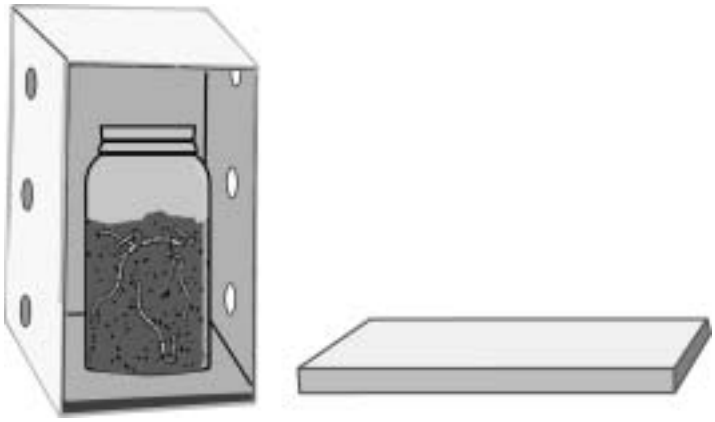
BENCHMARK SC.H.1.2.1

Strand H	The Nature of Science
Standard 1	The student uses the scientific processes and habits of mind to solve problems.
Benchmark SC.H.1.2.1	The student knows that it is important to keep accurate records and descriptions to provide information and clues on causes of discrepancies in repeated experiments.
Item Type(s)	MC
Benchmark Clarification	The student identifies and explains the reasons for documenting scientific activities.
Content Limits	Items should assess the student's understanding that investigations should be repeated for validity and new questions asked.
Stimulus Attributes	Items may provide the student with data in simple, clearly labeled graphs or pictures of real-world scenarios.
Response Attributes	None specified.

Sample MC Item

Jim was planting a garden and a friend suggested he put worms in his garden. Jim wanted to do an experiment to find out what worms do for gardens. Jim put soil, food, and worms in a clear jar. He placed a shoebox with holes cut in it on its side and put the jar in it. The lid was kept on the shoebox, except when Jim was making an observation.



If Jim does his experiment correctly, what will he do each time he takes the lid off the shoebox?

A. add more worms to the jar
* B. write down what he sees in the jar
D. try to guess where the worms will be
C. plan what he will do next in the experiment

BENCHMARK SC.H.1.2.2

Strand H	The Nature of Science
Standard 1	The student uses the scientific processes and habits of mind to solve problems.
Benchmark SC.H.1.2.2	The student knows that a successful method to explore the natural world is to observe and record, and then analyze and communicate the results. This benchmark also assesses SC.H.1.2.4[12] and SC.H.3.2.2.[13]
Item Type(s)	MC, SR, ER
Benchmark Clarification	The student identifies, explains, and describes, or applies the scientific process (i.e., accurately reporting and analyzing data, reaching logical conclusions that reflect the data, repeating investigations for validity, asking new questions, and communicating results).
Content Limits	None specified.
Stimulus Attributes	Items may provide the student with data in simple, clearly labeled graphs or pictures of real-world scenarios.
Response Attributes	Items will NOT require the student to provide scientific terms (e.g., analyze, data, predicting, or communicating) in open-ended responses.
Sample MC Item	Pierre wants to find out if a plant grows taller when given a new fertilizer called EverGrow. He plants seeds in pots and adds the proper amount of fertilizer according to the directions. What else should Pierre do to find out if EverGrow really does make plants grow taller? A. provide more light to his plants * B. grow some seeds without fertilizer C. put the plants in windows in different rooms D. water some of the plants at the end of two weeks

[12] The complete text for SC.H.1.2.4 is "The student knows that to compare and contrast observations and results is an essential skill in science."

[13] The complete text for SC.H.3.2.2 is "The student knows that data are collected and interpreted in order to explain an event or concept."

Sample SR Item

Trash was often found on the playground right after recess. Peg's class knew the area was always clean when they left the playground. Peg wanted to solve the mystery of the trash on the playground. Each day, she stayed on the playground five minutes longer after recess. Peg wrote down what she saw for one week. On Friday, she reviewed her notes for the week. She then reported to the class that the cause of the trash on the playground was a pair of hungry crows looking for food in the trash cans after recess.

