

Science Fair Written Report Information Packet

Middle School Science

Key Information:

At this point, preparing your science fair project final report will entail pulling together the all information you have already collected, throughout your experiment, into one large document.

- Your final report will include these sections:
 - **Abstract.** An abstract is an abbreviated version of your final report.
 - **Safety Sheet**
 - **Title page.**
 - **Table of contents.**
 - **Purpose and hypothesis.**
 - **Acknowledgements** *This is your opportunity to thank anyone who helped you with your science fair project, from a single individual to a company or government agency.*
 - **Review of Literature.** *This is the Research paper this should include what you wrote before you started your experiment and new information that you learned from your experiment.*
 - **Experimental Procedure and Materials list.**
 - **Results** *This is your data analysis and discussion. This section is a summary of what you found out in your experiment, focusing on your observations, data table, and graph(s).*
 - **Data Tables and Graphs.**
 - **Conclusions.** *Include whether your hypothesis was **supported or not supported** based on your experiment. Apply what you learned to your research and future research you might want to do based on what you learned.*
 - **References** *Must be done in APA format and can only include materials properly cited in your review of literature.*
- Write the **abstract** section last, even though it will be one of the first sections of your final report.
- Your final report will be several pages long, but don't be overwhelmed! Most of the sections are made up of information that you have already written. Gather up the information for each section and type it in a word processor if you haven't already.
- Save your document often! You do not want to work hard getting something written the perfect way, only to have your computer crash and the information lost. Frequent file saving could save you a lot of trouble!
- Remember to do a spelling and grammar check in your word processor. Also, have a few people proof read your final report. They may have some helpful comments

Things to Avoid

- Any other formatting rather than this example (Times New Roman, 12pt Font and 1” margins)
- Avoid jargon or any technical terms that most readers won't understand (Unless explained first).
- Avoid abbreviations or acronyms that are not commonly understood unless you describe what they mean.
- Use of indirect language example, I think..., maybe..., kind of..., etc.)

Abstract (First Page of Packet, but not listed in the Table of Contents)

An **abstract** is an abbreviated version of your science fair project final report. It must be limited to a maximum of 250 words. The science fair project abstract appears at the beginning of the report as well as on your display board. Your science fair project abstract lets people quickly determine if they want to read the entire report. Consequently, at least ten times as many people will read your abstract as any other part of your work. It's like an advertisement for what you've done. If you want judges and the public to be excited about your science fair project, then write an exciting, engaging abstract!

An abstract should have the following four pieces:

- **Title**
- **Purpose.** *Explain why you did your experiment and how it relates to the world.*
- **Procedure.** *Briefly describe your approach for investigating the problem. Don't go into detail about materials unless they were critical to your success. Do describe the most important variables if you have room.*
- **Conclusions.** *State what your science fair project or invention contributes to the area you worked in. Did you meet your objectives? For an engineering project state whether you met your design criteria.*

Safety Sheet. (Second Page of Packet, but not listed in the Table of Contents)

Experimentation or research may involve an element of risk or injury to the student, test subjects, and to others. Recognition of such hazards and provision for adequate control measures are joint responsibilities of the student and the sponsor. Some of the more common risks encountered in research are those of electrical shock, infection from pathogenic organisms, uncontrolled reactions, damage to eyes from materials or procedure elements. Countering these variable are an integral part of scientific experimentation and must be addressed in this section.

In this Section, list the principal hazards associated with your project and the materials you used as safeguards. If your project posed no hazards you must write "No hazards were associated with this project". Be sure to account for all possible hazards.

(SAMPLE OF RESEARCH SUMMARY TITLE PAGE)

(title)

Type of Science

(category)

Experimental or Design Investigation

(designate your type of investigation)

Sponsoring Teacher

Signature of School Science Fair Coordinator

John Smith

Riverside School
Chicago, IL 60601
Grade 9

Table of Contents. (Fourth Page of Packet, but not listed in the Table of Contents)

- o Project title and exhibitor's last name typed at the top left corner
- o Pagination is accurate

Title and Last Name	
Table Of Contents:	
Purpose and hypothesis.	1
Acknowledgements.....	2
Review of Literature.....	3-8
Procedure and Materials.....	9
Results	10
Data Tables and Graphs.	11
Conclusions.	12
Reference/Bibliography.....	13

Purpose and Hypothesis. (Fifth Page of Packet, listed in the Table of Contents as #1)

Purpose

This is where you describe the purpose for doing your science fair project or invention. Why should anyone care about the work you did? You have to tell them why. Did you explain something that should cause people to change the way they go about their daily business? If you made a discovery or developed a new procedure how is it better, faster, or cheaper than what is already out there? **Motivate** the reader to read the entire paper or display board.

