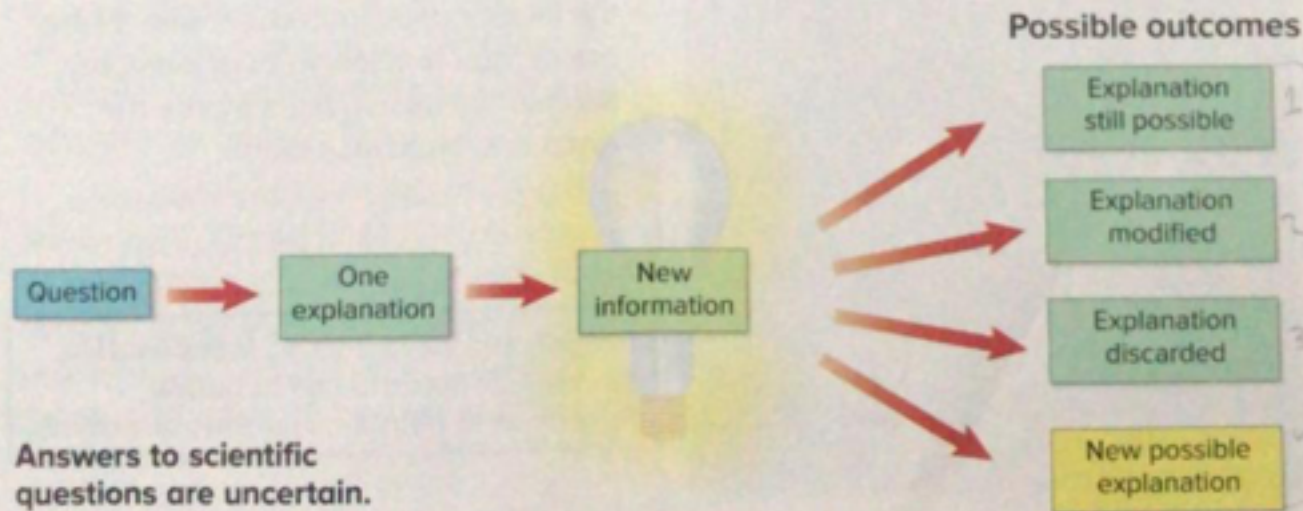


If learning about your world begins with asking questions and making observations, can science provide answers to these questions? Science can answer a question only with the information available at the time.

Sometimes, the answers to scientific questions are inferred. An **inference** is a conclusion formed from available information or evidence. You might infer, based on the information you gather, that days are shorter in winter because of the tilt of Earth's axis.

Any answer to a scientific question is uncertain because people will never know everything about the world around them. With new knowledge, they might realize that some of the old explanations no longer fit the new information. The figure below shows how scientists modify their explanations as new information becomes available. Some observations might force scientists to think of new explanations. Science can only provide possible explanations.

Modifying Explanations



Answers to scientific questions are uncertain.

Quick Check

1. Explain the difference between an observation and an inference.

An observation is using your senses and An inference is a conclusion formed from available.

Read a Diagram

What do scientists do when new information is discovered about an existing explanation?

Clue: Look at the boxes.

Explanation still possible
 Explanation modified
 Explanation discarded
 New possible explanation

Controlled Experiment



This student is adding different types of gas to each of the experimental test tubes. He will not add any gas to the control test tube.

Read a Photo

What is the independent variable in this experiment?

Clue: Which factor was changed?

The variable that is changed in a controlled experiment is called the independent variable.

Variables

A controlled experiment allows scientists to determine a cause-and-effect relationship among the factors that are changed in the experiment. These factors are called *variables*. The variable that is changed in a controlled experiment is called the **independent variable** or manipulated variable. The variable that is being measured is called the **dependent variable**. The dependent variable might change as a result of the change in the independent variable. Scientists try to keep all other variables constant—or unchanged.

A controlled experiment must have two groups—a control group and an experimental group. The independent variable is changed in the experimental group and unchanged in the control group. Both groups include the same factors under the same conditions.

Look at the student's experiment in the above photo. He is performing a controlled experiment. He collected different types of gas in a balloon. He is adding the gases to separate test tubes to see if the pH of the cabbage juice in the test tubes changes. He will not add any gas to the control test tube. A control group allows scientists to determine whether changes observed during an experiment are a result of the changes in the dependent variable or changes in some other variable.

✓ Quick Check

2. Which is the independent variable in an experiment investigating the effect of weight on the speed of vehicles?

Dependent variable.

Scientific Theories

After a scientific explanation has been accepted by the scientific community, a scientific theory is formed. A **scientific theory** is an attempt to explain a pattern observed repeatedly in the natural world. Theories are not guesses or someone's opinions, nor are theories vague ideas.

Theories in science are supported by observations and results from many investigations. Theories are the best explanations that have been found so far. However, theories may change as new information becomes available. Albert Einstein discovered the theory of relativity. This theory has held true for many years. A large amount of evidence supports it.

