

# STEM Fair



So you're doing a STEM Fair Project. This guide will help you as you follow along the series of steps to completion.

Remember

**Rule #1-** Yes. STEM Fair should be fun. You should be interested in your Problem. If you have watched Mythbusters, you have seen a group of adults perform an experiment.

**Rule #2-** Think of as many problems that you can actually test. If you can't perform the experiment you can't do the experiment. We knew the earth was flat before Columbus; He used the technology that became available to prove it.

**Rule #3-** STEM Fair can be broken into 3 major groups.

1. Experimentation- Performing a controlled experiment (1 variable changed)
2. Research from collected data- Data can be found all over (Internet/Books) and then be analyzed.
3. Survey- This is the hardest because anything involving people enters a realm of STEM paper work most students do not want to see.

**Rule #4-** The categories listed below can also guide you or help place your problems into the correct branch of Science.

**Rule #5-** Remember to bounce all ideas or problems off Mr. Watts and Mrs. Carroll.

## Glossary:

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# Science Fair Categories

## **Behavioral/Social Sciences**

*Behavioral sciences* encompass all the disciplines that explore the activities of and interactions among organisms in the natural world.

*Social science* refers to the academic disciplines concerned with the society and the relationships of individuals within a society.

## **Biochemistry**

*Biochemistry*, sometimes called biological chemistry, is the study of chemical processes within, and relating to, living organisms.

## **Botany**

*Botany* is the branch of biology dealing with the scientific study of plant life.

## **Chemistry**

*Chemistry*, a branch of physical science, is the study of the composition, properties and behavior of matter.

## **Computers**

A *computer* is a general purpose device that can be programmed to carry out a finite set of arithmetic or logical operations.

## **Earth and Planetary Science**

*Earth science* is an all-embracing term for the sciences related to the planet Earth.

## **Engineering**

*Engineering* is the application of scientific, economic, social, and practical knowledge in order to design, build, and maintain structures, machines, devices, systems, materials and processes.

## **Environmental Science**

The branch of science concerned with the physical, chemical, and biological conditions of the environment and their effect on organisms.

## **Mathematics**

*Mathematics* (from Greek "knowledge, study, learning") is the abstract study of topics encompassing quantity, structure, space, change, and other properties; it has no generally accepted definition.

## **Medicine and Health**

*Medicine* is the applied science or practice of the diagnosis, treatment, and prevention of disease. It encompasses a variety of health care practices evolved to maintain and restore health by the prevention and treatment of illness in human beings.

## **Microbiology**

*Microbiology* (from Greek *mikrós*, "small"; *bios*, "life"; and *-logia*) is the study of microscopic organisms, either unicellular (single cell), multicellular (cell colony), or acellular (lacking cells).

## **Physics and Astronomy**

*Physics* (from Ancient Greek: *physis* "nature") is a part of natural philosophy and a natural science that involves the study of matter and its motion through space and time, along with related concepts such as energy and force.

*Astronomy* is a natural science that deals with the study of celestial objects (such as moons, planets, stars, nebulae, and galaxies).

## **Zoology**

*Zoology* occasionally spelled zoölogy, is the branch of biology that relates to the animal kingdom, including the structure, embryology, evolution, classification, habits, and distribution of all animals, both living and extinct.

# Calendar

| Date            | Deadline   |
|-----------------|--|
| June            | Think about STEM Fair Topic  |
| July            | Think about STEM Fair Topic  |
| August          | Think about STEM Fair Topic/Begin Experimentation                                    |
| September       | Think about STEM Fair Topic/Begin Experimentation                                    |
| October         | Begin Experimentation if not already started<br>Start submitting required paper work |
| November        | Experimentation<br>Start submitting required paper work                              |
| <b>December</b> | School Wide Competition  |
| January         | School based finalists are identified. Students complete Fair Registration Form      |
| February        | Regionals at Tampa Convention Center   |

| Gantt Chart         | June | July | Aug | Sept | Oct | Nov | Dec | Jan | Feb |
|---------------------|------|------|-----|------|-----|-----|-----|-----|-----|
| Idea                |      |      |     |      |     |     |     |     |     |
| Experimentation     |      |      |     |      |     |     |     |     |     |
| Submit Paper Work   |      |      |     |      |     |     |     |     |     |
| School Competition  |      |      |     |      |     |     |     |     |     |
| Regional Paper Work |      |      |     |      |     |     |     |     |     |
| Regionals           |      |      |     |      |     |     |     |     |     |

## Research Plan Requirements:

The following are the 5 requirements for a research plan.

They are to be in the order found below. Examples can also be found below.

**A.** Rationale

**B.** Problem, Hypothesis, Predictions, Variables, Constants, and Control.

**C** Materials and Procedure

**C1.** Required Ending Procedures

**D** Summary Conclusion

**E** Annotated Bibliography

## A.

What is the RATIONALE for your project? Include a brief synopsis of the background that supports your research problem and explain why this research is important scientifically and if applicable, explain any societal impact of your research.