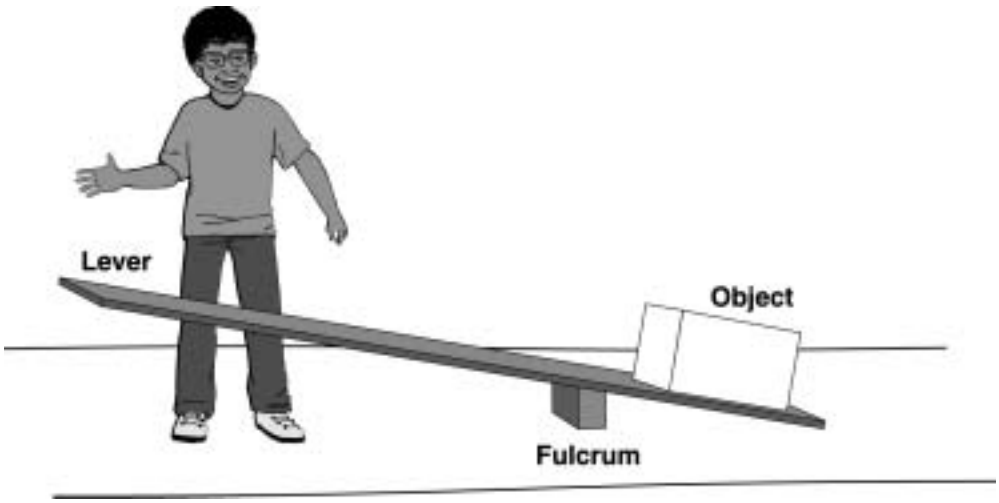
Identify and describe the four steps of the scientific method that Peg used to solve the mystery of the playground trash.

Correct and Complete Response

First, Peg asked a question. Second, she observed the playground every day for five minutes. Third, during each observation she recorded her findings. Fourth, after observing the playground for a week, she analyzed her findings and reported them to her class.

Sample ER Item

Robert is designing a demonstration to display at his school's science fair. He will show how changing the position of a fulcrum under a lever changes the amount of force needed to lift an object. To do this, Robert will use a piece of wood for a lever and a block of wood to act as a fulcrum. He plans to move the fulcrum to different places under the lever to see how its placement affects the force needed to lift an object.



Part A Identify at least two other actions that would make Robert's demonstration better.

Part B Explain why each action would improve the demonstration.

Correct and Complete Response

Part A When Robert measures how much force it takes to move the object and writes it down, he can tell if it took more force or less force to move the object each time he moved the fulcrum. When he compares the amount of force needed to lift the object without the lever he can prove that using the lever helped.

Part B First, Robert needs to have a way to measure how much force it takes to move the object. Second, he needs to compare this to the amount of force needed to lift the object without the lever. Each time he moves the fulcrum to different places under the lever he should write down how much force it took to move the object.

BENCHMARK SC.H.1.2.5

Strand	**H**	The Nature of Science
Standard	**1**	The student uses the scientific processes and habits of mind to solve problems.
Benchmark	**SC.H.1.2.5**	The student knows that a model of something is different from the real thing, but can be used to learn something about the real thing.
Item Type(s)		MC
Benchmark Clarification		The student identifies and analyzes models that are used to interpret real world situations.
Content Limits		None specified.
Stimulus Attributes		Items may describe an experiment or activity.
Response Attributes		None specified.
Sample MC Item		Leon filled Tray A and Tray B with soil. He planted grass in Tray B. He raised the trays on an incline and watered them. He noticed that more soil ran off of Tray A than Tray B.

What does this activity represent?

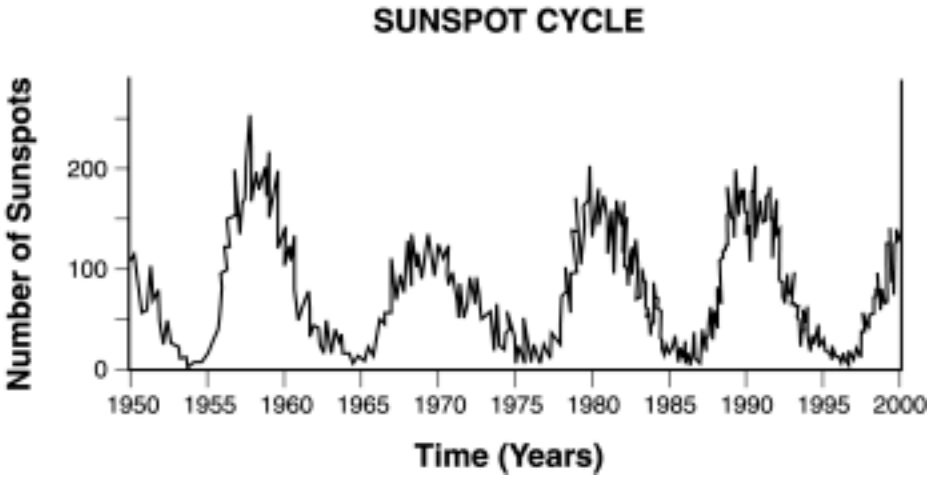
* A. using a model
B. drawing a conclusion
C. classifying information
D. developing a hypothesis

BENCHMARK SC.H.2.2.1

Strand	**H**	The Nature of Science
Standard	**2**	The student understands that most natural events occur in comprehensible, consistent patterns.
Benchmark	**SC.H.2.2.1**	The student knows that natural events are often predictable and logical.
Item Type(s)		MC
Benchmark Clarification		The student uses information about nature to forecast events and reach conclusions.
Content Limits		None specified.
Stimulus Attributes		Items may ask for a prediction based on data, charts, or other information.
Response Attributes		Items may ask for calculations in predicting a natural event.

