

SCIENCE FAIR



THIRD & FOURTH GRADE STUDENT PACKET

2015

FRANK C. MARTIN K-8 CENTER

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Dear Students and Parents,

It is time to start planning the Frank C. Martin K-8 Center Annual Science Fair! The Science Fair is a school- sponsored activity that supplements the regular curriculum of classroom instruction. The classroom teacher and school administration have the responsibility to regulate the content and presentation of all student projects to assure that they are consistent with the interests of the school community. The purpose of this activity is to encourage students' interest in science, to develop their inquiry and investigation skills and to enhance children's pride in completing research projects.

The Frank C. Martin K-8 Center Science Fair will:

- Enable students to exhibit their projects and share ideas with other students and community members;
- Provide students with exciting opportunities to work with the scientific method on a topic of their own choosing which need not necessarily relate directly to the curriculum at a particular grade level;
- Recognize all students for participation or merit based on a rubric or set standard and
- Adhere to standards of effective scientific instruction. Projects that "fail" to turn out as expected are an important learning opportunity. Experimentation is a very valuable part of learning and "failure" of a project or experiment is considered a valid project for display.

All project ideas must be submitted to the school on the provided Project Proposal form. The proposal must contain a statement of problem or hypothesis and the proposed procedures for the project. The classroom teacher will approve projects. Projects without prior approval, projects inconsistent with the prior approved proposal, or projects that have been substantially changed from what was previously approved will only be displayed at the principal's discretion.

This packet will serve as a guide for a successful project. On the following pages you will find the following:

- A Science Fair Student Checklist: This is the timeline of what is due and when it is due to your teacher. Working plan grades will be earned by submitting your work in a timely manner.
- The Working Plan Pages: These pages will tell you what each portion of your project must contain.
- Safety and Display Requirements: These are the Do's and Don'ts of your final project
- Scoring Rubric Guidelines: This is a guide for your grading. A score will be determined on how well you are able to achieve the items on this rubric.

Feel free to speak with your Science Teacher if you have questions. Most importantly, have fun! All students will receive a ribbon of participation for their efforts in the Science Fair. Projects will be displayed for parents and visitors on **Wednesday, January 13, 2015**.

The Frank C. Martin K-8 Center Administration.

Science Skills Learned and Practiced through Science Fair Participation:

Observing - The learner will identify objects and their properties utilizing all five senses, identify changes in various systems, and make organized observations.

Classifying - The learner will sort objects by their properties, match objects by their likenesses and differences, and describe the sub-components of objects.

Measuring - The learner will compare two like quantities where one is used as a unit of measure.

Collecting and Organizing - The learner will gather, describe, and record data and then order, classify, and compare the data to identify patterns and similarities.

Predicting and Inferring - The learner will suggest explanations for a set of collected data and then form generalizations.

Identifying Variables - The learner will formulate a hypothesis from a set of observations and inferences, and devise a method to verify the hypothesis.

Synthesizing - The learner will integrate process skills in the design, experimentation, and interpretation of an investigation of an observable phenomena.



TYPES OF PROJECTS

Scientific Investigation: In this type of experimental project you ask a question, construct a hypothesis, test your hypothesis using an experiment and draw conclusions from your experiment. It involves using the scientific method. It must follow an experimental design.

- A. **Experiment:** In this kind of investigation, your purpose is to change something (test or independent/manipulated variable) and record the outcome of this change (outcome or dependent/responding variable). EXAMPLE: Which material, aluminum foil or plastic wrap, will insulate cold water better?
- B. **Experiment with a Control Group:** This kind of investigation involves a more complex investigation that is designed to test the effects of a single condition or factor on a system. For example, you might have a group of plants such as an experimental group and another group of the same type of plants as a control group.











Invention: Think of a need that exists for people in general, or a person with a specific handicap. Think about a device that could make a certain difficult task easier. Think of an inconvenience that could be made easier with a simple device. For example, if you hate searching for the toothpaste tube every morning, consider developing a homing beacon for it. You might want to look at specialty stores. This can be an improvement to an existing product or something completely brand new!