## B.

State your HYPOTHESIS(ES), RESEARCH QUESTION(S), ENGINEERING GOAL(S), EXPECTED OUTCOMES. How is this based on the rationale described above?

### **Statement of Problem:**

What is the most effective container for preserving strawberries in?

### **Hypothesis:**

If I change the container, then the strawberry oxidation time will differ, because not all containers are made with the same materials.

### **Prediction: w/ why**

I think that the glass container will preserve the strawberries the longest, because, whenever I use glass containers at my house, they seem to preserve for a long time. Also, the glass is container has a very tight seal.

**Independent variable:** The containers

**Dependent Variable:** Oxidation

### **Constants:**

1. Source of strawberries
2. Mass of strawberry
3. Temperature
4. Measurement of time
5. Type of Ziploc bags
6. Type of glass container
7. Type of plastic container
8. Type of Green Bag

**Experimental Control:** The strawberries in the same container they originally come in

## C.

Describe in detail your RESEARCH METHODS AND CONCLUSIONS.

• Procedures: Detail all procedures and experimental design including methods for data collection. Describe only your project. Do not include work done by mentor or others.

Risk and Safety: Identify any potential risks and safety precautions needed.

• Data Analysis: Describe the procedures you will use to analyze the data/results that answer research questions or hypotheses.

### **Materials:**

1. \*Ball regular pint size mason jar (473.176 ml)
2. \*Debbie Meyer EvertFresh Green Bags (1892.71 mL)
3. \*Driscoll's strawberries (approximately 145 grams per container)
4. \*Driscoll's strawberry associates, inc. Watsonville, CA 95077 container (946.353 mL)
5. \*Rubbermaid Take Alongs plastic container (500 mL)
6. \*Sunbeam precision electronic postal scale (in grams)
7. \*Bosch refrigerator (model number B22CS80SNS)

8. \*Parts Master refrigerator - freezer thermometer (degrees in Celsius)

9. \*Gloves

10. \*Protective Goggles

### **Procedures:**

1. Gather materials
2. Put on gloves and goggles
3. Select firm strawberries without blemishes
4. Weigh strawberries to approximately 145 grams
5. Place strawberries in Rubbermaid Take Alongs container
6. Repeat steps 2-3 for Ball regular pint size mason jar
7. Repeat steps 2-3 for Debbie Meyer EvertFresh Green bags
8. Repeat steps 2-3 for Driscoll's strawberry container
9. Place all containers in Bosch refrigerator all on the same shelf
10. Place thermometer in Bosch refrigerator on the shelf with all of the strawberries
11. Every 24 hours, take out all of the strawberries and record observations, and then put strawberries back into their original containers
  - a. Mold may grow on the genus fragaria.
  - b. Mold can lead to Watery or itchy eyes, Sore throat, Congestion, Coughing, Skin irritation, Asthma.
  - c. Goggles and gloves are to be worn any time seal is broken.
  - d. Research will stop upon first sign of mold growth.
12. Every 24 hours, check and record the temperature from the thermometer - in Celsius
13. Record how many days it takes until strawberries get mush or start developing mold or bacteria spots
14. Weigh strawberries again and record percent lost/gained
15. Repeat steps 2-13 for trials 2-8
16. Place all biological material into a trash receptacle and discard upon completion of experiment.
17. Calculate the statistical terms necessary (mean, median and mode) of all the trials.
18. Graph all the statistical data to see if there are any patterns or relationships with the data.

## **D.**

### **Summary of Conclusion:**

I found out all the celebrities' net worth. I also found the mean, median and mode of both the Golden Ratios and net worth. I discovered that net worth is affected by the golden ratio. Brad Pitt had matched the Golden Ratio and had a Net Worth of \$240,000,000. Whereas Patrick Dempsey had a Golden Ratio of 1.583 to 1 and a Net Worth of \$60,000,000. Anne Hathaway also matched the Golden Ratio and had a Net Worth of \$35,000,000. Whereas Brittany Snow had a Golden Ratio of 1.523 to 1 and a Net Worth of \$7,500,000. Patrick Dempsey and Brittany Snow were just two examples of how the Golden Ratio is affected by Net Worth.

## **E.**

**Bibliography:** List at least five (5) major references (e.g. science journal articles, books, internet sites) from your literature review. If you plan to use vertebrate animals, one of these references must be an animal care reference.

### **Citations:**

Waite, Linda J., Frances Koberg Goldscheider, and Christina Witsberger. "Nonfamily Living and the Erosion of Traditional Family Orientations Among Young Adults." *American Sociological Review* 51.4 (1986): 541-554. Print.

The authors, researchers at the Rand Corporation and Brown University, use data from the National Longitudinal Surveys of Young Women and Young Men to test their hypothesis that nonfamily living by young adults alters their attitudes, values, plans, and expectations, moving them away from their belief in traditional sex roles. They find their hypothesis strongly supported in young females, while the effects were fewer in studies of young males. Increasing the time away from parents before marrying increased individualism, self-sufficiency, and changes in attitudes about families. In contrast, an earlier study by Williams cited below shows no significant gender differences in sex role attitudes as a result of nonfamily living.