Kansas Middle School Science Flipchart

▲ S.7. 1.1.1
The student identifies questions that can be answered through scientific investigations.

Official Test Specifications
- Multiple Choice
- Short Passages
- Mid Level Process Questions

Instructional Examples
- Develop a scenario and have students identify the question being investigated.
- Which of the following cannot be answered through a scientific investigation?
- Explore properties and phenomena of various materials and generate testable questions to investigate.

Item Specification
a. Distinguish between testable and untestable questions. Testable questions address phenomena that are measurable, repeatable, and able to be proven or disproved using scientific methods. Untestable questions involve matters of opinion, preference, values, religious or philosophical beliefs.
b. Given a scenario with an unresolved problem, state a question that could be the basis of a scientific investigation to resolve the problem.
c. Given an experimental procedure, identify the question being tested.
d. Items SHOULD NOT test experimental design (see S.7.1.1.2) but should address testable or untestable questions.

State Assessment Sample Item
A student designed an investigation to answer a question. The steps the student followed during the investigation are listed below.

Step 1. Measure the mass of ten of the same type of plant seeds.
Step 2. Plant each seed in a pot of soil and place each pot in a sunny window.
Step 3. Give each plant the same amount of water each week.
Step 4. Measure the mass of each plant at the end of each week for the next two months.

Which question was this investigation **most likely** designed to answer?

A) Which type of seeds grow the fastest?
B) How long does it take a plant to flower?
C) X What is the average rate of plant growth?
D) Do plants grow better in sunlight or shade?

QuestionId: 32528, Standard 1 "Science As Inquiry", Benchmark 1 "1", Indicator "1", Sub Indicator "1"

▲ S.7.1.1.2

The student designs and conducts *scientific investigations* safely using appropriate tools, mathematics, *technology*, and techniques to gather, analyze, and interpret data.

Official Test Specifications

- Multiple Choice
- Short Passages
- Mid Level Process Questions

Instructional Examples

- Use different scenarios. Have students identify variables- independent & dependent, constants, experimental & control groups.
- Never mix meanings (e.g., Which is the **variable** being **controlled**?) when you are looking for constant as the correct choice.
- Scenarios: Paper towel absorption or strength, temperature and amount of sugar dissolved, temperature and the speed seltzer tablets dissolve, difference in rate at which water and land absorb heat, etc.
- Design and conduct an investigation on the question, "Which paper towel absorbs the most water?" (Materials include different kinds of paper towels, water, and a graduated cylinder. Components of the investigation may include background and hypothesis, identification of independent variable, dependent variable, constants, list of materials, procedures, collection and analysis of data, and conclusions).
- Given an investigative question, determine what to measure and how to measure.
- Display data collected from performing an investigation using tables, graphs, diagrams and other graphic organizers.

Item Specification

a. Identify a design of an investigation that will answer a stated scientific question.
b. Identify flaws in an experimental design (e.g., too many uncontrolled parameters, no control group, sample size too small, looking for data to support preconceived conclusions.)
c. Understand the term hypothesis, and, given a question, identify an appropriate hypothesis.
d. Arrange the basic steps in a scientific procedure (i.e., question – hypothesis – gather experimental data – draw conclusions).
e. Understand the relationship between sample size and validity of results.
f. Distinguish between dependent and independent variables.
g. Identify the parameters that should be constant in an experiment and explain why some parameters must usually be held constant.
h. Understand the purpose of control groups and know the types of studies in which they would be appropriate.
i. Choose the correct measuring tool or technology to measure a property or variable (e.g., graduated cylinder, meter stick, balance, spring scale, thermometer, stopwatch).
j. Identify the property (exclusive to the properties explicitly identified in the Grade 5-7 assessable indicators) or variable a tool measures.

1. Inquiry						

k. Read measurements on tools and instruments. (DO NOT test significant figures.)
l. Choose the correct observational tool (e.g., hand lens, microscope, telescope, audio or video recorder).
m. Identify safe or unsafe procedures when conducting investigations (e.g., appropriate clothing; correct handling of materials that are toxic, flammable, corrosive, explosive, radioactive, hot, or sharp). ONLY include equipment common to most middle school laboratories.
n. Choose an appropriate format (e.g., data table, diagrams, etc.) for collecting or recording data. Item ideas may include appropriate units of measure, column and row headings, and adequate space to record data for all samples.
o. Match units of measurement to properties. Use ONLY metric units except °F for weather temperatures. Use °C for all other temperature values (e.g., liquid, objects in a room, gas in a cylinder).
p. Calculate the mean (average) of a set of data.

State Assessment Sample Item

A scientist is studying wind speed at a research station in the Flint Hills of Kansas. Which unit of measurement should the scientist use for recording wind speed?

A) grams per liter (g/L)
B) degrees per second (°/s)
C) X kilometers per hour (km/h)
D) minutes per meter (min/m)

QuestionId: 32547, Standard 1 "Science As Inquiry", Benchmark 1 "1", Indicator "2", Sub Indicator "2"

1. Inquiry						

▲ S.7.1.1.3

The student identifies the relationship between evidence and logical conclusions.

Official Test Specifications

- Multiple Choice
- Short passages
- High Level Process Questions

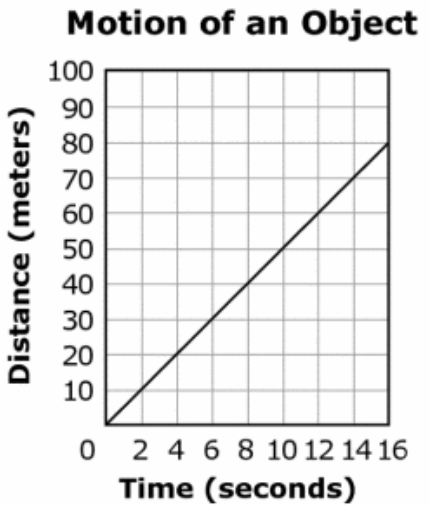
Instructional Examples

- DON'T include questions about inductive/deductive reasoning.
- Provide data tables/graphs. Ask students to identify the logical conclusions.
- Check data to determine: Was the question addressed? Was the hypothesis supported/not supported? Did this design work? How could this experiment be improved? What other questions could be investigated?
- Look for patterns from the mean of multiple trials, such as the rate of dissolving relative to different temperatures.
- State relationships in data, such as variables, which vary directly or inversely.

Item Specification

a. Make predictions based on data in tables and graphs using analysis, extrapolation, and interpolation.
b. State relationships among variables (e.g., inverse, direct) or recognize lack of relationship.
c. Analyze data to find if a hypothesis was supported.
d. Suggest modifications to an experiment based on inconclusive data.
e. Identify relationships in, or conclusions based on, quantitative data.
f. DO NOT create items that just require reading or identifying one data point from a table or graph.

State Assessment Sample Item
The graph below shows the motion of an object.



Which term **best** describes the speed of the object?

