Section 1: The Nature of Science

Preview

Key Ideas

- How do scientists explore the world?
- How are the many types of science organized?
- What are scientific theories, and how are they different from scientific laws?

Bellringer

Even before you started this course, you probably knew a lot about science and the ways it plays a part our lives every day. To help you tap this knowledge, answer the questions below.

1. The term *science* encompasses many areas of study.
   Name four branches of science and briefly describe the topics that each branch studies.
2. Computer technology has changed the way many tasks are completed today.
   Name three other technological advances that have occurred since 1900 that have changed our lives significantly.
3. Scientific laws such as the law of gravity govern our daily lives.
   Name two such laws of science.

How Science Takes Place

- How do scientists explore the world?

- A scientist may perform experiments to find a new aspect of the natural world, to explain a known phenomenon, to check the results of other experiments, or to test the predictions of current theories.

How Science Take Place, *continued*

- Scientists investigate.
- Scientists plan experiments.
- Scientists observe.
- Scientists always test the results.

The Branches of Science

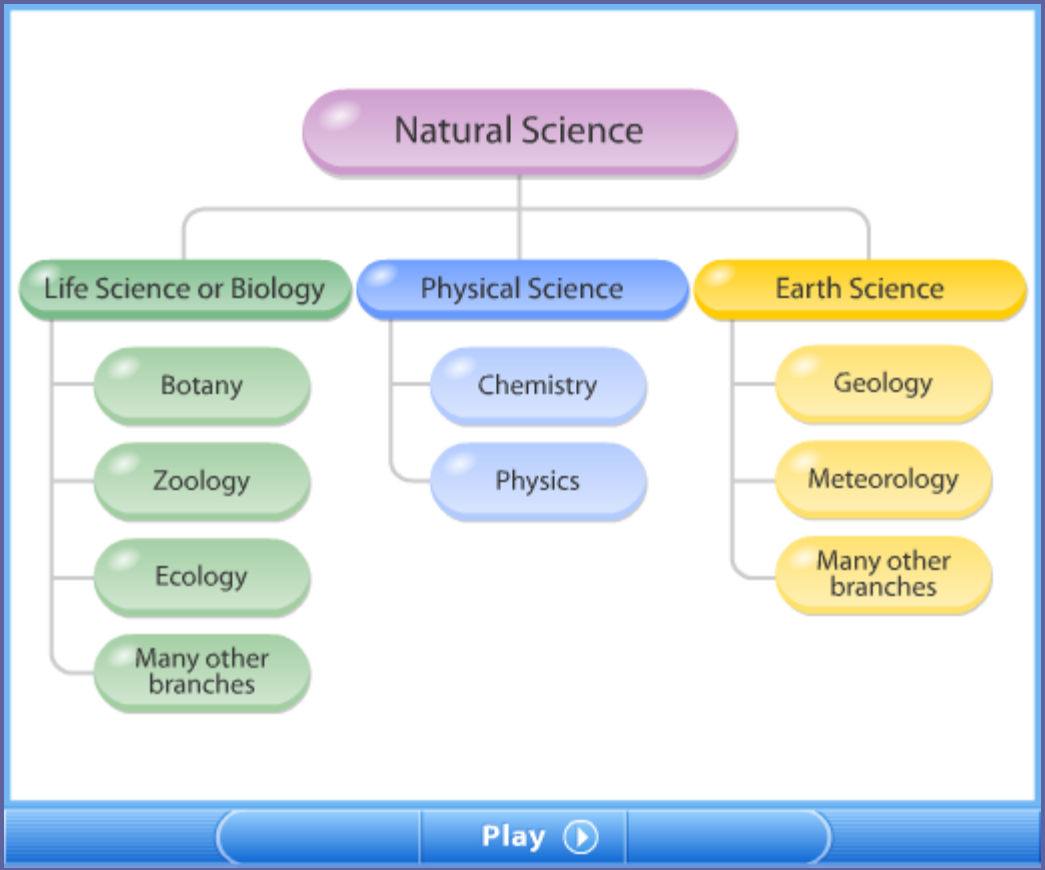
- How are the many types of science organized?
- Most of the time, natural science is divided into biological science, physical science and Earth science.

