

2019-2020

Painted Rock Academy

4th Grade Science Fair Handbook

Student Guide

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_ School\_\_\_\_\_\_\_\_\_\_

Revised 12/2019

**Science Project Grading Rubrics**

**Student’s Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Final Project Grade\_\_\_\_\_\_\_\_\_\_\_\_**

**Check Point Grades**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date Due** | **Part Due** | **Total Points** | **Points Earned** | **Comments** |
| 1/30 | Problem/Question Approval  ***(Parent Acknowledgement Form)*** | 5 |  |  |
| 2/13 | Research and Essay  **(*Research Documentation Worksheet & Typed Essay)*** | 50 |  |  |
| 2/24 | Draft – Question, Hypothesis, Procedures, Variables and Materials  ***(Scientific Project Documentation Form*)** | 25 |  |  |
| 3/2 | Rough draft of final board  (***written rough drafts of proposed pieces for final project)*** | 10 |  |  |
| 3/9 | Final Draft Presentation Board (see below)\*\* | 55 |  |  |
| 3/9 | Board Format (ordered correctly) | 15 |  |  |
| *TOTAL AVAILABLE PROJECT POINTS* | | 160 |  |  |

***\*\*Final Presentation Board Points Break Down (55 Points)***

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Total Points** | **Points Earned** | **Comments** |
| Problem | 5 |  |  |
| Hypothesis | 5 |  |  |
| Materials/Procedures/Variables | 15 |  |  |
| Data (at least 2 graphs) | 10 |  |  |
| Conclusion | 5 |  |  |
| Application | 5 |  |  |
| Conventions (6 Traits of writing - grammar/ mechanics) | 5 |  |  |
| Neatness/Appearance | 5 |  |  |

***Table of Contents:***

***Rubric for Project …………………………………………………………………..Page 2***

***Project Explanation/Information………………………………………..Page 3***

***Idea List …………………………………………………………………..Page 9***

***Forms/Instructions…………………………………………………………………..Page 13***

***Example Project …………………………………………………………………..Page 24***

***STUDENT SCIENCE FAIR HANDBOOK***

**(Adapted from the International Science and Engineering Fair Student Handbook)**

***INTRODUCTION:***

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

**CONFUSED ABOUT GETTING STARTED?** Getting a topic requires some thought. The internet is an excellent source of ideas and information. Choose a topic that interest you and then decide how you can do an experiment that deals with this topic. Think how this project might improve the world and its inhabitants. The categories for the Science Fair are on the following page.

**WHAT’S NEXT?** Basically, there are several ways to proceed. Decide what type of project suits your needs.

1. A field (outdoors) investigation
2. A laboratory (indoors) study
3. A series of experiments or tests

\*\*NO SURVEYS

**Reminder: A science project IS NOT a book report, IS NOT a demonstration, and IS NOT simply building a model!** Students cannot do an experiment on a volcano or the solar system. Building a model or reporting on either is not a science fair project. The project must be something that requires repeated testing, observation and reporting/measuring.

**THEN…** you have to consider the ‘scientific problem’. Is the experiment something the student can test so that it will yield measurable results? The student should ask if he/she has the necessary time, money, equipment and technology necessary to see the project to its conclusion.

**LAST…**research, perform, document and present your science project! Don’t worry – this packet has all the steps broken down for you. Just do each step by the deadline and the rest will be a breeze ☺

**\*IMPORTANT NOTE! All Projects MUST Have….. Free Standing, Tri-Fold, Display Board!!**

***How it works:***

Students will choose, research and document all the steps of a Scientifically Modeled Experiment. Each step of the project has been broken down in this guide. Follow each step by the due date and the final project will be simple to assemble (as all the pieces build on themselves and contribute to the final product).

