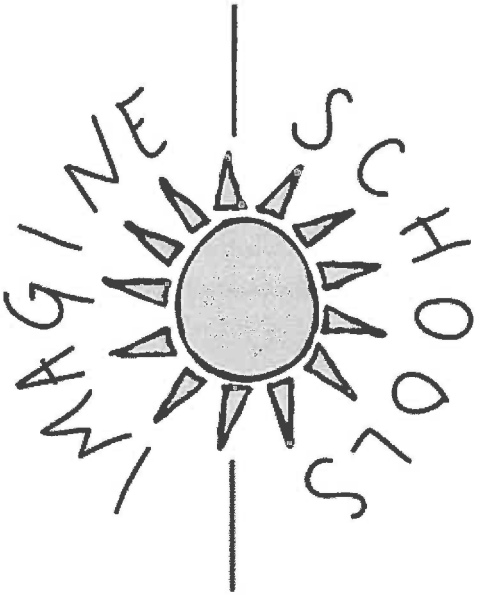


2016-2017
Imagine Schools
Southwest Group
Science Fair Handbook
Student Guide

Name_____

Parent Acknowledgement Form

Dear Parents,

On _____ 2016, Imagine _Prep_ will be holding its Annual Science Fair. All students in grades 5th through 8th will be participating. The winners of the _IPS_ Science Fair in grades 5th-8th will be competing in the Imagine Schools Regional Science Fair.

In order for your child to be successful in this amazing academic adventure your help will be required. We need you to assist your child through the exciting process of choosing, conducting, and constructing a science fair project. These projects are utilized to stimulate your curiosity and expand their personal knowledge of their surroundings as well as offer a new perspective of science and the world.

The science fair project is a long-term process that shows a progression of scientific methods and learning, and is thus a key component of your child's academic grades. It is imperative that your child stay on track and meets all the required due dates, as well as, follow the steps of the scientific method. Their scores will be distributed across the second and third quarter grades for the school year.

Please encourage and support your child along the way, but please ensure they do the majority of the work. Parents sometimes want to build the entire project and to make it "perfect". It is important that your child wrestles with the problems (as real scientists do) and tries to solve them individually because learning is often a trial-and-error process. Guide your child whenever and wherever you can, but let the final project reflect your child's individual effort and design.

The attached packet contains instructions and suggestions, which will assist your child with their project. The guidelines will help your child narrow down a topic, focus on the deadlines and expectations, and give directions and ideas on creating an effective project. Please take some time to review this with your child. There are many science fair websites with ideas and "how to" information. The following website contains additional worksheets that can be used to help guide your student's progress and organize information.

The project must include the following:

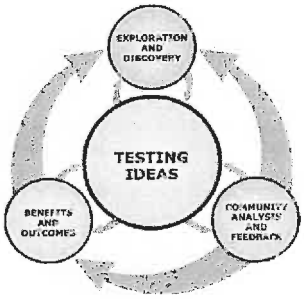
- Display board that can stand by itself
- Data Notebook
- A thorough understanding of project that will enable the student to answer a judge's questions.

Please contact _____Ms. Holcomb_____ for more information.

Alixandria.holcomb@sp.imagineprep.com

STUDENT INFORMATION PAGE

Imagine Schools at __Surprise____ will be holding its Science Fair on _____, 2017. Students placing 1st, 2nd, and 3rd in their grade level will be eligible to enter the Imagine School's Arizona Regional Science Fair. To be eligible, students in 5th-8th grade MUST first enter the school science fair. In addition to the 1st, 2nd, and 3rd place winners, one honorable mention project from each school will be entered into the Imagine School's Regional Science Fair.



WHY DO A SCIENCE FAIR PROJECT?

A science fair project allows you to participate in the scientific process, understand the scientific method, develop skills in writing, oral presentation, creative thinking and problem solving. Explore a subject that interests you and stimulates your curiosity. You are the scientist. HAVE FUN!

CONFUSED ABOUT GETTING STARTED?

Getting a topic requires some thought. Try looking through journals and magazines like *Natural History, Popular Mechanics, National Geographic, Consumer Reports, or Science News.* The internet is also an excellent source of ideas and information, but check with your science teacher to ensure your sources are credible. Choose a topic that interest you and then decide how you can do an experiment that deals with this topic. Think how this project might improve the world and its inhabitants. Choose a limited subject, ask a question, and identify or define a problem.

