Warm-Up | Development of Scientific Knowledge

Lesson Objectives

By the end of this lesson, you should be able to:

- Examine how scientific knowledge has the ability to change based on new investigations.
- Demonstrate how scientific knowledge is used to answer questions and solve problems.
- Analyze the role scientific knowledge plays in society, technology, and potential career opportunities.

Science Practice: Assess the universal process of developing scientific knowledge.

Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

hypothesis	a testable explanation of a scientific problem that is based on research and observation

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Lesson Question How do scientific practices and values promote the development of scientific knowledge?

Early Scientific Knowledge Based on Observation

Early scientists based hypotheses on observations, but did not test their ideas.

Experimentation led to changes in scientific knowledge.

One experiment leads to another.

Scientific Discovery Limited by Available Technology

Technology extends a scientist's senses.

Scientific discoveries are affected by available technology.

Discoveries lead to new technologies.

Repetition Improves Validity of Data

REAL-WORLD CONNECTION

There are ways to increase the validity of data.

- Make multiple observations.
- Repeat trials.
- Repeat experiments.
- Measure data in SI units.

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The Scientific Method

The scientific method involves developing and testing a hypothesis.

- A hypothesis is a possible explanation of or answer to a scientific question that is based on prior knowledge or research and is testable.
- Scientists can test hypotheses in many different ways.
  - Tests in a lab
  - Observations in the field
- Scientists use hypotheses in different ways.
  - Earth scientists often hypothesize about what has happened.
  - Biologists often hypothesize about what will happen.

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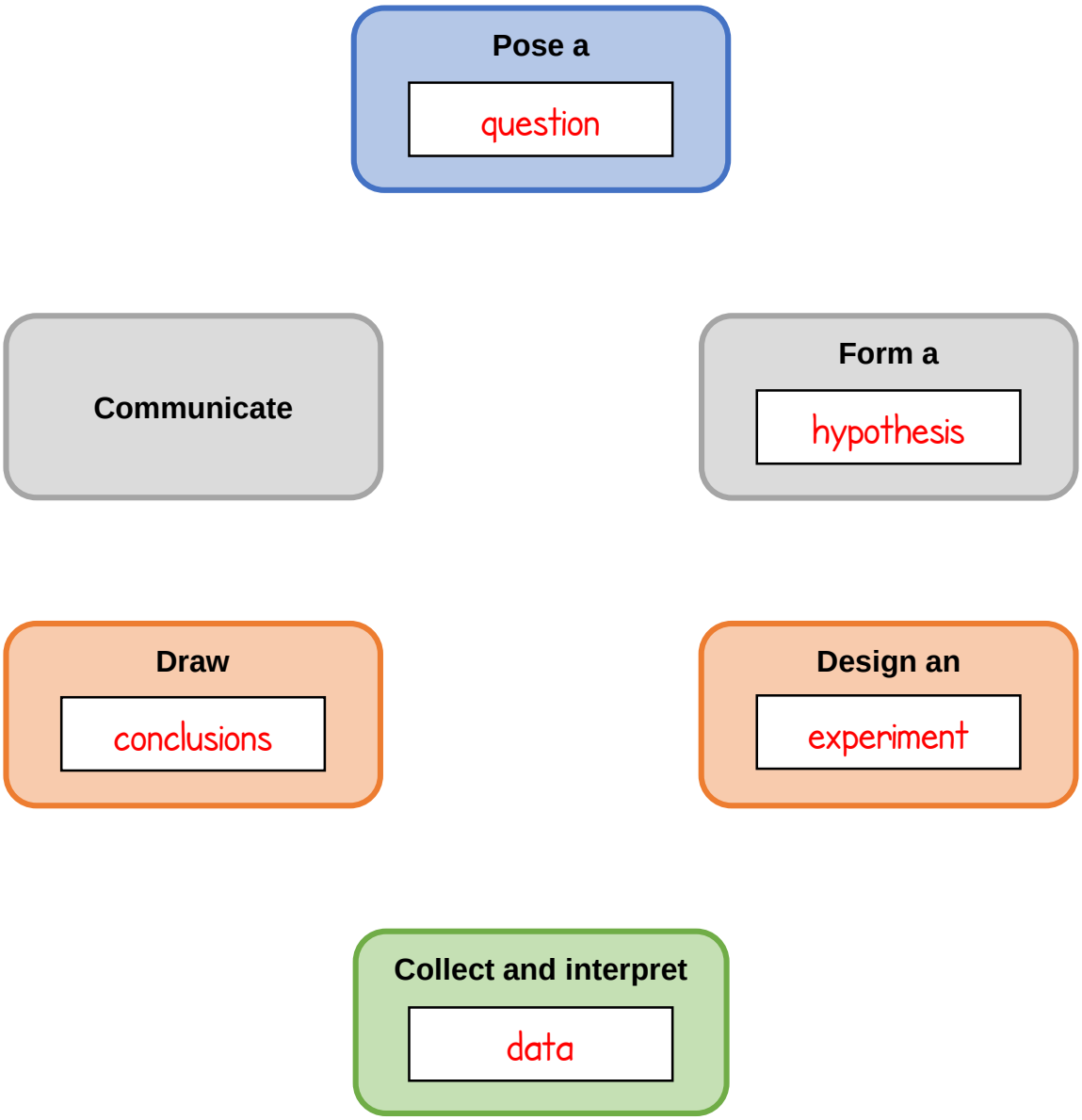
The Nonlinear Scientific Method

Label the steps of the scientific method. Then draw two alternate paths that a scientist could follow when using the nonlinear scientific method. Grading Note: Students can draw any alternate paths in the diagram.



