

Please feel free to adapt these handouts for use in your classroom! To personalize this document to your school/classroom, simply change the text highlighted in red. This guide was adapted from Bill Rigney's "Embedding Student Research Projects in the Science & Technology/Engineering Curriculum" developed at Marlborough High School in Marlborough, Massachusetts.

Science Project Packet

2011-2012

Introduction

It's time to embark on your science project adventure! As you know, all [chemistry, biology, physics, honors science, etc] students participate in an experimental project that culminates with the **Central Sound Regional Science & Engineering Fair** which is Saturday, March 10, 2012 at Bellevue College. Students who compete in the regional fair can then go on to compete in the Washington State Science & Engineering Fair.

The project will entail the following:

- Selecting a topic of your choice.
- Writing a short research paper.
- Designing an experiment.
- Performing the experiment.
- Evaluating the results of this experiment.
- Writing a report on your conclusions.
- Making a poster or PowerPoint to summarize your project.
- Presenting this poster/PowerPoint to the class or at the Science Fair.



"I couldn't think of a science fair project so I just re-invented the wheel."

Throughout this process you will do three things:

- Keep an experiment notebook.
- Occasionally meet with me to discuss the progress of your project.
- Provide proof of your work in the form of pictures.

Due Dates & Grading

Each assignment is due by 2:00 on the due date, **regardless of your attendance or the class schedule for the day**. Items must be turned in to me directly, not left in my mailbox or on my desk- things have been “lost” this way. Since these due dates are known well in advance, absence is not an excuse for turning in the assignment late. Late assignments lose 10% of their points for each day late- assignments are worth zero points three days after the due date (**weekends count as a day**- so an assignment due Friday, and turned in the following Monday, has lost 20% of its point value). Drafts will not be evaluated if turned in after the due date.

Project Component	Draft due	Final version due	Possible Points	Points received
Topic Selection	October 7, 2010	October 13, 2010	10	
Research Meeting w/teacher			None	N/A
Peer Editing – Research Paper (rough draft)		November 4 or 5, 2010	4	
Scientific Research Paper (w/bibliography & hypothesis)	November 3, 2010	November 8, 2010	60	
Materials & Procedure Meeting w/teacher			None	N/A
Materials & Procedure	November 12, 2010	November 17, 2010	16	
Regional Science Fair Forms		November 22, 2010	None	N/A
Results Meeting w/teacher			None	N/A
Data, Graphs & Statistics	January 19, 2011	January 31, 2011	30	
Peer Editing – Conclusion (rough draft)		February 3 or 4, 2011	4	
Conclusion	February 2, 2011	February 9, 2011	30	
Project Notebook	February 7, 2011	February 11, 2011	30	
Posterboard	February 14, 2011	February 18, 2011	8	
Oral Presentation			8	
Total:			200	

Keeping a Project Notebook

The burden of proof for an independent science project is on the student. Keeping a scientific notebook, or journal, is the most effective to document that whole project and provide proof of the process. The guidelines below address both the content and format of the journal. In addition to this notebook, you should be *taking pictures of yourself* doing the experiment that can be added into the journal as well as the posterboard at the end.

General Guidelines:

1. Begin using the notebook right away and document everything you do for the project.
 - Your notebook must be with you and be used whenever you work on this project.
2. Whether working individually or as a team, ***each person must have a notebook.***
3. Use a bound notebook.
4. Pages are not to be removed.
5. Write on the right-hand pages only.
 - All pages are to be numbered before any information is entered.
 - All pages are to be dated.
6. Each new entry is to begin on a separate page.
7. All entries must be done in ***blue or black ink.***
8. Simply put a line through errors – no white-out.
9. All entries must be done by hand....do not staple in computer generated pages other than final graphs or analysis data.
 - Use more than one notebook if necessary.
10. All data recorded must be verified by the adult supervisor as the project takes place.
 - Signatures of witnesses to project on research pages and data pages.

Contents of the Notebook:

- Table of Contents (*set this up on your first page and fill it in as you go along*)
- Topic Ideas
- Problem Statement for chosen project (and Project title)
- Research notes (*NOT the actual final draft*)
- Draft of Materials & Procedure
- Actual Materials & Procedure (*reflects teachers recommendations*)
- Data Tables (raw and summary data)
- *Daily observations (*similar to a diary*)
- Pictures of experimentation
- *Calculations
- Graphs (scatter plots)
- Statistical Analysis (confidence intervals & t-tests)
- Data Analysis notes
- Conclusion notes
- Poster design

**Item may not apply to all types of projects*

Topic Selection

This is one of the most difficult things about doing a science fair project. If you are doing a project in another science class as well, ideally you should try to find a project that combines aspects of the two sciences. Once you choose an idea that you like, spend a good amount of time thinking about how the whole project would work. ***If you can imagine obstacles that will be too difficult, then find a new topic.*** Don't forget the cost of supplies and time constraints. It is very discouraging to start a project, and then realize that you will not be able to do it, and scramble to find a new one. If you change your topic, you lose credit for the work that you had done on it. Don't make a hasty decision just to have a topic.

Finding ideas:

- Consider last year's project – could you expand on that idea? (*see the Topic Selection Worksheet*)
- What are your personal interests? (academic as well as extracurricular)
- Take advantage of the following resources for ideas as well:
 - science books
 - science lab manuals
 - science magazines
 - science teachers
 - newspapers
 - educational T.V.
 - science museums
 - web sites that may be helpful:
- <http://scidiv.bellevuecollege.edu/sami/scifair> (Central Sound Regional Science & Engineering Fair site)
- <http://www.wssef.org> (Washington State Science & Engineering Fair site)
- <http://www.sciserv.org/isef> (International Science Fair site)
- <http://www.ipl.org/youth/projectguide> (Provides guidelines & links to many other useful sites)
- <http://www.cdli.ca/sciencefairs/> (Look under Senior Projects for some good ideas here)
- <http://www.sciencebuddies.com> (This site helps you brainstorm about topics of interest)

Also consider the following in selecting your topic:

1. Feasibility
 - Can the project be completed in the allowed time? (*you must finish by February*)
 - Cost of completing the project- is it too expensive? Do you need special equipment?
 - Is the design of the experiment adequate? Are the effects **measurable in an objective way**?
2. Does the project violate any state or federal laws pertaining to scientific research?
 - State Law prohibits the use of any vertebrate (frogs, mice, humans, etc.) without special permissions.
 - The Regional Science Fair Committee also regulates the use of controlled substances and hazardous chemicals – they also require special permissions.

Name: _____

Period: _____

Science Project Topic Selection Brainstorming

What was your topic last year? _____

What were your independent & dependent variables? _____

What did you find out? _____

Are you interested in working with this same topic again? _____

If yes, how could you continue your project or change/improve last year's topic?

What would be your "new" problem? _____

What would be your "new" independent & dependent variables?

If no, is there any part of your project last year that can help you plan a topic this year?

If no, is there any project you saw a classmate do last year that can help you plan a topic this year?

Name: _____

Period: _____

Science Project Final Topic Selection

Partner's name: _____
**if applicable*

Possible Topic #1: _____

Problem Statement: (What are you wondering about?)