Hypothesis

Remember. . .

- A hypothesis is **NOT** an educated guess about how things work. Your hypothesis should be something that you can actually test, what's called a **testable** hypothesis. In other words, you need to be able to measure both "what you do" and "what will happen."
- Most of the time a hypothesis is written like this: "If _____[I do this] _____, then _____[this]_____ will happen." (Fill in the blanks with the appropriate information from your own experiment.)
- Include Independent and Dependent Variables

Acknowledgements. (Sixth Page of Packet, listed in the Table of Contents as #2)

A listing of persons or agencies that gave the student guidance and helped with this research or experiment. It may include a single individual, an organization, a hospital, or some other agency. Please include their role in the project.

Review of Literature. (Seventh Page of Packet, listed in the Table of Contents as #3-...)

A discussion of the background information that helps establish the hypothesis and explains procedures adapted for the experiment where necessary. Also any similar research that helps establish the hypothesis or procedure. Other background information about the topic that may help the reader understand the project should also be included. Paraphrased information should be cited as such. No references to the literature are to be placed in footnotes. Citation to particular pages in the text should be in the form (Smith, 2010, p. 10); for a general citation in the text (Smith, 2002). This citation should be placed at the end of the sentence to which it refers. The style for citations is based on the Publication Manual of the American Psychological Association, 6th ed., (APA style) which is the official style manual.

Overview

- As you do your research, follow a **background research plan** and take notes from your sources of information. These notes will help you write a better summary.
- The purpose of your **research paper** is to give you the information to understand why your experiment turns out the way it does. The research paper should include:
 - The history of similar experiments or inventions
 - Definitions of all important words and concepts that describe your experiment
 - Answers to all your background research plan questions
 - Mathematical formulas, if any, that you will need to describe the results of your experiment
- For every fact or picture in your research paper you should follow it with a citation telling the reader where you found the information. A citation is just the name of the author and the date of the publication placed in parentheses like this: (Author, date). This is called a reference citation when using APA format and parenthetical reference when using the MLA format. Its purpose is to document a source briefly, clearly, and accurately.
- If you copy text from one of your sources, then place it in quotation marks in addition to following it with a citation. Be sure you understand and avoid plagiarism! Do not copy another person's work and call it your own. Always give credit where credit is due!

What Is Review of Literature

The short answer is that the research paper is a report summarizing the answers to the research questions you generated in your background research. It's a review of the relevant publications (books, magazines, websites) discussing the topic you want to investigate.

The long answer is that the research paper summarizes the theory behind your experiment. Science fair judges like to see that you understand why your experiment turns out the way it does. You do library and Internet research so that you can make a prediction of what will occur in your experiment, and then whether that prediction is support or not supported, you will have the knowledge to understand what caused the behavior you observed.

From a practical perspective, the research paper also discusses the techniques and equipment that are appropriate for investigating your topic. Some methods and techniques are more reliable because they have been used many times. Can you use a procedure for your science fair project that is similar to an experiment that has been done before? If you can obtain this information, your project will be more successful. As they say, you don't want to reinvent the wheel! If these reasons sound to you like the reasons we gave for doing background research, you're right! The research paper is simply the "write-up" of that research.

Outline for writing your Review of Literature: *Use the outline below to write a minimum of 5 referenced paragraphs.*

- Introduction
 - Attention getter: quote, statistic, fact, or question that gets the reader's attention
 - Connection to world: why might the reader be interested/ or why is this topic important?
 - Thesis statement: introduce the question or purpose of the experiment
 - State your hypothesis and why you chose the project.
 - Summary of the main ideas the body paragraphs state. (set up the essay)
- Background information
 - Introduce your experiment and any information the reader may need to know to understand your paper i.e. vocabulary, mathematic equations, engineering designs etc.
- Connection to Research #1
 - Main Idea: Turn your background question #1 into a statement
 - Evidence: Support your claim using facts, data, quotes, or anything else from your research
 - Links: Explain your evidence and **how** it supports your main idea. 1 – 2 sentences per piece of evidence
 - Con: Wrap up sentence that summarizes what you have written and gives your paragraph closure
- Connection to research #2 (see same format as above paragraph)
 - Main Idea → Evidence → Links → Con
- Connection to Research #3
 - Main Idea → Evidence → Links → Con
- Conclusion
 - Use a transition (not "in conclusion")
 - Summarize each of the three points from your body paragraphs
 - Thesis: restate your thesis (testable question/ purpose) in a different way
 - Attention Getter Loop: Tie back to your introduction
 - Clincher: Explain the "so what?" about your thesis to get your reader interested

Materials and Procedure. (Must be listed in the Table of Contents)

