Name: _____ Period: _____ Date:_____

Scientific Method Guided Notes – Student Edition

Scientific Method

The scientific method is a _____ used to investigate the unknown. It is the general process of scientific _____. This process uses _____ and _____.

Scientists use the scientific method so they can find _____. A common method allows all scientists to answer questions in a _____ way. Scientists who use this method can _____ another scientist's experiment.

Scientific method is a _____ way of solving a scientific problem or a question that can be answered through experimentation. Almost all versions of the scientific method include the following _____, although some scientists do use slight variations.

Make observations → Ask a question → Form a hypothesis → Test the hypothesis → Draw conclusion → Communicate results

Make Observations and Ask a Question

As scientists conduct their research, they make observations and collect data. The observations and data often lead them to _____ something is the way it is. Scientists pursue _____ to these questions in order to continue with their research. Once scientists have a good question to _____, they begin to think of ways to answer it.

Form a Hypothesis

Based on their _____ and observations, scientist will often come up with a hypothesis. A hypothesis is a _____ solution to a problem. It is a statement that describes the _____ between two or more variables. A hypothesis may be based on their own observations, existing _____, and information they gather from other sources.

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A hypothesis is a specific, testable _____ about what is expected to happen in a study. Though hypothesis is a prediction, it involves more than a guess. Most of the time, hypothesis begins with a question which is then explored through a _____. It is only at this point that researchers begin to _____ a testable hypothesis.

There are _____ evaluation criteria that a hypothesis must meet.

First, it must state an expected _____ between variables. A hypothesis often follows a basic format of "_____ {this happens} _____ {this will happen}." One way to structure the hypothesis is to describe what will _____ to the dependent variable if the independent variable is _____. The basic format might be: "If {these changes are made to a certain independent variable}, then we will _____ {a change in a specific dependent variable}."

Second, it must be testable and _____. In the scientific method, falsifiability is an important part of any _____ hypothesis. In order to test a claim scientifically, it must be possible that the claim could be proven false.

Third, it should be _____ with the existing body of knowledge. Finally, it should be stated as _____ and _____ as possible.

In many cases, researchers may find that the results of an experiment _____ support the original hypothesis. When writing up these results, the researchers might suggest other options that should be explored in _____ studies.

Test the Hypothesis

_____ is needed to test the hypothesis. Testing the hypothesis means conducting an _____ to gather data and determine whether the variables identified show relationship or not. Scientists can gather their data by _____ the natural world, _____ an experiment in a laboratory, or by _____ a model.

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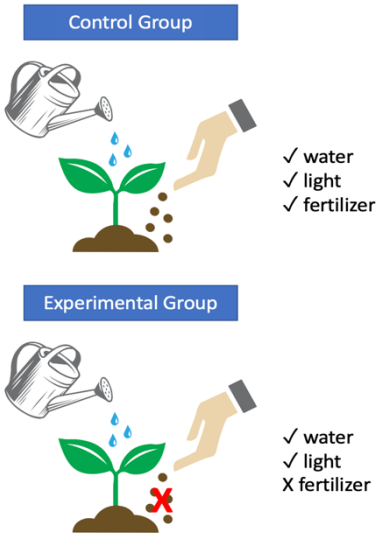
Scientists decide what strategy to use, often _____ strategies. Then they plan a procedure and gather their data. They make sure the procedure can be _____, so that other scientists can evaluate their findings.

Scientists _____ their data in tables, graphs, or diagrams. If possible, they include relevant data from other sources. They look for _____ that show connections between important variables in the hypothesis they are testing.

When possible, scientists test their hypotheses using _____ experiments. It is a scientific test done under controlled conditions, meaning that just _____ factor is changed at a time, while others are kept constant.

> *For example, two identical plants were grown at the same location where light is sufficient, and water is provided to each plant. However, other plant receives fertilizer while the other one does not. After a week, the plant that receives fertilizer grew taller than the plant without fertilizer.*



In controlled experiment, there are two groups and they are _____ except that one receives a treatment while the other does not. The group that receives the treatment in the experiment (with fertilizer) is called the _____ group, while the group that does not receive the treatment (without fertilizer) is called the _____ group. The control group provides a _____ that allows the scientists to see if the treatment has an effect.

Draw a Conclusion and Communicating Results

If a hypothesis and experiment are well _____, the results will indicate whether the hypothesis is true or false. If a hypothesis is _____, scientists will often continue testing the hypothesis in new ways to learn more. Successfully proven hypotheses can lead to either scientific _____ or scientific _____, which are similar in character but are not synonymous terms.

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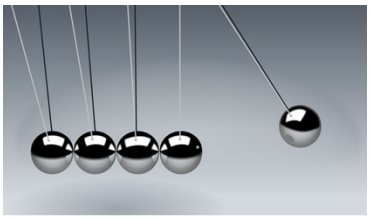
Albert Einstein's theory of relativity claims that massive objects (like the Earth) cause a distortion in space-time, which is experienced as gravity.

A scientific theory is a _____ of the natural world that scientists have proven through _____ testing. As understood within the scientific community, a theory explains _____ nature behaves under specific conditions. Theories tend to be as _____ as their supporting scientific evidence will permit. They seek to serve as a _____ explanation of some aspect of the natural world.



Sir Isaac Newton's 1687 law of gravity describes the attractive forces between all forms of matter.

Like theories, scientific laws describe phenomena that the scientific community has found to be provably true. Generally, laws describe _____ in a given situation as demonstrable by a mathematical equation, whereas theories describe how the phenomenon happens. Scientific laws develop from scientific _____ and rigorously tested hypotheses, and _____generally uphold and expand laws—though neither is ever held to be unimpeachably true.

If a hypothesis is false, the results may be used to come up with and test a _____ hypothesis. A scientist will then _____ the results to the scientific community. This will allow others to _____ the information and _____ the studies. The scientific community can also use the information for related studies. Scientists communicate their results in a number of ways. They may talk to small groups of scientists and give talks at large scientific meetings. They will also write articles for _____. Their findings may also be communicated to journalists.

Importance of Scientific Method

The scientific method attempts to minimize the _____ of bias or prejudice in the experimenter. Even the best-intentioned scientists can't escape bias. It results from _____ beliefs, as well as _____ beliefs, which means any human filters information based on his or her own experience. Unfortunately, this _____ process can cause a scientist to prefer one outcome over another.

Scientific method provides an _____, _____ approach to conducting experiments and, in doing so, improves their results. By using a standardized approach in their investigations, scientists can feel _____ that they will stick to the facts and limit the influence of personal, preconceived notions.

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