



Benjamin Rush Science Fair

Instruction Packet

For 4th Grade Students

Goal: To have fun creating a controlled experiment demonstrating your understanding of the Investigative Format.

Working individually or in teams of two, you will design, document, and conduct a controlled experiment using the *Investigative Format*. On the successful completion and documentation of your experiment, you will create a display board for the Science Fair. Your display may also include models of your experiment, the equipment, or pictures and video.



Recommended Approach and Key Dates

1. **IDEA DEADLINE:** You and your partner, if you have one, will have selected, built, and PLAYED with your demonstration/apparatus of science. For example, you decide to and then build a potato battery. You must complete the attached Science Fair Proposal and return it to your teacher for **extra credit**. Date: right after the 1st work party.
2. Your work will be done at home but we can confer on your project at school.
3. **Kick-off work party:** Thursday, March 12th from 3:15 – 4:15 in the 4th grade pod. (pizza and snacks)
4. **All 4/5th science work party:** Thursday, March 26 from 3:15 – 4:15 in the 4th and 5th grade pods. (pizza and snacks). Purpose of this work party is to COMPLETE and put together your display board.
5. **COMPLETE EXPERIMENT by Wednesday, March 25: (recommended):** Present results of the experiment in the *Investigative Format*. Then put this document on a display board for the Science Fair.
6. **Thursday, April 2, 7:00-8:30 PM is the Science Fair:** Have fun and share your experiment with people. I will come around to view and ask questions about your project.

Project Requirements

1. Projects must follow the *Investigative Format*.
2. Experiments and demonstrations must answer a scientific question and prediction.
3. You may work independently or in teams of two.
4. Your project may not use fire or dangerous chemicals.
5. Your display board must contain the following sections:

	Title & Name		
Question	Materials List	Data Table	Conclusion
Prediction	Procedures	Graphs	Science Explanation

- Your teachers will provide example display boards and provide formatting ideas so your information can be clearly read by Science Fair attendees.
- The PTA is generously providing display boards for students.

Science Fair Resources¹

http://www.kcls.org/homework_help/scienceexperiments.cfm

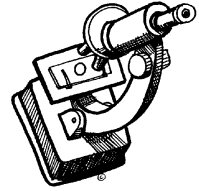
<http://www.stevespanglerscience.com/experiments>

<http://www.factmonster.com/spot/sciproject2.html>

<http://science-project.com/>

<http://school.discoveryeducation.com/sciencefaircentral/?pID=fair>

Investigative Format Documents



Check your science journal or look below:

INVESTIGATIVE FORMAT FOR A CONTROLLED EXPERIMENT

1. QUESTION – a testable question based on experience.

2. PREDICTION – a testable IF/THEN prediction that includes the changed and measured variables.

IF _____, THEN _____

3. MATERIALS LIST – a list of supplies needed to complete the experiment. Don't forget to include how many of each item you need and measuring tools.

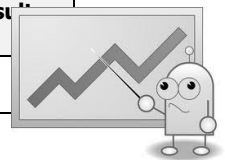
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4. PROCEDURE – the steps describing how to do the experiment. The steps must include the three types of variables: a **changed** variable, a **measured** variable, and the most important **controlled** variables. The steps must be clear, tell how to measure data, and repeat the test 3 times.

- 1.
- 2.
- 3.

5. DATA – a data table and graph showing the **measured** variable.

Changed (manipulated) Variable	Measured (responding) Variable (units used to measure the variable)			
	Trial 1	Trial 2	Trial 3	Average Result
1 st value				
2 nd value				
3 rd value				



6. CONCLUSION – a four-sentence conclusion.

1. State whether the experiment 'supports' or 'falsifies' the prediction.

3. State the highest average of the measured variable.

The experiment **supports** that darker colored containers, retain more heat. The light colored containers **averaged** 34° C. The dark colored containers **averaged** 38° C. Dark colored containers were 4° C **hotter** than light colored containers.

4. Describe the relationship between the highest and lowest changed variables.

2. State the lowest average of the measured variable.

Examples of Good Questions

1. Which type of glue makes the strongest Popsicle Bridge?
2. Does a disco ball pendulum swing faster than a bowling ball pendulum?
3. Do certain types of fabric repel more water better?
4. Will the size of the tire affect the distance a car travels?
5. Will increasing the amount of sugar affect the growth of a plant?
6. Will increasing the sand in soil affect the growth of a garlic plant?
7. Does the liquid a boat is floating in affect how many passengers it will carry?
8. Does the type of paper affect a paper towel's absorbency?
9. Does the type of liquid affect the speed at which paper towel absorbs?
10. Does the amount of water affect how well a plant will grow?
11. Do the ingredients of an ice cube affect how fast it melts?
12. Does the size of a container affect how fast the temperature of the water rises?
13. Does the type of parachute material affect how long a parachute takes to fall?
14. Does the size of a lemon affect the voltage of a lemon battery?
15. Does adding more lemons in sequence create a longer lasting battery?

