

Hypotheses, Theories and Scientific Laws

Guided Notes – Student Edition

Science is a way of making sense of the _____ around us. The theories and principles found in science as a discipline have been established through repeated and careful _____ and _____. Scientific research is peer-reviewed by other specialists in the field to ensure that the findings are accurate and that the experiments used, and the findings are consistent and fair.

Scientific ideas can progress from a _____, to a _____ using testable, scientific laws. Only a few scientific facts are considered scientific _____ and many hypotheses are tested to generate a _____.

Hypothesis

A hypothesis (plural hypotheses) is an idea or _____ that can be tested through observation or experimentation. In some occasions, a hypothesis may take the form of a question called an _____. Hypotheses are often made after _____ background research or an _____ has been conducted. Its purpose is to provide _____ into further scientific research.

Once a hypothesis has been made, it must be tested by conducting a carefully designed and _____ experiment to prove it _____ or _____. The experiment must meet certain criteria so that the results are valid and _____.

Valid and reliable results come from experiments that:

- Change only **one** variable at a time.
- Control **all** other variables in the experiment.
- Use measuring instruments that give **accurate** results.
- Have **repeated** trials/tests to show consistent results.

Theories

A _____ describes how or why something occurs. Scientists are always making new discoveries and so scientific theories evolve overtime. Scientific theories have the following features:

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A theory is:

- Consistent and compatible with the current scientific **evidence** available
- Tested against a **wide** range of phenomena
- Demonstrates **effective** problem-solving

In science a hypothesis or an idea is not considered a theory until it has been tested thoroughly and _____ by many scientists. Scientific theories are more _____ than hypotheses but less certain than scientific laws. Scientific theories are often made up of many _____ which add together to provide detailed information on a topic. In many cases, these theories have been contributed to by many _____, often over several years.

For example:

Gregor Mendel's work on inheritance in the 1860's formed the theories on how traits are inherited between generations. However, he was unaware of the concept of DNA and the fact that this molecule carried the instructions for every trait in an organism. This was discovered almost a century after Mendel.

Some of the more well-known theories that have contributed to modern biology and that are covered in this course are shown in the table below:

Theory	Description
	All living organisms are composed of one or more cells.
Theory of Evolution	All organisms arise and develop through the _____ of small but inherited variations which increases the chance of an organism's survival.
Gene Theory	That genes are the basic _____ in which features are passed from one generation to the next.
Homeostasis	Living organisms maintain a dynamic range of _____ within which they can function.

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Scientific Laws

Theories which have been thoroughly tested and are accepted by the scientific community often become scientific laws. There are few laws compared to _____. _____ are often expressed as _____ statement and are brief but are concise.

Laws have the following features:

- They are universally accepted to be true.
- Laws predict the results under certain conditions.
- They do not provide explanations of how or why something occurs.

Below are examples of laws that will be covered in this course:

Law	Description
Law of independent assortment	The genes controlling different _____ are distributed separately from each other during _____.
Law of segregation	That the alleles which control a trait are separated during the creation of _____ (meiosis)
Liebig's Law of the minimum	Whichever nutrient is scarcest will limit the _____ of the organism.