**Introduction to Scientific Inquiry: Controlled Experiments and The Scientific Method**

Science is about observing things, asking questions, proposing solutions, and testing those solutions. One way to test solutions in through a controlled experiment.

**Controlled Experiment:** a test in which one variable (something that can change in your experiment) is purposely and steadily changed to see what effect occurs.

*Example Question/Purpose***:** Will plants change the direction they grow in order to face the light?

*Possible Hypothesis:* **If** different plants are placed different directions (angles) from the light, **then** over time they will bend toward the light **because** plants require light to grow.

To test this solution, you can conduct a controlled experiment to determine whether the angle of light shining on the plants effects the direction that the plant grows.

Figure 1-

Corn seedlings

bending toward

the light

**Independent Variable:**

*Example*:

**Dependent Variable**:

*Example:*

What other factors in this experiment would have to be kept the same to make sure it is a “controlled experiment” that is only testing the effect of one variable on the direction of plant growth?

Control group-

Ex. The light source is placed directly above the plant, not at an angle.

*The control group helps to determine if changing the independent variable is really the reason that the plants grew sideways.*

**The Scientific Method**

The Scientific Method is a process that scientists use to find answers to their questions. The steps of this process must be followed whenever you design or conduct an experiment.

1. **Asking a Question (Determining a Problem):**

*Ex.* Why does water freeze? ()

*Ex.* What is the effect of decreasing the temperature on the time it takes for water to freeze? *( )*

1. **Hypothesizing:** Making an ­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_about your question. Suggesting an answer to how one \_\_\_\_\_\_\_\_\_\_\_\_\_\_will affect another. This can be based on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Ex. The lower the surrounding temperature, the faster that water will freeze.

1. **Designing the Experiment**:
* Identifying your\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Deciding on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ you will need to conduct the experiment
* Writing a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that explains how you will conduct the experiment
* Drawing a labelled \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of your procedure and materials
* Creating a \_\_\_\_\_\_\_\_\_\_\_\_\_ to record \_\_\_\_\_\_\_\_\_\_\_\_.
1. **Conducting the Experiment**:
2. **Observing and Recording Data**: Describe and record the results of experiment clearly and accurately.

**Qualitative Data-**

*Ex.* Colour, smell, sound, shininess, state, etc.

**Quantitative Data-**

 *Ex.* Length, mass, height, time, temperature, etc.

1. **Analyze Observations and State Conclusions**:
* Creating \_\_\_\_\_\_\_\_\_\_\_ to study \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_to identify \_\_\_\_\_\_\_\_\_\_\_\_\_and trends
* Deciding whether to support or refute your \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Thinking about how you would \_\_\_\_\_\_\_\_\_\_\_\_ your experiment in the future
* Developing an explanation for your \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Repeating the Process**- Testing the experiment again to make sure your results are reliable.