SCIENCE FAIR PROPOSAL

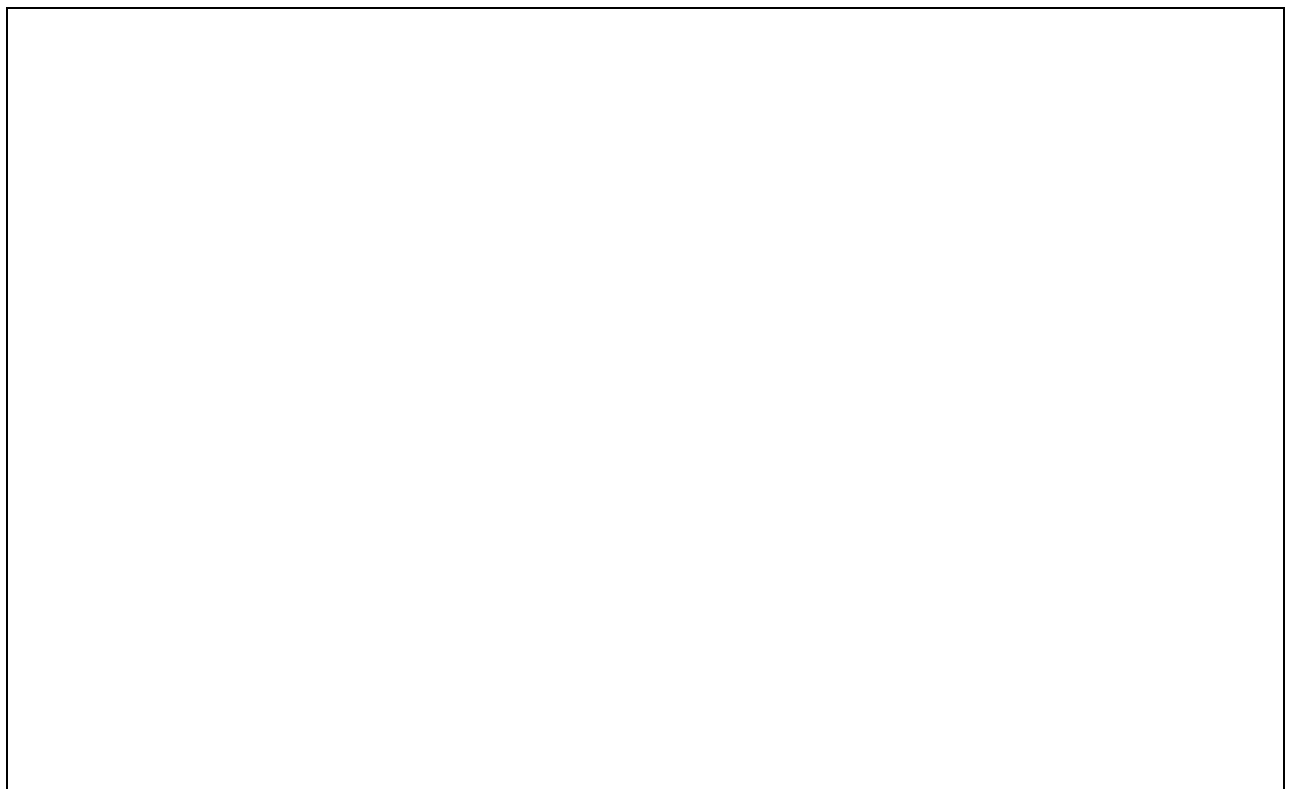
Instructions: each team must complete a proposal. It is due on _____ .

Team Members: _____ AND _____

Experiment/Display Name: _____

Describe your idea for the science fair and the science concept it demonstrates:

Draw a picture of your display/apparatus and/or attach a picture.



SCIENCE FAIR PROPOSAL

List all the variables involved in your demonstration/apparatus:

What materials did you need to build your demonstration/apparatus?

CONSUMABLE SUPPLIES	REUSABLE EQUIPMENT	MEASUREMENT TOOLS
• ex. 2 paper cups	• ex. glass jar	• ex. thermometer
•	•	•
•	•	•
•	•	•
•	•	•
•	•	•

What are three questions you could use your demonstration/apparatus to answer?

1.

2.

3.

If you have already decided on which question you will use for your Science Fair Display, please circle it above and then write your prediction below:

IF

THEN

SCIENCE FAIR PROPOSAL

Examples of Science Fair boards –

Hypothesis
What do you think will happen? Make a prediction regarding the outcome of your experiment.

Materials
What did you need for your experiment? List all materials and equipment that were used.

Title
The title should be eye catching and grab your interest.

