Name: _____ Period ____ Date: _____

Summer 2018 Assignment: Introduction

As a part of the 9th grade curriculum you will be required to write a scientific research paper based on a scientific experiment that you will prepare and conduct. This summer project is an example of a scientific study that could be done. For your 9th grade research project you will have to complete more background research which will play a part in you final 9th grade research project. Just imagine the inquiry and organizational skills you'll learn and practice. For your assigned topic next year you will come up with proposed hypotheses and conduct **research** relevant to your topic. For example if you had to test the effect of caffeine on the growth of a tomato plant, your hypothesis can be "If caffeine is given to a tomato plant, then the tomato plant will grow taller." You will then conduct research on what plants need to grow, what caffeine is and the effects of caffeine on living things etc. Use this summer research project to practice your scientific method.

These are the Steps of the scientific method and you will use them in the write up below:

1. **Ask a QUESTION or identify a problem.**
2. **Gather information and form a HYPOTHESIS.**
3. **Create an EXPERIMENT to test your hypothesis.**
4. **Collect DATA and OBSERVATIONS by doing the experiment.**
5. **Draw a CONCLUSION.**
6. **SHARE your findings.**

Project Introduction Apples and Lemons:

Students should design and carry out an experiment to find out whether lemon juice prevents cut apples from browning.

Sliced apples make a healthful and tasty snack or side dish for dinner. But keeping them looking fresh after they have been sliced can be tricky. Try this experiment to see how chemistry can keep your apples and fresh even after they have been cut.

Materials: What You Need

- **An apple**
- **A knife**
- **Lemon juice - Tablespoon (TBSP)**
- **Small bowl (big enough to fit a quarter of the apple)**
- **Clock/timer**
- **Paper plates**
- **Pen and paper**

Procedure: What You Do

1. Use your pen and paper to make two labels, one reading "control" and the other reading "experimental."

2. Pour the lemon juice into the bottom of the bowl.

3. With an adult's help, cut the apple into quarters.

4. Take one apple quarter and place it cut side down into the bowl of lemon juice. Leave it for two minutes. The other apple half without lemon juice is your 'control' sample that lets you see what normally happens to a cut apple.

5. Observe the color of both apple quarters, then place them white part up on the plates, with the corresponding labels nearby.

6. Observe the apples again at 15-minute increments, up to 45 minutes. Note any color changes and/or differences in appearance.

7. Look at the apples again periodically throughout the day. What do you find?

Don't forget… The Steps of the scientific method:

1. **Ask a QUESTION or identify a problem.**
2. **Gather information and form a HYPOTHESIS.**
3. **Create an EXPERIMENT to test your hypothesis.**
4. **Collect DATA and OBSERVATIONS by doing the experiment.**
5. **Draw a CONCLUSION.**
6. **SHARE your findings.**

You will need to complete the following parts of a Controlled experiment below:

- **Please write answers in this worksheet this will be collected and graded.**

First, what is our **QUESTION** for this experiment? _____

_____

I. TITLE Hint: You should do this after you find the I.V and D.V below.
Hint: You could structure the title as "The effect of I.V. on the D.V."

_____

_____

II. Independent Variable (IV):

- You can only change 1 variable, so what did you change about the experiment?
- Here are some examples:
  - The amount or type of light, the water color, vinegar, Gatorade, soda, etc…

_____

_____

III. Dependent Variable (DV):

- What will you observe/measure in your experiment?

_____

_____

IV. HYPOTHESIS (If…, then… statement)

_____

_____

V. Material:

- Use the list above. List the material you will need for the experiment. Be as exact as possible.

✓ _____

✓ _____

✓ _____

✓ _____

✓ _____

✓ _____

✓ _____

✓ _____

VI. Procedures:

✓ Write out the steps you used for your experiment. Number each step and you can repeat steps if necessary.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

VII. Control Group: What will you keep the same between groups?

_____

_____

VIII. Experimental Group: Name the changing (independent variable).

_____

_____

IX. Data Table and Graph :

- ✓ Make a data table chart to collect your data. You should include the date the data is collected and also the specific data (the dependent variable) that you are collecting.

