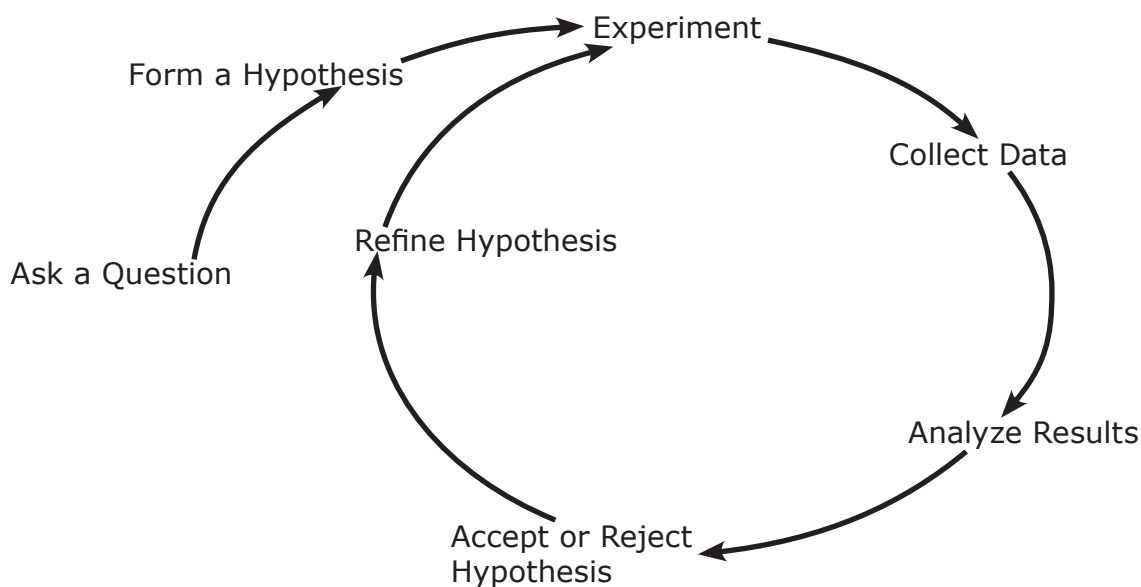


Sample Lesson #1

Theory and Scientific Law

Scientists **replicate** (repeat) experiments many times in order to verify the results. Once they make sure that the experiments yield the same results over and over again, scientists develop a model called a **theory** that summarizes their conclusions. In order for a hypothesis to become a theory, the data from experiments must be confirmed time after time. That's why it usually takes many scientists and many years for a hypothesis to become a theory. Scientists can never prove any theory for certain. The nature of science is based on the open idea that further exploration with new and different outcomes is always possible.

When the outcomes of a replicated experiment are repeatedly confirmed, scientists may believe that they have discovered a **scientific law**. Although both a theory and a law require repeated study with the same outcome each time, there is a significant difference between the two. A **theory** is a conceptual model. It explains what we believe is the reason something occurs. A **scientific law** is not a model. It does not attempt to *explain* anything. It simply states an accepted fact. The Law of Conservation of Energy is an example of this. Remember that the Law of Conservation of Energy states that energy is neither created nor destroyed. The law does not attempt to *explain why* this is so.



- Which is more certain, a hypothesis, a theory, or a law? _____
- The scientist **tests** a prediction using a(n) _____.
- Nitrogen fixation is performed _____.
 mostly by bacteria only by plants only by animals

4. _____ are the factors that vary or change in an experiment.
5. Oceans are considered the largest _____ in the water cycle.
freshwater system process reservoir product
6. Name one biome consistently found near the equator.
tundra coniferous forest rainforest

Lauren designed an experiment to find out how to make tomato plants grow faster. She bought two different kinds of plants, bags of soil, and some fertilizer. Lauren put the tomato plants in identical containers and fed each plant with a mixture of fertilizer and water every other day. She placed the pots side-by-side on a sunny porch. Lauren observed the growth of the plants and recorded her observations in the chart below.

Plant Type	Soil Type	Amount of Water	Amount of Fertilizer	Height Week 2	Height Week 5
Cherry Tomato	loam and sand mix	200 ml	10 grams	15 cm	27 cm
Plum Tomato	regular potting soil	150 ml	5 grams	15 cm	19 cm

7. What is a major flaw in the design of this experiment?
- A) Nothing is held constant. C) There was not enough time for plants to grow.
B) Too many variables are involved.
8. What is one thing that would improve the design of the experiment?
- A) Use only one type of tomato plant. C) Use more varieties of plants.
B) Place the plants in a greenhouse.
9. What is one **other** thing that would improve the design of the experiment?
- A) Do not use the metric system for measuring.
B) Use only one type of soil.
C) Water plants more frequently.
10. What can Lauren conclude from the results of the experiment?
- A) Cherry tomato plants grow faster in a loam / sand mixture.
B) Plum tomato plants need more than 150 ml of water every other day.
C) There are no valid conclusions from this study.