What will you measure?

Possible Topic #2: _____

Problem Statement: (What are you wondering about?)

What will you measure?

Name: _____

Period: _____

Self Assessment – Problem Statement Rubric

Category	4 – Proficiently Meets Standard	3 –Meets Standard	2 – Nearly Meets Standard	1 – Standards Not Met	0	Weight	Total
Problem Statement	Problem statement is clear and includes independent variable, dependent variable, and units. Topic is creative and challenging.	Problem statement includes independent variable, dependent variable, and units. Topic is grade appropriate.	Problem statement is missing one variable or units. Topic is not very challenging or grade appropriate.	Problem statement is missing one of the variables and units. Topic is not challenging and not grade appropriate.	Absent	2.5	

Name: _____

Period: _____

Teacher Assessment – Problem Statement Rubric

Category	4 – Proficiently Meets Standard	3 –Meets Standard	2 – Nearly Meets Standard	1 – Standards Not Met	0	Weight	Total
Problem Statement	Problem statement is clear and includes independent variable, dependent variable, and units. Topic is creative and challenging.	Problem statement includes independent variable, dependent variable, and units. Topic is grade appropriate.	Problem statement is missing one variable or units. Topic is not very challenging or grade appropriate.	Problem statement is missing one of the variables and units. Topic is not challenging and not grade appropriate.	Absent	2.5	

Writing a Scientific Research Paper

What is a Scientific Research Paper?

A scientific research paper is a review of the relevant material (books, magazines, websites) that discuss the topic that you want to investigate. It should provide a summary of the ideas that are behind your experiment. You need to do this research so that I know that you understand what is happening in your experiment and so that you can make a hypothesis or prediction of what is going to happen in your experiment. Research is also necessary so that you can understand why your project turns out the way it does in the end.

This paper is different from a research paper that you would write for an English class in a few ways:

1. The introduction will contain your ***problem statement***.
2. The body of the paper should contain very few “direct quotes” and instead paraphrase.
3. The citations you include will be a different format – APA, not MLA.
4. Your conclusion will contain your ***hypothesis***.

How to organize your scientific research paper:

Before you begin writing your paper, think about how you want to organize your information. You should think about what the person who is reading your paper needs to know in order to understand your project.

1. You should begin with an introduction that includes your problem statement, variables, and a brief description of the experiment you want to do.
2. Next you should include any definitions that are important, any science concepts that the reader must understand, and any equations that you might use.
 - a. If you are using an organism such as a plant or bacteria, you should describe and name the organism.
 - b. If you are using a chemical, you should name it and describe its properties.
 - c. If you are using a special technique or piece of equipment, you should name and describe it.
3. The next few paragraphs should discuss the variables that you are using in your project. (*Your independent variables – the things that you are testing*)
4. You should discuss your dependent variable. (*The thing that you are measuring*)
5. If you found any similar experiments during your research you should talk about those experiments.
6. You should end with a prediction of what will happen in your experiment. In other words, now that you know all of this information about your variables, how do you think this experiment will turn out?

How do I get started?

To begin writing your Scientific Research Paper, you must first do some research. These notes should be recorded in your project notebook. The actual paper (*rough draft and final draft*) **do not go in this notebook**. Those drafts should be typed on a computer and saved in a safe place for editing and use later on in this process.

Make sure to cite your sources!!!!

If you summarize, paraphrase or quote one of your sources you need to make sure that you use the APA guidelines and cite your source in parentheses after the summary, paraphrase or quote. Make sure that all of the sources that you cite in your paper are included on your bibliography.

Where can I find helpful information?

- http://www.sciencebuddies.org/mentoring/project_research_paper.shtml
(On this website, there is a sample research paper for a science project that you can read to get an idea about what is expected of you.)
- <http://citationmachine-east.net/>
(This website is an online tool to help create an APA bibliography and citations.)

Name: _____

Period: _____

Science Project

Scientific Research Paper – Research Notes

1. Take one page of your journal and title it “Research Notes”
 - Brainstorm a list of keywords, phrases or questions you will research.

2. Take the next 5 pages of your journal and write the following titles (*along with the date & page number*):
 - **Book Source**
 - Author last name, First initial, Middle initial. (Date). *Title of work.*
Location: Publisher.

 - In-text citation: (_____, ____)

 - **Magazine Source**
 - Author last name, First initial. Middle initial (Year, Month, Day). Title of article. Title of Magazine, Volume number, Pages.

 - In-text citation: (_____, ____)

 - **Internet Source (#1)**
 - Author last name, First initial, Middle initial. (Date of web page). Title.
Retrieved from URL

 - In-text citation: (_____, ____)

 - **Internet Source (#2)**
 - Author last name, First initial, Middle initial. (Date of web page). Title.
Retrieved from URL

 - In-text citation: (_____, ____)

 - **Internet Source (#3)**
 - Author last name, First initial, Middle initial. (Date of web page). Title.
Retrieved from URL

 - In-text citation: (_____, ____)

3. As you find each source, fill the rest of that page in the journal with notes from that source.

Name: _____

Period: _____

Science Project Scientific Research Paper - Outline

- **Introduction**

- Introduce your topic, previewing the topics you will talk about.
- Problem Statement
- Why is this important to know about?

- **Body**

- Explain the basic science concepts behind your project.
- Define all of the keywords you researched.
- Describe your variables.
- Describe what you will think happen when you test each of these variables.
- Paragraph #1 topic: _____
- Paragraph #2 topic: _____
- Paragraph #3 topic: _____
- Paragraph #4 topic: _____

- **Conclusion**

- Restate your problem statement.
- Summarize the main point of each paragraph.
- State your hypothesis: “If _____, then _____.”
- Write a sentence explaining why you chose this variable and outcome, based on information you explained earlier in the paper.

Name: _____

Period: _____

**Science Project
Conference for a Team Project's Research Paper**

Student Names #1 _____

#2 _____

#3 _____

Project Topic: _____

Problem Statement: _____

Subtopics to be researched by each team member:

Student #1	Student #2	Student #3
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Agreement:

As a Science Project Team, we understand that we are each responsible to research the topics we have designated above. It is our individual responsibility to each write 3-5 pages with parenthetical documentation, and to provide 5 sources toward the Bibliography for the complete paper. We understand that each member of the Team will be graded based on the pages and subtopics we have individually submitted to our teacher, but that the teacher will also read the entire paper to insure that it covers the topic completely and is well written throughout.

Signatures:

#1 _____ #2 _____ #3 _____

Teacher: _____

Date _____

Documenting a Scientific Research Paper

Documentation, or “documenting” your paper, means to give credit to the book or website where you found that information. Any information that is not common knowledge or evidence discovered on your own must be referenced as to where you read about it. This is called “citing” your paper. The citations follow a specific format called APA format. This format is to similar put the author’s name and the year the source was published right after the sentence you found there, just like this (Sawyer, 2010). At the very end of your paper, you will attach a list of all of these sources, with more detailed information as shown below. This saves space when someone is reading your whole paper.