WHAT'S NEXT?

Basically, there are several ways to proceed. Decide what type of project suits your needs.

1. A field (outdoors) investigation
2. A laboratory (indoors) study
3. A series of experiments or tests
4. A carefully collected set of observations

A SCIENCE PROJECT IS NOT A BOOK REPORT!

Students cannot experiment on a volcano, because that is a demonstration. Building a model or reporting on something is not a science fair project either. Choose a topic you are curious about and shows you are testing an idea, rather than showing information you simply researched from textbooks or online resources.

TO BEGIN…

You have to determine a problem to solve. Is it something you can test so that it will yield measurable results? Be sure you have discussed with your parents that you will have the necessary time, money, equipment, and other materials necessary to see the project through to the end.

Key Definitions

Independent Variable: the variable that you change to cause a potential effect on your subject(s). List the different conditions you will use.

Dependent Variable: the observed or measured effect of the independent variable

Constants: the items that are kept the same during the experiment

Control Group: the group that does not receive the independent variable, used as a comparison

THE SCIENTIFIC METHOD

It's important to remember that there are several ways to find answers to a problem and therefore there is no one perfect scientific method. Scientists discover things and find answers to problems in several different ways and sometimes without even trying! The following is just one way to help you organize your thinking and planning of your project.

1. Choose a problem. (What do you want solve? Ask a question about it.)

- Choose something that interests you.
- Choose something you don't know the answer to.
- Choose something you can work with.

2. Research your problem. (How can you find the answer to your question?)

- Look in reference materials (encyclopedias, textbooks, etc.).
- Research the internet. Check with your teacher for credible resources.
- Get advice from experts or scientists in your field of study.
- Diagram representing your science topic.
- Make observations.
- Use 5 references (books, internet resources, magazines, etc.). Conduct research using the question words. (who, what, where, when, why, and how)

3. Develop a hypothesis or statement that tries to explain a relationship between variables. A hypothesis is an idea that is based on known facts and can be tested. (What do you think the answer to your question will be?)

- State the hypothesis as a fact.
- Form your hypothesis from a simple question.
- Diagram representing your hypothesis.
- Your hypothesis must be very clear so you can test it.

4. Write your procedures *before* you test your hypothesis (Tell what you will do to test your hypothesis)

- List the materials you will need, how much of each material you will need and a sentence explaining what each material will be used for.
- List each thing you will do. Number each step in order. Write down everything you will do. Others should be able to repeat your experiment by reading your procedures.
- Be sure that you are testing your hypothesis. (Is there anything you haven't considered that could affect your experiment?)
- Control your variables. (A variable is anything that can change or vary during an experiment. In an experiment, everything should be the same each time you test, except the one variable you are testing.)

  Test your hypothesis.
  - Get your materials.
  - Follow your procedures.
  - Make observations.
  - Collect data and record it in a notebook
  - Be honest.

5. Organize your data.

- Make tables, charts, or graphs.
- Write a summary.
- Draw pictures or take photographs to show your results and/or procedures.

6. State your conclusions. (What happened? Was it what you expected? Did you find out what you wanted to know?)

- Decide what your data tells you about your hypothesis based on your results.
- Decide how you might change your hypothesis based on your results.
- Think about what you might do to experiment further.
- Communicate the results with others.

CATEGORY DESCRIPTIONS

Astronomy –

- **Astronomy**: Meteorology, life on a planet, research studies on planets or moons, telescopes (how powerful different scopes are, make a telescope)

Earth Science –

- **Earth:** Geology, mineralogy, physical oceanography, seismology, geography, topography. (Ideas: test weather tools; test the causes of earthquakes; test the strength of rocks.
- **Chemistry**: Study of nature and composition of matter and laws governing it – physical chemistry, organic chemistry (other than biochemistry), inorganic chemistry, materials, plastics, fuels, pesticides, metallurgy, soil chemistry, etc. You may test some consumer products here. For example testing the effectiveness of detergents waxes, cleaning products. Testing physical and chemical changes is appropriate for this category. Ideas: how to prevent rust, mildew, mold, shoe scuffs, scratches on floors or cars.
- **Biochemistry:** Chemistry of life processes – molecular biology, molecular genetics, enzymes, photosynthesis, blood chemistry, protein chemistry, food chemistry, hormones.

