

# About Science

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## Summary of Terms

- **Biology** The study of life and living organisms.
- **Fact** A phenomenon about which competent observers can agree.
- **Hypothesis** An educated guess or a reasonable explanation. When the hypothesis can be tested and is falsifiable, it qualifies as a *scientific hypothesis*.
- **Law** A general hypothesis or statement about the relationship of natural quantities that has been tested over and over again and has not been contradicted; also known as a *principle*.
- **Principle of falsifiability** For a hypothesis to be considered scientific, it must be testable or “falsifiable”—it must, in principle, be capable of being proven wrong.
- **Science** The collective findings about nature, and the process of gathering and organizing knowledge about nature.
- **Scientific method** An orderly method for gaining and organizing new knowledge about nature.
- **Technology** The means of solving practical problems by applying the findings of science.
- **Theory** A synthesis of a large body of information that encompasses well-tested hypotheses about certain aspects of the natural world with great explanatory powers.

## Detailed Chapter Summary

Biology is the study of life and living organisms. Living organisms share many key characteristics. For example, they use energy, develop and grow, maintain themselves, and have the capacity to reproduce. Living things are also a part of populations that evolve -- that is, populations that change over time, often in response to their environments.

The classic scientific method describes how much scientific research is conducted, including in biology. The key steps in the scientific method are:

1. Observe: Closely observe the physical world around you.



2. Question: Recognize a question or a problem.
3. Hypothesize: Make an educated guess—a *hypothesis*—to answer the question.
4. Predict: Predict consequences that can be observed if the hypothesis is correct. The consequences should be *absent* if the hypothesis is not correct.
5. Test predictions: Do experiments to see if the consequences you predicted are present.
6. Draw a conclusion: Formulate the simplest general rule that organizes the hypothesis, predicted effects, and experimental findings.

To be valid, a scientific hypothesis must be *falsifiable*—that is, it must be able to be proven wrong. Scientists conduct carefully designed experiments to test their hypotheses.

The application of scientific knowledge for practical purposes is known as *technology*. New technologies often arise from scientific discoveries. In biology, scientific discoveries have led to technological advances in genetics and medicine, among other areas. Technology is a double-edged sword that can be both helpful and harmful. It is society's responsibility to make sure that technology is used in helpful, rather than harmful, ways.

In science, a *fact* is something that competent observers can observe and agree to be true. A *scientific law* or *principle* is a hypothesis that has been tested over and over again and that has not been contradicted. A *scientific theory* is a synthesis of facts and well-tested hypotheses. The value of a scientific theory is in its ability to explain a wide range of observations. Scientific theories are not fixed, but evolve and change over time as they are refined in light of new evidence.

Numbers are important in many scientific observations and experiments. In *scientific notation*, numbers are expressed using digits, with a decimal point after the first digit, multiplied by a power of 10. For measurements, scientists generally use the units of the *metric system*.