Sample Bibliography

Battery. (1990). *Encyclopedia britannica*. (pp. 100-101). Chicago: Encyclopedia Britannica.

Best batteries. (December 1994). *Consumer Reports Magazine*, 32, 71-72.

Booth, Steven A. (January 1999). High-Drain Alkaline AA-Batteries. *Popular Electronics*, 62, 58.

Brain, Marshall. How batteries work. *howstuffworks*. Retrieved August 1, 2006, from <http://home.howstuffworks.com/battery.htm>

Cells and batteries. (1993). *The DK science encyclopedia*. New York: DK Publishing.

Dell, R. M., and D. A. J. Rand. (2001). *Understanding batteries*. Cambridge, UK: The Royal Society of Chemistry.

Learning center. *Energizer*. Eveready Battery Company, Inc. Retrieved August 1, 2006, from <http://www.energizer.com/learning/default.asp>

Learning centre. *Duracell*. The Gillette Company. Retrieved July 31, 2006, from <http://www.duracell.com/au/main/pages/learning-centre-what-is-a-battery.asp>

Sample Citations

A complete list of other types of sources is available upon request.

Book	APA Format	Example
One Author	Author last name, First initial, Middle initial. (Date). <i>Title of work</i> . Location: Publisher.	Smith, K.C. (2004). <i>Children's literature of the Harlem renaissance</i> . Bloomington, IN: Indiana University Press.
Two to Seven Authors	Author last name, First initial, Middle initial., & Author last name, First initial, Middle initial. (Date). <i>Title of work</i> . Location: Publisher.	Branson, J. J., & Larson, B. (2003). <i>Educating Rita</i> . New York: Norton.
Periodical Article	APA Format	Example
Magazine	Author last name, First initial. Middle initial (Year, Month, Day). Title of article. <i>Title of Magazine</i> , Volume number, Pages. Note: If no volume number is available, use p. or pp. before page numbers.	Bender, M. (2006, December). 2-minute winter warm-ups: Wake up your hibernating muscles, starting now. <i>Health</i> , 20, 38-40.

Journal: Continuous page numbers	Author last name, First initial, Middle initial. (Year). Title of article. <i>Title of Journal, Volume number, Pages.</i>	Brown, P. (2002). New architecture today. <i>Art Digest, 25</i> , 303-13.
Article in an online database	Same as print but add doi or electronic retrieval information at end. <ul style="list-style-type: none"> ➤ If doi is available, add doi to end of entry. ➤ If no doi is available, and it was retrieved online, add the following phrase and the homepage url of the journal, newsletter, or magazine: Use this format: Retrieved from http://www.xxxxxxxx ➤ Note that you do not use a period after the url or the doi 	Vissing, Y. (2003, December). The yellow school bus project: Helping homeless students get ready for school. <i>Phi Delta Kappan, 85</i> (4), 321-323. Retrieved from http://www.ebscohost.com Kroon, L. (2007). Drug interactions with smoking. <i>American Journal of Health-System Pharmacy, 64</i> (18), 1917-1921. doi: 10.2146/ajhp060414
Newspaper (Electronic Version)	Give the URL of the home page if available: This strategy allows you to avoid nonworking URLs.	Shin, A. (2006, December 6). Trans fat banned in N.Y. eateries; city health board cites heart risks. <i>The Washington Post</i> . Retrieved from http://proquest.umi.com
Encyclopedia	APA Format	Example
One or more Authors	Author last name, First initial. Middle initial. (Date). Article title. In A.A. Editor (Ed.), <i>Title of publication</i> (Vol., pp.). Location: Publisher.	Hernandez, J., & Squires, R. (1999). House plants. In T. Z. Zollinger (Ed.), <i>The encyclopedia of botany</i> (Vol. 7, pp. 45-75). New York: Macmillan.
No Author	Article title. (Date). Article title. In B. B. Editor (Ed), <i>Title of publication</i> (Vol., pp.). Location: Publisher. Note that the sample shown is an electronic example.	Achievement gap. (2006). In L.B. Johnson (Ed.), <i>The encyclopedia of education</i> . Retrieved from http://find.galegroup.com
Web Site Article	APA Format	Example
With Author	Author last name, First initial, Middle initial. (Date of web page). Title. Retrieved from URL Note: If source may change over time on a Web page (such as a wiki), you can include a retrieval date. If source will not change, you do not need to include the retrieval date.	American Library Association YALSA (2005). <i>Outstanding books for the college bound</i> . Retrieved from http://www.ala.org/yalsa/booklists/obcb Jameson, E. (n.d.). NCH FACT sheets on homelessness. Retrieved August 12, 1999, from http://nch.ari.net/facts.html
With no Author	Article title. (Date). Retrieved from URL	The trials and tribulation of the homeless on the streets of Phoenix. (2003, October 13). Retrieved from http://www.save.the.homeless.org/trials.html
Entire Website	Note: With APA, when citing an entire Website (and not a specific document on the website), you may cite it in your parenthetical in-text citation and not include it on your References page.	Example of in-text reference: The Mark Twain Page discusses the significance of Twain's works, especially relating his stories to the political controversies of his day. It especially emphasizes racial issues (http://www.ualberta.ca/_dawe/twain.html).

Name: _____

Period: _____

Science Project Peer Editing of Research Papers

Peer Editing Process

As an editor, it is your responsibility to help your peers edit their work. Often when you write a paper it is easy to overlook common mistakes. When a different person reviews your work they often find mistakes that you have overlooked. *Please take this responsibility seriously.* Editing can make the difference between an 'A' and a 'B' paper. Also, as the editor, you will be receiving points in your final grade for your editing work.

Editor: _____ Author: _____

1. Read through the paper once to get an idea of what the paper is about.
2. Read the paper a second time, this time mark errors using the guidelines below:

Clarity	You should read the paper out loud to yourself. ○ draw a box around any single sentence or phrase that just doesn't make sense. (You don't have to correct these, just box them.)	Done _____
Spelling	Circle all misspelled words.	Done _____
Grammar	Underline all grammatical errors. ○ places where commas are needed ○ places where capitalization is needed ○ incorrect verb tenses	Done _____
Complete sentences	Look for incomplete sentences or run-ons. ○ put a star anywhere that you see a sentence that is incomplete or running on	Done _____
Citations	Look for parenthetical documentation. ○ write "source?" after anything that looks like it needs to be cited and is not	Done _____

3. Evaluate each of the following criteria by circling the option you think best describes the paper for each row's description.

