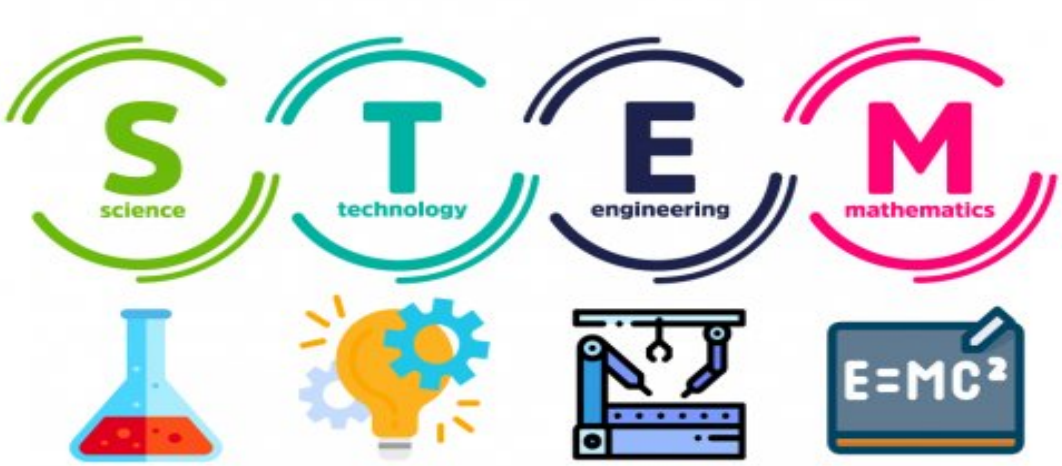


STEM Night Project Guide

For

Rock Creek Valley

2020

Dear Students and Parents,

Welcome to the 2020 RCV STEM Night Project guide!

The inventor Nikola Tesla once said, "If you want to find the secrets of the universe, think in terms of energy, frequency and vibration."

Open the door to the universe of learning by participating in a 2020 STEM Night project. Your first step is to send an email to clhillard08@gmail.com letting us know you will present a project at the 2020 RCV STEM Night by April 15th. Please make sure you include the title of your project and the name of any partner(s) you may be working with.

Projects will be presented at the 2nd Annual RCV STEM Night on Friday, May 1st. Students will be able to share their science discoveries with fellow RCV students. This year we will continue the RCV Student Choice award for each grade. The top choice for each grade will be awarded with a prize. All projects will be judged by professional scientists.

Remember, the astronaut Mae C. Jemison once said, "Some of the most fun people I know are scientists."

Science Categories

Physical Science: Projects that study the nature and properties of nonliving matter, energy and/or force and motion.

Life Science:

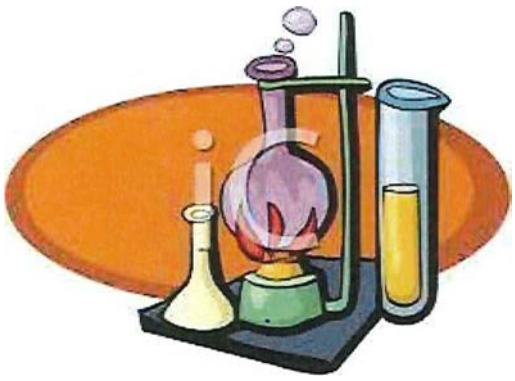
Plants - (plant growth, development or behavior; factors affecting these, plants used in medicine, plants used in industry, forestry, etc.)

Animals - (investigations of animal behaviors or interactions, including those of insects, etc.)

Chemistry: Projects that examine chemical reactions, the chemistry of living things, photosynthesis, solubility, heat capacity, etc. **No dangerous or illegal substances should be used** in the experiments.

Earth and Space Science: These are projects investigating principles of geology (for example, weathering and erosion), geography, astronomy, meteorology, and related fields.

EXPERIMENTAL PROJECT



What is the Scientific Method?

The key to a good science fair project is the scientific method, an essential tool for scientific discovery and sound conclusions.