MATERIALS

- All equipment and materials are listed (including exact measurements.)
- Be as specific as possible future scientist should be able to obtain exact materials
- Materials should be bulleted

PROCEDURE

- Write the experimental procedure like a step-by-step recipe for your science experiment. A good procedure is so detailed and complete that it lets someone else duplicate your experiment exactly!
- Repeating a science experiment is an important step to verify that your results are consistent and not just an accident. For a typical experiment, you should plan to repeat it at least three times (more is better).
- If you are doing something like growing plants, then you should do the experiment on at least three plants in separate pots (that's the same as doing the experiment three times).
- If you are doing an experiment that involves testing or surveying different groups, you won't need to repeat the experiment three times, but you will need to test or survey a sufficient number of participants to insure that your results are reliable. You will almost always need many more than ten participants!
- A control or comparison group is present and appropriate
- Number of trials within each test group is adequate
- Control of variables is evident
- Drawings and photographs are present if they enhance and clarify the project.

Results. (Must be listed in the Table of Contents)

The results section of your paper should include all conclusions, trends, and patterns found in your data. You should explain what analysis you did with your data and what you found. You should not only talk about your successful design attempts, but also the problems you encountered and how you solved them. Be sure to explain what new knowledge has been gained and how it leads to further questions. Include any important research that you have found that may explain your results. This should be done in paragraphs and should relate to how you would improve your experiment and how you can go further with it.

Data Tables and Graphs. (Must be listed in the Table of Contents)

Overview

Take some time to carefully review all of the data you have collected from your experiment. Use charts and graphs to help you analyze the data and patterns. Did you get the results you had expected? What did you find out from your experiment? Really think about what you have discovered and use your data to help you explain why you think certain things happened. Often, you will need to perform calculations on your raw data in order to get the results from which you will generate a conclusion. A spreadsheet program such as Microsoft Excel should be used to perform such calculations, and then later the spreadsheet can be used to display the results. Be sure to label the rows and columns—do not forget to include the units of measurement (grams, centimeters, liters, etc.).

You should have performed multiple trials of your experiment. Think about the best way to summarize your data. Do you want to calculate the average for each group of trials, or summarize the results in some other way such as ratios, percentages, or error and significance for really advanced students? Or, is it better to display your data as individual data points?

Do any calculations that are necessary for you to analyze and understand the data from your experiment.

- Use calculations from known formulas that describe the relationships you are testing. ($F = MA$, $V = IR$ or $E = MC^2$)
- Pay careful attention because you may need to convert some of your units to do your calculation correctly. All of the units for a measurement should be of the same scale— (keep L with L and mL with mL, do not mix L with mL!)

Guidelines for Making a Data Table

In most cases, the independent variable (that which you purposefully change) is in the left column, the dependent variable (that which you measure) with the different trials is in the next columns, and the derived or calculated column (often average) is on the far right. Reaffirm that rows are a series of horizontal cells and that columns are a series of vertical cells. Data Tables should be do first on paper then transferred to an EXCEL file.

Title: Clearly state the purpose of the experiment (e.g., The effect of ____ (independent variable) on _____ (dependent variable).

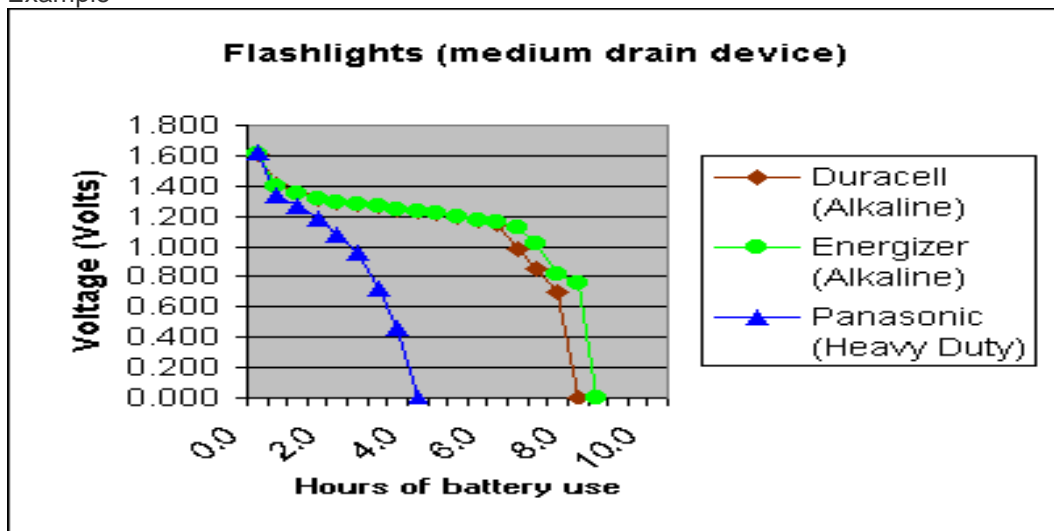
Independent Variable (unit)	Dependent Variable (unit)			Derived Quantity (unit)
	Trial 1	Trial 2	Trial 3	

Note: This data table format is adapted from *Students and Research* (Cothron, Giese, and Rezba, 2000).