Sample MC Item

For many years, astronomers have observed different numbers of sunspots on the surface of the Sun. Sunspots occur in predictable cycles. When there is a lot of activity, it is called the "solar maximum" and when it is quiet, it is called the "solar minimum." The graph below shows the number of sunspots observed since 1950.



The last solar maximum occurred in the year 2000. What would be the **best** prediction for the next solar maximum in the sunspot cycle?

A. 2002
B. 2006
*C. 2011
D. 2013

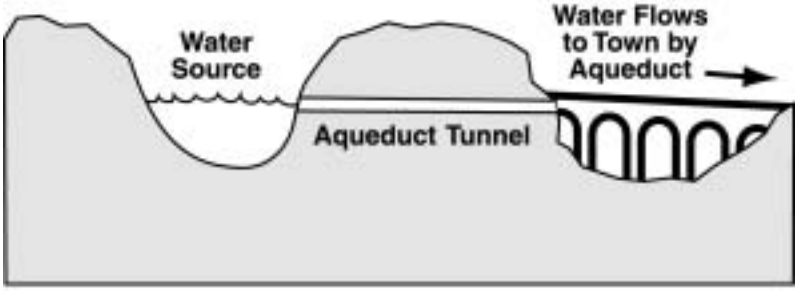
BENCHMARK SC.H.3.2.1

Strand H	The Nature of Science
Standard 3	The student understands that science, technology, and society are interwoven and interdependent.
Benchmark SC.H.3.2.1	The student understands that people, alone or in groups, invent new tools to solve problems and do work that affects aspects of life outside of science. This benchmark also assesses SC.H.3.2.3.[14]
Item Type(s)	MC, SR
Benchmark Clarification	The student identifies ways in which people impact others, including inventions and discoveries.
Content Limits	Items may assess the student's understanding of: • simple tools, and • how the tool helps in the time period specified. Items will NOT assess calculations or amounts of work.
Stimulus Attributes	Items may use graphics that illustrate tools.
Response Attributes	Items will NOT require the student to complete a diagram or chart.
Sample MC Item	Cities have water purification programs to keep drinking water free from bacteria and other pollutants. How does this help people living in these cities? A. It eliminates filters from factories. B. It produces large amounts of water. C. It helps people by cleaning the air they breathe. * D. It helps people by making the water safer to use.

[14] The complete text for SC.H.3.2.3 is "The student knows that before a group of people build something or try something new, they should determine how it may affect other people."

Sample SR Item

The Romans originally used aqueducts to carry water from lakes to lower, drier areas. Today, Los Angeles uses aqueducts for the same purpose.



Aqueduct

Part A How would an aqueduct affect food production?

Part B How would aqueducts change the human population of an area after an aqueduct was built?

Correct and Complete Response

Part A With aqueducts, water could be carried to farms that otherwise would have little or no water. Crops would be able to grow and people would have an increase in food production.

Part B People would be able to move to areas that normally would not be able to support life because aqueducts would provide water for these areas. As a result, human population would increase.

BENCHMARK SC.H.3.2.4

Strand	**H**	The Nature of Science
Standard	**3**	The student understands that science, technology, and society are interwoven and interdependent.
Benchmark	**SC.H.3.2.4**	The student knows that through the use of science processes and knowledge, people can solve problems, make decisions, and form new ideas.
Item Type(s)		MC, SR
Benchmark Clarification		The student identifies how scientific method affects progress.
Content Limits		Items will address the relationship between science and technology and their effects on living organisms. Items will portray science methods that ensure validity (multiple trials, repeatable procedure, etc.). Items will NOT assess the definition of terms.
Stimulus Attributes		Items will assess the student's understanding of the purpose of a hypothesis, conclusion, multiple trials, etc.
Response Attributes		None specified.
Sample MC Item		Mr. Brown wonders how minerals affect animal growth and decides to conduct an experiment with his chickens. He begins with three buckets containing exactly the same amount of chicken feed and then adds the same amount of two different minerals to two of the buckets. He adds calcium to one bucket, magnesium to another bucket, and he doesn't add any minerals to the third bucket. What scientific term is used to describe the type of mineral placed in each bucket? A. control B. hypothesis C. specimen ★ D. variable

Sample SR Item

Todd wanted to determine the amount of water that could be saved with a water-saving nozzle on his family shower. Each day for one month, each family member plugged the bathtub drain and measured the water level after taking a shower using the water-saving nozzle.

Part A What could Todd do to improve his experiment to show how much water his family saved?

Part B What additional benefits to the environment would there be to using the water-saving nozzle?

Correct and Complete Response

Part A Todd should reduce the number of variables in his experiment. For example, he should be sure each family member showers for the same length of time.

Part B The nozzle that saved more water would increase water conservation. Less water would be used in the shower, reducing the amount of water polluted with soap, shampoo, etc., and increasing the amount of water saved.