A) variable
B) X constant
C) increasing
D) decreasing

QuestionId: 32554, Standard 1 "Science As Inquiry", Benchmark 1 "1", Indicator "3", Sub Indicator "3"

1. Inquiry						

▲ S.7.1.1.4
The student communicates scientific procedures, results, and explanations.

Official Test Specifications
- Multiple Choice
- Short Passages
- Mid Level Process Questions

Instructional Examples
- Give a sample procedure. Could this experiment be repeated? How could this procedure be improved?
- You have just completed a scientific investigation. Which of the following is the best way to communicate your results?
- Present a report of an investigation so that others understand it and can replicate the design.

Item Specification
a. Identify the aspects of an experimental procedure that must be specified in order for another person to repeat the experiment. (e.g., Can this experiment be repeated given the information presented? Identify the detail missing from the report of the procedure or results that prevents the experiment from being repeatable.)
b. Given an experimental outline, describe the experiment in sufficient detail.
c. Choose the best graphic format for analyzing and displaying numerical data.
d. Choose the best method or format for reporting results of an experiment (e.g., graphical format, graphical organizers, numerical data displays).

State Assessment Sample Item
A student added water to glasses and tapped the glasses with a pencil to make musical notes. She adjusted the water levels in the glasses until the pitches of the notes matched the eight notes of a musical scale. Which information is **most** important to include in her report so another student can repeat her investigation?

A) X the volume of water placed in each glass
B) the length and mass of the pencil used to tap each glass
C) the date and location of the investigation
D) the student's previous experience with making musical instruments

QuestionId: 32566, Standard 1 "Science As Inquiry", Benchmark 1 "1", Indicator "4", Sub Indicator "4"

▲ S.7.1.3.2
The student evaluates the work of others to determine evidence which scientifically supports or contradicts the results, identifying faulty reasoning or conclusions that go beyond the evidence and/or are not supported by data.

Official Test Specifications
- Multiple Choice
- Short Passages
- High Level Process Questions

Instructional Examples
- Given a scenario, is the stated conclusion supported by the data?
- Given a variety of data, have students identify which data is relevant for a particular conclusion.
- Explain how a reasonable conclusion is supported.
- Analyze evidence and data that supports or contradicts various theories (e.g., theory of continental drift, spontaneous generation, etc.).
- Recognize sources of conflict of interest and bias.
- Evaluate research based on the interest of parties conducting the research.

Item Specification
a. Distinguish between valid conclusions based on experimental data/evidence and unsupported opinions.
b. Explain why a report or claim may be unreliable or biased based on the extent or source of data.
c. Recognize missing data/evidence/information that is needed to verify a claim.
d. Identify and fix flaws or omissions in a scientific report.

State Assessment Sample Item
After analyzing historical temperature data for Kansas, a student made the statement below.

The mean high temperature in June in Topeka is 29 degrees Celsius (°C).

This statement is **best** described as

A) an opinion.
B) a prediction.
C) X a conclusion.
D) a hypothesis.

QuestionId: 32591, Standard 1 "Science As Inquiry", Benchmark 3 "3", Indicator "2", Sub Indicator "2"

▲ S.7.2.1.1

The student compares and classifies the states of matter; solids, liquids, gases, and plasma.

Official Test Specifications

- Multiple Choice
- Pictures
- Knowledge Questions

Instructional Examples

- Graph temperature/state of matter relationship using metrics, including degrees Celsius.
- Interpret a graph to determine the phase of matter of water at a certain temperature (point on the graph).
- Makes a diagram/model showing the various states of water demonstrating that the molecules of a solid has definite volume and shape, the molecules of a liquid have a definite volume but an indefinite shape, the molecules of a gas have an indefinite volume and indefinite shape.

Item Specification

a. Understand that matter is made of particles.
b. Identify substances as solids, liquids, or gases. (DO NOT include plasma.)
c. Predict the physical state of common materials at a specified temperature. Limit materials to water and common substances (e.g., milk, metal, rock).
d. Describe the properties of a phase (physical state) of matter in terms of shape and volume.
e. Know that particles of matter are constantly in motion and arranged differently in solids, liquids, and gases (includes models and graphical representation of arrangement of particles in different states of matter).
f. Understand that mass is conserved during physical changes, including phase changes.
g. Understand that all materials, including gases, are made of matter and know that matter has mass and takes up space.
h. Understand which properties can be used to classify and identify materials/substances in different states of matter (e.g., boiling and melting points, color, hardness, volume –definite vs. indefinite, temperature).
i. Recognize that the mass of a substance does not change as the substance undergoes phase changes.
j. When developing items, identify the object, NOT JUST the material/substance (e.g., copper spoon, iron shovel, wooden stick).

State Assessment Sample Item

***This indicator is new or has been altered to warrant writing new assessment questions. A released sample item will be added to this flipchart when available.*

▲ S.7.2.2.1
The student understands the relationship of atoms to elements and elements to compounds.

Official Test Specifications
- Multiple Choice
- Diagram with atoms labeled.
- Low Level Knowledge Questions

Instructional Examples
- What is matter made of? – atoms, elements, compounds
- If two atoms have a different number of electrons and protons they are two different _____.
- The student draws a diagram to show how different compounds are composed of elements in various combinations.

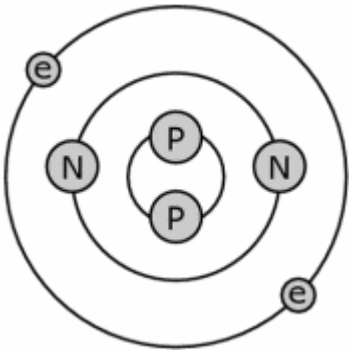
Item Specification
a. Understand the basic structure of an atom (proton and neutron located in the nucleus, electrons orbit the nucleus). DO NOT assess charges.
b. Understand that materials made of one kind of atom are elements and that, likewise, all atoms of an element have the same chemical properties. DO NOT include or assess isotopes.
c. Understand that compounds are chemical combinations of atoms of more than one element. DO NOT include molecules.
d. Understand that all the many compounds in the world are made of different combinations of a finite number of approximately 100 elements. DO NOT assess the number of elements except by comparing highly diverse approximations (e.g., approximately 100 elements, approximately 1,000 elements).
e. Understand that, when atoms combine, the compound formed has different properties than the original atoms. DO NOT assess chemical vs. physical change.

	2. Physical					

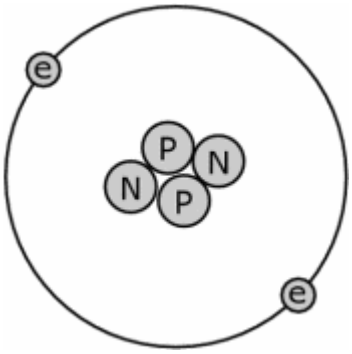
State Assessment Sample Item

A model of a helium atom contains 2 protons, 2 neutrons, and 2 electrons. Which model **best** represents the structure of a helium atom?

