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**2013 Summer Assignment  
Pre-AP Biology  
Odem High School**



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**Directions for the Independent Research Project**  
**Pre-AP Biology**  
**Mrs. Esquivel**



In Pre AP Biology, you will be expected to use inquiry to design, implement, record, and explain research projects in class also known as labs. In Biology, there are categories that a lab/project can be completed over. You will need to pick a topic/situation from only one of those categories. The categories to consider are: Behavioral/Social Science, Biochemistry, Botany, Environmental Science, Medicine Health, Microbiology, and Zoology. A further description of each category can be found on the attachment titled, "Categories of Biology." The research project is due on or before August 9, 2013 and must be submitted to the Odem High School Office.

USE THE FOLLOWING PLAN TO HELP YOU MEET THE PRE AP BIOLOGY REQUIREMENTS FOR THE INDEPENDENT RESEARCH PROJECT.

1. **PICK YOUR TOPIC.** Choose a lab that falls inside one of the categories from the list above for your study. Think about how you can design/implement/investigate your lab. Do you feel like more than 3 trials need to occur (at least 3 trials need to be performed)? Do you have all proper materials available to do so? Do you have interest in the topic? Do you understand the context/content of topic?
2. **RESEARCH FOR BACKGROUND INFORMATION.** Every lab needs background information to introduce the topic of study, Your project will require background information on the organism (plant or animal) used and certainly would need elaborate information on what is being studied such as germination, cell respiration, enzyme activity, or photosynthesis. Go to the library and read everything possible that is included in the topic of study. At least **5 references** will be needed. You may use a combination of textbooks, journals, scientific magazines, interviews, and the internet all within the last 10 years-2000. The internet may not be used more than 2 times. **Encyclopedias, dictionaries, Wikipedia, eHOW, YouAsk, and websites like ChaCha are not permitted as cited references in this project.**  
Your family, friends, and teachers may have materials available on your topic and/or may be a source of information for an interview. Therefore, gather existing information on your topic. **Take notes** on the information you find. If you talk to professionals in the field, make notes about the interview with the questions that you asked. You may consider writing to a company and asking for particular information. **Keep your notes together on notecards, notebook paper, or xerox the article you are using and highlight the sections you can use in your research. Clearly label the entire reference on your notecards, Xerox copies...using the format listed below.**
3. **PREPARE A WORKS CITED PAGE.** Examples of works cited formats are listed below. ASK about the format when in doubt.

**(For a Book)**

Rost, Thomas L., Barbour, Michael G., Stocking, C. Ralph, and Murphy, Terence M. Plant Biology. Belmont, CA: Thomson, Brooks/Cole, 2006.

**(For a Magazine or Journal Article)**

Clark, Stephen H. and Roland B. Stoughten. "The Magic of Microarrays". Scientific American, Feb. 2000: 44-49.

**(For a Newspaper Article)**

Clark, Gary. "Close Encounter with a Costa Rican Toucan". San Antonio Express-News. 13 November, 2010.

**(For an Interview)**

Martin, Tad. Personal Interview. Aug. 3, 2002.

(For WWW Sites)

Strattler, James. "Shark FAQ." Sea World Online. 5 May 1998 [Online] Available <http://www.seaworld/sharkfaq>, 28 January 1998.

(Videotape)

The World of Sharks. Videotape. National Geographic Society, 1996.