During the project the student will complete these steps – in this order:

1. Turn in an approval form (to be sure Parents are aware/involved and materials are obtained)
2. Research, write and turn in a proof of the research and final essay about research and scientist
3. Turn in a Documentation Form – to ensure all the necessary steps are present for successful experiment
4. Do Experiment – Document Results!!
5. Write *Conclusion* and *Application* section of project. Prepare *Graphs/Tables*
6. Write/type and turn in a rough draft of entire final project with appropriate headers (for preliminary approval/corrections)
7. Assemble and turn in the final completed presentation board
8. Team of teachers will judge boards for the “Science Fair”
9. Participate and show off their hard work in the “Science Fair” (see notices from teacher for exact times and dates)

***Science Project Breakdown -***

How to Complete Each Section on the Final Presentation Board

1. Purpose:

Explain the reason why you chose to do this experiment.

1. Problem:

What question does your research answer? It should be an open-ended measurable question that is answered with an explanation, not a yes or no response. (Ex: “How does the color of light affect the growth of a plant?” – not…”Will it affect growth?”)

1. Research Information:

This is a short summary of all of the information you have learned throughout your research and sets up the reader to understand why the experiment is being done.

1. Hypothesis:

Your ‘educated guess’ is the predicted answer to your problem. The experiment is designed to test the hypothesis. The hypothesis does not change even if the results are different. (Ex: “I believe that if all plants are given regular white light, then they will grow. I base this hypothesis on the information I learned in my background research that showed me how plants convert light energy into food.”) \* It should be an “If… Then” statement based upon research.

1. Experiment :

The variables, materials, and procedures used.

* + Variables: Describe the items that affect your experiment. Remember, only test 1 variable at a time and list all three types of variables in your documentation.
  + Materials: List any supplies necessary to complete your experiment. Must be written like a grocery list
  + Procedures: Describe the step-by-step process you used to carry out your experiment. It should be detailed so that someone would be able to repeat the experiment. Number your steps in list form.

1. Results**:**

Your results should show the outcome of your experiment through tables, graphs, or diagrams, etc. explaining your data. (Remember what we have practiced in class)

1. Conclusion:

Specifically summarizes what the student discovered and, it needs to answer the question from step 2. The conclusion also needs to address whether or not the hypothesis from step 4 was correct or not. Describe how the results compare to the hypothesis and why the hypothesis was correct, or incorrect. Also include how the data gathered related to any information the student has learned in the research phase of the project.

1. Application:

A summary about how the project relates to real-world (not fictional movie or book ) problems or situations. This is a way to reflect on how the knowledge learned could change a real life situation in the world. Brainstorm! Think Globally!

**Science Fair Project Display Presentation**

**All projects will need to follow the guideline below when assembling the display board.** These display boards can be purchased in local stores, school and office supply stores. All projects must have a free standing display board.

**TITLE/Name**

**Problem Data**

**Graph, charts, tables**

**Purpose Materials Procedure**

**Hypothesis Results/Conclusion**

**Variables**

**Research Info**

**Application**

After all the research, experimentation, time and effort spent on the preparation of the science fair project should show off your hard work. First impressions can make a difference. Be creative. Boards are judged on: Creativity, Scientific Thought, Thoroughness, and Neatness.

**Display Board Checklist**

**(use this as a check list to be sure you don’t miss any sections – be sure they are in the order and lay out as shown in the picture above)**

**\_\_\_Problem**

**\_\_\_Purpose**

**\_\_\_Hypothesis**

**\_\_\_Title**

**\_\_\_Materials**

**\_\_\_Procedure**

**\_\_\_Variables**

**\_\_\_Data**

**\_\_\_Conclusion**

**\_\_\_Application**

***SCIENCE FAIR JUDGES RUBRIC***

This rubric is what is used by the panel of judges to evaluate the completed Science Fair Display Boards for the class room and grade level winners. This is separate from the grading rubric that is shown on page 2 and does not affect individual student scores.

**A: Project Uniqueness/Creativity**

1-Project has been done numerous times or is widely used on television and the internet The project has no consistency in font or theme; does not utilize pictures, graphs or other visual aids. Project is disjointed.

