear and Particle Physics<br>Optics, Lasers, Masers<br>Theoretical Physics, Theoretical or Computational Astronomy | Agriculture/Agronomy<br>Development<br>Ecology<br>Genetics<br>Photosynthesis<br>Plant Physiology (Molecular, Cellular, Organismal)<br>Plant Systematics, Evolution<br>Other | Aerospace and Aeronautical Engineering, Aerodynamics<br>Alternative Fuels<br>Fossil Fuel Energy<br>Vehicle Development<br>Renewable Energies<br>Other | Analytical Chemistry<br>General Chemistry<br>Inorganic Chemistry<br>Organic Chemistry<br>Physical Chemistry<br>Other |

# SFP Time Line for Controlled Experiments

| Assignments | Due Dates |
|---|---|
| **Part I: Research Plan**<br>**The Research Plan should be typed, printed and signed by parents or Sponsors. It must contain:** | |
| 1. Title of the Project<br>2. Problem Statement<br>3. Hypothesis<br>4. Independent (Manipulated or Test) Variable<br>5. Dependent (Responding or Outcome) Variable<br>6. Constants<br>7. Control Experiment<br>8. Materials<br>9. Procedures<br>10. Bibliography: with at least five (5) major references | ***Nov. 3-7***<br><br>**The research plan should be signed by parents or sponsors and turned in to the teacher before experimentation. Each teacher may assign specific due dates for each part of the project.** |
| **Part II: Experiment, Poster Board and Data Book**<br>**Information on the Project Board should be typed. Keep a Journal "Data Book"** | |
| **Run your experiment trials, making sure you have a control. Then display your process on a Poster Board showing the following:**<br>1. Title (that refers to your topic)<br>2. Problem Statement<br>3. Hypothesis<br>4. Independent (Manipulated or Test) Variable<br>5. Dependent (Responding or Outcome) Variable<br>6. Constants<br>7. Control Experiment<br>8. Materials<br>9. Procedures<br>10. Data Tables and Graphs/Pictures<br>11. Results<br>12. Conclusion<br>13. Abstract | **Jan 12-16**<br><br>***Data Book is (highly recommended)** |

**Only Teachers:**

| | |
|---|---|
| **Submit Class Research Plans to Judges** | **Nov. 11 (During Planning)** |
| **School Judges Meeting** | **Nov. 11 (During Planning)** |

**Very Important:**

- Science Fair Project Research Plan and Display board sections must be typed.
- An ADULT SPONSOR/PARENT must sign the Research Plan and turn it in to the teacher on Nov. 3-7
- Observe the procedures described in this guide.

**Science Fair Research Plan is due Nov. 3-7**
**Science Fair Project Board w/Data Book due Jan 12-16**
**Research Papers Thesis Statement and Introduction due Nov. 3-7**

# SFP Guide for Students and Parents

## Part I: Research Plan (Due Nov. 3-7)

**The Research Plan should be typed and printed. It must include the following parts:**

1. **Title of the Project (Topic):** The topic is perhaps the most difficult part. Get an idea of what you want to study and learn about. Ideas should come from things in your area of interest. A hobby might lead you to a good topic. What is going on in the world that you would like to know more about? Choose a topic that can be done in the amount of time you have. **"Make sure your topic is appropriate to your grade level and oriented to increase your scientific knowledge".** Research your topic. Go to the library or internet to learn more about your topic. Always ask Why? or What if?. Look for unexplained or unexpected results. Also, talk to professionals in the field, organize your information and start writing your Research Plan by giving a "Title" to your project. **Be as creative as you can be! The title must refer to the topic.**
2. **Problem:** Pick a question or problem that is not too broad and that can be answered through YOUR scientific investigation. Be very specific!
   The problem must be stated as a QUESTION:
   **What is the effect of _____ on _____?**
   **(I.V) Independent variable (D.V) Dependent variable**

3. **Hypothesis:** State a hypothesis using the IF and THEN format:
   If… (the cause or Independent Variable), then… (the effect or Dependent Variable) … because… (reason why this would happen)
   **"If a pansy plant is placed in natural light then it will grow five centimeters higher than a pansy plant grown in the artificial light, because …**

