Bang Control (Student Sheet)

Safety Precautions:

Chemicals and flying objects will be used in this lab. Be sure to wear safety goggles at all times. As always, take care to first read through the entire set of procedures, then clarify any questions you have before proceeding with the experiment. Follow the directions exactly, be sure your instructor reads and approves your experiment plan before conducting your experiment.

Materials (For Control):	**Possible available materials for manipulated variable experiment**
Paper towel strip 4" wide by 8" long 10 mL graduated cylinder Baking soda (10 mL per group) 20 ounce soda bottle Cork (rubber #3) Balloon 150 mL beaker Vinegar (120 mL each) Water (120 mL each) Purple Cabbage indicator (15 mL)	Bromothyol Blue Indicator Universal pH Indicator pH Strips Balloons Glass and rubber tubing and 1 hole stopper Baking Powder Thermometers Measuring tape Extra Beakers Rice paper Facial Tissue Limewater

Procedures for Control:

1. Take 10 mL of baking soda and spread it down the length of a paper towel strip, in the center. Leave an inch or two at the end of the paper-towel free of baking soda.
2. Roll the paper towel lengthwise, so the roll would be shorter than the alternative. Make sure the baking soda does not get close to the ends of the towel.
3. Once it is rolled, twist the ends so that the powder does not come out.
4. Place the cork inside the rubber balloon.
5. Pour 120 mL of vinegar and 120 mL of water into the bottle and swirl to mix.
6. Add indicator so that the resulting solution is bright pink—about 10 mL.
7. Choose a location, preferably outside where it will not matter if the cork shoots upward with considerable force.
8. Put the soda bottle containing the solution upright on the selected spot, drop in the twisted tube of baking soda, and rapidly and firmly cork the bottle. Be sure the bottle is standing upright so it will fire straight into the air and out of the way of people and other living things. (There should be a few seconds delay before you observe changes.)

Title: Bang!

Name_____

Period_____

Use this paper to record your observations and experimental design.

A. Record observations of the control in the data table below. Complete the manipulated variable after you have completed the experiment.

Time	Control Observations	Manipulated Variable Observations

How did you quantify your data?

B. Research the following on the internet or in a book then record answers:

1. What are the chemical formulas for baking soda and vinegar?

2. Write the equation for the reaction between baking soda and vinegar.

3. What is the balanced equation for #2? What is your evidence that it's balanced?

4. What does purple cabbage indicator indicate?

5. How would evidence for a chemical reaction differ from a physical reaction?

Source of Research

_____

C. Plan your experiment:

Variable you will manipulate _____

What will you change about that variable or how much will you change it?

Research question:

Hypothesis:

D. Analyze Data:
Graph

F. Conclusion: (Be sure to address the following questions: What did you discover about changing your variable? Was this a chemical reaction or a physical reaction? What is your evidence?; How are the reactants different from the products? Did the number of atoms in this reaction change? What did change? What did you learn?)

Analysis:

1. Which manipulated variable produced the most dramatic Bang?

Why?

2. Which manipulated variable produced the least dramatic Bang?

Why?

3. What manufacturing processes rely on this kind of data?

4. Using the compound $NaHCO_3$ calculate the following. **Show all your work!!**

   a. Given 15 grams of $NaHCO_3$ calculate the number of moles present.

   b. Given 15 grams of $NaHCO_3$ calculate the number of molecules present.

Use the following chemical equation and molecular masses to complete question #4.

$NaHCO_3$ (cr) + $HC_2H_3O_2$ (aq) ------> CO_2 (g) + H_2O (aq) + $NaC_2H_3O_2$ (aq)

Compound	Molecular Mass (u)
$NaHCO_3$	84
$HC_2H_3O_2$	60
CO_2	44
H_2O	34
$NaC_2H_3O_2$	82

5. If 50 grams of baking soda ($NaHCO_3$) react with an excess amount of vinegar ($HC_2H_3O_2$), calculate the number of grams of CO_2 produced. **Show all your work!!**