Science Fair Rules and Guidelines:

- 1. Only individual projects are allowed**
- 2. Only two types of projects may be entered, they are scientific investigation or an invention.**
- 3. Projects must fit in one of the 11 science fair project category criteria.**
- 4. Projects may not include mold growth or the use of bacteria.**
- 5. No use of vertebrate animals is allowed except for human observational projects.**
- 6. No use of prescription drugs, harmful or illegal substances are allowed. Grocery items (i.e. baking soda, vinegar, salt, lemon juice, etc.) are appropriate.**
- 7. Project display board must follow safety guidelines in this handbook.**
- 8. Projects must be approved by the classroom teacher.**

SCIENCE FAIR CATEGORIES

	<p>Physical Science: Projects that study the nature and properties of nonliving matter, energy and/or force and motion.</p>
	<p>Behavioral Science: Projects that observe the behavior of invertebrate animals. The use of vertebrate animals is not allowed except for human observational projects.</p>
	<p>Botany: Projects that use subjects such as plants (mosses, seed plants) agriculture, conservation, and forestry. NO LIVE PLANTS may be displayed. Experiments using MOLD or FUNGI are NOT ALLOWED.</p>
	<p>Chemistry: Projects that examine chemical reactions, the chemistry of living things, photosynthesis, solubility, heat capacity, etc. No prescription drugs, dangerous or illegal substances should be used in the experiments.</p>
	<p>Earth and Space: These are projects investigating principles of geology (for example, weathering and erosion), geography, astronomy, meteorology, and related fields.</p>
	<p>Engineering: Projects can develop technological devices, which are useful to the global society within an engineering-related field, such as electricity, mechanical, chemical, aeronautical, and geological.</p>
	<p>Environmental Science: Projects that deal with global change, issues related to Earth, such as water, air, climate, waste and pollution, green living, human health, ecosystems and related fields.</p>
	<p>Medicine & Health: The project's emphasis will be on human health (Studies are limited to observational projects only)</p>
	<p>Zoology: Projects that observe and record the growth behaviors of animals (INVERTEBRATES). Vertebrate studies are limited to observational projects only.</p>
	<p>Mathematics: Projects are developed that demonstrate any theory or principal of mathematics.</p>
	<p>Inventions: Projects that uses design and engineering processes to find a practical solution to a problem that addresses a need that exists for people in general or a person with a specific handicap.</p>

THE SCIENTIFIC METHOD

Step 1– Decide on a Problem

The most important part of any science fair project is determining what the project will be about. Think of things that may interest you or things you may want to learn more about. A good topic is one that asks a specific question that can be solved in a reasonable amount of time. From this point forward, everything should be recorded in a log book; this will help you to remain organized.

Begin by exploring a scientific concept that you are interested in. Perhaps it is something you read about or were introduced in your classroom. Think of some kind of experiment that you would like to try. Remember that you must be able to measure the experiment each day.

Write down your problem. Make sure that there is a purpose to your experiment. Before you proceed, be sure to have your teacher approve your Problem Statement and Purpose.

Sample Project Topic:	Lights, Camera, Grow!
Sample Project Question:	In which light will bean seeds grow best: sunlight, red light, or green light?
Sample Project Purpose:	The purpose of this project is to determine which light is best for growing bean seeds.

Step 2 – Conduct Research

At this point, you should learn about your topic. Research experiments that may have been conducted on your topic to determine what is already known about it. Use various resources to help you understand your topic, not answer your problem statement.

Be sure to keep a record of what you research and read. This research will be used to create your bibliography.

Encyclopedia	Author's Last Name, First Name (year published). Topic. <u>Name of Encyclopedia</u> (volume #, page #) State published in: Name of Publisher.
Book	Author's Last Name, First Name (year published). <u>Title of Book</u> . City, State published in: Name of Publisher.
Internet	Give the title and internet address. Example: Battery Brands-www.Energy.com (Search engines, i.e. Google, ASK, etc. are not website addresses.)
Magazine	Author's Last Name, First Name (date published). "Title of Article." Name of Magazine. Pages.

Step 3 – Form a Hypothesis

Now that you have completed your background research you are ready to write a hypothesis. A hypothesis is an educated guess. It is a statement based on your research that you will attempt to prove or disapprove. Your hypothesis is a prediction of what you think will happen during your investigation.

A good hypothesis a testable statement that is clear and brief.

Sample Project Hypothesis:	If bean seeds grow best in certain light, then bean seeds will grow best in sunlight.
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Step 4 – Experimental Design/Research Plan

The experimental design is a plan to confirm your hypothesis. This is not a specific item on your display board, but is determined by what your hypothesis is, the materials that you need and the procedures that you will carry out.

Scientists use the terms: subjects, variables, and controls.

The subject of the experiment is what is being tested.

Sample Project Subject:	The subject is the bean seed.
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The variable is the condition that is changed.