Life Science

- **Botany:** Study of plant life – agriculture, agronomy, horticulture, forestry, plant taxonomy, plant physiology, plant pathology, plant genetics, hydroponics, algae, etc
- **Microbiology:** Biology of microorganisms – bacteriology, virology, protozoology, fungi, bacterial genetics, yeast. Remember to take pictures; you cannot display this because it could be harmful to us.
- **Environmental:** Study of pollution (air, water, and land) sources and their control, ecology, waste disposal, impact studies. Ideas: ways to prevent erosion, study on decomposition (this takes awhile so get started right away). How about studying air pollution from different pollutants; cars, buses, trucks? Test things marketed as biodegradable.

- **Medicine and Health:** Study of diseases and health of humans and animals – medicine, dentistry, pharmacology, pathology, veterinary medicine, nutrition, sanitations, pediatrics, allergies, speech and hearing, etc. Be careful with this section. You must get approval from your teacher when working with people or animals PRIOR to starting your project.

Engineering

- **Engineering:** Technology projects that directly apply scientific principles to manufacturing and practical uses – civil, mechanical, aeronautical, chemical, electrical, photographic, sound, automotive, marine, and heating and refrigeration, transportation, environmental engineering. Ideas: What structures are the strongest (test shapes) – think of bridge designs. Why are cars made in different shapes? Will a "Hummer" go as fast as a "Corvette" – test the design.

Behavioral/Social

- **Behavioral and Social Sciences**: Human and animal behavior, social and community relationship – psychology, sociology, anthropology, archaeology, animal behavior, learning, perception, urban problems, public opinion surveys, educational testing, etc. When working with humans or animals you must get PRIOR approval from your teacher

Physical Science

Physics: Pertaining to the part of the Physical Science Strand: Energy (light, sound, heat, and electricity) – this is a great category and we don't see too many experiments here. Think of something with light waves (light bulbs), sound waves (iPods), radio waves, materials that protect us from heat (oven mitts) electrical circuits – what about those Christmas tree bulbs and if one is burned out? Force (gravity, friction, magnetism and motion.) Ideas: roller coaster, design of airplanes, rockets as it affects motion and or speed, type of materials used that may affect physical laws: type of pavements, type of baseball bat, football other sporting equipment. How about a study on equipment used in the winter Olympics (skates, skis, snowboards).