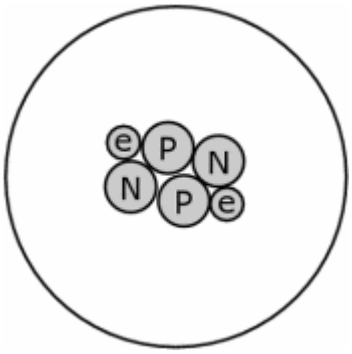
A)



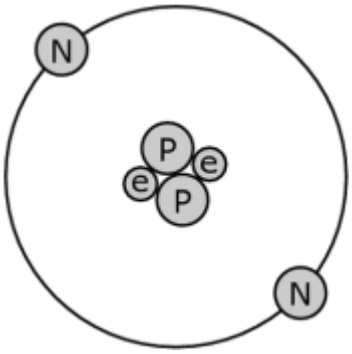
B) X



C)



D)



QuestionId: 32623, Standard 2 "Physical Science", Benchmark 2 "2", Indicator "1", Sub Indicator "1"

	2. Physical					

▲ S.7.2.2.2

The student measures and graphs the effects of temperature on matter.

Official Test Specifications

- Multiple Choice
- Diagram
- High Level Process Questions

Instructional Examples

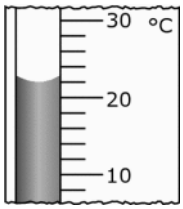
- Which balloon represents matter at the warmest temperature? (Same number of atoms in each balloon.)
- Change water from solid to liquid to gas using heat. Measure and graph temperature changes. Observe changes in volume occupied.

Item Specification

a. Interpret a heating/cooling curve for water (may use other substances with documentation).
b. Measure temperature by reading a thermometer.
c. Compare the effect on temperature change of adding the same amount of heat to the same volume (or to different volumes) of the same substance (or to different substances).
d. Extrapolate/predict the state of matter of a substance from the temperature curve on a graph of the substance as it is heated over time.
e. Determine change in matter based on change in temperature (e.g., expansion and contraction).
f. Predict how adding heat affects the rate or extent of a particular chemical or physical change (e.g., dissolving, evaporating, decaying).
g. Understand that melting and boiling points are independent of mass, volume, or rate of heat change (Combining two volumes of water that are both at 0°C does not decrease the temperature of the combined volume. One liter of water boils at the same temperature as 10 liters of water.)

State Assessment Sample Item

The picture below shows a portion of a thermometer.



Which is the **best** estimate of the temperature shown on the thermometer?

A) 21°C
B) X 22°C
C) 24°C
D) 25°C

QuestionId: 32634, Standard 2 "Physical Science", Benchmark 2 "2", Indicator "2", Sub Indicator "2"

▲ S.7.2.3.2

The student describes, measures, and represents data on a graph showing the motion of an object (position, direction of motion, speed).

Official Test Specifications

- Multiple Choice
- Diagram/graph
- Low Level Knowledge & Process Questions

Instructional Examples

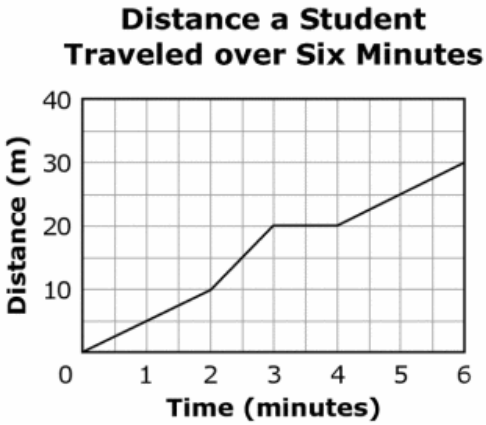
- At which point on the graph is the speed the greatest?
- Trace the force, direction, and speed of a baseball, from leaving the pitcher's hand.
- Roll a marble down a ramp. Make adjustments to the board or to the marble's position in order to hit a target located on the floor. Measure and graph the results.

Item Specification

a. Interpret change of position on a two-dimensional grid.
b. Interpret linear distance vs. time graphs. (On graphs, represent **average** speeds as linear relationships between distance and time. DO NOT assess acceleration.)
c. Chose the graphical representation that matches a type of motion (e.g., moving, moving away/toward, moving fast/slowly).
d. Identify the time interval on a distance vs. time graph that corresponds to a given type of motion.
e. Graphically determine the effect on motion when a moving object changes from one surface to another or changes the media through which it travels (e.g., average speed of riding a bike on concrete then through sand).

State Assessment Sample Item

The graph below shows the distance a student traveled over a period of 6 minutes.



During which time interval was the student **most likely** standing still?

A) between 0 and 2 minutes
B) between 2 and 3 minutes
C) X between 3 and 4 minutes
D) between 4 and 6 minutes

QuestionId: 32653, Standard 2 "Physical Science", Benchmark 3 "3", Indicator "2", Sub Indicator "2"

	2. Physical					

▲ S.7.2.3.3

The student recognizes and describes Newton's Laws of Motion.

Official Test Specifications

- Multiple Choice
- For your info: Newton's Laws:
  - I. An object in motion stays in motion
  - II. Acceleration depends on mass and amount of force
  - III. Equal and opposite reactions
- Mid Level Knowledge Questions

Instructional Examples

- What happens to a book bag sitting on a car seat when the car stops suddenly?
- Use an illustration with a ping pong ball and two straws blowing on the ball. According to Newton's Laws of Motion which direction will the ball move? (Select the correct force – vector arrows.)
- What forces keep a satellite traveling in orbit around a planet rather than falling into the planet or flying off into space?
- Place a small object on a rolling toy vehicle, stop the vehicle abruptly, and observe the motion of the small object. Relate to personal experience – stopping rapidly in a car.
- Research safety equipment, such as seat belts and safety helmets, and the role they play related to inertia.

Item Specification

a. Understand Newton's first law (inertia) in the following ways:
   - i. Objects in motion tend to stay in motion.
   - ii. Objects at rest tend to stay at rest.
   - iii. Friction and air resistance account for most observed motions that appear to deviate from the first law.
   - iv. Predict motion on a frictionless surface.

b. Understand Newton's second law in the following ways (DO NOT assess F = ma):
   - i. A change in motion (i.e., speeding up, slowing down, changing direction) is the result of an unbalanced force.
   - ii. Know a change in mass and/or a change in force changes the motion of an object (qualitative understanding, NOT quantitative).
   - iii. Given change in force or mass, predict change in motion (qualitative).
   - iv. Determine net force (simplified quantitative analysis), with mass and force identified, acting on an object based on two force arrows in one dimension (← ←) (→ →) (← →) (→ ←) or in two dimensions (e.g. ↑ →).

c. Understand Newton's third law (action-reaction) in the following ways:
   - i. Understand that for every action force there is an equal and opposite reaction force.
   - ii. Given one force of an action-reaction pair, identify the other.
   - iii. Relate the need for impact safety gear to Newton's Laws of Motion.

f. DO NOT assess identification of laws of motion by name or label.