The scientific method is the way scientists get from asking a question to finding an answer. *The method can be summarized in five simple steps:*

- *Define the problem. Ask a question you can answer through experimentation.*
- *Observe I Gather data. Collect information about the topic-learn as much as you can. Sometimes what you learn will cause you to rework your question.*
- *Predict I Hypothesize. Based on the information you found in your research, predict an answer to your problem (make a hypothesis). Tell why you predict a certain outcome.*
- *Experiment. Design an experiment to test your hypothesis.*
- *Analyze data I Form conclusion. Evaluate the results of your tests to determine if your hypothesis was correct. If it wasn't, explain why not.*

STEM Night Project Ideas

To develop your project idea, think about things that interest you or that you like to do. Maybe you have an unanswered question about a science unit in your class. Perhaps you have seen something in the news or weather that you would like to know more about. Think about how you would complete the investigation and the materials you would need. Try to choose a question that you can investigate with a minimum of assistance from adults. After brainstorming possible ideas, take some time to:

- Think about the project ideas;
- Research possible ideas using available resources (such as the library, Internet sites, etc.)
- Discuss it with any adults who may be assisting you; and
- Decide on a project.

The following is just a sample of questions, keywords, and project ideas organized by category. ***Use the internet list of science websites included in this packet for many other project ideas.***

Life Science Ideas

- Have you noticed how the seeds in different kinds of fruit (like an apple and an orange) look very different from each other? Try growing seeds from different fruit that you've eaten, soaking them in water for one night and then planting them in a cup of dirt. Which kinds of seeds do you expect to grow best? (Which seed turns into the tallest plant after a month?) After doing the experiment, which seeds really grow best? Why do you think that might be?

  Lots of factors affect plant growth. Try experimenting with soil type, light, temperature, water, and more.

  A person's five senses are sight, smell, sound, taste, and touch. Compare sensitivity to touch in different parts of the body. Can you distinguish between an apple and a peach using your toes, knees, elbows, or belly? What about the difference between a sweater, sweatshirt, and t-shirt?

- Have you ever watched ants carrying bits of food? What food from your kitchen do you think an ant or other insect would like best? What "bait" will probably attract the greatest number of different insect species?

- Do a project to find out if temperature affects the butterfly life cycle. Make sure there is a 2-3 degree temperature difference between the caterpillars placed in a warm area versus those placed in a cooler area. For smaller creatures, you could hatch some brine shrimp. Is tap water or distilled water better for hatching the eggs?

- If you like collecting insects, perhaps you could design an experiment dealing with collecting techniques. What is the best method for softening butterfly wings so they can be mounted?

Earth Science Ideas

- The sun causes water to evaporate into the air, where it forms clouds and comes back down as rain or snow. Can wind speed, humidity, or temperature have an effect on the rate of evaporation?

  How good is soil at breaking things down? What can you find that is biodegradable? How can you test to see whether something is or not?

What holds more water, sand or soil? How does this affect what kinds of plants can grow in each?

- Can you learn to predict the weather from the clouds? Try using a cloud chart to make your own forecast every day for a few weeks. How accurate was the cloud-forecast method?

Physical Science Ideas

- Can you use a magnet to find traces of iron in food, dollar bills, and other household materials? Are some magnets stronger than others?

What type of flooring creates the most or the least friction? Try carpet, wood, tile, linoleum, etc. Younger kids might test this by rolling a ball or toy truck over different surfaces.

- Why does a balloon stick to the wall after you rub it against your hair? Experiment with static electricity to find out how positive and negative charges in household items interact. What causes static electricity to increase? What are some ways to decrease static electricity and which methods work best?

- The sun gives off energy that can be used like a battery to power things. Connect a motor to a solar cell and figure out what conditions it runs best under. Do different types of light (such as fluorescent, incandescent, halogen, or LED light) power a solar cell better than others? What happens on a cloudy day? Older kids can research to find out what else solar energy can be used for.

- What makes a rainbow after a storm? Use a spectroscope to compare the spectra of different types of light. Do different light sources contain different colors of light?

Experiment with the density of different liquids. Which is denser, oil, corn syrup, or water? If you add all three to the same glass, which liquid will float on top of the others? Compare how well some objects (e.g., raisin, paper clip) float in each of the three substances. You can also experiment with colored water (e.g., red for hot, blue for cold) to find out whether different temperatures affect water density.

Chemistry Ideas

Design a science fair project comparing and contrasting how long it takes ice to melt at room temperature compared to a warm stovetop or the refrigerator.

- Your kitchen offers lots of chemistry ideas. How does cola or another soft drink compare in acidity with other common drinks or food? You can test acidity using pH paper. You can also test which fruits have the most vitamin C using indophenols.

- Water is sometimes called "the Universal Solvent" because it dissolves other substances so well. How well does water dissolve salt or sugar compared to other liquids (oil, corn syrup, or vinegar)?