Sample Project Variable:	The type of light being used is the variables.
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The controls are the conditions that are not changed.

Sample Project Controls:	Only the light source is changed. All other factors (container, amount of water given, temperature, soil, etc.) are controls. They are the same for every bean seed tested.
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All the factors, other than the variable, need to be the same for each subject. If factors in your experiment change, it will be impossible to determine whether your variable or some other factor caused the results.

Step 5 – Materials/Equipment

Now that you have planned your experiment, gather all the materials you will need to do the experiment. You will need to prepare a complete materials inventory. This list must include everything that you will use. Tell the size, quantity, kind and/or temperature of all items.

As you begin the experiment, make detailed observations of what is happening. Take your measurements carefully. Keep carefully written notes about what you do and how you do it.

Step 6 – Procedure

Write a detailed description of how to do your experiment. The procedure should be a step-by-step numbered list that anyone could follow to duplicate your experiment. You are writing a recipe for your science experiment.

As you work through it, you may find that you have to change it. That's OK, just make notes and change your procedure afterwards, to show the changes. Remember, any scientist should be able to take your procedure and repeat your experiment following your instructions.

- It is easier to use a numbered list, like in a cookbook rather than write a paragraph.
- **Start each sentence with an action verb: mix, stir, get, measure, etc.**
- Include quantities or amounts that you will measure. Use the metric system, of measurement for all units (ie, grams, liters, meters, etc.)

Step 7 – Variables and Controls

- Identify the independent (manipulated) variable, this is the one that you control, or are changing in your experiment, i.e., type of light.
- Identify the dependent (responding) variable, this is the one that reacts or changes in response to the independent variable, i.e., the height of the plant (growth of the bean seed).
- How do you use constants in your experiment? Constants are the part of your experiment that you do not change so that you can compare the results of your test.
- It is wise to use a control group in your experiment. A control group is the group that does not receive the experimental variable. It has what is usually considered normal conditions, i.e., room temperature, normal amount of water, normal amount of sunlight. A control group helps you to be sure that what you are testing for is really happening because of what YOU DO in your experiment i.e. bean seed receiving sunlight).

Step 8 – Experiment

- Carry out your experiment.
- Make and record observations using a measuring tool (i.e., ruler, thermometer, balance, etc.) whenever possible.
- Record measurements in metric units, i.e., centimeters (cm); grams (g); degrees Celsius ($^{\circ}\text{C}$).
- Design a data table to keep track of your results.

Then, **REPEAT THE EXPERIMENT** over again at least **two more times**. Record your results as carefully as you did for the first time. ALL scientists repeat their experiments; we **INSIST** you repeat yours as well.

Step 9 – Results

- When you have all of your results, from all the times you did the experiment, you need to design the way that you will report your results.
- Many students use graphs, charts and written summaries of what happened in the experiment.
- Determine averages, mean, mode, or frequency when appropriate.
- Use photographs whenever possible to show changes.
- Display all your results and measurements, even if it doesn't match what you thought was going to happen.

Step 10– Compare your results with your Hypothesis

Look again at your HYPOTHESIS and at the results of your experiment. Think about what happened and why it happened that way. Write down the reasons you think the results happened the way they did.



Step 11 – Conclusion (One page Maximum)

A summary of what your experiment shows and how your work can be used for more research. Your conclusion should begin with a statement on whether or not your results agreed or disagreed with your hypothesis.

- Explain what you learned from your experiment.
- Explain the importance of your results, how it contributes to making something better.
- Write comments about your project.
- Explain how you could have improved your project.

1.

Step 12 – Abstract and Bibliography (150 Words Maximum)

- Paragraph 1 – Describe your purpose and hypothesis.
- Paragraph 2 – Briefly describe your procedure.
- Paragraph 3 – Describe and explain your results and also state if you hypothesis was supported or not supported by the results. Suggest a reason why it was or was not supported.
- Paragraph 4 – Explain your conclusion and application(s).
- Put your bibliography of at least 3 different sources on the same page.

Step 13 – Application (1/2 page Maximum)

In the application you should explain why this experiments was important. It must be relevant to real life situations.

