1995-96 KIRIS OPEN-RESPONSE ITEM SCORING WORKSHEET

Grade 4 — Science Question 5

The academic expectations applied in this item include:

2.1 Students understand scientific ways of thinking and working and use those methods to solve real-life problems.

2.4 Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.

The core content assessed by this item includes:

Process

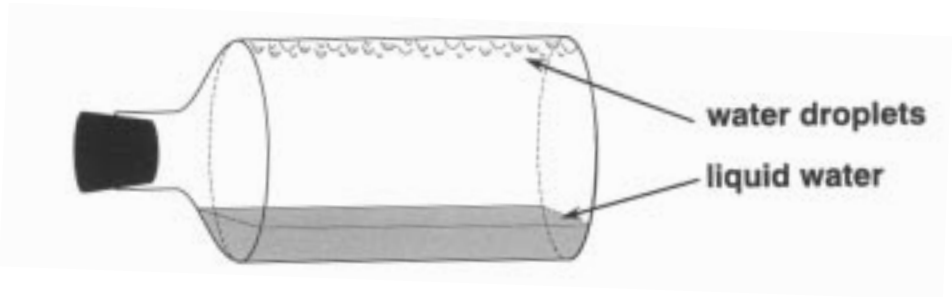
- Data is used to construct a reasonable explanation.
- Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.

Content

- Properties of Objects and Materials
  - * Materials can exist in different states - solid, liquid, and gas. Some common materials can be changed from one state to another by heating or cooling.
- Earth's Components
  - * Water on the earth can be a solid, liquid, or gas and can go back and forth from one state to the other. If water is changed from one state to another, the amount (mass) of water remains constant.

5. Weather in a Bottle

The picture below shows a large, sealed, glass bottle. The bottle had some water in it and was left on a warm surface. This bottle is a model of the water cycle.



a. Use what happens in the bottle to explain the water cycle.

b. Tell what would be different on Earth if water did not go through the changes that are happening in the bottle. Include two or more differences in your answer.

SCORING GUIDE

Score	Description
4	Student response contains no misconceptions. A. Student correctly uses the bottle system as a model to clearly explain evaporation and condensation of water as it relates to the water cycle. B. Student tells two or more acceptable differences that would be seen if water did not evaporate and condense.
3	Student response contains minor misconceptions. A. Student implies or weakly uses the bottle system as a model to explain evaporation and condensation of water as it relates to the water cycle. The use of the model and the explanation has limited detail. B. Student tells one or more acceptable differences that would be seen if water did not evaporate and condense.
2	Student response is vague or unclear and includes errors, but the response shows some pertinent science. A. Student attempts to explain the water cycle without using the bottle system as a model, OR A. Student tells what happens in the bottle without referring to the water cycle, OR B. Student attempts to tell the difference that would occur on Earth without the changes in the bottle, OR Student succeeds on either A. or B.
1	Student shows minimal understanding or makes a weak attempt to respond. Student response attempts to explain the water cycle, but is mostly wrong or confused.
0	Response is incorrect or irrelevant.
BLANK	Blank/no response.

Note: If a student uses “steam” in place of “water vapor,” then treat it as a minor misconception for fourth graders.

Background Information:

Success in responding to this item requires interpretation of the bottle as a model. The bottle should be used to help describe the way water evaporates, rises, and then condenses to form clouds and finally falls as precipitation. The relatively cool inside of the upper glass surface represents the cool atmosphere where real clouds form. Water evaporating from the surface of the water in the bottom of the bottle represents evaporation from ground or surface water. The water then rises to form clouds in upper altitudes that later can drop water on higher levels of land.

The fact that water easily changes state within the range of temperatures found in normal Earth weather conditions makes it possible for the water to continually be recycled. Without this process, the water would all be in the sea, and higher land masses would be totally dry due to gradual migration of water to its lowest level.

KIRIS ASSESSMENT ANNOTATED RESPONSE
GRADE 4 SCIENCE

Sample 4-Point Response of Student Work

The bottle is part of a water cycle. A. The water evaporates and then forms condensation on the top of the bottle. Then after a while the water rains down. This is called precipitation. This is how the water cycle works. B. The world would have no life on it if there was no water cycle. We wouldn't get any new water if we didn't have a water cycle neither would the plants so there would be no life on earth. This is why the water cycle is a very important part of the world.