COMPONENTS OF A SCIENCE FAIR PROJECT

IMPORTANT! All Projects MUST have the following

1. Display Board

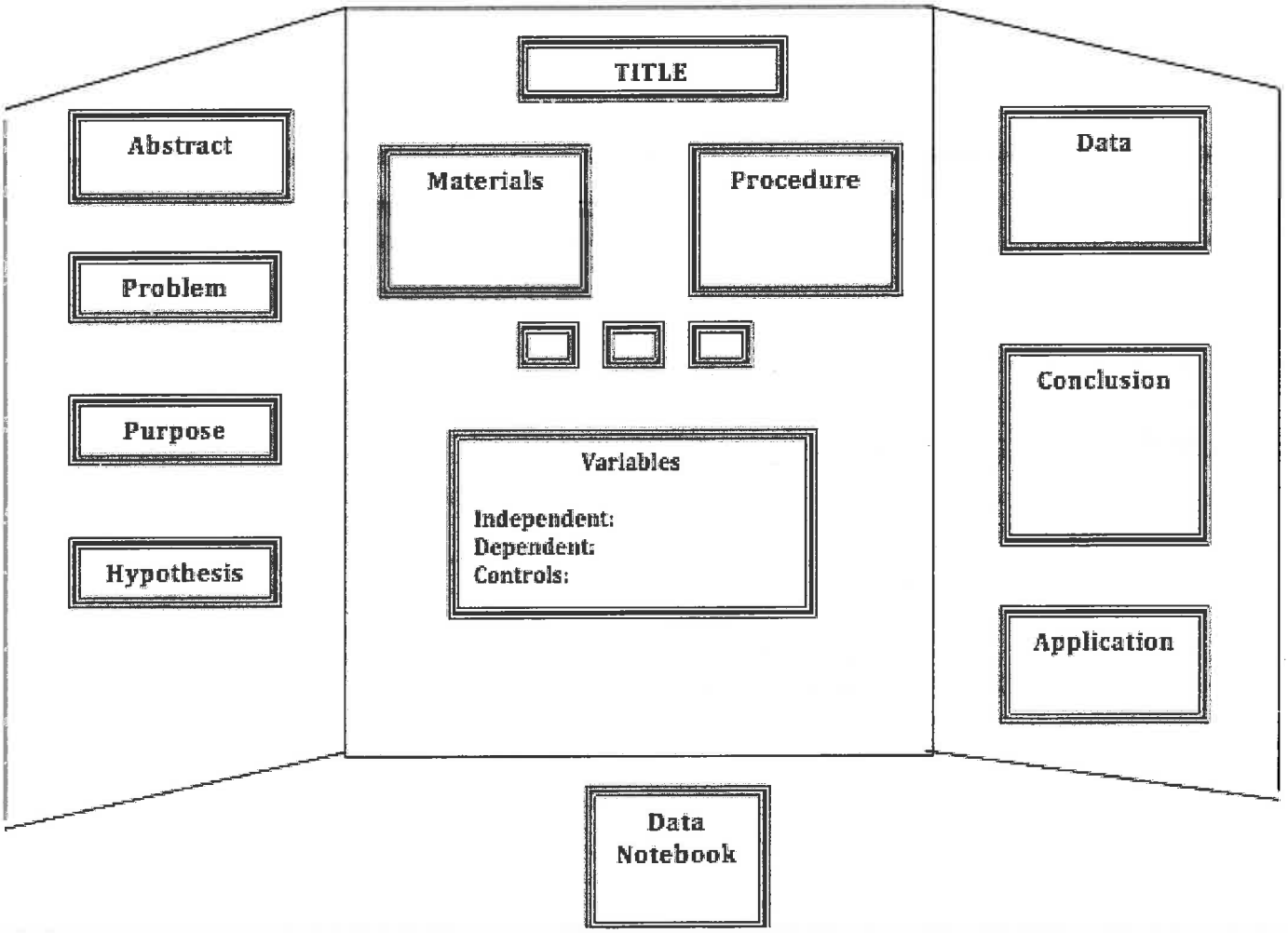
All projects will need to follow the guideline below when assembling the display board. First impressions can make a difference. Be creative. These display boards can be purchased in local stores, school and office supply stores. All projects must have a free standing display board. The display board can be no larger than: 76 cm (36 in.) deep and 122 cm (48 in.) wide.

Please do not bring models to the Science Fair. Only your presentation board, knowledge of the project and your data notebook are to be displayed. Students will be judged based on their knowledge of the project and their problem solving achieved by the scientific method, NOT on their ability to build a model. Students should be striving to understand and make sense of their data, explaining their results and applying their learning to real world situations.

The material on the board must be typed and presented in a neat, organized, and creative manner.
****Also, please remember: *Display boards should not have student's names or pictures of faces displayed on the front. Pictures (2 minimum) may be displayed anywhere on the board.***

Format for display boards:

- All information on the project should be readable from 1 meter away
- Headings for each section must be separate from the information in that section
  - Headings should be **20 point** font or larger
- Information under each heading should be *no smaller* than **16 point font**



What Each Section on the Display Board Should Look Like

*Templates for some sections may be provided by the teacher

A. Abstract:

An abstract gives a brief summary of the project. Your abstract should be a summary of no more than **250** words. Judges and the public should have a clear understanding of the project after reading the abstract. It should summarize the purpose, procedure, and results of the investigation; therefore, it should be one of the last pieces to be completed. An abstract does not give details about the materials used unless it greatly influenced the procedure.

Components of Abstract (in paragraph form)

1. Purpose/Problem: A statement that explains why you are doing the experiment and what question you are trying to answer.
2. Hypothesis: This should include the if/then statement that suggests an answer to your original question. 2 sentence maximum.
3. Procedures: A **very** brief summary of how the experiment was performed.
4. Results: A brief description of the important results that lead directly to your conclusion. Do not give too many details or include tables or graphs of data.
5. Application: A brief summary of how your results can be applied in everyday life.

B. Problem

1. State the problem you are trying to solve in the form of a question.
    a. Example sentence starter: "The problem being investigated/solved is...."

C. Purpose

1. State the purpose, goal, or aim of your experiment in a complete sentence.
    a. Example sentence starter: "The reason this problem is being investigated/solved is because..."

D. Hypothesis

1. State what you believe will happen in your experiment. 2 sentence maximum. The second sentence of your hypothesis should use research to back up your hypothesis.
    a. Example sentence starter: "It is predicted that if.....then.....because....."