Scientific Laws

A rule that describes a pattern in nature is called a **scientific law**. For an observation to be a scientific law, it must be observed repeatedly. Then, the law stands until someone makes observations that do not follow the law. A law, unlike a theory, does not attempt to explain why something happens. It simply describes a pattern. Sir Newton's laws of motion describe how objects move.

✓ Quick Check

3. All objects exert gravitational force. Is this a scientific theory or a scientific law? Explain.

Scientific law

A law, unlike a theory does not attempt to explain why something happens.



NEWTON'S FIRST LAW

An object at rest tends to stay at rest, and an object in constant motion tends to stay in motion, unless acted upon by an unbalanced force.

NEWTON'S SECOND LAW

The unbalanced force on an object is equal to the mass of the object multiplied by its acceleration: $F = m \times a$.

NEWTON'S THIRD LAW

All forces occur in pairs, and these two forces are equal in strength and opposite in direction.

Each of Sir Newton's laws describe the motion of an object.

Branches of Science



life science

Life, Earth, and physical scientists each study different parts of the natural world.



Earth science



physical science

What are the branches of science?

Science is often divided into three branches—life sciences, Earth sciences, and physical sciences. Each branch asks different types of questions and focuses research efforts on different topics.

6. The study of living things is called life science. Life scientists study plants, animals, where they live, and how they interact.

The study of Earth and space is called Earth science. Earth scientists study rocks, soils, oceans, black holes, clouds, rivers, planets, or the atmosphere. Earth science also includes the study of weather and the climate systems that affect Earth.

Physical science is the study of matter and energy. Matter is anything that takes up space and has mass. The ability to cause change in matter is energy. Living and nonliving things, such as plants, animals, rocks, and the atmosphere, studied by life and Earth scientists are made of matter. Physical science is divided into two fields—chemistry and physics. Chemistry is the study of matter and its interactions. Physics is the study of energy and its ability to change matter.

✓ Quick Check

5. Which branch of science might study how diseases spread in a population?

Life sciences The study of living things

Visual Summary

Complete the lesson summary in your own words.



Science is the study of everything around you from cells, animals, plants and etc.



Scientific Investigations are tests and experiments that are done to help understand



Technology

Technology is the practical use of science or applied science

Think, Talk, and Write

- 1 **Vocabulary** The application of science is _____
- 2 **Classify** Explain the difference between an independent variable and a dependent variable.

Science is the study of the world such as animals, humans, plants and other things.	Independent variable Dependent variable The that
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- 3 **Critical Thinking** Give an example of how you use technology every day. What scientific concepts needed to be understood to develop this technology?

I use smart phone and whatsapp every day
The concept of sending messages fastly.

- 4 **Test Prep** Scientific theories are
- A guesses why something happens.
 - B supported by observations and results from many investigations.
 - C scientists' opinions.
 - D rules that describe patterns in nature.
- 5 **Test Prep** The variable that is changed in a controlled experiment is called the
- A independent variable.
 - B dependent variable.
 - C control variable.
 - D experimental variable.

Essential Question What do scientists do?

The scientists make experiments observe things and find out new inventions.

Vocabulary

Fill in each blank with the best term from the list.

consistency	mean
data	metric balance
dependent variable	scientific method
hypothesis	spring scale
independent variable	technology

1. The variable that is measured during an investigation is called the dependent variable.
2. A series of steps that scientists use when conducting a scientific investigation is called the scientific method.
3. Information gathered during a scientific investigation is called data.
4. Scientists use consistency to be sure that tasks and procedures can be repeated with minimal variation.
5. An object's mass is measured with a metric balance.
6. The mean of a set of numbers is the sum of the numbers divided by the number of entries in the data set.
7. The use of science to meet human wants and needs is called technology.
8. The independent variable in a controlled experiment is the variable that is changed. u/c
9. A hypothesis in an investigation is a prediction that can be tested.
10. A spring scale is used to measure weight.

Types of Reproduction	Number of Parents	Sex Cells	Offspring	Mixing of Traits
Asexual reproduction	1	not needed	identical to parent	no
Sexual reproduction	2	needed	different from parent	yes

Asexual Reproduction

Asexual reproduction is the production of a new organism from a single parent. It produces a new offspring that has the same genetic information as the parent. No male and female sex cells combine during asexual reproduction. Since there is only one parent in asexual reproduction, genetic information is not mixed. The offspring are identical to the original parent.

You can find organisms that reproduce asexually in all six kingdoms. All members of the bacteria kingdoms and most unicellular protists reproduce asexually. Most fungi and many plants can reproduce asexually during a part of their lives and sexually during another.

Animals, such as jellyfish, corals, worms, and some echinoderms, can form new offspring asexually. Some kinds of lizards, frogs, fish, and insects can also reproduce asexually.

FACT Multicellular organisms can reproduce asexually.



Spider plants reproduce asexually. Each tiny plant is a new offspring.

Quick Check

1. What is the first step of sexual reproduction?

A sperm cell from a male goes towards the egg cell in a female.

2. Asexual reproduction produces an exact copy of the parent organism. When could this be a disadvantage?

Asexual reproduction doesn't provide a variety in a different species.

Everything is the same.