2- Project is typical of the average fourth grade student. Project displays some consistency in font or theme; uses some pictures, graphs or other visual aids, but data is not clearly presented. A centralized theme is apparent, but not focused.

3- Project is somewhat unique and is not usually attempted by other students. Project has consistent font and theme throughout; utilizes pictures, graphs and other visual aids. Project displays a centralized focus.

4- Project is very unique and has not been done by another student. Project has consistent font and theme throughout; goes beyond traditional visual aids to include other media examples to present experiment (PowerPoint, models, manipulatives, hand-outs, etc) that enhance the overall theme of the project.

**B: Scientific Thought & Process**

1- Project displays little or no representation of the Scientific Method.

2- Project displays some, but not all steps of the Scientific Method.

3- Project displays all steps of the Scientific Method, but not all are accurately represented.

4- Project displays all steps of the Scientific Method correctly and accurately. All information is easily represented and understood.

**C: Thoroughness/Presentation**

1- Project is unorganized. It displays consistent errors in grammar and spelling, which

detract from the overall presentation of the project.

2- Project shows minimal organization and displays inconsistencies in grammar and

spelling. Project

3- Project displays few spelling and grammatical errors, which do not take away from

the overall presentation of the project.

4- Project displays no spelling and grammatical errors. The project is displayed in a

manner that is clear and concise, which enhances the overall presentation of the project.

***GET STARTED***

***IDEAS!!***

Project Ideas

**Read through for ideas and inspiration – you can use one of these or use them for inspiration to make your own!**

**(*These questions are not to be copied word for word – your project question needs to be written in correct format)***

**Life Science**

**Behavioral and Social Science**

What cat food do cats prefer (for)?

Does the color of a birdhouse affect feeding habits of birds?

Will holding a mirror in front of a fish change its behavior?

What color of birdseed to birds like best?

Do insects behave differently depending on the temperature?

What food do mealworms prefer?

What travels faster a snail or a worm?

Does temperature affect the metamorphosis of a butterfly?

Do ants like cheese or sugar better?

Does smell affect the taste of food?

On which surface can a snail move faster (dirt, sand, soil, grass, cement etc.)?

What scents are preferred by girls/boys?

Can cologne/perfume affect your mood (or pulse rate)?

Do your senses influence your taste buds?

Does music affect your heart rate?

How does playing video games affect hand-eye coordination?

**Botany**

What is the effect of crowding on plants?

In what kind of material (sand, clay etc.) do seeds grow the best?

Will vitamins affect the growth of a plant?

What fertilizer is the best for plant growth?

Will frozen seeds sprout?

Can plants grow without soil?

Do bigger seeds produce bigger plants?

What substances prolong the life of cut flowers?

Can distilled water be used to water plants?

Is rain water better for plants than water from the faucet?

What are the effects of varying amounts of water on seed germination?

What is the effect of common window cleaners on plants?

What sunlight is better for plants; through a window, directly outside, through a shade?

What is the affect of different colored lights on the growth rate of a plant?

What is the effect of blue food coloring on white carnations?

Does temperature affect the growth of plants?

Which mulch retains moisture the longest?

**Health/Medicine**

What removes plaque better from teeth: dry brush or moist toothbrush?

Which teeth whitening products work better?

Do taller people have greater lung capacity than shorter people?

What is the relationship between muscle strength and body fat?

Are boys more physically fit than girls?

Does washing hands really get rid of germs?

Sanitation wipes vs. Anti-bacterial gels: Which one works better?

What is worse for your teeth: juice or soda?

**Physics**

How do sunglasses protect your eyes?

Is there a difference in sunglasses?

What is the difference in light bulbs?

Does everything make a shadow?

What colors fade the most?

What can prevent fading?

What is the difference between regular light bulbs and fluorescent bulbs?

Do materials all melt at the same rate?

How does temperature affect make-up?

How does the type of chocolate affect the melting rate?