Step 14– Final Display: 36 in. X 36 in. (Include First and last name and Teacher’s name on back)

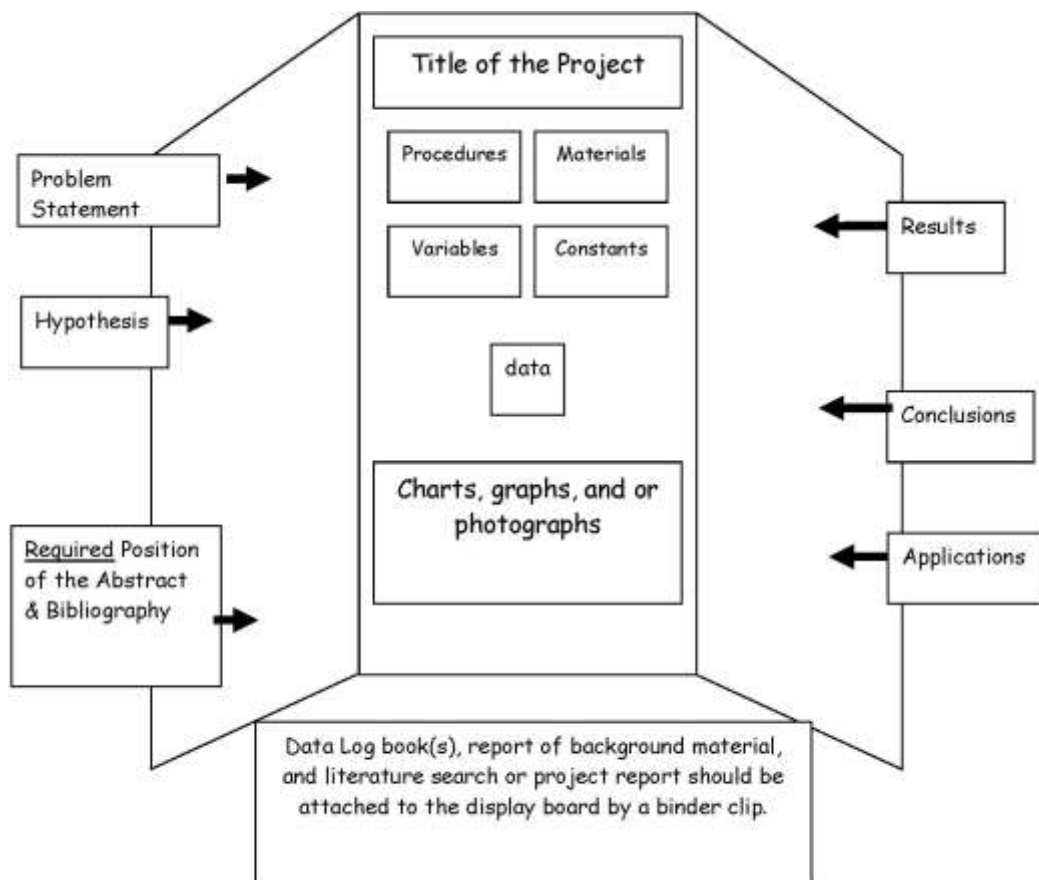


EXHIBIT GUIDELINES

EXHIBIT SPACE: Maximum size is:

Width: (side to side) 9 cm (3 feet)

Depth: (front to back) 76 cm (2 1/2 feet)

Height: Table Exhibit 92 cm (3 feet)

- Keep the exhibit neat, uncluttered and to the point.
- All posters, charts, etc. must be attached to the exhibit.
- No part of an exhibit may be attached to walls or tables.
- Build your exhibit compactly. It must be self-supporting (FREE STANDING).
- Be sure to make everything sturdy so it can be safely transported.
- Fasten everything well.
- The exhibit displays your project. Use attractive lettering. Make cut-out letters since stencil letters can be hard to read.
- Use one-color printing to avoid confusion.
- Spell everything correctly.
- Main points should be large and simple. Details must be clear and legible from three feet away.
- The abstract/bibliography must be placed on the board's lower left-hand corner (as you face the board).

Elementary Safety Display Guidelines

- Anything which could be hazardous to the public, the exhibitor, or other exhibitors is PROHIBITED.
- Nothing sharp or pointed

No organisms may be displayed, No vertebrates, invertebrate, fungi, bacteria, or plants.

- No owl pellets No mice, live or dead No skeletons
- No fish, live or dead
- Microbial cultures- No fungi, live or dead
- No bread molds, bacteria, viruses, viroids, prions, rickettsia, live or dead
- No parasites, human or other, live or dead
- No insects, live or dead

No chemicals may be displayed.