- **science:** the knowledge obtained by observing natural events and conditions in order to discover facts and formulate laws or principles that can be verified or tested

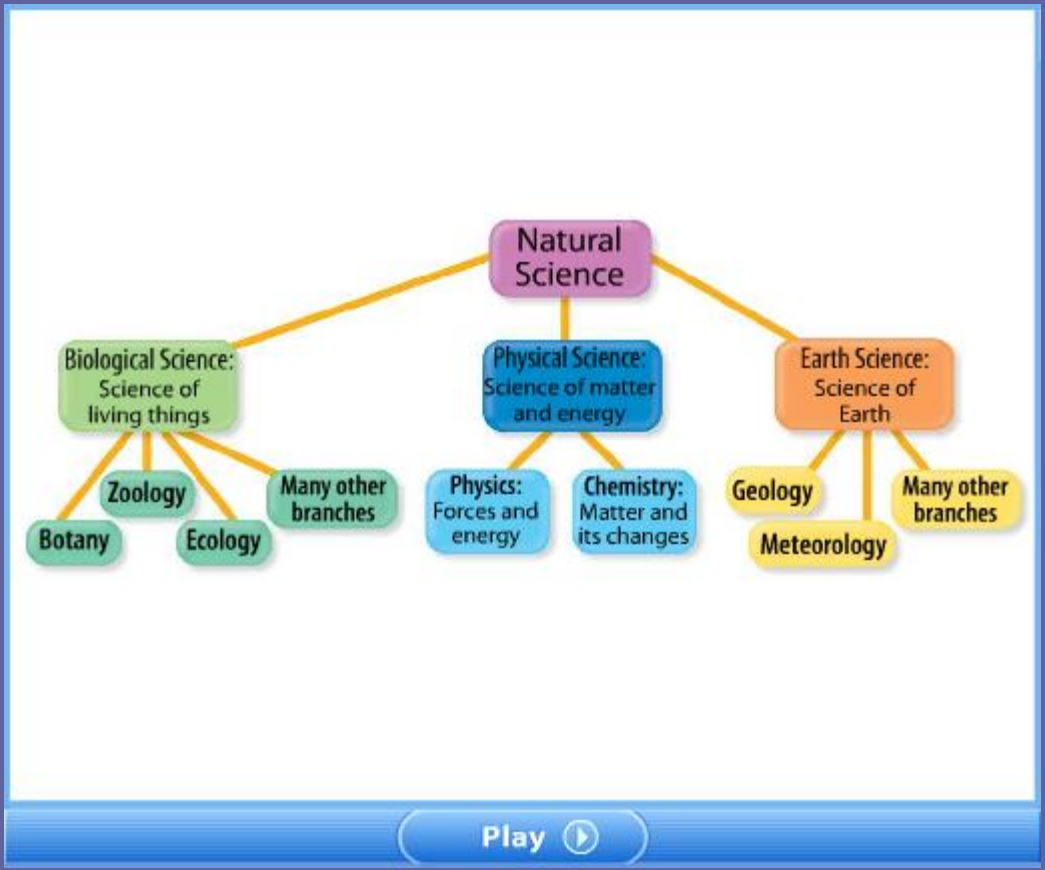
The Branches of Science, *continued*

- The branches of science work together.
  - *biological science:* the science of living things
    - botany, ecology
  - *physical science:* the science of matter and energy
    - *chemistry:* the science of matter and its changes
    - *physics:* the science of forces and energy
  - *earth science:* the science of the Earth, the atmosphere, and weather
    - geology, meteorology