Does the color of an object affect how warm it gets?

What is the effect of color on the rate of evaporation of a liquid?

Which battery lasts the longest?

What objects conduct electricity the best?

What foods conduct electricity?

How is the strength of a magnet affected by glass, cardboard and plastic?

Which skateboards go faster?

What does reduce friction?

Why are there different shoes for different sports?

How does the weight of a pendulum affect the swing?

How does changing the position of a fulcrum affect level of movement?

**Engineering**

Does the shape of a boat affect its speed?

What shape is the strongest?

What is the strongest design for a bridge?

What packing materials protect fragile products the best?

What conditions affect the strength of adhesives?

Why are the shapes of cars different?

Will the shape of an airplane affect its speed or distance?

What is stronger against hurricane force winds: tile, gravel roof or shingles?

What kind of shutters protects glass windows the best during hurricanes?

What structures will prevent flooding?

**Chemistry**

Which brand of paper towel absorbs the most water?

Does alcohol or water evaporate faster?

Which kinds of kitchen wraps are best for keeping odors contained?

What is the fastest way to cool down hot chocolate?

In which liquid will ice cubes float?

What conditions cause metal to rust quicker?

What materials prevent rust?

What materials remove rust?

What brand of eraser is most effective in removing pencil marks?

What kind of juice cleans pennies?

Which dish soap makes the most bubbles?

What brand of soap last longer in water?

How long will it take a drop of food dye to color a glass of still water – will temperature affect this?

Are all liquids the same weight?

Which detergent removes carpet (clothes) stains the best?

Do all objects sink in all liquids?

What materials dissolve in water?

Which materials absorb the most water?

Which brand of tape holds the most weight?

What holds things together better; tape, liquid glue or glue stick?

What type of tape works best?

Which bar of soap lasts longer?

Is print quality affected by the kind of paper used?

Does fabric softener affect drying time?

Do Earth friendly cleaning products work better

than chemical cleaning products?

**Biochemistry**

Why do foods turn colors when you cook them?

What makes a gummy bear sticky?

What ships faster, egg whites or whipping cream?

Which ice cream melts faster (yogurt)?

Which bacon has the most fat?

Which ketchup is the thickest?

Does chewed gum lose mass?

Do fruit and vegetable juices contain the same amount of vitamin C?

Do hydrating shampoos really strengthen hair more than regular shampoos?

What is the effectiveness of different kinds of sunscreen?

***NECESSARY FORMS AND INSTRUCTIONS FOR EACH PART OF PROJECT***

***This page intentionally left blank.***

***PARENT ACKNOWLEDGMENT FORM / Scientific Question*** (due 1/30/19)

**Student’s Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Homeroom Teacher:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Dear Parents/Guardians,**

**Please sign this document as acknowledgement that:**

1. **Student has brought home the Science Fair Packet.**
2. **You are aware of the time line (included in the packet) that lists the items’ due dates.**
3. **This is an individual project that is to be done at home by the student, with parent assistance.**
4. **You are aware of the grading rubric and project rules.**

**Parent Signature**

**Date**

**Teacher Approval:**

Students please record your problem/question below. Remember this is the question your experiment is trying to answer. Make sure it is testable and cannot be answered with a “yes” or “no”!

Problem/Question:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the variable you are going to measure/count?

What variable will you change, modify, or alter to make that happen?

***This page intentionally left blank.***

***Research Documentation Worksheet*** (2/13/2020)

You will be researching your experiment before you perform it to ensure you fully understand all the elements and factors involved in planning the experiment. You will need to know what the “science” is behind the thing you are testing. From that you will be able to make a list of your own variables, materials, and steps needed to conduct the experiment yourself.

In addition, you will be including information about a famous scientist in the same field of study that your experiment is involved with. You will use the questions on the Project Essay Page (see next page) to guide your research and writing. You will need to document all of your sources and notes for a bibliography below.