   **Identification of Variables:** Make sure you identify the following:

4. **The independent variable** (also called manipulated, experimental or Test variable). This is the variable, the only one thing that you can freely manipulate or change in your experiment. In a controlled experiment you only change one variable at a time to be certain that the effect that this change produced is the result of the action of this variable. In your project the independent variable will be: _____
5. **The dependent variable** (also called responding or outcome variable). The dependent variable is that factor that is affected in response to the independent variable. In your experiment the dependent variable will be: _____
6. **The constant variables**: These are **all** the **factors** and **conditions** that will be kept identical for all the trials. The constant variables will be: _____(list all possible constants)_____
7. **The control experiment:** A control is an additional experiment you run alongside your test experiment. It is identical in every way to your test experiment, except for the one thing you are testing or independent variable. For example: You want to know if salt affects the time it takes for water to boil. You boil water "without" the salt and take the time it takes in regular conditions; this would be your control experiment, because you are not adding the salt. When you start boiling the water adding the salt, you will compare the results with your "Control test" to see if actually salt affected the time it takes for the water to boil.

8. **Materials:** List all materials necessary to complete the experiment- be specific (include amounts, size, type, etc- remember **everything must be in SI Units/Metric System** Use bullets to list your materials.
9. **Procedures:** Number as many steps as necessary to perform the experiment. Use numbers to explain in detail how you will do your experiment and exactly what will be involved. Remember that you have to be very specific for someone would replicate your experiment, should he be able to follow the directions.
10. **Bibliography:** You should include the source about any information that is not your own (i.e. books, journal articles, websites, etc.)
    You can use MLA Format: (example)
    1. Journal article, one author-
    Bekerian, DD.(1993), In search of the Typical Eyewitness. American Psychologist, 48. 574-576
    2. Reference to an entire book-
    Cone, J.D.,& Foster, S/L/ (1993. Dissertations from Start to Finish: Psychology and Related Fields. Washington, D.C: American Psychological Association.
    This is APA Style. Bibliography is alphabetical and not numbered. First line is at the margin, and the second line of same reference is indented.
    3. Reference to a website:
    Lynch, Tim. "DSN Trials and Tribble-actions Review." Phi: Bradley's Science Fiction Club. 1996. Bradley University. 8 Oct. 1999
    http://www.bradley.edu/campusorg/sci[hi/DS9/ep/503r.html
    To help you out with this, here a citation maker: http://www.easybib.com/

Once you have finished with the last step (Bibliography), type your plan, print it and turn it in to your Science Teacher on Nov. 3-7.

**Part II: Experimentation, Poster Board and Data Book (Due Jan.12-16)**

**Experimentation:**

- Now, follow your Research Plan making sure you have made the adjustments suggested by your teacher or sponsor.
- Get a Journal notebook to use as a "DATA BOOK"
- Get your project materials.
- Perform at least 3 trials of your experiment using SI units (metric system)
- Create your Data table to record the results; write notes, drawings and observations on the Journal "Data Book" with the entry dates.
- Don't forget the "control experiment", which should be running at the same time as your experiment.
- Take pictures and record data on your Data Book as frequently as possible.
- On your "Data Book" create Graphs (bar graphs, circle graphs, line graphs) of your results.
- Analyze your data comparing your results with the control.
- Write the results in "words" using SI units/metric system. (See more about how to write results on the next page)
- Draw conclusions. (See more about writing Conclusions on the next page)

**Poster Board**:

From your Research Plan and your Data Book, type and print the following to be displayed on your Poster board:

- **Title**
- **Problem**
- **Hypothesis**
- **Independent Variable**
- **Dependent Variable**
- **Constants**
- **Control Experiment**
- **Data Tables**
- **Graphs**
- **Pictures-** (If you are including pictures, make sure not to disclose the identity of the people involved. Otherwise you will need written consent and signature of participants. Take photographs of the most important parts/phases of your experiment to use in the display.
- **Results-** Describe your data table, graphs and pictures in written form or describe your data using words. For example: Based on the data collection the plant grew 5 cm during the first week, 3cm during the second week, etc. DO NOT WRITE conclusions on this section. Do not write whether your hypothesis was supported or not. Write only what you have as a result of your experimentation.
- **Conclusions-** Before writing the Conclusion Essay read your results; examine your graphs and tables/pictures. This will help you check your testable hypothesis and answer the problem. Identify patterns in the graphs. Did your experiment give you the expected results? Why? Why not? Was your experiment performed with the same exact steps each

trial? Are there any other explanations that you had not considered or observed? Were there experimental errors in your data taking, experimental design or observations? Remember that understanding errors is a key skill scientist must develop.

Write the conclusion in a 3-paragraph Essay that addresses all the following answers to these questions. Don't forget that this is an ESSAY not a question answer paragraph.

**First Paragraph**

1. What was investigated?
2. Was the hypothesis supported by the data?
3. What were your major findings? Analyze your data using the statistics that you can understand and explain how the variable tested produced a change compared to the control experiment. Never alter the results to "fit" your hypothesis.

**Second Paragraph**

4. How did your findings compare to those of other researchers that investigated the same topic?

**Third Paragraph**

5. What possible explanations can you offer for your findings?
6. What recommendations do you have for further study and for improving the experiment?
7. What are possible applications of the experiment?

- **Abstract:** The abstract is the description of the project in a few words. Must be typed on the proper form: paragraph format and 250 words or less. Follow this format:
  The problem was _____
  It was hypothesized that if _____ , then_____.
  The procedure followed was _____
  It was concluded that_____
  The results of the experiment _____ did (did not) ___support the hypothesis.

## Sample ABSTRACT

**Title:** Effects of Marine Engine Exhaust Water on Algae
**Name of Student:** Mary E. Jones
**School:** Hometown High School, Hometown, PA, United States

This project in its present form is the result of bioassay experimentation of the effects of two-cycle marine engine exhaust water on certain green algae. The initial idea was to determine the toxicity of outboard engine lubricant. Some success with lubricants eventually led to the formulation of "synthetic" exhaust water which, in turn, led to the use of actual two-cycle engine exhaust water as the test substance. Toxicity was determined by means of the standard bottle or "batch" bioassay technique. Scenedesmus quadricauda and Ankistrodesmus sp. were used as the test organisms. Toxicity was measured in terms of a decrease in the maximum standing crop. The effective concentration - 50% (EC50) for Scenedesmus quadricauda was found to be 3.75% exhaust water; for Ankistrodesmus sp. 3.1% exhaust water using the bottle technique. Anomalies in growth curves raised the suspicion that evaporation
was affecting the results; therefore, a fl ow-through system was improvised utilizing the characteristics of a device called a Biomonitor. Use of a Biomonitor lessened the infl uence of evaporation, and the EC 50 was found to be 1.4% exhaust water using Ankistrodesmus sp. As the test organism. Mixed populations of various algae gave an EC 50 of 1.28% exhaust water.
The contributions of this project are twofold. First, the toxicity of two-cycle marine engine exhaust was found to be considerably greater than reported in the literature (1.4% vs. 4.2%). Secondly, the benefits of a flow-through bioassay technique utilizing the Biomonitor was demonstrated.

# Sample Project Backboard Set Up

<table>
<tr>
<td>Problem Statement<br><br>Hypothesis<br><br>Abstract<br>(This is the required location, please follow format)</td>
<td>Scientific Title:<br>The Effect of … on …<br>(or creative title)<br><br>Materials Procedures<br><br>Independent Variable Constants<br><br>Dependent Variable Control Experiment<br><br>Data Table Graphs<br><br>Pictures</td>
<td>Results<br><br>Conclusions (Follow format)<br><br>Applications (extract from Conclusions)</td>
</tr>
</table>

Hints:

- Be organized. Make sure the display is logically presented and easy to read. A glance should permit ANYONE to locate title, experiment results, and conclusions.
- Eye-catching: Use neat colorful headings, charts and graphs. Pay special attention to labeling the graphs, diagrams, etc.
- ANYONE should be able to understand the visuals without further explanation.