Graphs

Graphs are often an excellent way to display your results. In fact, a good science fair project should have at least one graph. For any type of graph:

- Generally, you should place your independent variable on the x-axis of your graph and the dependent variable on the y-axis.
- Be sure to label the axes of your graph— don't forget to include the units of measurement (grams, centimeters, liters, etc.).
- If you have more than one set of data, show each series in a different color or symbol and include a legend with clear labels.
- Different types of graphs are appropriate for different experiments
- Example



Conclusion. (Must be listed in the Table of Contents)

Your conclusions will summarize whether or not your science fair project results support or contradict your original hypothesis. If the results of your science experiment did not support your hypothesis, don't change or manipulate your results to fit your original hypothesis, simply explain why things did not go as expected. Professional scientists commonly find that results do not support their hypothesis, and they use those unexpected results as the first step in constructing a new hypothesis. If you think you need additional experimentation, describe what you think should happen next. Scientific research is an ongoing process, and by discovering that your hypothesis is not true, you have already made huge advances in your learning that will lead you to ask more questions that lead to new experiments. Science fair judges do not care about whether you prove or disprove your hypothesis; they care how much you learned.

Your **conclusions** summarize how your results support or contradict your original hypothesis:

- Summarize your science fair project results in a few sentences and use this summary to support your conclusion. Include key facts from your background research to help explain your results as needed.
- State whether your results support or contradict your hypothesis. (Engineering & programming projects should state whether they met their design criteria.)
- If appropriate, state the relationship between the independent and dependent variable.
- Summarize and evaluate your experimental procedure, making comments about its success and effectiveness.
- Suggest changes in the experimental procedure (or design) and/or possibilities for further study.

Works Cited or References. (Must be listed in the Table of Contents)

A list of at least 8 published articles, books, and other communications, including works either quoted or paraphrased, that are actually cited in the Review of Literature. Use the format described in the Publication Manual of the American Psychological Association, 6th ed. (APA style). The reference list should be presented alphabetically by author's last name and should be placed at the end of the paper.

Formatting Style can be found below.

APA – for additional APA formats & examples go to: <http://owl.english.purdue.edu/owl/resource/560/01/>

Book	Author, A. A. (Year of publication). <i>Title of work not all capitals</i> . Location including state abbreviation: Publisher. Harris, A. B. (1994). <i>Broadway Theatre</i> . London, UK: Routledge .
Scholarly Journal Article (electronic) <i>Also showing: multiple authors.</i>	Author, A. A., Author, B. B., & Author, C. C. (Date of publication). <i>Title of article not all capitals: Subtitle not all capitals. Title of Journal, volume number, page range</i> . Retrieved from http://www.someaddress.com/full/url/ only include URL if article is hard to find Reddy, S. K., Swaminathan , V., & Motley, C. M. (1998). Exploring the determinants of Broadway show success." <i>Journal of Marketing Research</i> 35, 370-383.
Magazine/Newspaper Article (online) <i>Also showing: URL.</i>	Author, A. A. (Year, Month Day). <i>Title of article not all capitals. Title of Newspaper</i> . Retrieved from http://www.someaddress.com/full/url/ use URL of site/journal/blog not of the article Pogrebin , Robin. (2003, Mar 11). Theatre strike ends after all-night talks." <i>New York Times</i> . Retrieved from http://www.nytimes.com
Single Chapter/Essay from an Edited Book <i>Also showing: corporate name.</i>	Author, A. A. (Year of publication). <i>Title of chapter not all capitals</i> . In A. Editor & B. Editor (Eds.), <i>Title of book not all capitals: Subtitle not all capitals (pages of chapter)</i> . Location including state abbreviation: Publisher. Le Gallienne , E. (2009). On repertory and audiences. In American Theatre Magazine Staff (Eds.), <i>American Theatre reader: Essays and conversations from American Theatre Magazine</i> (29-31). New York, NY: Theatre Communications Group.
Page of a Website	Author, A. A. (Year, Month Day of publication). <i>Title of document not all capitals</i> . Retrieved from http://Web address Simonson, R. (2011, Apr 4). When did Broadway shows start offering Sunday performances? Retrieved from http://www.playbill.com/news/article/149291-ASK-PLAYBILLCOM-When-Did-Broadway-Shows-Start-Offering-Sunday-Performances