Category	4	3	2	1
<p>Grammar & Literacy</p> <p>This category describes how well the paper is written and whether your English teacher would be proud.</p>	<ul style="list-style-type: none"> ◦ Good introduction. ◦ Well developed paragraphs. ◦ Logical conclusion. ◦ Proper citations throughout. 	<ul style="list-style-type: none"> ◦ Good introduction. ◦ Paragraphs seem a bit disorganized or out of order. ◦ Logical conclusion. ◦ Some citations seem to be missing. 	<ul style="list-style-type: none"> ◦ Good introduction. ◦ Paragraphs need to be better organized – topic sentences? ◦ Paper seems to just end, no conclusion. ◦ Very few citations – careful of plagiarism! 	<ul style="list-style-type: none"> ◦ Paper lacks any introduction or conclusion. ◦ Lacks any citations – this would be considered PLAGIARISM.
Category	4	3	2	1
<p>Science Content</p> <p>This category describes the actual scientific content of the paper. Can you understand what is being explained? Do you feel like you could perform the experiment as well?</p>	<ul style="list-style-type: none"> ◦ Your English teacher would understand this explanation! ◦ All vocabulary is defined within the paper in your own words. ◦ Relationships are explained well. 	<ul style="list-style-type: none"> ◦ Vocabulary is defined, but it sounds like it was copied from the book. ◦ Relationships are pointed out, but still needs some clarification. 	<ul style="list-style-type: none"> ◦ The idea is there, but needs to be explained more ◦ Vocabulary is not defined. ◦ Relationships are poorly explained. 	<ul style="list-style-type: none"> ◦ More research needed ◦ Contradictions are found within the paper.

Constructive comments:

Teacher Assessment – Research Paper Rubric - Honors

Name: _____ Period: _____

Category	4 – Proficiently Meets Standard	3 – Meets Standard	2 – Nearly Meets Standard	1 – Standard not met	0	Weight	Total
Problem Statement	Clearly and concisely states the paper’s purpose with a problem statement that includes variables.	Clearly states the paper’s purpose with a problem statement.	States the paper’s purpose.	Incomplete and/or unfocused.	Absent	1	
Introduction	The introduction is engaging, states the main topic and previews the structure of the paper.	The introduction states the main topic and previews the structure of the paper.	The introduction states the main topic but does not adequately preview the structure of the paper.	There is no clear introduction or main topic and the structure of the paper is missing.	Absent	1	
Body	Each paragraph has thoughtful supporting detail sentences that develop the main idea.	Each paragraph has sufficient supporting detail sentences that develop the main idea.	Each paragraph lacks supporting detail sentences.	Each paragraph fails to develop the main idea.	N/A	1	
Organization & Development of Ideas	Writer demonstrates logical sequencing of ideas through well-developed paragraphs.	Paragraph development present but not perfected.	Logical organization; organization of ideas not fully developed.	No evidence of structure or organization.	N/A	1	
Conclusion	The conclusion is engaging and restates the problem.	The conclusion restates the problem.	The conclusion does not adequately restate the problem.	Incomplete and/or unfocused.	Absent	1	
Science Content	The paper defines all scientific terms and contains background information on all variables. The paper clearly leads to a hypothesis for the project.	The paper defines most of the scientific terms and contains background information on all variables. The paper leads to a hypothesis for the project.	The paper defines some of the scientific terms and contains background information on some of the variables. The paper somewhat leads to a hypothesis for the project.	The paper does not define the scientific terms or contain background information on the variables. The paper does not lead to a hypothesis for the project.	Absent	4	
Mechanics	No errors in punctuation, capitalization and spelling. Written with correct grammar and passive voice.	Almost no errors in punctuation, capitalization and spelling. Mostly correct grammar and passive voice.	Many errors in punctuation, capitalization and spelling; not in passive voice.	Numerous and distracting errors in punctuation, capitalization and spelling; not in passive voice.	N/A	1	

Category	4 – Proficiently Meets Standard	3 – Meets Standard	2 – Nearly Meets Standard	1 – Standard not met	0	Weight	Total
Citation	All cited works, both text and visual, are done in APA format with no errors.	Some cited work, both text and visual, are done in the correct format.	Few cited works, both text and visual, are done in the correct format.	Few cited works, both text and visual, are not done in correct format.	Absent	2	
Format	1” margins, double spaced, 12pt Times New Roman font, 3-5 pages in length, correct order of pages (title page, body, bibliography)	Correct margins, spacing, order of pages and almost correct page length.	At least three of the requirements	At least two of the requirements	Absent	1	
Bibliography	APA format with no errors, includes 5 or more primary references (e.g. journal articles, books, no more than 2 internet sources/encyclopedias)	APA format with few errors, includes 5 or more primary references (e.g. journal articles, books, no more than 2 internet sources/encyclopedia)	APA format with some errors, includes 4 or less primary references (e.g. journal articles, books, no more than 2 internet sources/encyclopedias)	APA format with several errors, includes 3 or less primary references (e.g. journal articles, books, no more than 2 internet sources/encyclopedias)	Absent or only provides internet sites	2	

Total points: _____/60

Plagiarism Policy:

- **For grades 8, 9, and 10** – plagiarized work will receive a 0, with the possibility of earning a maximum grade of 60 by redoing the work with proper documentation.
- **For grade 11 and 12** – a grade of 0 will be assigned with no possibility of redoing the work.

Teacher Assessment – Research Paper Rubric - CP

Name: _____

Period: _____

Category	4 – Proficiently Meets Standard	3 – Meets Standard	2 – Nearly Meets Standard	1 – Standard not met	0	Weight	Total
Problem Statement	Clearly and concisely states the paper’s purpose with a problem statement that includes variables.	Clearly states the paper’s purpose with a problem statement.	States the paper’s purpose.	Incomplete and/or unfocused.	Absent	1	
Introduction	The introduction is engaging, states the main topic and previews the structure of the paper.	The introduction states the main topic and previews the structure of the paper.	The introduction states the main topic but does not adequately preview the structure of the paper.	There is no clear introduction or main topic and the structure of the paper is missing.	Absent	1	
Body	Each paragraph has thoughtful supporting detail sentences that develop the main idea.	Each paragraph has sufficient supporting detail sentences that develop the main idea.	Each paragraph lacks supporting detail sentences.	Each paragraph fails to develop the main idea.	N/A	1	
Organization & Development of Ideas	Writer demonstrates logical sequencing of ideas through well-developed paragraphs.	Paragraph development present but not perfected.	Logical organization; organization of ideas not fully developed.	No evidence of structure or organization.	N/A	1	
Conclusion	The conclusion is engaging and restates the problem.	The conclusion restates the problem.	The conclusion does not adequately restate the problem.	Incomplete and/or unfocused.	Absent	1	
Science Content	The paper defines all scientific terms and contains background information on all variables. The paper clearly leads to a hypothesis for the project.	The paper defines most of the scientific terms and contains background information on all variables. The paper leads to a hypothesis for the project.	The paper defines some of the scientific terms and contains background information on some of the variables. The paper somewhat leads to a hypothesis for the project.	The paper does not define the scientific terms or contain background information on the variables. The paper does not lead to a hypothesis for the project.	Absent	4	
Mechanics	No errors in punctuation, capitalization and spelling. Paper is at least 2 - 4 (individual) or 4 - 8 (team) full pages in length.	Almost no errors in punctuation, capitalization and spelling, 3/6 pages.	Many errors in punctuation, capitalization and spelling. Paper is at least 2.5/5.5 pages.	Numerous and distracting errors in punctuation, capitalization and spelling. Less than 2.5/3.5 pages.	N/A	1	

