

Lessons 1&2 Test Study Guide on Unit 1, “Science, Technology, and Engineering”

The observations, measurements, and other data gathered to evaluate an explanation is called empirical evidence.

In **science**, conclusions must be based on valid logic and have substantial support from valid scientific data. The opposite is true in **pseudoscience**.

To be **unbiased** means to not favor one side or another.

It's important for scientists to be unbiased when investigating theories so that they can examine research results fairly.

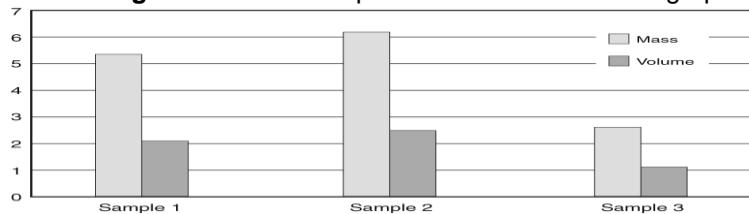
A student is studying plants that grow in different areas and receive different levels of carbon dioxide from their environments. The student finds that in one area, plants have shown tremendous growth, whereas in another area, plants have shown little to no growth. The student hypothesizes that the different levels of carbon dioxide contribute to the differences noticed in the plants. A **controlled experiment** in which the student attempts to control all variables except the carbon dioxide level would best test this hypothesis.

If a student wants to investigate properties of static electricity, the first thing the student should do in the investigation is ask a testable question about static electricity.

There are limits on the things that scientists can study in their work. They can study only phenomena that they can observe or model.

Imagine that the label on a sunscreen product reads, “Recommended by nine out of ten doctors.” No other information regarding this claim is provided. A scientist would tell a consumer to be wary of this statistical claim because the supporting scientific data are missing

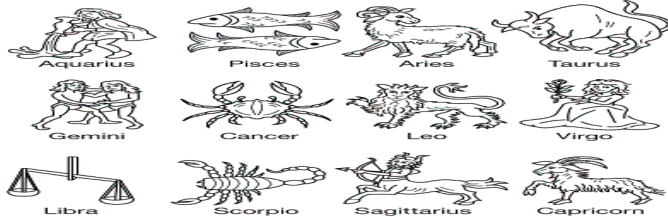
A scientist graphs the mass and volume of three samples, as shown in the graph below. Scientists often rely on their own personal trait of **logic** to devise an explanation for data like this graph above shows.



Experimental data obtained by using technology to get objective measurements is a good support for an explanation. The chart above shows some experimental data.

Empirical evidence is the term for the cumulative body of observations on which scientific explanations are based. The chart above shows some possible empirical evidence.

Below is a drawing of the astrological zodiac signs just to remind you what astrology is. Do not memorize.



Astrology is an example of **pseudoscience**. Astrologists use horoscopes that are based upon the positions of planets and stars to make predictions about a person's life. Science is different from pseudoscience. Pseudoscientific conclusions are not supported by data gathered using scientific methods, while science conclusions are.

Astrology (above) is an example of a pseudoscience because it is not based on empirical evidence, it is based on human opinion about the movement of the stars.

Astronomy, however, is a **science** because it is based on empirical evidence.

An article titled, "How Aliens Built the Pyramids, should be classified as pseudoscience because no evidence supports aliens building the pyramids.

An article titled, "Is Life Possible on Mars," should be classified as science because it is a reasonable question that can be answered through scientific investigation.

Two students want to investigate how different substances can exist as solids, liquids, or gases.

They each develop a similar question that they intend to answer.

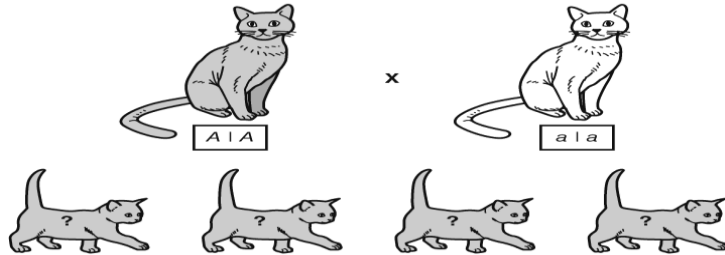
Their experiments include different steps, which leads to the students having slightly different results.

Even though the investigations have different steps; it is still possible for each student to have valid results.

According to Gregor Mendel's laws of genetic inheritance, when two parents have different genes for a trait, one form of the trait will be dominant and the other recessive.

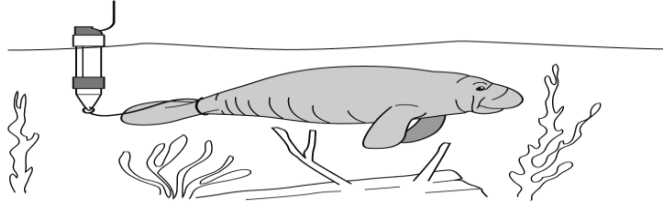
The dominant form normally appears in the offspring.

In this illustration, one cat parent has genes for gray fur and the other has genes for white fur. Gray fur is dominant. The gene for gray fur is A. The gene for white fur is a.



The kittens would have to be **gray** in order to provide evidence supporting Mendel's laws.

The figure below shows a manatee wearing a radio tracking device that biologists use to track its migration pattern.



This method of evidence collection is a good way to study the manatee migration pattern because it allows the manatee to travel freely.

The purpose of repeated trials in an investigation is to **verify** the results of the experiment

Part of cell theory says that all living things are made up of one or more cells.

Scientists had to find ways to test this theory.

Examining plant or animal tissue with a **microscope** is one way scientists could use to test this part of cell theory.

Objectivity is important to scientific investigations because it means that the opinions of the scientist do not affect the results.

Jordan is researching a recent, controversial scientific issue. A scientific journal with peer-reviewed articles is a reliable source for Jordan to use for **unbiased** scientific information.

ESSAY TOPIC:

A student wants to investigate the chemical changes that a piece of wood undergoes when it is burned. She believes wood that burns for 15 minutes will weigh less than unburned wood. Design a laboratory experiment that would allow the student to test her predictions, using appropriate equipment and technology. Be sure to consider safety requirements in your answer.

(Example Response)

Weigh the wood before burning. Burn the wood in a fireproof container for 15 minutes. Observe any changes to the wood while it burns. Put out the fire after 15 minutes by covering the fire to remove the oxygen supply. When the fire is out, weigh the remaining wood and ash. Record the results.