Question
Ask a Question: The scientific method starts when you ask a question about something that you observe: How, What, When, Who, Which, Why, or Where


Procedure
What did you do? How did your experiment look?
Give a detailed explanation of how the experiment will be performed to test your hypothesis. Your procedure should be like a recipe -- Another person should be able to perform your experiment following your procedure. Test this with a friend or parent to be sure you have not forgotten anything.

Results/Data
Display the results of your experiment in a table or graph format.

Conclusion
Did your experiment agree or disagree with your Hypothesis? If you repeated this project, what would you change?

Photographs of you conducting your experiment may be displayed above.

Keep a detailed journal of observations, data and/or results. They can be data measurements and written notes about what you are sensing (hearing, seeing, or touching) about your experiment.



UV DEFENSE

WHAT'S YOUR BEST PROTECTION?

QUESTION
What items that people put on to go out in the sun will block UV rays the best?

HYPOTHESIS
I believe the dark colored cloth will block the most UV rays and the hat will block the second most UV rays.

MATERIALS
1. Light-colored clothing
2. Dark-colored clothing
3. Hat
4. Sunscreen
5. UV sensor
6. UV meter
7. UV light source
8. Stopwatch
9. Paper
10. Pencil

PROCEDURE
Step 1: All of the materials and make UV sensor ready for testing.
Step 2: Place the original cover of the UV sensor on the sensor.
Step 3: Place the UV sensor in sunlight.
Step 4: Record the UV sensor's reading.
Step 5: Take the original cover off the sensor and place the UV sensor under the hat.
Step 6: Record the UV sensor's reading.
Step 7: Record the UV sensor's reading with the dark-colored clothing.
Step 8: Record the UV sensor's reading with the light-colored clothing.
Step 9: Record the UV sensor's reading with the sunscreen.
Step 10: Record the UV sensor's reading with the hat and sunscreen.

RESULTS
Sunscreen - 100%
Hat - 95%
Dark-colored clothing - 85%
Light-colored clothing - 75%

DATA
Sunscreen - 100%
Hat - 95%
Dark-colored clothing - 85%
Light-colored clothing - 75%

CONCLUSION
My hypothesis was partly correct. The hat blocked the most UV rays overall.
If I go out into the sun, I would wear a hat and dark clothes because they blocked the most UV light. I would also use SPF 50 sunscreen because my face and hands cannot be covered by a hat or dark clothes and the SPF 50 sunscreen blocked more UV light than the SPF 8 sunscreen or using nothing at all.

WHAT ARE UV RAYS
UV rays are ultra-violet rays that can damage the human body and rays are within the sun. That is enough to melt steel without the help of fire.

LEAST EFFECTIVE
MOST EFFECTIVE

THOMAS BULL
DORRIS / SHERWOOD

SCIENCE FAIR PROPOSAL

More Examples of Science Fair Boards

WHICH STARCH WILL GENERATE THE MOST ELECTRICITY

BY DANIEL CHRISTENSEN

QUESTION

Which starch will generate the most electricity?

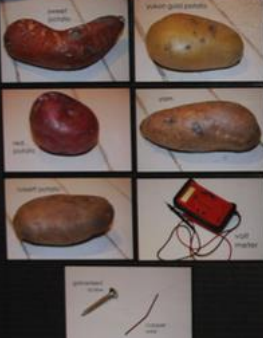
HYPOTHESIS

I believe the Yam will generate the most electricity because of it's size.

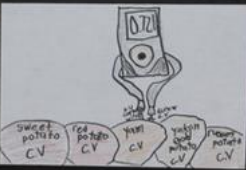
PROCEDURE

1. Gather all materials
2. Place first starch on flat surface
3. Place galvanized screw in starch
4. Place copper in starch one inch from screw
5. Using voltage meter, attach black cable (negative) to the galvanized screw.
6. Attach red cable (positive) to the copper wire
7. Read and record voltage from the meter.
8. Repeat with additional starches.

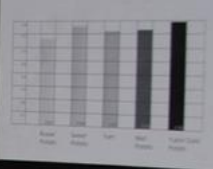
MATERIALS



DIAGRAM



DATA GRAPH



RESULTS

Yukon Gold Potato had the highest voltage and the most electricity

CONCLUSION

I concluded from this experiment that the Yukon Gold Potato conducted the most voltage.

DISCUSSION

I would be interested in trying this experiment with Yukon Gold Potatoes that range in size, to see if they would each have a different voltage.

CONTROLLED

1. Yukon Gold Potato
2. Sweet Potato
3. Yam
4. Red Potato
5. Russet Potato
6. Piece of Copper Wire
7. Galvanized Screw
8. Voltage Meter

VARIABLES

RESPONDING
1. Amount of voltage in each starch

MANIPULATED
None