Please remember, you will use your research as information and inspiration, but your reports and board MUST be in YOUR OWN WORDS. Do not copy or plagiarize!

All information is necessary for each source (if it applies to that source type). Please use a minimum of 2 different sources (books, websites, academic journals, encyclopedias). At least one should be a book (ie. Not both internet)

**Source 1: Must be about the experiment (This summary will end up being the “research” section on your final project)**

Author(s) Last name, First name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Title of magazine or book \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Publisher \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Title of Article \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Pages \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Internet website address\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Summary of the experiment: What are the elements?, Why does it work? What are the theories behind it? What have others discovered? What are some issues/problems with doing it? Each summary should be a minimum of 5 sentences and should be written in your own words.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Source 2: Must be about the scientist in your field. (This is a short summary of what you learned about your scientist from this source-this will just be a verification check that you are doing your research and ready for your essay).**

Author(s) Last name, First name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Title of magazine or book \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Publisher \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Title of Article \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Pages \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Internet website address\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Summary about scientist: Who are they? Where did they live/work? What were they famous for? How does this person’s work influence field/the world?.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Project Essay - Due 2/13/2020***

The essay is a 5-paragraph biography of a famous scientist that is related to your field of your experiment. All paragraphs will need to include a topic sentence, supporting details and a transition sentence that introduces the upcoming paragraph (or in paragraph 5, concludes the paper). All paragraphs must answer the guiding questions and be a minimum of 6 sentences each. Sentences should be well-crafted. All paragraphs will be graded based on the six writing traits (see below for rubric). This report should be turned in along with the project research documentation worksheet on 2/24/16. The report should be typed, double spaced, in Times New Roman Font Size 12. The title can vary.

**Title**

**Paragraph 1:**

Briefly describe your experiment and why you have chosen to study this particular subject/topic. Explain what scientific category (botany, social behavior, chemistry, etc.) your project falls into.

**Paragraph 2:**

Who was/were the scientific pioneer(s) of your topic of study? What information can you tell us about their background? Where did they live? Where did they go to school? Who were they influenced by? When did they become interested in the topic?

**Paragraph 3:**

What are the theories and scientific ideas that this scientist, and other influential scientists of their time, have proposed? How does this relate to your experiment? What have you learned that will help you with your experiment?

**Paragraph 4:**

Where, when and from what cause did this scientist pass away? If they are still living, what are their current projects?

**Paragraph 5:**

What advances have been made in your field of study since? What future directions do you see the research going?

**Rubric:**

|  |  |
| --- | --- |
| **Paragraph 1:** | Described Experiment \_\_\_\_/2 Rationale for Study\_\_\_\_/2 Scientific Category\_\_\_\_/2 |
| **Paragraph 2:** | Background of Scientist \_\_\_\_/3 Major Influences \_\_\_\_/3 |
| **Paragraph 3:** | Theories/Ideas \_\_\_\_/3 Relate to Experiment \_\_\_\_/3 |
| **Paragraph 4:** | Passed Away/Current Projects \_\_\_\_/6 |
| **Paragraph 5:** | Advances \_\_\_\_/3 Future Directions \_\_\_\_/3 |
| Conventions (6-Traits): | **Ideas**: Thoroughly explained each question using your own words. \_\_\_\_/3 **Organization**: All paragraphs have a topic sentence, supporting details and transition sentence (concluding sentence at end). \_\_\_\_/3 **Sentence** **Fluency**: Ex: Have a sentence that begins with a dependent clause. Have a sentence that begins with a prepositional phrase. Have a variety of long and short sentences. \_\_\_\_/3 **Conventions**: Correct capitalization, usage, punctuation and spelling (CUPS). \_\_\_\_/3 **Word** **Choice**: Use words that are clear, vibrant, exciting and on- topic. \_\_\_\_/3 **Voice**: My paper sounds like me! \_\_\_\_/3 |
|  | **Typed** \_\_\_\_\_\_\_\_/2 |
|  | Total \_\_\_\_\_\_\_\_/50 |