Category	4 – Proficiently Meets Standard	3 – Meets Standard	2 – Nearly Meets Standard	1 – Standard not met	0	Weight	Total
Citation	All cited works, both text and visual, are done in APA format with no errors.	Some cited work, both text and visual, are done in the correct format.	Few cited works, both text and visual, are done in the correct format.	Few cited works, both text and visual, are not done in correct format.	Absent	2	
Format	1” margins, double spaced, 12pt Times New Roman font, 2-4 pages in length, correct order of pages (title page, body, bibliography)	At least four of the requirements	At least three of the requirements	At least two of the requirements	Absent	1	
Bibliography	APA format with no errors, includes 4 or more primary references (e.g. journal articles, books, no more than 2 internet sources/encyclopedias)	APA format with few errors, includes 5 or more primary references (e.g. journal articles, books, no more than 2 internet sources/encyclopedias)	APA format with some errors, includes 4 or less primary references (e.g. journal articles, books, no more than 2 internet sources/encyclopedias)	APA format with several errors, includes 3 or less primary references (e.g. journal articles, books, no more than 2 internet sources/encyclopedias)	Absent or only provides internet sites	2	

Total points: _____/60

Plagiarism Policy:

- **For grades 8, 9, and 10** – plagiarized work will receive a 0, with the possibility of earning a maximum grade of 60 by redoing the work with proper documentation.
- **For grade 11 and 12** – a grade of 0 will be assigned with no possibility of redoing the work.

Experimental Design

Now it is time to plan out your experiment, step-by-step, in your project notebook by writing your materials and procedure. Your directions must be *specific* and *detailed* enough that a classmate or teacher could repeat this experiment without you present to explain anything. I will review your procedure and make comments and suggestions in your notebook. This will serve as my approval for you to complete this procedure, meaning it is safe and well thought out. First let's review some details:

Location of Experiment: (*circle one*)

School Home (indoors) Home (outdoors) Other:

Independent variables (what you are changing): _____

Control group (the group with no change, to compare your results to): _____

Dependent variable: (what you are measuring): _____

Directions:

1. In your project notebook, write down each step of the procedure you will follow.
 - a. Make this a numbered list (i.e. 1-12).
 - b. Try to have only one action per step.
 - c. **Do not use personal pronouns.** Use the third-person when writing your steps; for example "Take the meter stick and measure...", rather than "I took the meter stick..." or "You take the meter stick..."
2. Include what instrument or tool you will use for each step (ruler, beaker, graduated cylinder).
3. Include the units you will use to record these measurements.
4. **Visualize** every step as you write it down to anticipate anything you might need.
 - a. As you write out every step, jot down every material you will need.
 - b. Create a bulleted list of these items.
 - c. If, as you do this, there is some material that you need and cannot find, come see me and we will try to find it in a catalog and the Science Department will order it for you.
5. Make a drawing of your set-up in order to help explain how you will perform this experiment.
6. Include a sketch of how you will organize your data – a sample data table, a graph that you create, etc.

Name: _____

Period: _____

Self Assessment – Materials & Procedure Rubric

Category	4 – Proficiently Meets Standard	3 –Meets Standard	2 – Nearly Meets Standard	1 – Standards Not Met	0	Weight	Total
Materials & Procedure	Materials listed in a logical order, experiment well written and easy to follow.	All materials listed and experiment is written so that it can be followed.	Materials missing, experiment is difficult to follow.	Neither is clear.	Absent	4	

Teacher Assessment – Materials & Procedure Rubric

Category	4 – Proficiently Meets Standard	3 –Meets Standard	2 – Nearly Meets Standard	1 – Standards Not Met	0	Weight	Total
Materials & Procedure	Materials listed in a logical order, experiment well written and easy to follow.	All materials listed and experiment is written so that it can be followed.	Materials missing, experiment is difficult to follow.	Neither is clear.	Absent	4	

Analyzing Data

Now that you have completed your project, you are ready to make sense of the data that you collected. For each component, you should print three sets of this information, (1) for data packet to be handed in and graded, (2) a set to be taped into your project notebook, and (3) a set for your posterboard.

This will involve the following components:

1. A typed data table.
2. A scatter plot for the control group and each variable group (at least 3 scatter plots).
3. Mean and confidence statistics for the control group and each variable group.
 - a. *Honors students will also perform t-Tests comparing the control to each variable and the variables to each other (at least 3 t-Tests).
4. Written Data Analysis – a summary explaining all of this information: stating means, confidence calculations, comparison of confidence intervals, comparison of t-Tests, and a summary of their meanings.

1. Data Table

Example:

Table 1: The height in cm of bean plants grown in different colored lights.

Trial #	Control - Sun light	Blue light	Green light
1	15	16	14
2	14	16	12
3	13.5	15	8
4	12	16	7
5	14.5	15	9
6	14	17.5	12
7	15	16	12
8	9	17	10.5
9	12.5	15.5	11
10	13	15	7.5
11	15.5	16.5	8.5
12	14	15.75	8
13	12.5	14	9
14	11.75	14.75	10.5
15	11	15	8
Mean	13.15	15.67	9.8

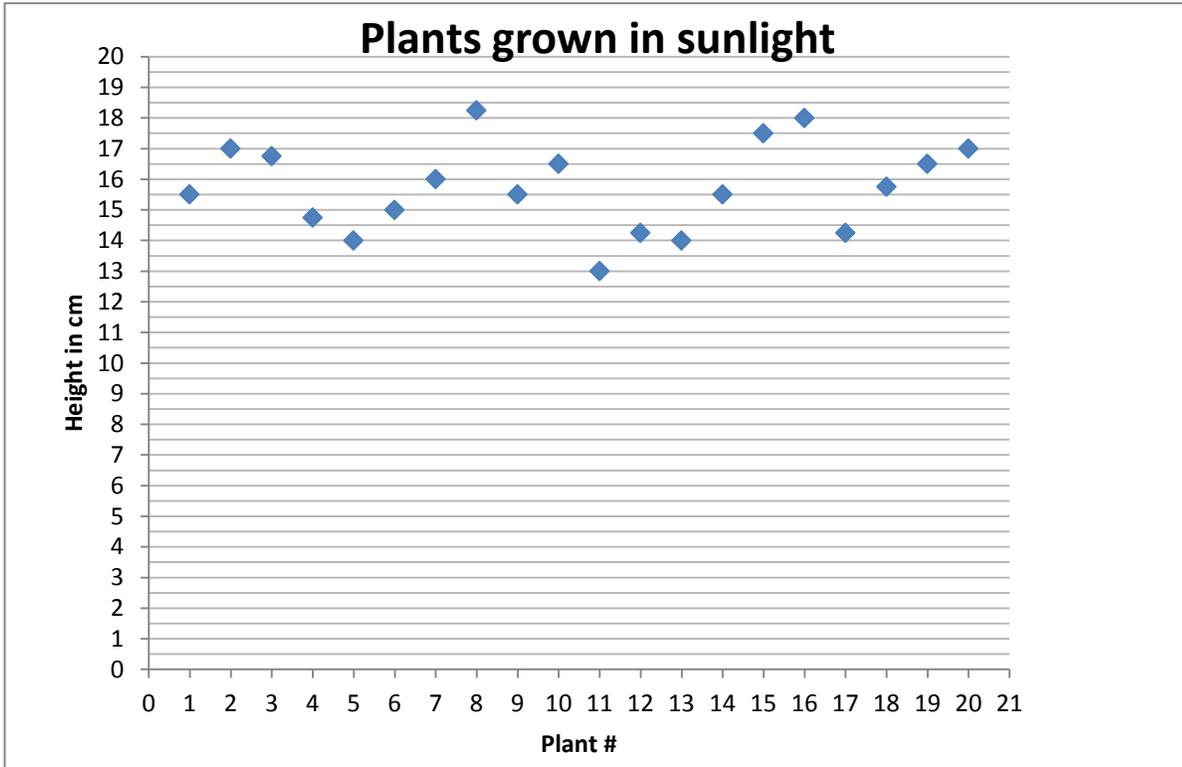
⇒ Make sure that your table has a title with the dependent and independent variables and **units!**

⇒ Make sure that you include your means.

