

Objectives

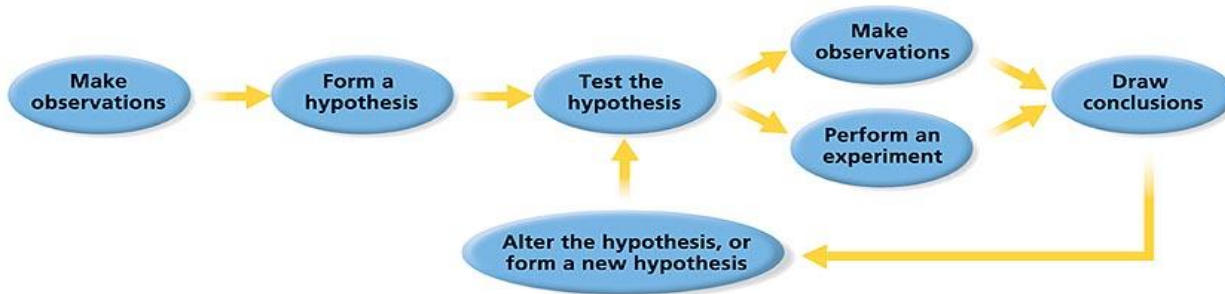
- Explain how science is different from other forms of human endeavor.
- Identify the steps that make up scientific methods.
- Analyze how scientific thought changes as new information is collected.
- Explain how science affects society.

Behavior of Natural Systems

- The goal of science is to explain natural _____.
- Scientists ask questions about natural events and then work to answer those questions through experiments and _____.
- Scientists start with the assumption that _____ is understandable.
- Scientists also expect that similar _____ in a similar situation will cause similar _____.
- Scientists also expect that nature is _____, which means that the future behavior of natural forces can be anticipated.

Scientific Methods

- Over time, the scientific community has developed organized and _____ approaches to scientific research. These approaches are known as *scientific methods*.
- Scientific methods are not a set of sequential steps that scientists always follow. Rather these methods are _____ to scientific problem solving.
- The diagram below shows a basic flowchart of scientific methods.



Ask a Question

- _____ - the process of obtaining information by using the senses; the information obtained by using the senses
- Scientific investigations often start with observations.
- Observations commonly lead to _____.
- Simple questions have fueled years of scientific _____ and have been investigated through scientific methods.

Form a Hypothesis

- **Hypothesis** - an idea or explanation that is based on observation and that can be _____
- Once a question has been asked and basic information has been gathered, a scientist may propose a _____ answer, which is also known as a hypothesis.
- Most hypotheses are based on known facts about _____ events.

Test the Hypothesis

- After a hypothesis is proposed, it is commonly tested by performing _____. An experiment is a procedure that is carried out according to certain guidelines.
- _____ **variable** in an experiment, the factor that is deliberately manipulated
- _____ **variable** in an experiment, the factor that changes as a result of one or more other factors (the independent variables)

Draw Conclusions

- After many experiments and observations, a scientist may reach _____ about his or her hypothesis.
- If the hypothesis fits the known facts, it may be accepted as true.
- If the experimental results differ from what was expected, the hypothesis is changed or _____.
- The results of scientific inquiry may lead to new knowledge and new _____ of inquiry that further scientific aims.

Scientific Measurements and Analysis

- Measurement is the comparison of some aspect of an object or event with a _____ unit.
- Scientists around the world can compare and analyze each other's measurements because scientists use a common system of measurements called the _____ of _____, or SI.

Accuracy and Precision

- *Accuracy* refers to how close a measurement is to the true _____ of the thing being measured.
- *Precision* is the _____ of the measurement.

Error

- Error is an expression of the amount of imprecision or _____ in a set of measurements.
- Error is commonly expressed as _____ error or as a confidence interval.

Observations and Models

- In Earth science, using controlled experiments to test hypotheses is often _____.
- When experiments are impossible, scientists make additional _____ to gather evidence.
- The hypothesis is then _____ by examining how well the hypothesis fits or explains all of the known evidence.
- Scientists also use models to _____ conditions in the natural world.
- A model is a _____, representation, or imitation of an object, _____, process, or _____.
- Scientists use several types of models, including _____ models, _____ models, _____ models, _____ models, and _____ models.

Acceptance of Scientific Ideas

- Scientific understanding moves forward through the work of many scientists, who build on the _____ of the generations of scientists before them.
- When scientists reach a _____, they introduce their findings to the scientific _____.