- No acids, dilute or strong
 - No bases, dilute or strong
 - No salt solutions
 - No insecticides
 - No repellents
 - No mercury
 - No medicines, vitamins, over-the-counter drugs
 - Flammable substances: No flammable substances may be displayed.
 - No gases
 - No solid rocket fuel
 - No flammable liquids
 - No fumes
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- An alternative solution to displaying the above items: Take photographs of the substances that were used or use a digital camera and create large pictures with a computer printer for display on your board. **No identifiable humans or their parts may be displayed in photos.**
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- All projects will be inspected for adherence to Science Fair Safety Guidelines by the classroom teacher or the school Science Fair Committee.

INVESTIGATION PROJECT ABSTRACT / BIBLIOGRAPHY

Student's Name: _____

Project Title: _____

Abstract

(Complete Summary 3-5 Paragraphs with approximately 250 words)

Be sure to include the following in the abstract of the project:

- The purpose of the project. Why did you choose to do this project or how did you get the idea to do it?
- State briefly what you thought would happen. Also, describe how you conducted your project.
- What happened? Tell the results of your experiment.
- What was the conclusion? Was your hypothesis correct?
- What are the applications of your project? How can the information you learned be used?
- How could your project be improved if you were to repeat it? If you were to continue your project, what would you do?

Bibliography

There should be at least three references. If the project concerns animals, there should be one reference concerning the care of that type of animal.

Book/Magazine Example:

Jones, Jenny R., "Science Experiments to Try" Science Time, New York: Sterling Publishing Co., May 2004, Vol. 3:12-15

Web Site Example: (Do not use search engines as a reference)

Helmenstine, Anne, About Chemistry Website, <http://chemistry.about.com>, October 4, 2005.

Conversation/Interview:

Smith, John, Telephone Interview, March 5, 2013.

SCORING RUBRIC GUIDELINES FOR INVESTIGATION PROJECTS

CATEGORY	POINT DESCRIPTION	STUDENT SCORE				
		0	1	2	3	4
Abstract & Bibliography To what degree does the abstract & bibliography describe the project and support the research?	0 =lacking an abstract/no documentation of research 1= poorly written and does not describe the project/ one documentation 2= poorly written /two documentations 3=well-written but does not describe all components of the project 4=well –written and completely describes the project	0	1	2	3	4
Problem Statement To what level if the problem (objective) statement new and/or different for a student at this grade level and how well is it written?	0 =lacking problem (objective) statement 1= incomplete problem (objective) statement 2= complete problem (objective) statement, poorly written 3= complete well-written problem (objective) statement, new idea for student 4= above expectations for that level – detailed and well-written	0	1	2	3	4
Hypothesis To what degree is this a testable prediction?	0 =lacking hypothesis (objective) 1= incomplete hypothesis (objective) 2= hypothesis (objective) is present, but not completely testable 3= hypothesis (objective) is present, is well-written and testable 4= hypothesis (objective) is above expectations – detailed and well-written	0	1	2	3	4
Procedures Numbered step by step, sentences begin with verbs, quantities to measure are listed in metric units, and procedures are in a logical sequence.	0 =no overall procedural plan to validate or confirm the hypothesis 1= partial procedural plan to validate of confirm the hypothesis 2= sufficient procedural plan to validate of confirm the hypothesis 3=well-written procedural plan to validate of confirm the hypothesis 4= exemplary and detailed procedural plan including repeatability	0	1	2	3	4
Variables and Controls -Test (independent/manipulated) -Outcome (dependent/responding) -Control (if applicable) -Constants	0 =no variables are identified or controlled 1= some variables are identified or some constants are recognized 2= variables are identified but not all controls/constants 3= variables and controls/constants are identified 4= variables and controls/constants are clearly and appropriately identified	0	1	2	3	4
Materials/Equipment Were the items utilized in appropriate and/or new ways, listed in column form equipment specifically named, metric units are used?	0 =no materials/equipment identified/used 1= materials/equipment not appropriately identified or used improperly 2= materials/equipment appropriately identified but used improperly 3= materials/equipment carefully identified in column form & used appropriately 4= materials/equipment carefully identified and/or used above expectations	0	1	2	3	4
Results To what degree have the results been interpreted?	0 =no written narrative interpretation of data 1= insufficient written narrative interpretation of data 2= sufficient written narrative interpretation of data 3= comprehensive written narrative interpretation of data 4= comprehensive & significant interpretation of data above expectations	0	1	2	3	4
Conclusion To what degree are the conclusions recognized and interpreted?	0 = no problem statement or interpretation of data support for hypothesis 1= incomplete problem statement or interpretation of data support for hypothesis 2 = correct/complete conclusion/interpretation of data support for hypothesis 3 = well written conclusion/interpretation of data support for hypothesis 4 = well written conclusion/interpretation of data support for hypothesis with major findings and possible explanations for them	0	1	2	3	4
Applications To what degree are the applications recognized and interpreted? Use of findings/new question to be investigated / improvement to investigation	0 = no recommendations, applications or new questions recognized 1 = incomplete or vague recommendations, applications or new question 2 = apparent recommendations, applications or new questions recognized 3 = recommendations, applications and new questions clearly recognized 4= significant well written recommendations, applications, and new question	0	1	2	3	4
Visual Display Free standing / correct grammar / correct spelling / clear and legible /attractive visual display	0 =unsatisfactory quality of display – more than 3 attributes missing 1= poor quality of display – only 2 – 3 attributes missing 2= average quality- only 1 attribute missing with minor errors and of fair quality 3= good quality – all attributes present and few if any minor errors 4= superior display – all attributes present and of exemplary quality	0	1	2	3	4
Oral Presentation/Interview How clear, well-prepared, and organized is the presentation? How complete is the student’s understanding of the experimental work?	0 =poor presentation; cannot answer questions 1= poor presentation; partially answers questions 2= fair presentation; adequately answers questions 3= good presentation; precisely answers all questions 4= exemplary presentation and knowledge; precisely answers all questions	0	1	2	3	4