	2. Physical					

State Assessment Sample Item
Newton's first law of motion states in part that an object in motion tends to stay in motion. Why is this law easier to observe if the object is in motion on smooth, level ice?

A) Gravity is not acting on the object.
B) Air resistance on the object is not a factor.
C) X The effect of friction on the object is reduced.
D) The force on the object is greater in cold temperatures.

QuestionId: 32665, Standard 2 "Physical Science", Benchmark 3 "3", Indicator "3", Sub Indicator "3"

	2. Physical					

▲ 7.2.3.4

The student investigates and explains how simple machines multiply force at the expense of distance.

Official Test Specifications

- Multiple Choice
- Pictures
- Process Questions

Instructional Examples

- Investigates the load (force) that can be moved as the number of pulleys in a system is increased.
- Investigates how bicycle gears work.

Item Specification

a. Identify types of simple machines [i.e., pulleys, levers, inclined planes (including wedge and screw), wheel-and-axles].
b. Understand that simple machines are used to reduce the force needed to move an object while increasing the distance over which that force is applied.
c. Friction will reduce the output of simple machines, or increase the amount of force needed (e.g., frictional forces do not affect the force needed to lift a box vertically without a simple machine but do increase the force needed to slide a box up an inclined plane).
d. The force needed to move an object can be reduced by combining two or more simple machines to create one machine.
e. Understand that the force required to lift an object without a simple machine is equal to the weight of the object, but a simple machine can lift the object with a force less than its weight.
f. Note: Use graphics where possible.

State Assessment Sample Item

***This indicator is new or has been altered to warrant writing new assessment questions. A released sample item will be added to this flipchart when available.*

	2. Physical					

▲ S.7.2.4.2

The student understands that when work is done energy is transformed from one form to another, including mechanical, heat, light, sound, electrical, chemical, and nuclear energy, yet is conserved.

Official Test Specifications

- Multiple Choice
- Mid Level Knowledge Question

Instructional Examples

- When energy is transformed from one form to another, does the amount of energy - increase, decrease, or stay the same?
- Sequence the transformation of energy through various real-life systems.
- Design an energy-transformation device using various forms of energy that will accomplish a simple task, such as popping a balloon.
- Describe the energy transformations through a telephone from the caller's voice to the listener's ear.

Item Specification

a. Identify mechanical, heat, light, sound, chemical, electrical, and nuclear as forms of energy and identify related energy source (e.g., sun, fossil fuel, wind, battery).
b. Describe or identify the possible transformations among the forms of energy in simple systems (e.g., flashlight, coal-burning electrical power plant, telephone).
c. Understand that energy is conserved in transformations.
d. DO NOT assess types of nuclear energy.
e. DO NOT assess or include potential or kinetic energy.

State Assessment Sample Item

In the 1800s, trains used coal to power steam engines. Which is the **most** accurate representation of energy transformations in the train's engine?

A) mechanical → chemical → heat
B) X chemical → heat → mechanical
C) mechanical → light → electrical
D) chemical → electrical → mechanical

QuestionId: 32690, Standard 2 "Physical Science", Benchmark 4 "4", Indicator "1", Sub Indicator "1"

▲ S.7.2.4.3
The student observes and communicates how light (electromagnetic) energy interacts with matter: transmitted, reflected, refracted, and absorbed.

Official Test Specifications
- Multiple Choice
- Mid Level Knowledge Question

Instructional Examples
- Classify classroom objects as to how they interact with light: a window transmits; black objects absorbs; a projector lens refracts; smooth shiny objects reflect images.

Item Specification
a. Know that we see objects because they reflect or produce light (e.g., A leaf can be seen because it reflects light. The sun can be seen because it makes its own light.).
b. Distinguish among and describe examples and graphic representations of transmission, absorption, reflection, and refraction.
c. Predict the type of interaction that occurs when light encounters the surface of a given material (i.e., transmission, reflection, absorption, or refraction).
d. Understand that white light is made of many colors.
e. Understand that the color of an object is determined by the color of light reflected by the object.
f. Predict the angle of reflection given the angle of incidence.
g. DO NOT assess the term electromagnetic energy.

State Assessment Sample Item
A white-colored fabric is dyed with a chemical that reflects red light and absorbs both green and blue light. Which color **best** describes how the fabric looks to the human eye?

A) X red
B) blue
C) white
D) green

QuestionId: 32713, Standard 2 "Physical Science", Benchmark 4 "4", Indicator "2", Sub Indicator "2"

	2. Physical					

▲ S.7.2.4.4

The student understands that heat energy can be transferred from hot to cold by radiation, convection, and conduction.

Official Test Specifications

- Multiple Choice
- Mid Level Knowledge Question

Instructional Examples

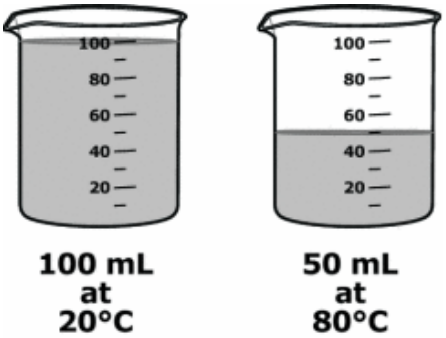
- Which illustration best shows the transfer of heat by convection?

Item Specification

a. Identify the type of heat transfer in a process or simple system as radiation, convection, conduction or any combination of the three.
b. Describe the characteristics of transfer by radiation (through some materials and across empty space), convection (movement of material in liquids and gases), and conduction (through material by the collision of particles).
c. Compare the relative ability of materials to transfer heat by conduction, convection, or radiation.
d. Predict the net direction of heat transfer in a system given initial temperatures of substances.
e. Predict changes in temperature given initial temperatures of two objects of the same substance in a system (Objects can be different sizes.)

State Assessment Sample Item

A student combined 100 milliliters (mL) of milk at 20°C with 50 mL of milk at 80°C. The pictures below show the two beakers of milk before they were combined.



Which is the **best** estimate of the final temperature of the combined milk after one minute?

A) 20°C
B) X 50°C
C) 80°C
D) 100°C

QuestionId: 32727, Standard 2 "Physical Science", Benchmark 4 "4", Indicator "3", Sub Indicator "3"

▲ S.7.3.1.1

The student will understand the cell theory; that all organisms are composed of one or more cells, cells are the basic unit of life, and that cells come from other cells.

Official Test Specifications

- Multiple Choice
- Knowledge Questions

Instructional Examples

- Include an item on the Cell Theory – that all living things are made of one or more cells, cells are the basic unit of living things, and cells come from preexisting cells.
- Compare parts of cells and their function with parts of multi-cellular organisms and their functions.