4. **PLAN YOUR EXPERIMENTAL DESIGN.** Write out a detailed procedure for your experiment. **Do not rewrite/copy the procedure that was originally given to you.** This plan must explain how you would do your experiment and exactly what it will involve. It must include all of the parts of a **well-designed controlled experiment** and include enough details so that anyone reading your plan can easily conduct your experiment and collect numerical data that would lead to a valid conclusion.
5. **EXPERIMENT.** Carry out the procedure to your investigation and record your observations daily. **DO NOT** wait until the last week of summer vacation to start your project. Start as soon as possible to ensure efficient and effective scholarly work.
6. **WRITE YOUR FINAL PAPER.** This will be turned in for a test grade **and** for a lab grade. **The following sections must be included in your paper. The paper will also be turned in to Turnitin.com.**
  - a. **Title Page.** (include a picture representing topic, title of investigation such as *The Effect of Microwaves on the Germination of Radish Seeds*, your name, school, teacher name, date, and grade level at the bottom right hand corner of the page).
  - b. **Table of Contents** (basically list the order in which you see here in bold but **INCLUDE** page numbers in which the reader can find where each component begins. Do not separate each part of the scientific method. Just list the steps on the table of contents and project which page that section can be found.) For Example:
    - Background Research. . . . . pg 1
    - Problem . . . . . pg 2
    - Hypothesis. . . . . pg 2
  - c. **Background Research.** This section should include a detailed discussion of:
    - Historical background - Give information about others who have studied the same or similar topic; identify important people and their findings.
    - Factual summary - Identify major terms including their definitions and an explanation of science concepts needed to understand your experiment.
    - Method summary - Provide an explanation of the methods, equipment, and measurement techniques used in the experiment. Are any unique methods used to observe or measure the results? If any organisms are used, give the scientific name. Tell what it is and why it was selected for this study.
    - Summary of importance - Discuss the value of this study. What is important or significant to mankind about this topic. Why is this experiment worth doing?

As you write your report, include references to your sources -

“According to (book title or author)

“The . . (book title) indicates that

OR

Place the author’s name and date in ( ) behind the sentence or paragraph which uses/provides facts from his/her work.

All sources that are used to write the Background information are to be listed in the Bibliography. See the “How to Write a Bibliography” page in

this guide.

\*\*\* A minimum of five sources is expected for this project. \*\*\*

**DO NOT COPY AN AUTHOR'S WORDS AND THEN REPRESENT THEM AS YOUR OWN! THAT IS PLAGIARISM. IT IS A SERIOUS OFFENSE AND WILL RESULT IN A MAJOR REDUCTION OF CREDIT, POSSIBLY A ZERO ON THIS PROJECT, AND/OR REMOVAL FROM THE PRE-AP BIOLOGY COURSE!**

- d. **Problem** (This is a statement which identifies what the experiment is intended to do. Example: What is the experiment about? Example: What is the effect of microwaves on the germination of radish seeds? (include scientific name if available) Please sure to include in the problem: the specimen identified, purpose of study, manipulated variable range and duration of experiment.
- e. **Hypothesis** (A hypothesis is an educated guess that answers the question or predicts the results. It should be an "If, then, because..." statement. Example: **If** radish seeds are exposed to increased time in microwaves, **then** the percentage of seeds that will germinate will decrease **because**...)
- f. **Experimental Design.** Independent Variable- Identify the one factor or condition in the experiment which is to be manipulated or altered. Explain exactly how it is to be changed and how the amount of change is described or measured. Example: The exposure of the radish seeds to microwaves will be manipulated by placing 20 radish seeds in a microwave oven and operating the oven on its lowest power for 1 second. Additional sets of 20 seeds will be exposed for 3,6,10,and 15 seconds. Dependent Variable- The factor or condition which you expect will respond. Explain how it is to be measured or observed. Example: The germination of the radish seeds will be determined by placing the seeds between wet paper towels and then counting the number of seeds that have sprouted a root after three days.. Constant Variable- List those factors of the experiment which are to be kept the same (constant) throughout the experiment. Example: Those factors of the experiment which are to be kept the same (constant) throughout the experiment are the use of the same microwave oven, the same kind and seed lot of radish seeds, the same plates, paper towels and amount of water used to germinate the seeds, and keeping the germinating seeds at the same temperature with the same lighting.
- g. **Materials.** List all the materials needed.
- h. **Procedure.**
- List all the steps that will be performed including those for a control.
  - Clearly identify the control procedure from the manipulated variable procedure.
  - Separate the procedures of the control from that of the manipulated variable.
- i. **Data.** Show data for your manipulated variable and control experiment. The data must be numerical. Present the information in a chart and graph. Raw data, mean data, and rates of reactions should be included in charts. Your graph should show the mean data. (include A- E)

A. Data Table

The raw data has to be rearranged into a format which will show a relationship or trend. Then the raw data should be converted to averages, percents, or other appropriate values that may be compared. Data tables use the dependent variable as the title, each change of the independent variable is a column heading, and each row is a trial or sample. Be sure to include measurement units for both variables.