***This page intentionally left blank.***

***Documentation Form*** (due 2/24/19)

**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Grade \_\_\_\_\_\_\_\_\_\_\_\_\_**

**Topic\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Please fill in the needed information for each step of the scientific process below. Each of these will be the 1st draft of each of the elements you will need to complete your final presentation board.**

1. **Problem (the question you will be investigating): *What is the BIG idea stated as a question? (Bad: If I put sugar, parsley and turkey lunchmeat outside, which substance will the ants like? Good: To which substance are ants most attracted?) 5 pts.*** *(Hint: this should be done already – see Parent Acknowledgement Form)*

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **Hypothesis (Your educated guess/based on research) *This is a statement, not a question. It needs to be in “if, then” format. (Bad: Will the ants eat the sugar? Good: If I place sugar, parsley and turkey lunchmeat in a box with 15 ants, then most of the ants will eat the sugar.) 5 pts.***

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **Variable(s): INDEPENDENT *is the variable you will be changing on purpose. (Ex: Substance in the box.)* DEPENDENT *is the one that you expect to see change/measure based on your independent variable.( Ex: What the ants eat.)* CONTROL *are the other variables that stay the same always.( Ex: Place the ants in their normal environment with their usual food sources available.) 3 pts.***

**Independent: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Dependent: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Controls: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **Materials: List what materials you will be using: *Be specific! 5 pts.***

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **Experimental Procedures (Explain what you intend to do) *These need to be very SPECIFIC and written in numbered steps. (Bad: Put some sugar in a box. Good: Place 50 mg of sugar in a circle in the right corner of the box.) 5 pts.***

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**How long will your experiment take to complete? 2 pts.   
*The rough draft is due 3 weeks from the date this form is due. If your experiment will take longer than that, you will need to turn this form in early. Your final draft is due 6 weeks from today. It is imperative that you receive feedback on this form and your rough draft to ensure that you submit a quality science fair project on the due date.***

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\*\*Teacher Approval: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Comments:**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**\_**\_\_\_\_\***Don’t forget….you will still need to write a conclusion and application section before you are done!**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

***Example Project***

**Science Fair Project**

**Purpose**

The purpose of this experiment was to determine what types of substances attract ants most. I was interested in this because I used to have a praying mantis and I found it fun to observe and learn about bugs. This experiment will help people who want to raise ants know what types of food to feed them. This experiment will also help people who don’t like ants because it might teach them what substances repel ants and what substances to keep off their floor to avoid attracting ants.

**Problem**

Which substances attract ants most?

**Research Information**

Through my research I learned that ants like sugar but they can’t only eat sugar because it does not have enough protein. Worker ants carry melted sweets in their abdomens back to the nest to feed the queen and other worker ants. Nuts and seeds are a few of the healthy foods that ants should eat. I also learned that ants will eat anything that they think they can. Ants should not eat French fries because they have too much grease. I learned that aspartame is very harmful to ants. In one study, ants covered aspartame to warn other ants not to eat it. Finally, I learned that healthy ants eat seeds, insect eggs and carcasses.

**Hypothesis**

My hypothesis is - If ants are contained with grains, dairy and sugar, then they will be attracted to the sugar. I base this hypothesis on my research which suggests that ants like sweet foods the best even if it is not the best food for them.

**Methods**

Variables

*Independent Variable* – Type of food

*Dependent Variable* – Where ants go

*Control Variable* – Location and environment, group of ants, access to food

Materials

30 harvester ants which I bought from a mail order store called Life Studies, LLC.

