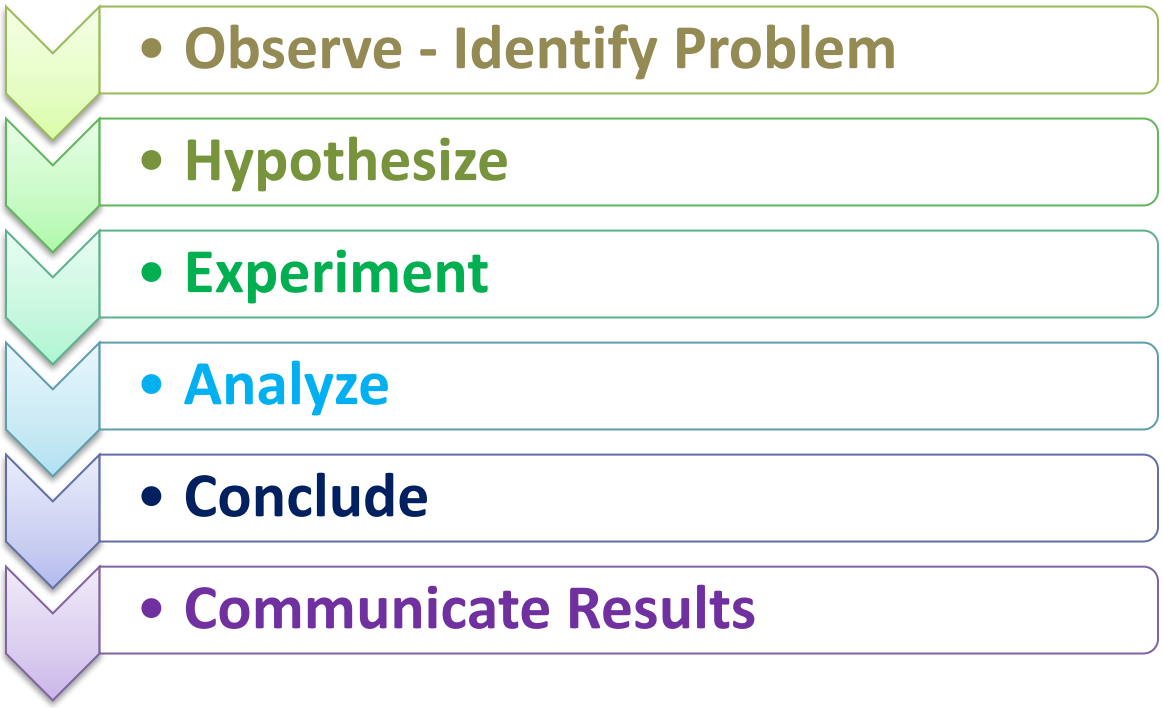
The Scientific Method

Introduction:

Science is all about describing and explaining the world around us. When scientists make an observation it leads to questions. Experiments are set up to answer these questions. These questions have to be testable in order to be considered science. There are many questions that can't be answered using experiments or observations. These types of questions are not scientific questions.

Abridged Overview of the Scientific Method



The Scientific Method is a series of steps that enable researchers to ask a question based off of observations they have made, hypothesize potential answers to that question, and then perform and interpret experiments to determine if their hypotheses were supported or nullified.

Important Terms:

Independent Variable: The variable in an experiment that is being manipulated by the researcher. Example: A tube containing a certain chemical reaction is placed at a variety of different temperatures ranging from 0-100 °C to see what effect the change in temperature may have on the products produced by the reaction. **Independent Variable: Temperature**

Dependent Variable: The variable in an experiment that has the potential to change in response to the experimental conditions altered by the researcher. The dependent variable often times is defined as the variable that changes in response to the independent variable.

Example: A tube containing a certain chemical reaction is placed at a variety of different temperatures ranging from 0-100 °C to see what effect the change in temperature may have on the products produced by the reaction. **Dependent Variable: Products produced by the reaction.**

Hypothesis: A hypothesis is not an educated guess, but instead is a statement based off of previously supported data. A hypothesis must be falsifiable, and therefore must provide a means to test and either support of nullify the hypothesis. Note that one does not "prove" a hypothesis as being true, but instead determines whether or not the hypothesis is supported by the data obtained from experiments. Example: Based on the previously observed data found in the lab manual, I hypothesize that if deionized water reaches a temperature above 100 °C, it will begin to boil. **Notice that the hypothesis is based on previous results, and that it provides the researcher with a means of proving or nullifying it. If the water is placed at or above 100 °C and it boils, it supports the hypothesis, but if it does not boil, then it will nullify this hypothesis.**

Procedure:

Step 1: Label 5 100 ml beakers, 1 through 5. In beaker 1 through 4, fill with 50 ml tap water. Beaker 1 will be the control.

Step 2: Add 1 tbl of salt into beaker 2 and stir with stir rod.

Step 3: To beaker 3 add 2-3 cubes of ice.

Step 4: To beaker 4, heat that beaker up on the hot plate until it reaches 65 °C. Make sure you confirm the temperature with the thermometer.

Step 5: To beaker 5, fill it with 25 ml tap water and 25 ml vinegar using a graduated cylinder; stir it with the stir rod.

Step 6: Now drop an Alka-Seltzer tablet into beaker 1, and track how long it takes to dissolve completely. Record time from the moment you drop the Alka-Seltzer into the beaker until it finishes dissolving. Now repeat this process for the next 4 beakers. (Note: You should only drop one Alka-Seltzer at a time so that you will not lose track of time for each beaker.)

Now record your results on the worksheet table and draw conclusions.

Type of Water/Beaker Number	**Dissolve Time**