Item Specification

a. Identify the cell as the basic unit of living organisms.
b. Know that some organisms consist of only one cell.
c. Recognize that each single-celled organism must perform all the following functions required for life:
   i. Gas exchange
   ii. Locomotion
   iii. Intake of nutrients
   iv. Disposal of waste
   v. Stimulus response
   vi. Reproduction
d. Understand that different cells have different functions in a multi-cellular organism.

State Assessment Sample Item

A student is comparing the cells from a maple leaf with the cells of a group of single-celled organisms called paramecium. Which difference will the student **most likely** observe?

A) The maple leaf cells all have a nucleus, but the paramecium cells do not.
B) X Some of the maple leaf cells have different shapes, but the paramecium cells only have one shape.
C) The maple leaf cells all have a membrane, but the paramecium cells do not.
D) Some of the maple leaf cells have different types of organelles, but the paramecium cells only have one type.

QuestionId: 32735, Standard 3 "Life Science", Benchmark 1 "1", Indicator "1", Sub Indicator "1"

▲ S.7.3.1.2

The student relates the structure of cells, organs, tissues, organ systems, and whole organisms to their functions.

Official Test Specifications

- Multiple Choice
- High Level Knowledge Questions

Instructional Examples

- Compare and contrast plant and animal cells.
- Describe the functions of the digestive and or circulatory systems.
- Sequence the structures of living things from the least complex to the most complex – cells, tissues, organs, organ systems, organism
- Identify human body organs and characteristics and relate their characteristics to function.
- Compare and contrast plant and animal cells.

Item Specification

a. Identify human body organs and their characteristics and relate characteristics to function (i.e., circulatory, respiratory, digestive, integumentary, immune, skeletal, and nervous).
b. DO NOT assess interactions between organ systems.
c. Compare and contrast plant and animal cells (i.e., cell wall, cell membrane, chloroplast, nucleus, and cytoplasm).
d. Understand that body cells of multi-cellular organisms reproduce for growth and repair of tissue.

State Assessment Sample Item

Which cell part is found in plant cells but **not** in animal cells?

A) nucleus
B) X cell wall
C) cytoplasm
D) cell membrane

QuestionId: 32751, Standard 3 "Life Science", Benchmark 1 "1", Indicator "2", Sub Indicator "2"

▲ S.7.3.2.1

The student differentiates between asexual and sexual reproduction of organisms.

Official Test Specifications

- Multiple Choice
- Low Level Knowledge Question

Instructional Examples

- Which of the following is an example of regeneration?
- Which of the following can reproduce both sexually and asexually?
- Which of the following is an important trait of sexual reproduction?
- Which form of reproduction requires sex cells?
- Compare the propagation of new plants from cuttings (which skips a portion of the life cycle) with the process of producing a new plant from fertilization of an ovum.
- Observe and communicate the life cycle of an organism.

Item Specification

a. Compare asexual propagation of plants with sexual reproduction (e.g., pollination and fertilization of an ovum)
b. Recognize many single-celled organisms reproduce asexually.
c. Understand that the ability to reproduce is an essential requirement for the survival of every species.
d. AVOID using planaria on test questions; use plant cuttings as an example of regeneration.

State Assessment Sample Item

All of the following organisms can reproduce asexually **except**

A) X an owl.
B) a willow tree.
C) an amoeba.
D) a paramecium.

QuestionId: 32769, Standard 3 "Life Science", Benchmark 2 "2", Indicator "1", Sub Indicator "1"

▲ S.7.3.3.1

The student understands that internal and/or environmental conditions affect an organism's behavior and/or response in order to maintain and regulate stable internal conditions to survive in a continually changing environment.

Official Test Specifications

- Multiple Choice
- Mid Level Knowledge Question

Instructional Examples

- A runner sweats to –
- Select a variable to alter the environment (e.g., temperature, light, moisture, gravity) and observe the effects on an organism (e.g., pillbug or earthworm).
- Evaluate the effects of environmental conditions on ones own behavior.
- Observe the response of the body when competing in a running event. (In order to maintain body temperature, various systems begin cooling through such processes as sweating and cooling the blood at the surface of the skin).
- Investigate the effects of various stimuli on plants and how they adapt their growth (e.g., phototropism, geotropism and thermotropism).

Item Specification

a. Describes/predicts the response of the human body (innate responses) when internal or environmental conditions change (e.g., In order to maintain body temperature during running a race or in a hot environment, various systems begin cooling through such processes as sweating and cooling the blood at the surface of the skin.).
b. Describes/predicts the effects of various stimuli on plants and how they adapt their growth (e.g., phototropism, geotropism, and thermotropism).
c. Describe plant and animal responses to seasonal changes (e.g., nocturnal, migration, hibernation, color change, fur length).
e. Understand that disease in an organism creates an imbalance in internal conditions.

State Assessment Sample Item

Which source will a thermotropic plant grow toward?

A) X heat source
B) mineral source
C) nitrogen source
D) carbon dioxide source

QuestionId: 32806, Standard 3 "Life Science", Benchmark 3 "3", Indicator "1", Sub Indicator "1"

▲ S.7.3.4.1

The student recognizes that all populations living together (biotic resources) and the physical factors (abiotic resources) with which they interact compose an ecosystem.

Official Test Specifications

- Multiple Choice
- Mid Level Knowledge Questions

Instructional Examples

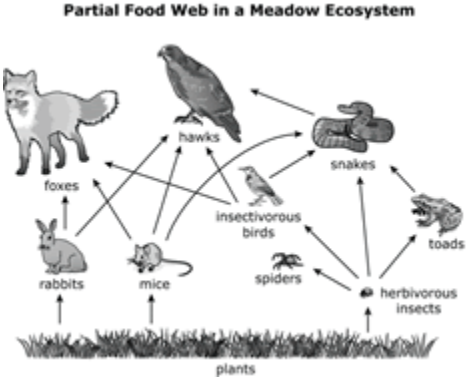
- In a food web diagram, remove a species and have students predict what will happen to the remaining population sizes.
- Have students identify biotic and abiotic factors in an ecosystem.
- Predict the possible affects of a drought on the various populations in an ecosystem.
- Create a classroom terrarium and identify the interactions between the populations and physical conditions needed for survival.
- Participate in a field study examining the living and non-living parts of a community.
- Change variables such as wheat crop yield, mice, or a predator, and chart the possible outcomes.

Item Specification

a. Identify biotic and abiotic factors in an ecosystem.
b. Describe how biotic and abiotic factors in an ecosystem interact.
c. Understand how changes in abiotic or biotic factors affect populations of organisms (e.g., fire, flood, drought, parasite infestation, non-native species introduction).
d. DO NOT specifically address limiting factors (not state assessable per S.7.3.4.3).

State Assessment Sample Item

A partial food web in a meadow ecosystem is shown below



The entire ecosystem would be **most** affected by a decline in which population?