E. Materials

1. List of materials, quantity needed, and one sentence justifying each items use.
    a. This could be a list, or it could be shown in the form of a data table.

F. Procedure

1. A numbered list of each step to follow in complete sentences.
    a. **This is NOT to be copied from a website or wherever else you may have found your experiment. Procedures should be written in your own words and should be clear and concise.** If you need to do the same steps several times but with different materials, write "Repeat steps #2-4 using....".

G. Variables

1. Label and state what each of the following variables are in your experiment: *independent variable, dependent variable, control group,* and *constants.*

H. Results Section

1. **One** table and **one** graph, each should fill at least half a page. *Be sure to include title and appropriate labels. The table should have a column for averages.*

I. Conclusion

1. 2 paragraph minimum

Components of Conclusion (in paragraph form)

1. Restate the purpose/problem: A statement that explains why you did the experiment and what question you were trying to answer.
2. Restate the hypothesis: This should include the if/then statement that suggests an answer to your original question. 2-sentence maximum.
3. Accept/Reject the hypothesis and why: State whether you accepted or rejected your hypothesis and why you made that decision. Use the data from your graph and data table to help explain.
4. Identify and Explain Anomalous data: State if any of your data did not fit into the trend or pattern. Explain what you will do with that data if you have/had it.
5. Identify and Correct Experimental Error: State which lab equipment may have not been the most reliable. Explain how you can make that equipment more reliable for next time.
6. Suggest Improvements to the Experiment: Explain what you could do better next time if you were to retry this experiment again or what else you could investigate to take this project to the next level to find out more information.
7. Restate What was Found: Restate what was found by performing the experiment.

J. Application

1. Explain how the project would relate to 3 real world issues/projects/companies, etc.
2. State who would use this information and explain why they would use it.
3. State what type(s) of science you used.

K. Data Notebook

These are your handwritten notes, original observations taken while doing the experiment, and research while you were completing your experiment. Entries should be neat, dated, organized and show a complete and accurate record of your project from start to finish. The data notebook is a representation of the time and effort that went into your project and should be displayed in front of your display board in a folder/notebook/binder/composition notebook with the title of your project. *Do not put your name on this.* Each number below represents an individual entry into your data notebook and the bulleted letters beneath each number represent the components of that entry and questions you should be answering and writing about. Each entry should be on a new page.

Cover of the notebook should contain *just the name of your project* and nothing else.

1. Choosing your problem/topic and purpose.
    a. State what the topic/problem of your experiment is.
    b. State what the purpose of your experiment is. Why are you trying to solve this problem?
    c. Explain why you chose this topic/problem.

    Reminder: your topic should be specific and your purpose should include both the independent and dependent variables in your experiment.

    Example sentence: "The purpose of this experiment is to determine if _____ is affected by _____." The blanks are your dependent and independent variable respectively.

2. Research - Resource #1
    a. What is your research piece?
    b. Where did you find this research? (Website, book, magazine, journal, etc.)
    c. Summary of important information you collected from reading this research piece. (1 paragraph minimum)
    d. Explain how this research piece relates to your experiment/problem.
    e. Explain how this research piece has helped you formulate your hypothesis.
    f. Include a drawing/diagram of how you might test your problem based on this piece of research if applicable.

    Reminder: conduct research using question words such as: who, what, where, when, why, and how.
3. Research - Resource #2
    a. See questions/directions in #2.
4. Research - Resource #3
    a. See questions/directions in #2.
5. Research - Resource #4
    a. See questions/directions in #2.
6. Research - Resource #5
    a. See questions/directions in #2.
7. Experiment: Daily results and observations, Trial #1
    a. Each entry should include 3 trials for the given independent variable
    b. Summarize exactly what you did for each trial.
    c. Record your observations
        i. Qualitative: what did you see happen
        ii. Quantitative: the numerical data you recorded/measured with units. METRIC UNITS ONLY!
    d. Questions or thoughts you had while taking measurements
8. Experiment: Daily results and observations, Trial #2
9. Experiment: Daily results and observations, Trial #3

You must have at minimum 3 trials. There is no limit to the number of trials that you have. The more trials you perform and record data for, the more accurate and reliable your results become if done correctly.

If a trial happens and you get a number that is far off from the numbers in your other trials, this may be anomalous data and if you can, you should redo the trial. Make sure you write about the anomalous data in your Experiment: Daily results and observations as this is important information in testing your hypothesis!