## Display and Safety Requirements (Read carefully)

1. Abstract: Must BE displayed on the front left wing of the board, in the lower left corner. Must be 250 words or less and written on the proper format.
2. Size of Display: Size Poster size cannot exceed 36" x 48".
3. Organisms: No living creatures including animals, plants and microbes (Bacteria, algae, fungi, etc) will be displayed. No organisms fungi, any type of cultured growth, spoiled food, or molds will be displayed)
4. Parts: No human or animal parts, histological sections (tissues) or wet mounts may be displayed.
5. Specimens: No taxidermy specimens or parts and no preserved animals, vertebrates or invertebrates, including embryos. No dry plant materials may be displayed.
6. Sensitive photographs: No visual presentations of surgical techniques, dissections and /or other laboratory techniques depicting vertebrate animals or humans in other than normal conditions. All pictures of human subjects must be accompanied by a consent from which grants permission to use the pictures.
7. Soil/Waste: No soil or waste materials or samples may be displayed.
8. Chemicals/water: No chemicals including water may be displayed.
9. Food: No food (human or animal) may be displayed.
10. Sharp Items: No syringes, needles, pipettes, or anything sharp may be displayed.
11. Controlled substance: No poisons, drugs, controlled substances, hazardous substances, or devices may be displayed.
12. Dry Ice/Gases: No dry ice or sublimating solids may be displayed. No gases under pressure may be displayed.
13. Fire/Heat: No flames or highly flammable materials may be displayed. No temperatures above 75º.
14. Tanks: No tanks that have contained combustible liquids or gases including butane and propane may be displayed.
15. Machinery: No unshielded belts, pulleys, chains, or moving parts that pose hazard may be displayed.
16. Lasers: No lasers which do not meet ISEF standards (Class II, student operated, with warning sign- Laser radiation: do not stare into beam, protective housing and power disconnect may be separated) No class II or IV lasers may be displayed.
17. Electricity: All ISEF standards must be observed. No unshielded high-voltage equipment, large vacuum tubes, or ray-generating device. No bare wires or exposed knife switches used in circuits of 12 volts or more may be displayed. No uninsulated wiring or connectors may be displayed.
18. Glass: No glass, glassware, or thermometers may be displayed.
19. Apparatus: no non-functional apparatus or chemical containers, empty or otherwise, may be displayed.
20. Batteries: no batteries with open top cells may be displayed.
21. Distractions: No loud disturbing sounds may be produced by a project's equipment. No bright or distractive light
22. Small Objects: No small objects that are not encased or attached to the project may be displayed.
23. Embellishments: No awards, medals, business cards, flags, etc. No personal information may be displayed. (no personal photographs, accomplishments, acknowledgements, addresses, phone or fax numbers) A one page narrative may be handed out to judges.
24. Project Data Book must be displayed if available.

## Information

**As new information becomes available, it will be posted at:**

**http://science.dadeschools.net/scienceFair/default.html**
**and http://rockway.dadeschools.net**

**Student Handbook**
**http://science.dadeschools.net/scienceFair/documents/2013-2014/Student%20Handbook.pdf**

**Guidelines for Science and Engineering Fairs 2014-15.**
**Which includes the Safety regulations.**
**http://science.dadeschools.net/scienceFair/documents/2014-2015/Rules%20and%20Guidelines%202015.pdf**

Please visit www.societyforscience.org/isef/students/project_categories
for a full description and definition of the Intel categories.

**Ideas Online:**
*If you obtain any information from any website it must be cited in your bibliography.

**Bibliography Citation maker:** http://www.easybib.com/
http://school.discoveryeducation.com/sciencefaircentral/
http://www.all-science-fair-projects.com/
http://www.ipl.org/div/projectguide/
http://homeworkspot.com/sciencefair/
http://www.chem4kids.com
http://www.sciencepage.org/scifair.htm
http://sciencefairproject.virtualave.net
http://www.sciencebob.com/lab/sciencefair/resources.html
**MDCPS Resources for Science Fair:**
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**http://rockway.dadeschools.net**