Scientific method Name_____

The Scientific Method involves a series of steps that are used to investigate a natural occurrence.

The steps are:

Observation/Question

Research

Formulate a Hypothesis

Experiment

Collect and Analyze Results

Draw Conclusions

Communicate the Results

An example of its use is as follows:

John watches his grandmother bake bread. He asks his grandmother what makes the bread rise.

She explains that yeast releases a gas as it feeds on sugar.

Observation/Question: John wonders if the amount of sugar used in the recipe will affect the size of the bread loaf?

Research: John researches the areas of baking and fermentation and tries to come up with a way to test his question. He keeps all of his information on this topic in a journal.

Formulate a Hypothesis: After conducting further research, he comes up with a hypothesis.

"If more sugar is added, then the bread will rise higher."

***Note : The hypothesis is an educated guess about the relationship between the independent and dependent variables.**

> **Independent Variable-** The independent, or manipulated variable, is a factor that's intentionally varied(or changed) by the experimenter. In this case it is SUGAR. There can only be **ONE variable that is changed** otherwise we will not know what is affecting the dependent variable (whatever we are testing; in this case the size of the loaf)John is going to use the amounts of 30g, 40g, 50g, 60g, and 70g of sugar in his experiment.
>
> **Dependent Variable-** The dependent, or responding variable, is the factor that may change as a result of changes made in the independent variable. In this case, it would be the size of the loaf of bread.

Experiment: Here he must come up with a procedure and list of needed materials.

John now also determines the control group. The **control group** is the group that serves as the standard of comparison.

The control group may be a "no treatment" or an "experimenter selected" group. The control group is exposed to the same conditions as the experimental group, except for the manipulation of the variable being tested. In this case since his grandmother always used 50g. of sugar in her recipe, John is going to use that amount in his control group.

OVER

John also has to have **constants** in the experiment. The constants in an experiment are all the factors that the experimenter attempts to keep the same. Constants are used so that any observed changes in the bread can be attributed to the variation in the amount of sugar.

Examples of constants in this case are Other ingredients to the bread recipe, oven used, rise time, brand of ingredients, cooking time, type of pan used, air temperature and humidity where the bread was rising, oven temperature, age of the yeast…

> Number of **trials** is also critical. When experimenting, we must replicate our experiment multiple times to see if the results are consistent. John will test each measure of sugar variable 3 times.

Collect and Analyze Results: John examines his data and notices that 70g. of sugar produces the largest loaf.

His hypothesis is accepted, but with conditions. (This will cause for further investigation)

Draw Conclusions: John concludes that if he added more sugar the loaf will get larger, but when he went above 70g. the loaf would get smaller. He believes that it must have something to do with the amount of yeast; that will have to wait for a different experiment.

Communicate the Results: John tells his grandmother about his findings and prepares to present his project in Science class.

Now it is your turn….

Here is your task: Come up with a mock experiment just as I described to you (but you cannot use the same example or anything similar. For instance you cannot say "I wonder if the amount of sauce on my pizza affects is crispiness."

So,

1. Come up with a question…**THIS MUST BE TESTABLE!**
2. Determine what **specifically** you would research about
3. Come up with a hypothesis.
4. Develop an experiment:
    a. What materials would you need?
    b. What will be the control group?
    c. What will be the independent variable? (What are you changing in each trial?)
    d. Specifically state the variations of the independent variable (In the experiment above, John used a range of amounts of sugar. The only thing he changed was the amount of sugar, so there is only **ONE variable changing,** and he listed the different amounts used. He could have also changed the type of sweetener to see if there was an affect so perhaps he could use honey, sugar, high fructose corn syrup, etc. My point for mentioning this is to say the independent variable could vary in amounts, type, time, etc…it is up to you and your experiment.
    e. What will be the dependent variable? (What are you looking to see?)
    f. What are the constants?
    g. How many trials will you do? How are you doing it?
5. Come up with results. (Of course you will have to make this up, but try to be as realistic as possible!)