2. Scatter plots

You should make a separate scatter plot for your control group and each variable group. If you want to put all of your data (all 3 data sets) on the same scatter plot, you can do that as well. This works better if you have a color printer so that you can see your different data sets. The instructions for doing this in Excel are on the following pages.

Example:



- ⇒ Make sure that you give your scatter plot a title.
- ⇒ Make sure you label your X axis and your Y axis. (Don't forget **units**!).
- ⇒ Make sure you draw your confidence intervals onto your scatter plot.

3. Mean, Confidence Statistics and T-test

You need to use Excel and run some Data Analysis calculations. For instructions and examples on how to do this see the instructions on the next few pages.

4. Written Data Analysis

The last part of your Data packet should include a written analysis. This should be in paragraph form. There should be no opinions or explanations. This is NOT the same as a conclusion.

Exemplar

Data Analysis

The average height for the plants grown in sunlight was 15.75 cm. The average height for the plants grown in blue light was 15.61 cm. The average height for the plants grown in green light was 10.39 cm. Therefore, the plants grown in sunlight and blue light were very similar and the plants grown in green light were shorter.

The confidence level for the plants grown in sunlight was 0.68, the confidence level for the plants grown in blue light was 0.63 and the confidence level for the plants grown in green light was 0.53. These confidence levels were used to find the confidence intervals for each type of light. The confidence interval for the sunlight was 15.07 to 16.43. The confidence interval for the blue light was 14.98 to 16.24 and the confidence interval for the green light was 9.86 to 10.92.

The mean for the sunlight group (15.75) is clearly contained in the confidence interval for blue light. Likewise, the mean for the blue light group (15.61) is clearly contained in the confidence interval for sun light. Therefore, these two groups are not statistically different from each other. It cannot be said that these plants grew taller in sunlight. However, the mean for the green light group (10.39) is not contained in any of the other confidence intervals. Therefore, the green light group is statistically different from the blue light and the sun light. It can be said that the plants grown in the sun light and the blue light grew taller than the plants grown in green light.

The t-Tests for all of these variables supported the conclusions from the confidence intervals. When the sunlight and blue light were compared, the t-Test value was .3817. This number is larger than the 0.05 so the two numbers are not statistically different. When the sunlight and green light were compared, the t-Test value was 1.54×10^{-13} . This number is smaller than the 0.05 so the two numbers are different. This was also true when the blue light and green light were compared. The t-Test value was 2.60×10^{-15} which makes the blue and green light different.

Creating Scatter Plots in Excel Office 2007

Scatter plots are a useful tool to show with a picture how variable the data is that you are collecting.

- 1) Enter your data in columns in Excel. The first column should be the trial number and the second column should be the actual measurement associated with that trial.
- 2) Highlight these two columns and go to the **Insert** Tab at the top of the menu bar. Click **Insert** and choose **scatter plot**. Click on **the first chart on the left (the chart without lines) from the choice given**. The chart will appear within your spreadsheet.
 - a. To enter a chart title which should be descriptive about what the plot represents, click on the **layout** button.
 - b. Click on **chart titles** and make a choice of where the title should appear. When the text box shows up on your chart, enter the title in the text box.
 - c. In order to add axis titles, choose chart titles and click on **axis titles**.
 - d. Choose the **primary horizontal axis** title for the X axis title and click on the choice of where you want it. Click on the text box and add the title.
 - e. To add the Y axis title, click on **primary vertical axis** and choose an option for how it should be displayed.
 - f. To print your chart, click on the outside edges of the chart border and click on the **Microsoft Office button** in the upper left hand corner. Choose the **print** button.
- 3) Once you have your scatter plot you can hand draw in a line that represents the mean and the confidence levels that you determine from using the data analysis option in Excel.

Creating Basic Statistics in Excel Office 2007

As we all know, all data has some error associated with it which can result in us getting different results each time we run the same experiment over and over. Because of this variability, it is important to use some statistical tools to help us make sense of our data. One easy way we can use statistical tools is to make use of Microsoft Excel and the Data Analysis Toolpak.

- If the "Data Analysis" box is not there, you must add it in. Click on the **Microsoft Office button**. Click on the button titled **Excel Options** at the bottom of the box. Click down to the **Add-Ins** option. Click on the **Analysis Toolpak** option and hit **OK**. Click on **Data** at the top of the menu. **Data Analysis** should be below the data button off to the right.

In order to gather some basic statistics on our data, we can start out using the following process:

1. Enter your data in columns in Excel. *Use the table you just made for your scatter plot.*
2. Click on the **Data** tab on the top menu.
3. Click on the **Data Analysis** button over to the far right of the menu.
4. Click on **Descriptive Statistics**. Hit OK.
5. To choose your variable locations input and output range:
 - a. Click in the box on the **input range** and highlight the data you want to input.
 - b. Next, click in the **output range** box and go over and place the cursor in the cell where you want the data to be pasted once Excel calculates it.
6. Check off **Summary Statistics and Confidence Level** and add the % confidence you want in the box (usually 95%) and hit OK.

This provides you with the **mean** (average) and the **standard deviation** (a measure of the variability) of your data set and a **confidence level** which we will use to produce a confidence interval. You will need the following information from this:

Example:

<i>Miracle Grow</i>	
Mean	10.3875
Standard Error	0.252926945
Median	10.25
Mode	10.25
Standard Deviation	1.131123684
Sample Variance	1.279440789
	-
Kurtosis	0.111998455
Skewness	0.637637939
Range	4.25
Minimum	8.75
Maximum	13
Sum	207.75
Count	20
Confidence Level(95.0%)	0.529382179

Give it a name (don't leave it as Column 1)

Use the **mean** to find your confidence interval.

Calculate your confidence interval by adding and subtracting this **confidence level** from your mean.

We can use these statistics to decide whether the Miracle-Grow we are putting on the plants in our science project really does yield bigger plants, by taking into account the natural variability of the plants themselves. It can be very difficult to look at two averages and decide whether there is really a difference when the data is so variable. Therefore we can use a couple of techniques in order to determine whether there is a true difference.