A) mice
B) toads
C) X plants
D) spiders

QuestionId: 32824, Standard 3 "Life Science", Benchmark 4 "4", Indicator "1", Sub Indicator "1"

▲ S.7.3.4.3

The student traces the energy flow from the sun (source of radiant energy) to producers (via photosynthesis – chemical energy) to consumers and decomposers in food webs.

Official Test Specifications

- Multiple Choice
- Low Level Knowledge Questions

Instructional Examples

- Include the sun in all pictures of ecosystems related to food webs.
- Understand that radiant energy from the sun is changed into chemical energy by plants through the process of photosynthesis.
- Identify the role of various organisms as a producer, consumer, and/or decomposer in an ecosystem/food web.
- Explore populations at a stream, pond, field, forest floor, and/or rotting log.
- Identify the various food webs and observe that organisms in a system are classified by their function.

Item Specification

a. Understand that a food web shows how energy is transferred from organism to organism in an ecosystem.
b. Understand the importance of photosynthesis to all life.
c. Define the terms *producer, consumer,* and *decomposer* in terms of their role in a food web.
d. Understand that fungi and bacteria are true decomposer organisms that break down organic matter into the smallest compounds. DO NOT use earthworms, beetles, ants, etc. as examples of decomposers (either as correct or incorrect examples).
e. Understand that the amount of energy available for living organisms in an ecosystem decreases from producer to consumer.
f. Know that energy passes out of a food web through heat at every level of the food web (i.e., from cell functions and through decomposers breaking down organic matter).
g. Describe how a change in the population of one member of a food web affects populations of other members of the food web.

State Assessment Sample Item

What do green plants produce that causes them to be classified as producers in an ecosystem?

A) habitats for mammals
B) X food using light energy
C) oxygen in the atmosphere
D) organic matter using bacteria

QuestionId: 32829, Standard 3 "Life Science", Benchmark 4 "4", Indicator "2", Sub Indicator "2"

▲ S.7.3.5.2

The student understands that adaptations of organisms (changes in structure, function, or behavior that accumulate over successive generations) contribute to biological diversity.

Official Test Specifications

- Multiple Choice
- Mid Level Knowledge Questions

Instructional Examples

- A bird with a long slender beak is most likely to eat …
- Adaptations are the traits resulting from genetic changes that lead to biological diversity over many generations.
- Compare characteristics of birds such as beaks, wings, and feet, with how a bird behaves in its environment. Relate characteristics and behaviors of a bird with its structures.

Item Specification

a. Understand that a species changes as the individual organisms best adapted to survive in the environment tend to survive and reproduce offspring with similar characteristics.
b. Relate biological diversity to environmental diversity.
c. Understand that organisms' adaptations are the result of random genetic variations.
d. Understand that natural selection requires genetic diversity of individuals in a population.
e. Understand that change through natural selection does NOT involve changes in an INDIVIDUAL member of a species during its lifetime.
f. Know that scientists learn how species have adapted (structure, function, or behavior) over time by studying the fossil record, genetic material, and characteristics of living species.
g. Identify the development of adaptations for survival in a given environment (e.g., development of fins for water, legs for land movement, wings for flying).
h. Use the terms adaptation, biological change over time, or natural selection.

State Assessment Sample Item

Which allows for adaptations within a population that contribute to biological diversity over time?

A) natural disasters
B) X genetic variations
C) random behaviors
D) accidental injuries

QuestionId: 32849, Standard 3 "Life Science", Benchmark 5 "5", Indicator "2", Sub Indicator "2"

▲ S.7.3.5.3

The student associates extinction of a species with environmental changes and insufficient adaptive characteristics.

Official Test Specifications

- Multiple Choice
- Low Level Knowledge Questions

Instructional Examples

- If the environment changes quickly and there is not enough time for individuals in a population to develop adaptive characteristics to survive, then the species will –
- Why are the wooly mammoths gone from Kansas?
- Use various objects to model bird beaks, such as spoons, toothpicks, clothespins. Use “beaks” to “eat” several types of food, such as cereal, raisins, noodles. (When “food” sources change, those species that have not adapted die.)

Item Specification

a. Understand that a species becomes extinct if its environment changes faster than the process of natural selection allows the species to adapt to the change.
b. Know that natural selection is a relatively slow process but can be observed directly in species with very short life spans (e.g., insects, bacteria).
c. Explain that genetic diversity among the individual members of a species increases the chances of the species surviving environmental change.
d. Understand that extinction is a natural process, NOT just the result of human activity.

State Assessment Sample Item

Throughout Earth's history, most species that have lived are now extinct. Which was the basic cause of extinction for **most** of these species?

A) hunting by humans
B) lack of resources due to overpopulation
C) disease from pollution
D) X inability to adapt to environmental changes

QuestionId: 32855, Standard 3 "Life Science", Benchmark 5 "5", Indicator "3", Sub Indicator "3"

▲ S.7.4.1.1

The student identifies properties of the solid earth, the oceans and fresh water, and the atmosphere.

Official Test Specifications

- Multiple Choice
- Low Level Knowledge Questions

Instructional Examples

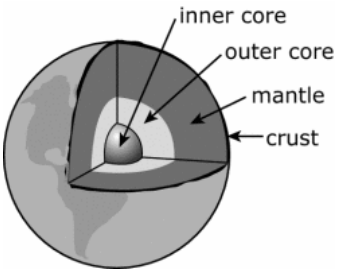
- Know that the four major interacting Earth systems are the geosphere (crust , mantle, core), hydrosphere, atmosphere, and biosphere.
- Compare the properties of ocean (salt) water and fresh water.
- Compare the heating and cooling of water and land.
- Describe the composition of the atmosphere as consisting of nitrogen, oxygen, carbon dioxide, water vapor, other gases and particles.
- Measure sediment load in a nearby stream.
- Investigate water's major role in changing the solid surface of earth, such as the effect of oceans on climates and water as an erosion force.

Item Specification

a. Locate the relative position and properties of the crust, mantle, and core.
b. Understand that water is found on Earth's surface, beneath Earth's surface, and in Earth's atmosphere.
c. Distinguish between salt and fresh water and know the places where each is located.
d. Understanding that the primary gases found in the atmosphere are nitrogen, oxygen, water vapor, and carbon dioxide.
e. Know that ozone layer is part of the upper atmosphere. DO NOT assess the function of the ozone layer to absorb ultraviolet radiation.
f. Know that inside of Earth, temperature and pressure increase as depth increases.
g. Know that in Earth's atmosphere, temperature and pressure change as altitude increases.

State Assessment Sample Item

The diagram below shows Earth's layers.



Which two Earth layers are made of solid material that does **not** flow?

A) X the crust and the inner core
B) the outer core and the crust
C) the inner core and the mantle
D) the mantle and the outer core

QuestionId: 32872, Standard 4 "Earth and Space Science", Benchmark 1 "1", Indicator "1", Sub Indicator "1"

			4. Earth/Space			

▲ S.7.4.1.2

The student models earth's cycles, constructive and destructive processes, and weather systems.