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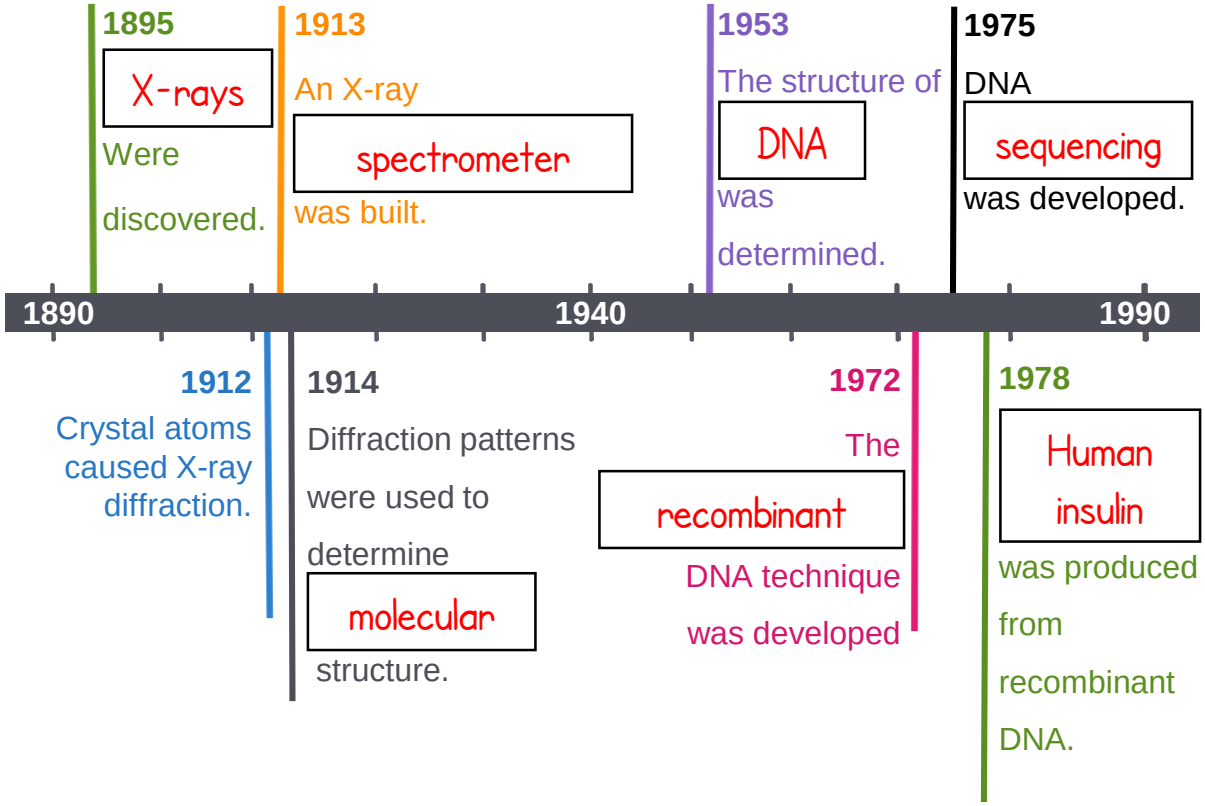
Biology and You

Complete the graphic.

- Individually → Research can affect health or food resources.
- Through government → Research can lead to public health and environmental regulations.
- Culturally and ethically → Cloning and stem-cell research can present ethical challenges.

Science and Technology

Complete the timeline.



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Career Opportunities in Science

- Classical sciences include biology, chemistry, earth/space sciences, and physics.
- Applied sciences include medicine, biotechnology, optics, and nanotechnology.
- New developments in science and technology lead to new career opportunities.

Summary | Development of Scientific Knowledge

Lesson Question

How do scientific practices and values promote the development of scientific knowledge?

Answer

(Sample Answer) Scientists use their senses and technology to observe the world around them and to ask questions about what they observe. They use the scientific method to answer questions they ask. This can result in new technologies that allow scientists to ask more questions.

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Review: New Information Changes Scientific Knowledge

- New [data] change scientific knowledge.
- The speed of change is limited by the available [technology].
- Changes in scientific knowledge occur when [repetition] leads to acceptance.

Review: Science Answers Questions and Solves Problems

Science answers questions and solves problems by:

- forming and testing [hypotheses].
- evaluating [results].
- generating new [questions] and [hypotheses].

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Review: Science, Society, Technology, and Career Opportunities

- Science affects and is affected by [society].
- Science advances [technology], and technology advances [science].
- Career opportunities in science are abundant and [increase] when new discoveries are made.

Use this space to write any questions or thoughts about this lesson.