Name: _____ Period: _____ Date: _____

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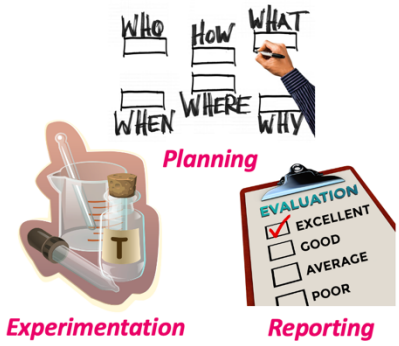

Scientific Investigation

Scientific investigations have _____ distinct phases:

1. Planning
2. Conducting the experiment and _____ collection
3. Reporting or writing up the _____ of the experiment

To develop a well-organized and workable plan, it is necessary to go through several _____ that are well-thought of. This is to ensure that appropriate _____ and information available to help the experimentation and data collection process run as smoothly as possible.

Making Observations

A good scientific investigation plan always starts with making a _____ _____ of one's surroundings. Observation allows scientists to be _____ of their surroundings. This curiosity will lead them to further investigate their observations.

Identifying Problem

The information gathered through observations serve as a basis for identifying a problem to _____ an investigation. This problem serves as the _____ of the investigation and may arise from research that was previously done, or from observations from previous experiments.

Formulating Hypothesis

To provide a _____ answer to a problem, scientists formulate a hypothesis. A **hypothesis** is an _____ guess that aims to answer a given problem. It must be _____ and answer the original question that is asked.

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A good hypothesis is:

- ✓ based on _____,
- ✓ is easy to _____, and
- ✓ a clear _____ relationship.

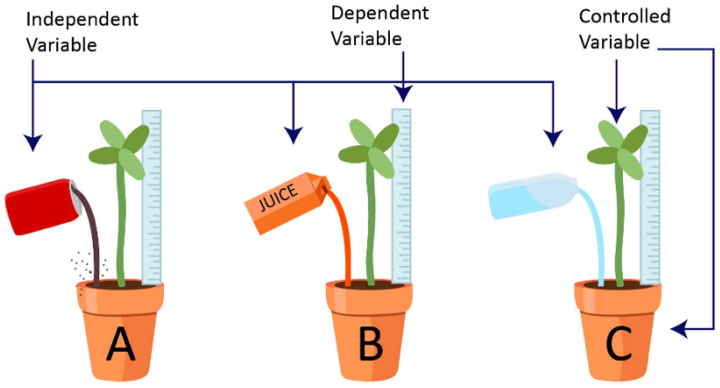
The sentence format *"If… is changed, then … will happen."* is often used to formulate a hypothesis.

Testing the Hypothesis / Experimenting

To find out whether the given tentative answer solves the problem, an _____ is conducted to test the hypothesis. Scientists use an experiment to search for cause and effect. There are many factors that could be changed to test the reaction of another. These changing factors are known as _____.

Identifying and Controlling Variables

A **variable** is any _____, _____, or _____ that can exist in differing amounts or types. An experiment usually has three types of variables namely the **independent**, **dependent**, and **controlled** variables.



- The _____ variable is the one that is changed by the scientist. To ensure a fair test, a good experiment has only _____ independent variable.
  - *In this example, the independent variable is the _____ that is added to the plants.*
- The _____ variable is the one that is changed by the scientist. It is the _____ of the changes that happened to the independent variable.
  - *In this example, the dependent variable is the _____ of the growing plant.*
- The _____ variables are quantities or items that are kept _____ throughout the experiment.

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- *Some controlled variables in this example are the* _____, _____, _____.

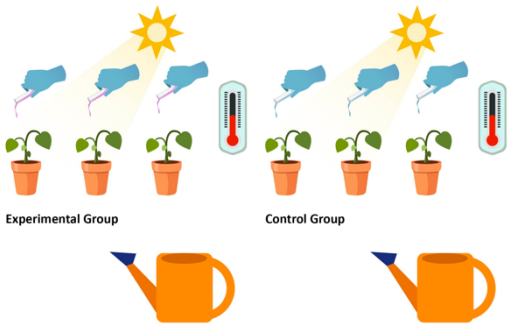
Writing a Method

Once variables are clearly identified and controlled, it is now time to write a _____ or a step-by-step description of how to carry out the experiment. A method should be _____ and have enough details that someone else could follow the steps easily and arrive at the same results as the first experimenter.

A good method includes the following:

- ✓ A _____ that will be used
- ✓ A _____ that shows the experiment set up
- ✓ How and when to change the _____ variable
- ✓ How and when to measure the _____ variable
- ✓ How to _____ any other variables that may impact the results
- ✓ Number of times that the experiment will be _____ to get valid results

Determining Experimental and Control Groups



In scientific experiments, there are experimental and control groups. An _____ group is a set up that is exposed to the conditions of the experiment while a _____ group has conditions that are maintained throughout the experiment. Each experimental group is given _____ treatment of an independent variable.

Experimental groups are observed for _____ to see if the independent variable has any effect on the dependent variable. On the other hand, the control group is given the _____ treatment, so that the results from the experimental groups can be compared.

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Collecting Data and Results

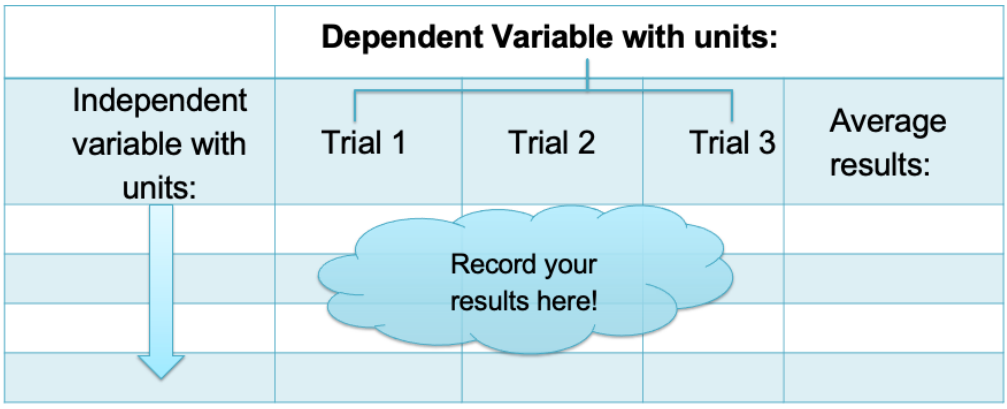
Once the written method has been finalized, conduct the experiment and _____ to use in the final phase of the investigation. The collection of data is crucial in determining whether the hypothesis _____ the problem or not.

Consider the following in carrying out an experiment:

- ✓ _____ – all equipment is in working condition, clean and dry
- ✓ _____ – wear correct safety equipment and follow safety regulations
- ✓ _____ – use correct procedures for heating, measuring, and transferring substances
- ✓ _____ – have an accurate way to record the results

In recording results, both _____ and _____ observations must be recorded and analyzed. Qualitative results can be quickly noted down as _____ while a raw data table, chart, or groups may be used to present the quantitative results which have been obtained through _____.

Here is a sample table that is often used in recording results and observations:



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