EXAMPLE:

The Number of Radish Seeds Germinated  
Three Days after Microwave Exposure

	Time Exposed to Microwaves (seconds)					
	0 sec.	1 sec.	3 sec.	6 sec.	10 sec.	15 sec.
Trial 1	20	15	14	5	3	1
Trial 2	19	16	13	3	2	2
Trial 3	18	18	10	2	2	1
Trial 4	20	14	11	6	0	0
Trial 5	16	17	8	1	1	1
Total	93	80	56	17	8	5
Average	18.6	16	11.2	3.4	1.6	1

### B. Observations

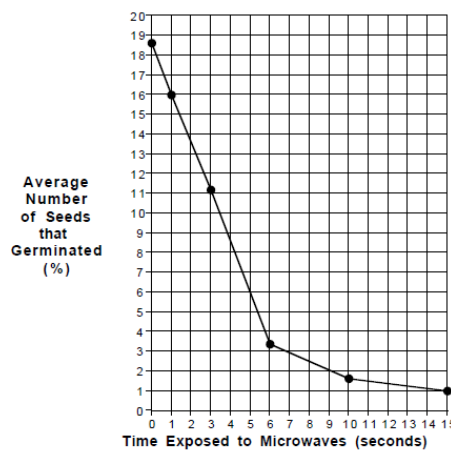
Record underneath the chart anything you see or notice during the experiment. Plan to write several sentences about how the experiment went and what you observed. Take note of anything that could be significant when you try to analyze your data. Were there any indications of possible error in the experiment? Use your log book to help you describe the changes you observed during your experiment.

### C. Graph

An experiment uses a graph with the averaged dependent variable on the y-axis and the independent variable on the x-axis. Use a line graph if the changes of the independent variable can be described with numbers or was measured over time. Line graphs use a "best fit" curve. Use a bar graph if the changes of the independent variable are described by words. The title of the graph should have the form "The Effect of the (IV) on the (DV) of (object or system)".

EXAMPLE:

The Effect of Microwave Exposure on the Germination of Radish Seeds



### D. Summary of Results

Write a general statement of what happened to the DV in this investigation. Describe what you see in the graph which has caused you to arrive at this statement.

EXAMPLE:

*When the time that the radish seeds were exposed to the microwaves was increased, the number of the radish seeds that germinated decreased.*

### E. Pictures

*(snapshots of the subject being investigated, of you conducting investigation, before/after, etc... Under each picture, a description of what the reader is looking at is required).*

- j. **Analysis.** Tell how the manipulated variable affected the outcome of your experiment. Give supporting evidence from data collected to back up what you are saying regarding how the variable affected your experiment. Use your research and background information to help explain why the manipulated variable has affected this study. Compare the manipulated variable results to the control results and explain the results of the control.
- k. **Conclusion.** Relate back to your hypothesis. *Definition: A final statement of what the results show or support. In this section of the report, relate your results to your hypothesis and your background information. Restate your hypothesis and tell whether or not the data supports or does not support your hypothesis. Use your data to explain why the hypothesis should be accepted or rejected. How do your results and your conclusion relate to facts in your background information? If your hypothesis is not supported, what could be the answer to your question? How are your findings significant or important? If your results show something totally unexpected or unusual, it is to be mentioned here. What difficulties or problems did you have while doing the experiment. What were some possible sources of error in the experiment? Do you*

*need to change the procedure and repeat your experiment? If you did this study again, what would you do differently next time? What difficulties or problems did you have while doing the experiment? What sources of error could have affected your results? (examples: mistakes with measurement tools, not using your equipment correctly, not keeping some variables constant, etc.). Why is studying this topic important? What new questions occurred to you while doing the experiment? How might these questions lead to future studies? Can you suggest new problem statements to be investigated?*