Official Test Specifications

- Multiple Choice
- Mid Level Knowledge & Process Questions

Instructional Examples

- Identify the missing part of the water cycle; evaporation, condensation, precipitation, runoff, infiltration (ground water), or transpiration (water from plants)
- Identify a naturally occurring event, such as a volcanic eruption, a hurricane, or a rainstorm, as a constructive or destructive force.
- Identify the temperature (warm or cold) and humidity (high or low) of air masses formed over polar or tropical and marine or continental areas.
- Illustrate global ocean and wind currents.
- Investigate weathering, erosion, and deposition.

Item Specification

a. Distinguish between constructive processes (e.g., any type of deposition, mountain building) and destructive processes (e.g., weathering and erosion, mass movement of material from high to low elevations).
b. Distinguish between specific examples of fast and slow processes that shape Earth's surface. (The relative time frame may need to be stated to determine speed of process.)
c. Describe the processes and rock types involved in the rock cycle (i.e., Sedimentation and compaction form sedimentary rocks; heat and pressure form metamorphic rocks; and melting and cooling form igneous rocks.).
d. Describe the processes and causes of weathering, erosion, and deposition.
e. Identify the major components of soil (i.e., organic matter, weathered rock, water, air).
f. Describe the processes that form soil.
g. Understand that Earth's climate has undergone dramatic global changes in climate in the past and cite evidence (e.g., fossils, landforms, glacial action, rock layers, ancient ocean beds). (See also S.7.4.2.1. for causes of global climate changes.)
h. Describe the steps in the water cycle, including phase changes, and understand that the cycle is driven by solar energy (i.e., evaporation, condensation, precipitation, runoff, transpiration, glaciers, and fresh and salt water bodies). Only use transpiration in limited water cycles focused on plants as vital components.
i. Understand the effects of global ocean and wind currents.
j. Understand the effects of landforms and bodies of water on weather systems.
k. Explain how temperature and pressure differences cause wind patterns.

State Assessment Sample Item

Which part of the water cycle occurs after condensation and before runoff?

A) infiltration

B) evaporation

C) X precipitation

D) transpiration

QuestionId: 32894, Standard 4 "Earth and Space Science", Benchmark 1 "1", Indicator "2", Sub Indicator "2"

			4. Earth/Space			

▲ S.7.4.2.1

The student understands that earth processes observed today (including movement of lithospheric plates and changes in atmospheric conditions) are similar to those that occurred in the past; earth history is also influenced by occasional catastrophes, such as the impact of a comet or asteroid.

Official Test Specifications

- Multiple Choice
- Pictures
- Knowledge Questions

Instructional Examples

- Plate tectonics – Lithospheric plates move (continental drift) because convection currents in the Earth's mantle cause sea-floor spreading. This also causes mountain building, volcanoes, and earthquakes. (Include diagrams.)
- Historically, rock types, fossil remains, and indicators of climatic change provide evidence for continental drift. (Use a map.)

Item Specification

a. Describe how Earth's crust is composed of large tectonic plates that are in constant motion because of convection currents in the mantle.
b. Describe how plate theory is related to continental drift. Identify evidence of continental drift.
c. Relate movement at plate boundaries to land forms (i.e., identify diverging plates with mid-ocean ridges and rift valleys, identify subduction boundaries with ocean trenches and coastal mountains, identify converging boundaries with mountains.
d. Relate volcanic activity, geothermal activity, and earthquakes to plate boundaries (e.g., Ring of Fire).
e. If occasional catastrophes are included in relation to climate change and mass extinction, they SHOULD BE LIMITED to those with total global consequences, such as massive volcanic eruptions and asteroid impacts, and NOT those resulting in regional disasters (e.g., tsunami, earthquake).

State Assessment Sample Item

The Himalayan Mountains, just north of India, are still increasing in height. Which type of tectonic plate movement forms mountain ranges like the Himalayas?

A) X two continental plates colliding
B) an oceanic plate sliding past a continental plate
C) two continental plates moving apart
D) an oceanic plate moving under a continental plate

QuestionId: 32906, Standard 4 "Earth and Space Science", Benchmark 2 "2", Indicator "1", Sub Indicator "1"

▲ S.7.4.3.1
The student compares and contrasts the characteristics of stars, planets, moons, comets, and asteroids.

Official Test Specifications
- Multiple Choice
- Mid Level Knowledge Questions

Instructional Examples
- Given a description of a star, planet, moon, comet, or asteroid, the student will identify the object.
  - Star – a very large gaseous body usually made up of a high percentage of hydrogen that emits energy.
  - Planet – a large, rocky or gaseous, spherically shaped object that circles a star.
  - Moon – a smaller object that circles a planet.
  - Asteroid – a smaller, irregular-shaped rocky object that circles a star.
  - Comet – a smaller, irregular-shaped gaseous object that circles a star in a narrow elliptical orbit.
- Identify the sun as a star and compare its characteristics to those of other stars.
- Classify bright stars visible from Earth by color, temperature, age, apparent brightness, and distance from earth.
- Create a graphic organizer to visualize comparisons of planets.

Item Specification
a. Identify the sun as a star and know that it produces its own light.
b. Identify an object as a star, planet, moon, asteroid, or comet, based on its description.
c. Identify planets in our solar system and compare their characteristics (includes the use of data tables).
d. Understand that a star produces its own light, and planets and moons reflect light.
e. Know the relative sizes, distances, and motions of common objects in the sky.

State Assessment Sample Item
Which object produces energy in the form of light?

A) Venus
B) X the sun
C) the moon
D) Halley's comet

QuestionId: 32926, Standard 4 "Earth and Space Science", Benchmark 3 "3", Indicator "1", Sub Indicator "1"

▲ S.7.4.4.1

The student demonstrates and models object/space/time relationships that explain phenomena such as the day, the month, the year, seasons, phases of the moon, eclipses, and tides.

Official Test Specifications

- Multiple Choice
- High Level Knowledge & Process Questions

Instructional Examples

- Rotation = one complete turn of Earth around its axis = one day Also, understand the appearance of sunrise/sunset.
- Earth's revolution around the sun = one year.
- Seasons are caused by the tilt of a planet on its axis during its orbit around the sun.
- The gravitational pulls between the sun, Earth, and moon are mainly responsible for causing tides.
- Moon phases occur because the illuminated portion of the moon appears different as the angles between the sun, the moon, and Earth change as the moon orbits Earth. (Given a photo of a moon phase, identify the correct diagram showing the sun/Earth/moon positions.)
- Use an Earth/moon/sun model to demonstrate a day, a month, a year, and the seasons.