1. Producing a confidence interval.

- a. To produce the **upper confidence interval**, take the **mean** and add the **confidence level**.
 - $10.39(\text{mean}) + 0.53(\text{confidence level}) = 10.92$
- b. To produce the **lower confidence interval**, take the **mean** and subtract the **confidence level**.
 - $10.39(\text{mean}) - 0.53(\text{confidence level}) = 9.86$
- c. You will then draw these lines in on your scatter plots, along with the mean, to show the range in which the mean can be found 95% of the time.

Interpreting the confidence intervals:



If the mean of Variable 1 is not contained within the confidence interval of Variable 2, then the two variables are truly providing different results, that is, the means or averages are not the same statistically.

2. Performing a t-Test - testing whether Means of two data sets are Statistically Equal

- Click on the **Data** tab on the top menu.
- Click on the **Data Analysis** button over to the far right of the menu.
- Click on **Two-Sample Assuming Unequal Variances**. Hit OK.
- Select the **Variable 1 Range** and highlight the data for your first variable (not the trial #).
- Select the **Variable 2 Range** and highlight the data for your second variable (not the trial #).
- Enter 0 in the box next to the **Hypothesized Mean Difference**.
- Choose **alpha level 0.05** (which corresponds with your 95% confidence).
- Select the **output range** box and select a blank area of the worksheet or choose a new worksheet if you want the data on a separate sheet.

Interpreting the t Test:

⇒ If the **p one-tail** test result is **less than** the alpha level you chose (0.05, if you followed these directions), then this means that the averages of the two variables are **not** statistically the same number.

⇒ If the **p one-tail** test result is **greater than** the alpha level you chose (0.05, if you followed these directions) then this means that the averages of the two variables cannot be said to be statistically different. *This means they are essentially the same result!!*

Example:

Give them names!

t-Test: Two-Sample Assuming Unequal Variances

	<i>Egg Shells</i>	<i>Miracle Gro</i>
Mean	15.6125	10.3875
Variance	2.02944079	1.279440789
Observations	20	20
Hypothesized Mean Difference	0	
df	36	
t Stat	12.8457859	
P(T<=t) one-tail	2.6031E-15	
t Critical one-tail	1.68829769	
P(T<=t) two-tail	5.2063E-15	
t Critical two-tail	2.02809399	

If this is less than 0.05 then the average of the two data sets is not statistically the same.

*remember the E-15 means 2.6×10^{-15}

Teacher Assessment – Final Data & Data Analysis Rubric - Honors Name: _____

Category	4 – Proficiently Meets Standard	3 –Meets Standard	2 – Nearly Meets Standard	1 – Standards Not Met	0		
Data Table	Tables: done very well, labeled with units, easy to read, contains 60/120 trials (or more variables), no errors using Excel	Tables: somewhat easy to read; poor labels. All data and units are included. May have some errors, using Excel	Tables: somewhat easy to read; missing labels, data, and/or units. Some errors, using Excel	Tables handwritten	Absent		1.5
Graphs	A minimum of 3 scatter plots: done very well, labeled with units, easy to read, no errors using Excel. Confidence intervals drawn on scatter plot.	Includes 3 scatter plots done in Excel. Axis labels may be poorly done but graph includes units and all data. May have some errors using Excel. Confidence intervals drawn.	Scatter plot: somewhat easy to read; missing labels, data, intervals, and/or units. Some errors, using Excel.	Graphs are hand drawn.	Absent		3
Statistical Analysis	Appropriately used statistical analysis; page attached with Confidence Level and confidence interval calculations for all 3 groups. 3 t-Test calculations, comparing all data sets.	Appropriately used statistical analysis; page attached with Confidence Level for all 3 groups. 3 t-Test calculations, comparing all data sets. May have mistakes in calculations for confidence and/or t-Test.	Statistical analysis done incorrectly and/or missing one type of analysis.	Only attempted one type of statistical analysis and it is done incorrectly.	Absent		1.5
Data Analysis	Comparison of means for all data sets, using actual numbers. Clear explanation of confidence intervals, including conclusions about actual statistical differences between groups. Explanation of t-Test results to support confidence intervals.	Comparison of means for all data sets, using actual numbers. Vague explanation of confidence intervals and lacks conclusions about actual statistical differences between groups. Explanation of t-Test results to support confidence intervals.	Comparison of means for all data sets, using actual numbers. Vague explanation of confidence intervals and lacks conclusions about actual statistical differences between groups. Lacks explanation of t-Test results to support confidence intervals.	Comparison of means for all data sets, using actual numbers. Lacks other statistical analysis.	Absent		1.5

Teacher Assessment – Final Data & Data Analysis Rubric - CP Name: _____

Category	4 – Proficiently Meets Standard	3 –Meets Standard	2 – Nearly Meets Standard	1 – Standards Not Met	0		
Data Table	Tables: done very well, labeled with units, easy to read, contains 45/90 trials (or more variables), no errors using Excel	Tables: somewhat easy to read; poor labels. All data and units are included. May have some errors, using Excel	Tables: somewhat easy to read; missing labels, data, and/or units. Some errors, using Excel	Tables handwritten	Absent	1.5	
Graphs	A minimum of 3 scatter plots: done very well, labeled with units, easy to read, no errors using Excel. Confidence intervals drawn on scatter plot.	Includes 3 scatter plots done in Excel. Axis labels may be poorly done but graph includes units and all data. May have some errors using Excel. Confidence intervals drawn.	Scatter plot: somewhat easy to read; missing labels, data, intervals, and/or units. Some errors, using Excel.	Graphs are hand drawn.	Absent	3	
Statistical Analysis	Appropriately used statistical analysis; page attached with Confidence Level and confidence interval calculations for all 3 groups.	Appropriately used statistical analysis; page attached with Confidence Level for all 3 groups. May have mistakes in calculations for confidence and/or t-Test.	Statistical analysis done incorrectly and/or missing one type of analysis.	Only attempted one type of statistical analysis and it is done incorrectly.	Absent	1.5	
Data Analysis	Comparison of means for all data sets, using actual numbers. Clear explanation of confidence intervals, including conclusions about actual statistical differences between groups.	Comparison of means for all data sets, using actual numbers. Vague explanation of confidence intervals and lacks conclusions about actual statistical differences between groups.	Comparison of means for all data sets, using actual numbers. Vague explanation of confidence intervals and lacks conclusions about actual statistical differences between groups.	Comparison of means for all data sets, using actual numbers. Lacks other statistical analysis.	Absent	1.5	

Total Points: _____/30

Writing a Conclusion for my Science Project

The conclusion for your project, or after any science lab, should be a clear concise summary of everything you did, start to finish. If another teacher were to read this essay, they would be able to understand everything about your project. Follow the outline below and the attached rubric to be sure you include all components.

Paragraph 1:

1. Restate your problem statement.
2. Highlight the most important facts from your research.
3. Restate your hypothesis.

Paragraph 2:

4. Summarize your procedure.
 - a. DO NOT list every step or include a list of materials!
 - b. This is a narrative overview of what you did.