- Make crystals from sugar, salt, and baking soda. How do their crystal shapes compare? Does the rate of evaporation of the crystal growing medium (water, vinegar) affect the size of the crystals? Does the rate of how fast the crystals cool down affect the size of the crystals? Do impurities (such as iodized salt versus salt that is not iodized) affect the growth of the crystals?

- Chemical energy can produce power! Try making a battery from food items. Which type of citrus fruit works best? What about vinegar?

- Experiment with polymers by using milk proteins to make homemade glue. How does homemade glue compare with commercial glue?

HELPFUL STEM NIGHT PROJECT STEPS

1. **Choose a topic.** Be sure it interests you. Don't pick one because you think it will be easy. Talk it over with your parents and when you have decided, inform your teacher. Get your Registration form signed by your parent and submit.

2. **State your problem as a question.** What is it that you want to find out by doing this project?

3. **Research your problem.** Look at any books/websites that might help you (see list provided in packet), make observations by simply looking at things, talk to people, and find out as much as possible about your topic. Write down any ideas you have and where you got them. Also, keep note of all information needed for citing your sources.

4. **Form a hypothesis.** What do you think is going to happen? Based on what you know or found out from step #3, what do you think the results of your experiments will be? After doing the experiments, it may turn out that your guess was wrong.

5. **Plan your project.** How will you test your hypothesis? What experiments will you do? How will you measure the results? Where will you keep your information? Be sure to keep notes and write down everything you do and what happens.

6. **Collect all your materials.**

7. **Conduct your experiments.** Remember, the more times you do an experiment the more reliable and accurate the results will be. Do each experiment at least three times and get an average of the results for your graph.

8. **Record your data.** As you do your experiments, you will want to write down what you saw or found out. Organize this information in an orderly manner. Put the date, time, and any other useful information. Write your measurements clearly.

9. **Draw conclusions.** What did you learn from your experiments? Have you proved or disproved your hypothesis? You made a guess about what you thought would happen. Now tell what really did happen.

10. **Prepare your charts, graphs, drawings, and diagrams.** Make them large enough to see, neat, and colorful.

11. **Construct your science fair display.** Get your cardboard display board so you can show all your work and have your hands free to point to sections when you give your presentation.

12. **Prepare and practice your presentation.** Be able to tell about what you used what you did in your experiments, and what you found out.

13. **Plan your timeline** so you don't leave everything until the last minute.

14. **Enjoy yourself.** You will do a GREAT job!

REFERENCE GUIDES

STEM Night Project and Invention Idea Websites

http://www.sciencebuddies.org/

http://www.sciencefairadventure.com/

http://www.scienceproiect.com/

http:!/school.discoverveducation.com!sciencefaircentra/l

http://homeworkspot.com/sciencefair/

***http://www.** education.com/science-fair!*

http://www.fun-science-proiect-ideas.com/

http:l/faculty.was hin gton .edu/chudlerl funs ciencefairproiects .html

http:l/www.1000sciencefairproiects .com/Science-Fair-Proiects-ldeas .php? gcli d=CNDJv7L- ***5MECFXEQ7AodxTBA1w***

htt p://ww w.sciencekids.co.nzlpro iects .html

http:llwww.all-science-fair-proiects.com/

http:llwww.sciencemadesimple.com/proiects.html

http://sciencefairproiect.virtua/ave.net!scientific method.htm

http:llwww.super-science-fair-proiects.com!list-of-science-fair-proiects.html

http:l/www.invention-help.com!invention-help-books.htm

http://www.inventivekids.com/2010/10!05/step-bv-step-guide-to-inventingl

http://www .kids inven t.org/

Helpful Books

Bardhan-Quallen, Sudipta. 2006. *Last-minute Science Fair Projects: When your Bunsen's not Burning but the Clock's Really Ticking.* Sterling Publisher.

Bachinski, Julianne Blair. 2005. *The Complete Workbook for Science Fair Projects.* Wiley Publisher

Brooks, Philip. 2002. *Questions and Answers: How Things Work.* New York: Kingfisher.

Egan, Lorraine Hopping. 1997. *Inventor and Inventing Grades 4-8.* New York: Scholastic Professional Books

Erlbach, Arlene. 1997. *The Kid's Invention Book.* Minneapolis: Lerner Publication Company.
Friedhoffer, Bob. 2006. *Everything You Need for Simple Science Fair Projects.* Chelsea Clubhouse

Gardner, Robert. 2004. *Electricity and Magnetism Science Fair Projects: using batteries, balloons, and other Hair-raising Stuff.* Enslow Publishers.