Apples	**15 minutes**	**30 minutes**	**45 minutes**
With Lemon Juice			
Without Lemon Juice			

X. CONCLUSION:

- ✓ Was your hypothesis correct or incorrect? Why?
- ✓ How could you improve your overall experiment?
- ✓ What kind of experiment could you do next time to test for this experiment?

_____

_____

_____

_____

_____

_____

_____

_____

_____

Living Environment Summer Assignment Grading Rubric

	4	3	2	1
Developing Hypothesis and Defining and Controlling Variables	The student correctly defines the independent variable and the dependent variable, and controls other relevant variables. The hypothesis clearly states a prediction of the effect of the independent variable on the dependent variable using the prompt "If...then."	The student correctly defines the independent variable and the dependent variable, and controls other relevant variables. The hypothesis adequately states a prediction of the effect of the independent variable on the dependent variable using the prompt "If...then."	The student correctly defines either the independent variable or the dependent variable, and controls only a few other relevant variables. The hypothesis states a prediction of the effect of the independent variable on the dependent variable not using the prompt "If...then."	The student defines either the independent variable or the dependent variable, but does not control other relevant variables. Student fails to state a hypothesis.
Designing the Experiment	The procedure is clearly explained in numbered steps and is an appropriate test of the independent variable.	The procedure is adequately explained in numbered steps and is an appropriate test of the independent variable.	The procedure is somewhat confusing but tests the independent variable.	The procedure is unclear and does not test the independent variable.
Making Observations and Creating Data Table	The student organizes and records observations clearly.	The student organizes and records observations adequately.	The student records observations adequately.	The student fails to organize and record observations.
Interpreting Data and Drawing Conclusions	Student's conclusion is explained clearly and is appropriate based on results. Conclusion includes whether hypothesis was supported or rejected, using data evidence to support their conclusion.	Student's conclusion is explained adequately and is appropriate based on results.	Student's conclusion is stated, but is not explained and is appropriate based on results.	Student's conclusion is stated, but is not explained and is not appropriate based on results.

Total Points: ___/16

THE SCIENTIFIC METHOD

The Scientific Method is an organized way for scientists (or anyone!) to answer questions and develop solutions. There are usually six parts to it.

- **PURPOSE/QUESTION** – What do you want to learn? An example would be, "What doorknob in school has the most germs ?" or "Do girls have faster reflexes than boys?" or "Does the color of a light bulb affect the growth of grass seeds?"

- **RESEARCH** – Find out as much as you can. Look for information in books, on the internet, and by talking with teachers to get the most information you can before you start experimenting.

- **HYPOTHESIS** – After doing your research, try to predict the answer to the problem. Another term for hypothesis is 'educated guess'. This is usually stated like " If I…(do something) then… (this will occur)"

  An example would be, "If I grow grass seeds under green light bulbs, then they will grow faster than plants growing under red light bulbs."

- **EXPERIMENT** – The fun part! Design a test or procedure to find out if your hypothesis is correct. In our example, you would set up grass seeds under a green light bulb and seeds under a red light and observe each for a couple of weeks. You would also set up grass seeds under regular white light so that you can compare it with the others. If you are doing this for a science fair, you will probably have to write down exactly what you did for your experiment step by step.

- **ANALYSIS** – Record what happened during the experiment. Also known as 'data'.

- **CONCLUSION** – Review the data and check to see if your hypothesis was correct. If the grass under the green light bulb grew faster, then you proved your hypothesis, if not, your hypothesis was wrong. It is not "bad" if your hypothesis was wrong, because you still discovered something!

A few other terms you may need to know:

INDEPENDENT VARIABLE

This is the part of your experiment that you will test (vary) to answer your hypothesis. In the example above, the independent variable would be the different colors of the light bulbs.

DEPENDENT VARIABLE

This is what occurs in response to the changing independent variable. In our example the Dependent Variable is how much the grass seeds grow.

CONTROL

A good experiment includes a part of the experiment where you do not include the Independent Variable. In our example, grass seed that is growing under the usual white (uncolored) bulb would be your control. The control lets you compare your results at the end of your experiment.