GRADING SCALE

Individual student projects must receive grades for each step in the research plan (See Science Fair Student Checklist). The teacher is to collect student responses to each area in the working plan no later than the date indicated. It is at the teacher's discretion to collect items earlier than the dates listed, providing students are provided adequate notice.

Overall project grades will be assigned using the scoring Rubric Guidelines form. A form will be provided for each student in third and fourth grades.

A = 44 – 39

B = 38 – 35

C = 34 – 30

D = 29 -26

F = 25 – 0

Students receiving a grade of A will be entered into the FCM Elementary Grades Science Fair Competition. Entries will be judged by guest judges and Participation, First, Second and Third place ribbons will be awarded for each grade level. The First and Second Place projects will be entered into the District's Elementary Grades Science Fair as a representative for the school.

WE LOOK FORWARD TO OUTSTANDING WORK!

SCIENCE FAIR STUDENT CHECKLIST

Student Name: _____

Project Title: _____

WORKING PLAN	DUE DATE	PARENT INITIAL	TEACHER INITIAL	COMMENT
Problem/Title (Include Topic, Statement and Purpose.)	09/18/15			
Background/Research (Include copies of research articles)	09/25/15			
Hypothesis	09/30/15			
Bibliography	10/02/15			
Research Plan (Include Procedures, Materials and Variables)	10/16/15			
Conduct Experiment (Collect Data and Record Results)	10/29/15			
Data (Include graphs, charts, pictures)	11/06/15			
Results	11/06/15			
Conclusion	11/13/15			
Abstract	11/13/15			
Application	11/20/15			
Final Display	11/24/15			
Oral Presentation	11/30/15 Through 12/18/15			

Assignments may be submitted early with teacher's approval. **Each area submitted will be entered as an individual grade by the Science teacher.** Failure to submit each assignment by the date specified will result in a "0" (zero) for the assignment.

Websites That May Be Helpful for Projects and Inventions:

<http://www.sciencebob.com/sciencefair/index.php>

<http://www.invention-help.com/invention-help-books.htm>

http://pbskids.org/designsquad/pdf/parentseducators/DS_Invent_Guide_Full.pdf (for teachers)

<http://www.inventivekids.com/2010/10/05/step-by-step-guide-to-inventing/>

<http://www.sciencebuddies.org>

<http://www.showboard.com>

<http://science.dadeschools.net/>

<http://www.proteacher.com/110031.shtml>

<http://www.sciedunet.org>

<http://sciencepage.org/scifair.htm>

<http://my.integritynet.com.au/purdic/science-fair-projects-ideas.htm>

<http://www.ipl.org/div/kidspace/projectguide/>

<http://www.super-science-fair-projects.com/elementary-science-fair-projects.html>

www.kidsinvent.org

www.howstuffworks.com

<http://edweb.sdsu.edu/courses/EDTEC596/Project1/Inventors.html> (teachers only)

<http://ctinventionconvention.org/>

<http://library.thinkquest.org/J002783/InvCon.htm>

<http://all-science-fair-projects.com/>