Student correctly uses the bottle system as a model to explain the water cycle.

Student tells two or more differences that would be seen, i.e. humans couldn't get "new" water and plants couldn't get water.

Student demonstrates an ability to use data to construct a reasonable explanation.

Student demonstrates an understanding that scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.

Student demonstrates an application of scientific ways of thinking and working and uses those methods to solve real-life problems.

Student demonstrates a knowledge that materials can exist in different states - solid, liquid, and gas. Some common materials can be changed from one state to another by heating or cooling.

Student demonstrates a knowledge that water on the earth can be a solid, liquid, or gas and can go back and forth from one state to the other. If water is changed from one state to another, the amount (mass) of water remains constant.

Student demonstrates an application of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.

KIRIS ASSESSMENT ANNOTATED RESPONSE
GRADE 4 SCIENCE

Sample 3-Point Response of Student Work

The bottle is like the water cycle by having the water evaporate and come to the top and then it falls into the pile of water in the bottom of the bottle. That is how the bottle is like the water cycle. For one thing if water didn't go through changes then it would never rain and nothing could grow. The earth would be covered in water. That is what would happen if water didn't go through the cycle.

Student uses the bottle system as a model to explain the water cycle. The explanation uses limited detail.

Student tells three differences that would be seen, i.e. it would never rain, nothing would grow, and the earth would be covered in water.

Student demonstrates an ability to use data to construct a reasonable explanation.

Student demonstrates an understanding that scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.

Student demonstrates an application of scientific ways of thinking and working and uses those methods to solve real-life problems.

Student demonstrates a knowledge that materials can exist in different states - solid, liquid, and gas. Some common materials can be changed from one state to another by heating or cooling.

Student demonstrates a knowledge that water on the earth can be a solid, liquid, or gas and can go back and forth from one state to the other. If water is changed from one state to another, the amount (mass) of water remains constant.

Student demonstrates an application of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.

KIRIS ASSESSMENT ANNOTATED RESPONSE
GRADE 4 SCIENCE

Sample 2-Point Response of Student Work

First on a sunny day with a few clouds water molecules are pulled up by the sun from oceans or lakes. Some wind up in the clouds. When the clouds move over land some molecules will be growing larger and the cloud will no longer be able to hold the water molecules and the cloud will let go. This is what we call rain. Some rain may hit moutains. Most will hit land. Either way usually streams are most of the time going to make rivers which flow back to the laks or ocean to start the water cycle all over again.
B. Well, if water would not go through these changes animals who only leaved near rivers or streams would no longer to get water, and eventually die.

Student explains the water cycle but does not use the bottle system as a model.

Student demonstrates some ability to use data to construct a reasonable explanation.

Student demonstrates some application of scientific ways of thinking and working and uses those methods to solve real-life problems.

Student demonstrates some understanding that scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.

Student demonstrates some knowledge that materials can exist in different states - solid, liquid, and gas. Some common materials can be changed from one state to another by heating or cooling.

Student demonstrates some knowledge that water on the earth can be a solid, liquid, or gas and can go back and forth from one state to the other. If water is changed from one state to another, the amount (mass) of water remains constant.

Student demonstrates some application of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.

Sample 1-Point Response of Student Work

part (a). for the water cycle first happends is that the clouds get very dark and the sky gets dark then water droplets start to avaprat in the sky it starts to rain out side and from the wet ground that avaparats to after.
part (b). Well we would not have that much water to advapart. Also there would not be water for animals or for food.

Student explanation shows a minimal understanding of the water cycle.

INSTRUCTIONAL STRATEGIES

Weather in a Bottle

Students demonstrate and explain a river's ability to erode the landscape.

Students trace the process of ocean sand as it makes its journey from a mountain rock to the ocean.

Students classify a variety of earth materials as being solid, liquid, or gas based on observing the objects' physical properties.

Students observe the evaporation, condensation, and movement of a small amount of water sealed in a large transparent bottle.

Students make ice cream, popsicles, or gelatin and observe and compare the (warm) liquid state at the beginning of the process with the (cooled) solid end product and describe the changes that took place.

Students construct a stream table to investigate variables that affect erosion.

Students observe and study types of cloud formations and identify the type of weather conditions occurring at the time of the observation.