Paragraph 3:

5. State the results for each test group using the actual numbers.
6. Discuss the highlights of your data analysis – were your three data sets statistically different from each other?
7. Explain what your results mean.
 - a. Do your variables affect the outcome of the experiment?
 - b. Reflect back on your hypothesis – was it proven *false*? *supported*? Or was your data *inconclusive* (aka “I’m not sure”).
 - c. Remember, it is just as important to discuss what *did happen* as what *did not happen*.
8. Consider all sources of error that could have affected the outcome.
 - a. Discuss how these errors would have impacted your results.

Paragraph 4:

9. Propose “next steps”.
 - a. How is this information useful to people? *What did you learn?*
 - b. Can you think of a new way to test the same statement?
 - c. Is there a new question you have based on the outcome?

Teacher Assessment – Conclusion

Name: _____ Period: _____

Category	4 – Proficiently Meets Standard	3 –Meets Standard	2 – Nearly Meets Standard	1 - Standards Not Met	0	Weight	Total
Format	Written in paragraph form, complete sentences, proper grammar and spelling.	Written in paragraph form, complete sentences, a few spelling and grammar mistakes. Does not affect meaning.	Written in paragraph form, mostly complete sentences, poor grammar and spelling affect meaning.	Not written in paragraph form, meaning is lost because of mistakes.	Absent	1	
Introduction	Clear, concise summary of the problem statement, research highlights, hypothesis, and procedures.	Clear, concise summary of problem statement and hypothesis. Lacks discussion of highlights from research and/or lacks summary of procedures.	Summary is hard to understand, but shows evidence of reference to the problem statement and hypothesis. Lacks discussion of both research highlights and procedures.	Reference to the problem statement is made, but no reference to the hypothesis, research, and procedures.	Absent	2	
Results	Uses actual data to support conclusion. Data analysis is used to determine if data sets are statistically different.	Uses actual data to support conclusion. Data analysis is used incorrectly to support conclusions.	Uses actual data to support conclusion. No reference to data analysis.	No actual numbers are used to support conclusion.	Absent	1.5	
Sources of error	Discusses several possible sources of error clearly by explaining the impact on results.	Discusses only one source of error and its impact on the results.	Discusses only one source of error with no discussion of its impact on the results.	Source of error is inaccurate or made up.	Absent	1.5	
“Next Steps”	Discussion of how the results are useful to self and others. Considers new tests or questions.	Discussion of how the results are useful to self and others.			Absent	1.5	

Total Points: _____ /30

Teacher Assessment – Project Notebook

Name: _____ Period: _____

Category	4 – Exceeds Standard	3 – Meets Standard	2 – Nearly Meets Standard	1 – Standard not met	0	Weight	Total
Science Content	Reflects overall process very well. Includes: <ul style="list-style-type: none"> Initial ideas through final analysis Discussion of data Conclusions Scientific procedures are recorded well and accurately	Reflects overall process well. Includes: <ul style="list-style-type: none"> Initial ideas through final analysis Some discussion of data Conclusions Scientific procedures are recorded accurately	Reflects overall process. Includes: <ul style="list-style-type: none"> Initial ideas through final analysis Data Some conclusions Scientific procedures are recorded and mostly accurate.	Does not reflect overall process clearly. <ul style="list-style-type: none"> Includes some initial ideas through final analysis Data No conclusions Scientific procedures are recorded	Absent	2.5	
Data	Data is recorded accurately with titles, units, labels; well organized	Data is recorded titles, units, labels; well organized	Data is recorded, missing some titles, units, labels; somewhat organized	Data is recorded, missing most titles, units, labels, data is poorly organized	Absent	1	
Graphs and Analysis	Graphs for data are accurate with titles, units, labels; graphs are analyzed including possible sources of error	Graphs for data are present with titles, units, labels; graphs are analyzed including some possible sources of error	Graphs for data are present with some titles, units, labels, unorganized; graphs are analyzed including some possible sources of error	Graphs for data are present with missing titles, units, labels, unorganized; graphs are analyzed, missing sources of error	Absent	1	
Format	Journal is in a bound book. All pages are dated, numbered, and hand written in pen; journal is neat, organized, legible and has a complete table of contents.	Journal is in a bound book. Most pages are dated, numbered, and hand written in pen; journal is neat, organized, legible and has a table of contents.	Journal is not in a bound book. Some pages are dated, numbered, and hand written in pen; journal is organized, legible and has a table of contents.	Journal is not in a bound book. A few pages are dated, numbered, and hand written in pen; journal is not neat, organized, legible and has no table of contents.	Absent	1	
Proof	All data pages are dated, and signed by witnesses on a daily basis.	Most data pages are dated, and signed by witnesses on a daily basis.	Some data pages are dated, and signed by witnesses on a daily basis.	All data pages are dated, but not signed by witnesses on a daily basis.	Absent	2	

Total Points: _____/30

Presentation

The presentation of your project includes two parts: a visual aide and an oral report. This presentation will occur either in class in front of peers or before the judges at the MHS Science, Technology, & Engineering Fair. These details will be explained by your teacher.

Visual Aide

The most common prop that students create is a tri-fold posterboard. This board will contain all portions of the project you have completed arranged in a visually pleasing manner. The diagram below is the arrangement you should follow. Pictures of your experiment or samples (if appropriate) can help to accessorize the display. In some instances, a PowerPoint presentation may be an acceptable substitute for this posterboard if it includes all of the same information and is approved by your teacher.



Oral Report

Prepare for your presentation by reviewing each part of the experiment so that you know it well. You should write a 2 - 4 minute overview of your project that takes us through the whole process, start to finish. Review your research so that you can speak intelligently about your topic.

Tips:

- Use note cards for your presentation, **do not read from your poster!**
- Practice your presentation before you actually present.
- Speak slowly, and do not chew gum.
- Take a deep breath if you get confused.
- Ask if there are any questions.

Teacher Assessment – Presentation

Name: _____ Period: _____

Category	4 – Proficiently Meets Standard	3 – Meets Standard	2 – Nearly Meets Standard	1 – Standard not met	0	Weight	Total
Poster board parts	All parts included, in the right logical order. Great appeal, “I want to check it out”, very creative, neat and fits topic.	All parts included; one out of order. Nice appeal, “I want to look at it”, some creativity, neat.	All parts included; some out of order. Good appeal, “Some things draw me in so I want to look at it”, neat.	1-2 parts missing. Some appeal, ”I’m not really drawn to look”. Not much creativity.	No Poster	2	
Oral report	Clear evidence of understanding experiment. Do not have to read board except to clarify data.	Understand experiment, check board a number of times to clarify data	Use board a number of times to clarify data. Not sure of experiment at all times	Not clear on experiment therefore board is continuously used as a guide	Board is read, but you understand your project a little	1	
Oral report questions	All questions answered well – know your project.	Most questions answered well.	Most questions answered.	Some questions answered not sure on some.	Few questions answered; limited knowledge.	1	

Total Points: _____ /16

Topic: _____ / 10

Peer-Edit Research: _____ / 4

Research Summary: _____ / 60

Materials & Procedure: _____ / 16

Data Analysis: _____ / 30

Peer-Edit Conclusion: _____ / 4

Conclusion: _____ / 30

Journal: _____ / 30

Presentation: _____ / 16