Gates, Phil. 1995. *Wild Technology: Inventions Inspired by Nature.* New York: Larousse Kingfisher Chambers, Inc.

Harper, Charise Mericle. 2001. *Imaginative Inventions.* Boston: Little, Brown and Company.

Karnes, Frances A. Ph.D and Suzanne M. Bean, Ph.D. 1995. *Girls and Young Women Inventing: Twenty True Stories about Inventors plus How You Can Be One Yourself* Minneapolis: Free Spirit Publishing.

Rubin, Joel. 2008. *Weather.* Heinemann Library

Sobey, Ed. 2002. *Inventing Toys: Kids Having Fun Learning Science.* Tucson, Arizona: Zephyr Press.

Spangenburg, Ray and Diane K. Mosher. 1997. *American Historic Places: Science and Invention.* New York: Facts On File.

Sullivan, Otha Richard. 2002. *Black Stars: African American Women Scientists and Inventors.* New York: John Wiley and Sons. Inc.

Thimmesh, Catherine. 2000. *Girls Think of Everything: Stories of Ingenious Inventions by Women.* Boston: Houghton Mifflin Books.

Tocci, Salvatore. 2006. *More Simple Science Fair Projects,* Chelsea ClubHouse Publisher.
Van Cleave, Janice. 2002. *Help My Science Project is Due Tomorrow.* Scholastic.

STEM NIGHT PROJECT PLANNING PACKET

Student _____

✔	Due Date	What To Do
		Choose a topic.
		Have your parent/guardian send an email to sign up for the Science fair.
		Propose a question to your topic.
		Research the topic.
		Write a hypothesis.
		Design an experiment; list variables and write procedure.
		List and gather your materials.
		Conduct experiment and record data and observations. Take photos *if* desired.
		Create a table, chart, or graph *of* the data.
		Draw conclusions.
		Make the project display.
		Write and print abstract.
		Present your project at RCV STEM Night!

STEM NIGHT PROJECT PLANNING PACKET

Student _____

1. BRAINSTORM!

As you think of possible STEM Night project ideas, write them down and write any important information you may need for those ideas!

2. QUESTION: Your question is the focus of your project and is also the title that will be displayed on your board. Your question should be able to be tested and measured. Helpful hint= Any question that can have a "yes" or "no" answer is not a scientific question.

Project Question

_____

_____

_____

_____

_____

_____

STEM NIGHT PROJECT PLANNING PACKET

3. RESEARCH: Learn as much as you can about your experiment and the materials you are using! Use reliable Internet sources, library books, science books, and other resources.

Research

STEM NIGHT PROJECT PLANNING PACKET

4. HYPOTHESIS: Decide what you think the outcome of the project is going to be. Make a good, educated guess as to what you think that answer to your question will be. **Explain WHY you think that will be the outcome.** There is no right or wrong hypothesis, so it's okay if your hypothesis does not prove to be correct! Be sure that your hypothesis is written in a complete sentence.

Hypothesis

5. DESIGN YOUR EXPERIMENT: Clearly write out the procedure you are going to follow. Remember that your experiment needs to Follow the scientific process and you need to have one variable that you are going to change.

Variables

Variables to keep the same (dependent variables)	Variables to change (independent variables)

STEM NIGHT PROJECT PLANNING PACKET

Procedure

List your experiment's steps below. Be sure to be as specific and clear as possible so that any members *of* your audience would be able to replicate the experiment exactly as you performed it.

STEM NIGHT PROJECT PLANNING PACKET

6. GATHER MATERIALS: List all of the materials that you will need to complete your experiment.

Materials

7. CONDUCT YOUR EXPERIMENT: As you complete your experiment, collect as much data as possible and record all observations. Complete your observations in your Experiment Log. As you complete the experiment, use your log to write down any data and record your observations.. In your log, you will need to:

l. **Collect Data=** You will need to collect NUMERICAL data. That means your data will include numbers and be measured using data such as temperature, height, distance, time, etc.

2. **Make Observations: Write** down any observations you make during this process.

3. Take Notes= What did you do in order to complete your project? Anything worth noting?

You may also use the space provided to record additional data and observations.