Cardboard box

Timer

Spoon

Oats

Sugar

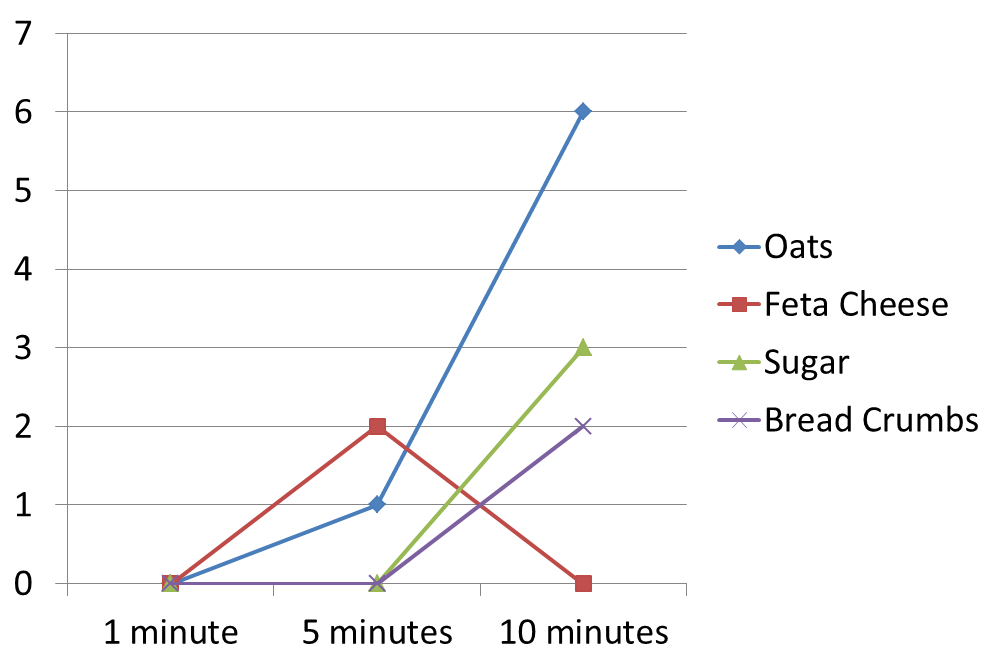
Bread Crumbs

Feta Cheese

Procedures

1. I ordered the ants.
2. I got a cardboard box and taped it up so the ants wouldn’t be able to escape.
3. Inside the box I drew circles with a marker in each corner of the box and marked the type of substance that would be placed there.
4. I placed on teaspoon full of each substance in the proper circle.
5. I looked at the time and poured 30 harvester ants in the middle of the cardboard box.
6. After one minute I counted how many ants were at each substance.
7. After 5 minutes I counted how many ants were at each substance.
8. After 10 minutes I counted how many ants were at each substance.
9. Finally, after 15 minutes I put the substances in a natural setting on the ground and let the ants go.
10. I went back 1 hour later and observed how much of each substance was still present.

**Results**

****

# of ants

|  |  |  |  |
| --- | --- | --- | --- |
| Results | | | |
|  | 1 min | 5 min | 10 min |
| oats | 0 | 1 | 6 |
| sugar | 0 | 0 | 3 |
| bread crumbs | 0 | 0 | 2 |
| feta cheese | 0 | 2 | 0 |

Time

After one minute there were no ants on any substance. They appeared to be running around wild and getting used to the habitat. After five minutes, there where 2 ants on the feta and one ant on the oats. There were no ants on either the sugar or bread crumbs at five minutes. At ten minutes, there were 6 ants on the oats, 3 ants on the sugar and 2 ants on the bread crumbs. There no ants on the feta cheese feta cheese at 10 minutes.

**Conclusion**

I discovered that ants prefer oats much more than sugar, feta cheese or bread crumbs. I hypothesized that ants would prefer sugar but I was wrong. Ants preferred the healthiest food that was provided. Oats have the most protein than any other substance used in the experiment. My research showed that ants would want sugar but the experiment showed only 3 of the 30 ants wanted sugar more than the other substances.

**Application**

Some people have ants in their homes and they need to learn what attracts ants and what keeps ants away. If a person does not want ants, they should sweep and vacuum their carpets and floors.

**Pictures**