10. Reflection

    Write a reflection about your experience working through your problem to try and find an answer/solution. The following questions should be considered in your reflection.

    - What did you learn about yourself throughout the experimentation process?
        - Were there struggles you endured? What were they? How did you overcome them?
        - Were you really good at a particular part of your project? What was it? Why do you think that part was easier for you than other parts?
        - What was your favorite part of the project? Explain why it was your favorite part.
        - What did you learn about completing the project? Were you able to do it all on your own? Did you need help? Who did you seek help from and why? How did those people help you?

- What did you learn about the scientific method? Did you follow the example scientific method exactly? Is there one right way to go through the scientific method, why or why not?
- What was your biggest takeaway from this project/what did you learn?
  - Cite at least 2 of your resources to help support your overall learning.

11. Bibliography
    a. Properly formatted and alphabetized list of resources that you have used during your project. Examples of how to cite different sources are given on the following page.

Last page - on the back of the last page, please write your name, grade, and your teacher's name. This helps to eliminate bias during the judging process.

BIBLIOGRAPHY

Reference Material	How to cite information
Book	Author(s) (Last name, First name). Title of Book. Place of Publication: Publisher, Year of Publication.
Book with corporate author	Corporation of Publication. Title of Book. Place of Publication: Publisher, Year of Publication.
Magazine or Newspaper Article	Author (Last name, First Name). "Title of Article" Title of Periodical. Date of Publication (Day/Month/Year): Page numbers.
Article from a Reference book	Author (Last name, First name). "Title of Article." Name of Reference Book. Volume. Year Edition was Published.
Interview that you conducted	Person you Interviewed (Last name, First name). Type of Interview. Date of Interview (Day/Month/Year).
Digital Media	Artist. Title of Album. Company that Produced Album, Year of publication.
Email	Author (Last name, First name). "Title of Message (if any)" Email to the author. Date of message.
Article in Reference Database on CD-ROM	"Title of Article." Reference Database. CD-ROM. City(and State) of publication: Publishing Company, Year of Publication.
Website	Author (Last name, First name). Title of Article. Date of Publication (Day/Month/Year). Title of Web site. Date of first visit to web site (Day/Month/Year). Website Address (Entire address)

Note: This table shows the students where to place the information in their bibliography. The final bibliography should not be in table format.

Example: from https://owl.english.purdue.edu/owl/resource/560/01/

Contributors' names (Last edited date). *Title of resource*. Retrieved from http://Web address for OWL resource

Angeli, E., Wagner, J., Lawrick, E., Moore, K., Anderson, M., Soderlund, L., & Brizee, A. (2010, May 5). *General format*. Retrieved from http://owl.english.purdue.edu/owl/resource/560/01/

Name: _____ Grade: 5 6 7 8 School: Imagine _____

Project title: _____

Board Presentation	Point Breakdown	Score
Abstract (12 points)	**2 points** for each problem, purpose, hypothesis, procedure, data, and conclusion (12)	
Problem (5 points) (Proposed in the form of a question)	**2 points** for being in the form of a question **3 points** for the clarity of the statement	
Purpose (5 points) (State the purpose/goal/aim of the experiment)	**2 points** for stating the purpose of the experiment **3 points** for the clarity of the statement	
Hypothesis (2 points) (no pronouns, 2 sentences maximum)	**1 point** for stating what they think will **1 point** for explaining why (because...)	
Materials/Apparatus (4 points) (In list format)	**2 points** for being in a list format **2 points** for being clear and concise	
Procedure (4 points) (In list format, no pronouns)	**2 points** for being in a list format **2 points** for being clear and concise	
Variables (4 points) (Constants, Independent, Dependent, Control group)	**1 point** for each variable (independent, dependent constants (2 minimum), control group) (4)	
Data (8 points) (Data table and graph)	**Table:** (4) **1 point** for correct table layout **1 point** for correct labels with units **1 point** for column with averages/percent change **1 point** all numbers are to the same decimal place **Graph:** (4) **1 point** for appropriate scales on each axis **1 point** for axis labels with units **1 point** for points plotted correctly/accurately **1 point** for accurate/appropriate title	
Conclusion (15 points) (Accept/refute hypothesis (or other wording), backup with data, give recommendations, closing)	**1 point** for restating the purpose **1 point** for restating the hypothesis **2 points** for accepting/rejecting the hypothesis *and* stating why **4 points** for supporting with data (2 points for referencing the data table) (2 points for referencing the graph) **2 points** for identifying and explaining anomalous data **2 points** for identifying and correcting experimental error **2 points** for suggesting improvements to the experiment for next time or further testing on the topic **1 points** for restating what was found by performing the experiment	
Application (10 points)	**1 point** for stating a real world relation (3 needed) **1 point** for explaining each real world relation (3 needed) **1 point** for stating who would use this information and why (3 needed, one for each real world relation) **1 point** for stating what type(s) of science you used	
Display Board (10 points) (At least two pictures (no faces), neat, proper format followed)	**2 points**: 2 pictures minimum with NO faces (1 point for each picture) **3 points**: aesthetics **5 points**: proper format (placement of materials)	
Conventions (11 points) (Spelling, Grammar, Punctuation, No Pronouns)	**1 point** for each section that is accurately completed without error on the board: Title through Application	
Total points (90)		