Item Specification

a. Know that one rotation of Earth on its axis equals 24 hours or 1 day.
b. Know that one revolution of Earth in its orbit around the sun equals 1 year or about 365 days.
c. Know that one revolution of the moon around Earth equals about one month.
d. Identify the correct order of moon phases and know the relative locations of Earth, the moon, and the sun during each phase.
e. Explain the relationship between gravitational forces and tides.
f. Recognize the positions of Earth, the moon, and the sun during solar and lunar eclipses.
g. Explain that the tilt of Earth's axis causes seasonal changes during its orbit around the sun.
h. Given an Earth-sun diagram, match the season to the hemisphere. Know that distance from the sun does not cause seasons on Earth.

State Assessment Sample Item

Which is the **main** cause of ocean tides?

A) the tilt of Earth's axis

B) Earth's rotation on its axis

C) X the gravitational pull of the moon

D) uneven heating of the oceans by the sun

QuestionId: 32936, Standard 4 "Earth and Space Science", Benchmark 4 "4", Indicator "1", Sub Indicator "1"

▲ S.7.6.1.1

The student identifies individual nutrition, exercise, and rest needs based on science and uses a scientific approach to thinking critically about personal health, lifestyle choices, risks, and benefits.

Official Test Specifications

- Multiple Choice
- Low Level Knowledge Questions

Instructional Examples

- Given various scenarios, identify the major health risk of:
  - Smoking
  - Drug and alcohol use
  - Poor eating habits
  - Poor hygiene
  - Lack of regular exercise
- Design, implement, and self-evaluate a personal nutrition and exercise program.
- Compare and contrast immediate benefits of eating junk food to long term benefits of a lifetime of healthy eating.
- Evaluate the risks and benefits of foods, medicines, and personal products.
- Evaluate and compare the nutritional and toxic properties of various natural and synthetic foods.

Item Specification

a. List the types of foods and nutrients (i.e., proteins, fats, carbohydrates/sugars, fiber, vitamins, minerals, water intake) in appropriate portions that make up a healthy diet.
b. Choose the healthiest menu (including vegetarian options) from a list of possibilities.
c. Identify environmental health hazards, including pollutants, household chemicals, and ultraviolet solar radiation.
d. Understand the benefits and risks of legal drugs, medicines, and substances and the dangers of illegal drugs. For example, identify the types of diseases people are more susceptible to if they smoke or use smokeless tobacco. Understand that nicotine is one of the most addictive drugs.
e. Understand that alcohol is an addictive drug. Alcohol reduces coordination.
f. Understand that the benefits of regular exercise include increased strength, muscle tone, stamina, weight control, mental alertness, bone strength, and a healthy cardiovascular system.
g. Describe the importance and characteristics of a healthy cardiovascular system.
h. Describe the benefits of aerobic exercise.
i. Understand the benefits of the proper amount of sleep (e.g., disease resistance, increased mental alertness, and stamina).

State Assessment Sample Item

Which disease are people at **greatest** risk to develop if they heavily use smokeless (chewing) tobacco over a long period of time?

A) diabetes

B) skin cancer

C) pneumonia

D) X mouth cancer

QuestionId: 32954, Standard 6 "Science in Personal and Environmental Perspectives", Benchmark 1 "1", Indicator "1", Sub Indicator "1"

					6. Perspectives	

▲ S.7.6.2.1
The student investigates the effects of human activities on the environment and analyzes decisions based on the knowledge of benefits and risks.

Official Test Specifications
- Multiple Choice
- Mid Level Knowledge & Process Question

Instructional Examples
- Identify the benefits and risks of various scenarios:
  - Stream channelization: The benefit is decreased local flooding; the risk is increased erosion & runoff.
  - Burning fossil fuels: The benefit is a relatively inexpensive source of energy in the short term; the risk is long term environmental damage from global warming, acid rain, etc.
  - Urban sprawl
  - Overpopulation
  - Soil erosion
- Investigate the effects of traffic volume on environmental quality (e.g., water and air quality, plant health).
- Evaluate the benefits of burning fossil fuels to meet energy needs against the risks of increased air pollution, etc.

Item Specification
a. Describe the greenhouse effect, identify CO_2 as the major greenhouse gas, and explain the concern over greenhouse gas buildup in the atmosphere.
b. Describe the benefit of the ozone layer and the hazards caused by a thinning ozone layer.
c. Describe the causes and effects of pollution resulting from human activities that harm the environment (e.g., various forms of soil, water, and air pollution, including pesticides, greenhouse gases, CFCs, acid rain from SO_2 emissions, thermal pollution).
d. Describe ways in which human activities benefit the environment or reduce the harm done to the environment (e.g., reforestation, habitat restoration, recycling, non-polluting energy sources).
e. Describe the effects of land management practices (e.g., introduction of non-native species, soil erosion from certain farming techniques, logging and mining practices, and overdrawing water from the water table).
f. Describe the role of humans in causing and preventing species extinction.
g. Compare and contrast renewable and non-renewable resources and relate rate of usage to future supplies.
h. Understand how personal choices and practices affect the environment (e.g., recycling, choice of fuels and transportation, energy conservation measures).

State Assessment Sample Item

Which human activity would be the **best** way to help prevent erosion on a barren hillside?

A) build a dirt road

B) construct drainage ditches

C) remove all old-growth trees

D) X plant native grasses and shrubs

QuestionId: 32962, Standard 6 "Science in Personal and Environmental Perspectives", Benchmark 2 "2", Indicator "1", Sub Indicator "1"

					6. Perspectives	

▲ S.7.7.2.1
The student recognizes that new knowledge leads to new questions and new discoveries, replicates historic experiments to understand principles of science, and relates contributions of men and women to the fields of science.

Official Test Specifications

- Multiple Choice
- Mid Level Knowledge & Process Questions

Instructional Examples

- Sequence of events to describe how one discovery led to another which led to the germ theory, or plate tectonics or evolution.
- Identify the contributions of Newton, Galileo, Darwin, Mendel, and Wegener.

Item Specification

a. Know that science began when humans began asking questions about their environment and that discovery and increased understanding motivate scientists today.
b. Know that the current body of scientific knowledge has developed over thousands of years and began in several ancient cultures.
c. Describe how scientific understanding usually progresses in small steps as old theories are added to and modified to account for new information.
d. Understand that sudden scientific breakthroughs that completely change our view of the world are very rare.
e. Describe the scientific community as being made up of men and women of diverse nationality, race, and ethnicity.
f. Understand that scientists check each other's results and conclusions and that scientists welcome these checks.
g. Match scientists with their contributions (i.e., Galileo with astronomy, Newton with laws of motion, Pasteur with germ theory, Wegener with plate theory, Mendel with genetics, Darwin with natural selection, Einstein with relativity, the Curies with radioactivity). Use the full names of scientists.
h. Understand that science has become more experimental and less philosophical since ancient times.

State Assessment Sample Item

Which **best** describes the main purpose of science?

A) to understand how decisions are made
B) to understand different cultural beliefs
C) to understand why languages are different
D) X to understand phenomena in the natural world

QuestionId: 32985, Standard 7 "History and Nature of Science", Benchmark 2 "2", Indicator "1", Sub Indicator "1"