Data

STEM NIGHT PROJECT PLANNING PACKET

Observations

8. DETERMINE THE RESULTS: Time to review your data and observations!

- Create a table or graph to present your numerical data. This includes bar graphs, circle graphs, pie graphs, line graphs, etc.
- All other results, such as observations, should be written into a paragraph using complete sentences.
- You may use the space below to plan for how you would like to present the data you have collected.

STEM NIGHT PROJECT PLANNING PACKET

Results (Paragraph Form)

Use this space to write your data into paragraph Form. Paragraphs contain at least 5-7 complete sentences.

9. DRAW CONCLUSIONS: What is the answer to the question you asked? Was your hypothesis correct? IF your hypothesis was incorrect, why do you think you were incorrect? Use information from the experiment to answer both *of* these questions.

Conclusions

Answer to your original question:

Was your hypothesis correct or incorrect? IF incorrect, why?

STEM NIGHT PROJECT PLANNING PACKET

If you were to complete the experiment again, what changes would you make? How would you improve this experiment?

_____

_____

_____

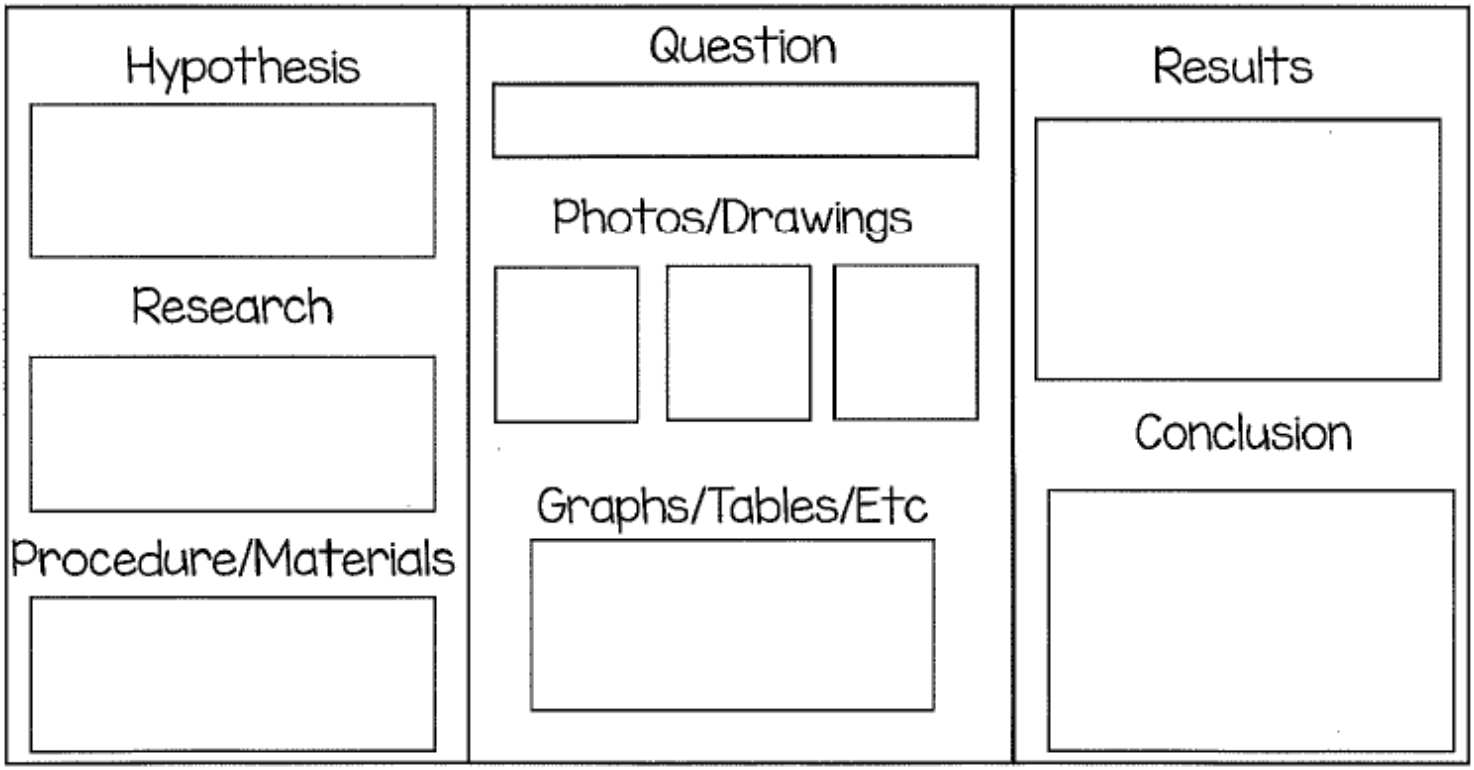
_____

_____

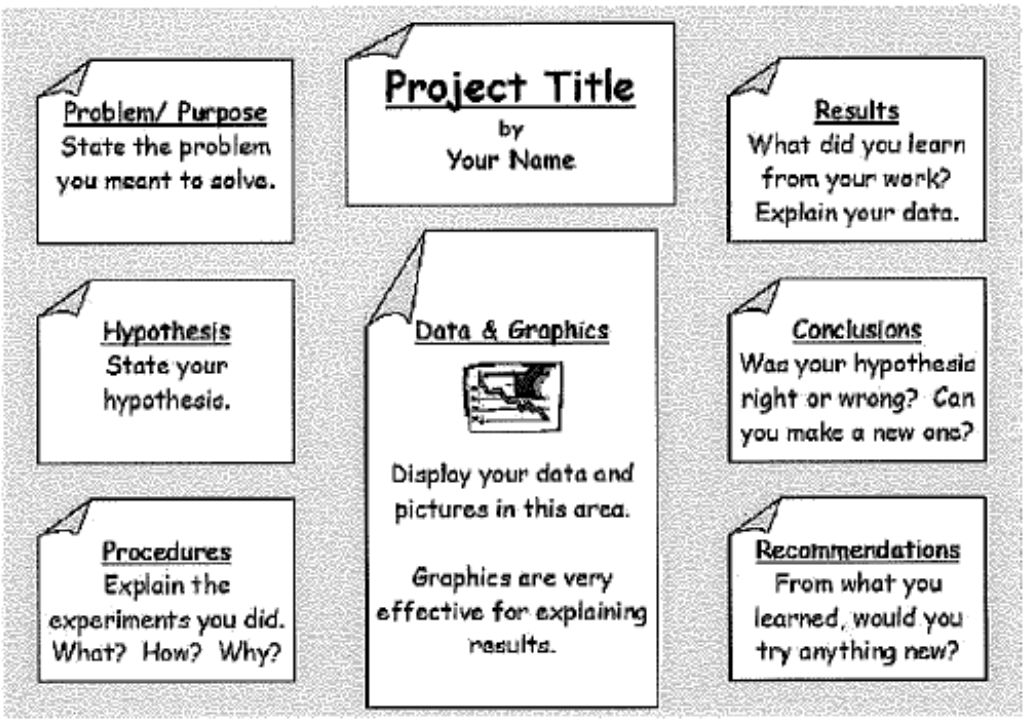
_____

10. DISPLAY BOARD: Using all *of* the information you have collected, put your display board together!