Data Notebook	Point Breakdown	Score
Entry #1 - Problem/topic & purpose (1 point)	**1 point** for explaining the problem being solved by the experiment (1 paragraph)	
Entry #2 - Research resource #1 (2 points)	**1 point** for source of research piece **1 point** for summary	
Entry #3 - Research resource #2 (2 points)	**1 point** for source of research piece **1 point** for summary	
Entry #4 - Research resource #3 (2 points)	**1 point** for source of research piece **1 point** for summary	
Entry #5 - Research resource #4 (2 points)	**1 point** for source of research piece **1 point** for summary	
Entry #6 - Research resource #5 (2 points)	**1 point** for source of research piece **1 point** for summary	
Entry #7 - Trial #1 Results and observations (3 points)	**1 point** for summary of what was done during the trial **1 point** for qualitative **and** quantitative data being recorded **1 point** for final thoughts after the trail	
Entry #8 - Trial #2 Results and observations (3 points)	**1 point** for summary of what was done during the trial **1 point** for qualitative **and** quantitative data being recorded **1 point** for final thoughts after the trail	
Entry #9 - Trail #3 Results and observations (3 points)	**1 point** for summary of what was done during the trial **1 point** for qualitative **and** quantitative data being recorded **1 point** for final thoughts after the trail	
Entry #10 - Reflection (4 points)	**2 points** for a thorough reflection showing learning and understanding of the project and topics discussed **1 point (2 total)** for referencing research sources	
Entry #11 - Bibliography (6 points)	**1 point (5 total)** for each of the 5 sources correctly cited **1 point** for sources being alphabetized correctly	
Total points (30)		

Oral Presentation	Point Breakdown	Score
Introduction of student (2 points)	**1 point** for introducing themselves and welcoming the judges **1 point** for stating the title of their project	
Present abstract (12 points)	**2 points discussing each** problem, purpose, hypothesis, procedure, data, and conclusion	
Questions (6 points) **1 standard question (below) must be asked to all individuals.** 1 or more additional questions may be asked to each individual.	**6 points** for answering and backing up with data or research from their project without reading their board/project **4 points** for answering and backing up with data or research from their project but reading it from the board/project **2 points** for basic answer with little to no support	
Total points (20)		

Question (you must ask this question and consider the student's response in your judging): **Describe** a pattern that you saw in your data to help support or refute your hypothesis.

Additional questions may be asked.

Board Presentation – 90 points
Data Notebook - 30 points
Oral Presentation – 20 points

Total Science Fair Project – 140 points

STUDENT/PARENT ACKNOWLEDGMENT FORM

Student's Name: _____

Science Teacher: _____

Dear Students and Parents/Guardians,

Please sign this document as acknowledgement that:

1. Student has brought home the Science Fair Packet and you have reviewed it together.
2. You are aware of the time line (included in the packet) that lists the items' due dates.
3. This is an individual project that is to be worked on at home and at school.
4. You are aware of the grading rubric and project rules.
5. You are aware that students will be given the necessary documents to complete for the Science Fair.
6. You are aware that your student's project is due on Wednesday, September 14th (per timeline).
7. You are aware that participation in the Science Fair and Science Fair Night is **mandatory**. ***Science Fair Night will be held on Monday, September 26th.***

Signature _____

Print Student Name _____ **Date** _____

Signature _____

Print Parent Name _____ **Date** _____