*What would you do different next time? What new questions occurred to you while doing the experiment? How might these questions lead to future studies? Finally, make suggestions for new problem statements for further study or experimentation.*

- l. **Works Cited**. Your reference list should include any material that is not your own. List only those books, journal articles, etc. **which you actually read and used to provide background information and analysis** for your research. Refer to the examples of works cited for proper format; use this format in alphabetical order when completing this section. 5 references are required (**remember not to use sources earlier than 2000 as well as encyclopedias, dictionaries, Pre AP textbook**; you may use a max. of 2 internet sites). **The first 5 references listed will be what is graded so make sure these meet the criteria.**
- m. **Appendix**. Include your notecards or notebook paper where notes were taken or use Xeroxed sheets highlighting the information used. Information in this section is what you actually used in the project and should appear in the background information, procedure, and/or analysis section. **Make sure that each of the 5 references listed in the works cited page has an appendix with the proper documentation identifying where it is coming from. Each book, journal...must have the proper reference written on notecards, notebook paper, or Xeroxed sheets.**

\*\*\*Remember: This independent research project is your own project. You may not work in a group or team. The procedure should be detailed enough so that someone should be able to repeat your experiment just by reading your plan. **Your paper should be written in third person. This means do not use the words I, me, or mine.** The font used should be **no smaller** than this font size and is to be double spaced. There is no page limit on your report. It must be submitted through Turnitin.com as well as a hardcopy to me.

### **Turning It In**

\*\*\* Your project must be placed inside a binder with each **printed** page placed inside a sheet protector. Your project must be typed, Times New Roman font, doubled-space, and 12 font size. \*\*\*

**Please place the following documents inside the portfolio in the following order:**

**DO NOT SEPARATE ANY PART OF THE FINAL PAPER.** *Just list the steps in the table of contents and project on which page that section can be found.*

Title Page

Table of Contents

Background Information

Problem

Hypothesis

Design

Materials

Procedure

Data (Do not forget to include photos of the investigation)

Analysis

Conclusion

Works Cited

Appendix Pages

## Categories of Biology

### **Behavioral/Social Science**

Any study such as is done by sociologist, anthropologists, psychologists, linguists, etc. that examines animal activities to discover recurrent patterns. For example: trigger of fear, learned behavior, actuality of prejudice, effect of color on choice, pecking order, group size. Because of protocol restrictions it is better to do observational studies in natural settings.

### **Biochemistry**

The chemistry of life processes such as respiration, photosynthesis, enzymes, diffusion etc. Study focuses on the chemicals and their reactions. For example reactants or products of processes, conditions which enable or regulate rate of reaction. All types of investigatino design is possible in this category: collection, observation, model, experiment, and invention.

### **Botany**

Studies of plants, their life cycle, structure, growth, processes, and classificaiton. Sciences of agriculture, agronomy, taxonomy, etc. For example: algae growth, leaf gas exchange, power of swelling seds, germination, development sequence, tropism responses. All types of investigation design are possible: collection, observation, model, experiment and invention.

### **Environmental Science**

Response of living organism to manaltered or to nature-altered

environment. For example: pollution effects, disaster effects, profile of organism density in a specific. environment. The experiment type of investigation is generally done in this category.

### **Medicine and Health**

Studies of diagnosing, improving, and preserving health. Includes disciplines such as medicine, dentistry, ophthalmology, nutrition, speech, hearing, etc. For example: monitoring health aspects of persons enrolled in diet or bodybuilding programs, checking for hearing or sight loss. Because of protocol the types of investigations which are most oftern done are collections, observations, or models.

### **Microbiology**

Studies of microorganisms such as algae, fungi, protozoans, virus and bacteria andtheir life processes. For example: bacteria in milk, water or soil, growth rates, identity of organisms. Five types of studies can be done in this category. Be careful of pathogenic agents which require protocol.

### **Zoology**

Study of animals, life cycle, anatomy, classification. Includes herpetology, entomology, husbandry, etc. For example: identify, classify, earthworm growth, butterfly life cycle, unique structure. All five types of studies can be done. Beware of protocol required for vertebrates.