- Font should be easy to read.
- Photos are optional.
- Information on the board can be typed or written neatly by hand
- Must be a tri-Fold board



Ideas for Science Fair Posters



Bubble Life and Temperature

Cy N Student
Sometown Middle School

Purpose

To determine if temperature affects how long bubbles last before they pop.

Hypothesis

Bubble lifespan is not affected by temperature.

Materials

Identical clear jars
Bubble solution
Measuring spoons
Thermometer
Stopwatch

Procedure

1. Use your thermometer to find locations that are different temperatures from each other.
2. Label each jar with the temperature of the location it will be placed.
3. Add identical amounts of bubble solution to each jar.
4. Place the jars at the different temperatures.
5. Wait 15 minutes for the temperature to equalize.
6. Shake each jar and record the time it takes for the bubbles to all pop.
7. Repeat three times.

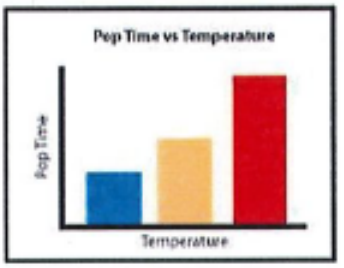
References

Bubble Life & Temperature
Anne Helmenstine
About Chemistry
http://chemistry.about.com

Data

Temperature	40°	75°	120°
Time to Pop			
Trial 1	50	36	22
Trial 2	55	32	17
Trial 3	60	28	21
Average	55	32	20

Results



Conclusions

Bubble lifespan is affected by temperature. Data indicates cold bubbles pop faster than warmer bubbles.