Publication of Results and Conclusions

- Scientists commonly present the results of their work in scientific _____ or at professional meetings.
- Results published in journals are usually written in a standard _____ format.

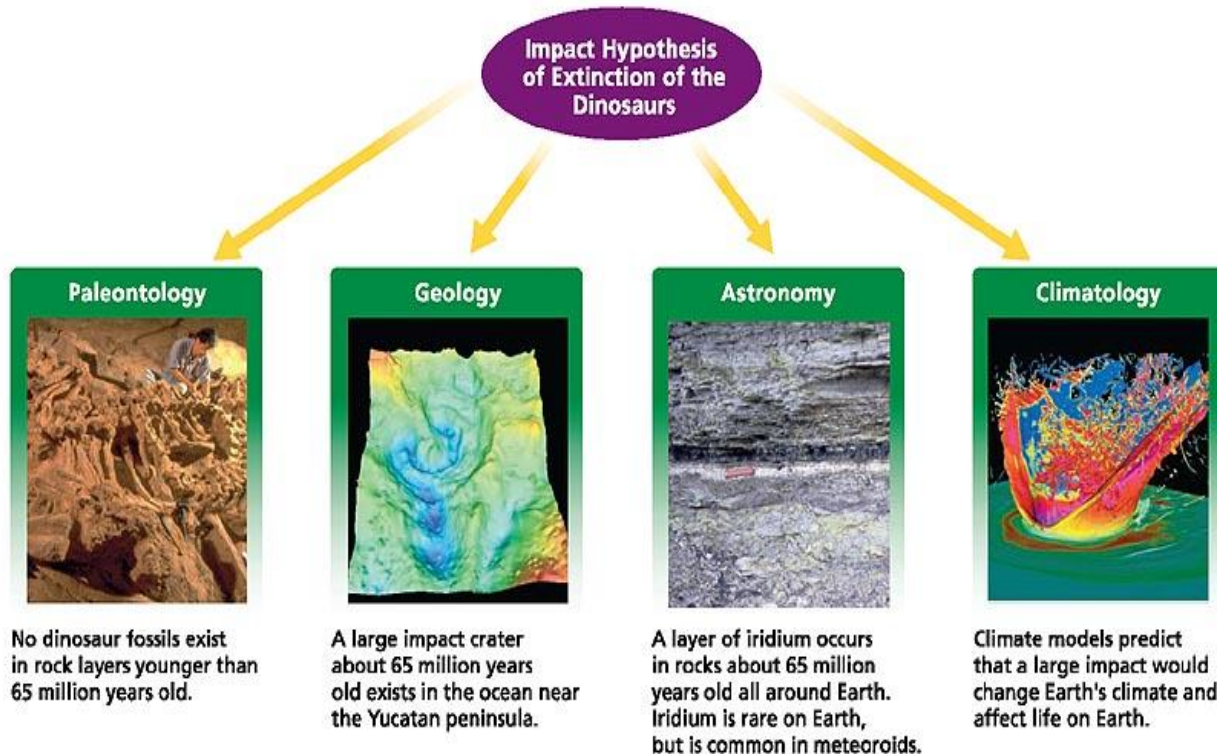
Peer Review

- Scientists follow an _____ code that states that only _____ experimental results should be published.
- To reduce _____, scientists submit their ideas to other scientists for peer review.
- **peer review** the process in which experts in a given field _____ the results and conclusions of a scientist's study before that study is accepted for publication

Formulating a Theory

- When an idea has undergone much testing and reaches general _____, that idea may help form a theory.
- **theory** the explanation for some phenomenon that is based on observation, experimentation, and reasoning; that is supported by a large quantity of _____; and that does not conflict with any existing experimental results or observations
- A scientific _____ is a general statement that describes how the natural world behaves under certain conditions and for which no _____ have been found.
- Theories and scientific laws can be changed if _____ information is discovered in the future.

The diagram below shows how interdisciplinary science helped develop the impact hypothesis of the extinction of the dinosaurs.



Science and Society

- The work of people, including scientists, is influenced by their _____ and personal beliefs.
- Science is a part of _____, and advances in science can have important and long-lasting effects on both science and society.
- Science is also used to develop new _____, including new tools, machines, materials, and processes.
- Sometimes technologies are designed to address a specific _____ need.
- In other cases, technology is an indirect result of _____ that was directed at another goal.