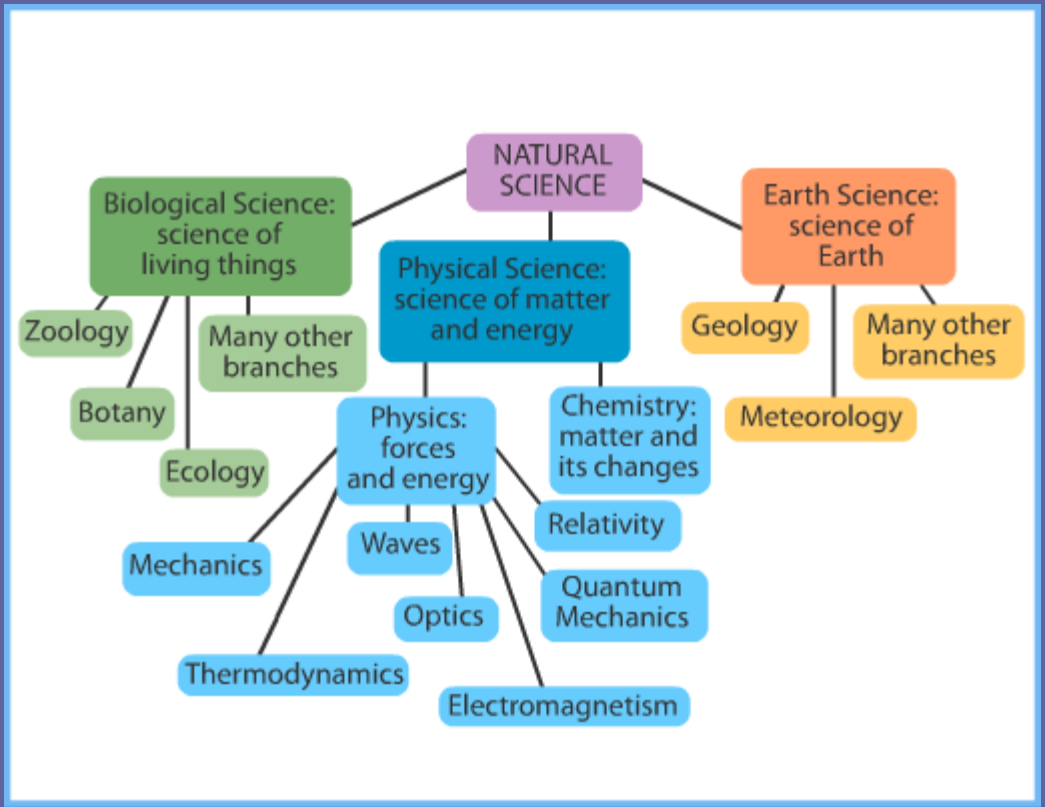
Visual Concept: Natural Science



Visual Concept: Biology



Visual Concept: Physics



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Visual Concept: Earth Sciences

Click a thumbnail image to learn more.

The Branches of Science, *continued*

- Science and technology work together.
  - *pure science:* the continuing search for scientific knowledge
  - Advances in science and technology depend on each other.
- **technology:** the application of science for practical purposes

Scientific Laws and Theories

- What are scientific theories, and how are they different from scientific laws?
- Theories explain why something happens, laws explain how something works.

- **law:** a descriptive statement or equation that reliably predicts events under certain conditions
- **theory:** a system of ideas that explains many related observations and is supported by a large body of evidence acquired through scientific investigation

Scientific Laws and Theories, *continued*

- Experimental results support laws and theories.
  - Scientific theories are always being questioned and examined. To be valid, a theory must:
    - explain observations
    - be repeatable
    - be predictable

Visual Concept: Comparing Theories and Laws

Scientific Laws and Theories, *continued*

- Mathematics can describe physical events.
  - *qualitative statement:* describes something with words
  - *quantitative statement:* describes something with mathematical equations

Scientific Laws and Theories, *continued*

- Theories and laws are always being tested.
- Models can represent physical events.
  - *model:* a representation of an object or event that can be studied to understand the real object or event
  - Scientists use conceptual, physical, and computer models to study objects and events.
- We use models in our everyday lives.

Visual Concept: Models

Visual Concept: Physical, Mathematical, and Conceptual Models

Physical Model: Airplane Model

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