Modeling the Water Cycle

Overarching Question – How does the water cycle recycle the Earth's water?

Background Information: Water is essential for life on Earth. It is recycled through the WATER or HYDROLOGIC CYCLE, which involves the following processes:

EVAPORATION – the changing of water from a liquid to a gas

CONDENSATION – the changing of water from a gas to a liquid

SUBLIMATION – the changing of water from solid to a gas

PRECIPITATION – the process by which water molecules condense to form drops heavy enough to fall to the earth's surface

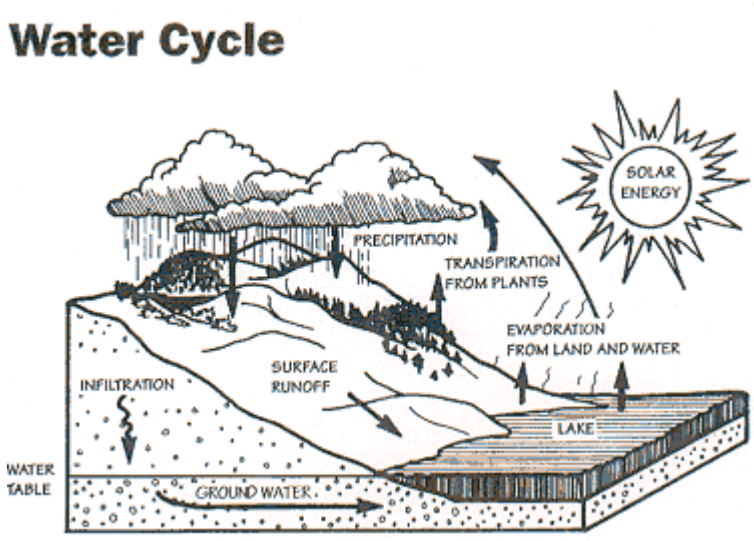
TRANSPIRATION – the process by which water is carried through plants from roots to leaves, where it changes to vapor and is released to the atmosphere

SURFACE RUNOFF – the flowing of water over land from higher to lower ground

INFILTRATION – the process of water filling in the porous spaces of soil

PERCOLATION – groundwater moving into the saturated zone below the earth's surface

MODELS are often used to think about processes that happen too slowly, too quickly, or on too small a scale to observe directly, or that are too large to be changed deliberately, or that are potentially dangerous.

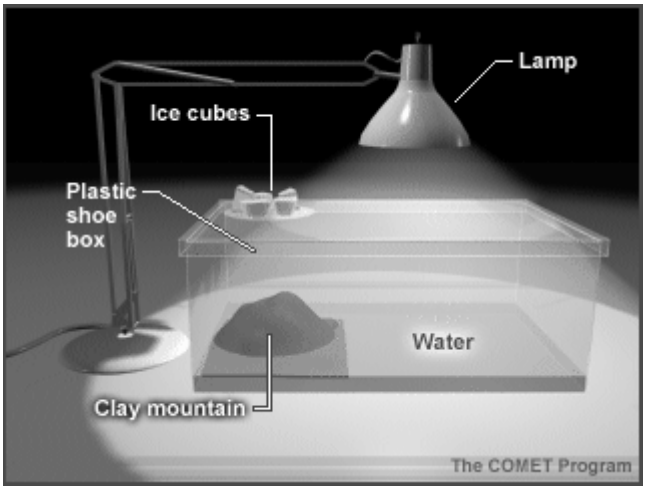


Adapted from: http://www.ucar.edu/learn/1_1_2_4t.htm

Name_____ Class _____ Date _____

Procedure:

1. Your teacher will set up the following demonstration:



2. Observe the model. Record your observations below:

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Questions & Conclusions:

1. Which part of the investigation simulated *evaporation*?

2. Which part simulated *condensation*?

3. Which part simulated *precipitation*?

4. What is the energy source and what does it represent?

5. What processes of the water cycle are NOT represented?

6. How could we demonstrate *transpiration* in this investigation?

7. Would *condensation* occur in the box without the ice? **Explain your answer**.

8. After observing this investigation, explain why water is considered a renewable resource. (Use a dictionary to look up renewable if necessary.)

9. The system you observed is a model of the way the actual water cycle works. Why might scientists use a model like this in their research into the water cycle in the real world?

10. What are some reasons that using such a model might be a problem?

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As this experiment utilizes matches, educators should use best judgment on whether or not to allow the students to directly participate.

Levels of Inquiry

Confirmation – Provide the students with the overarching question and the procedure, as well as the materials. Place several instrument artifacts around the room so that students can check their progress.

Structured - Provide the students with the overarching question and the procedure, as well as the materials. Allow students to discover the finished product on their own.

Guided – Provide the students with the overarching question and materials. Students are to create and write their own procedures and determine which materials to utilize. Allow students to discover the finished product on their own.

Open - Students are given a scenario that describes a situation. From this scenario, students are to generate an overarching question. From that point, students are to create and write their own procedures and determine which materials to utilize. Allow students to discover the finished product on their own.

Possible scenario – Jaquesz is observing the weather during a rainy day. He is wondering where exactly the water in the rain came from.

Correlated Literature (with Lexiles) (Audio capable)

(All literature can be found on the Galileo website unless otherwise noted.)

Ornes, S. (2009). Not bone-dry after all: the moon holds water. *Science News for Kids*. Retrieved from http://www.sciencenewsforkids.org/2009/10/not-bone-dry-after-all-the-moon-holds-water/ (Not Galileo)

STREEP, A. (2011). Repair the Water Cycle. *Popular Science*, *278*(5), 50. (1170) (Audio capable)

Williams, R. (1999). The tortoise and the hare. *Weatherwise*, *52*(1), 28. (1090) (Audio capable)

Technology Integration

Digital Camera – Documenting your student's work with a digital camera is a great idea. Not only do you have digital media, but students are usually excited about presenting their work to be captured by camera. With the media, there are endless possibilities, from PowerPoints to blogs to Glogs and beyond!!! (Always refer to your school's policies about posting student's pictures or work on the Internet.)

Presentation Platforms – Presentation platforms have evolved. PowerPoint is still effective, but here some examples of Internet based platforms. (Many of them allow the embedding of pictures, video, and audio, as well as text.)

http://www.prezi.com – zoomable slide presentation tool

Adapted from: http://www.ucar.edu/learn/1_1_2_4t.htm

http://edu.glogster.com/ - Internet based poster maker

http://museumbox.e2bn.org/index.php - description of an event or person in an interactive box

http://www.voki.com/ - create an avatar to speak for you

Common Core (Grades 6-8)

L6-8RST3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
L6-8RST7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
L6-8WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style and objective tone.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Georgia Performance Standards

S6CS2. Students will use standard safety practices for all classroom laboratory and field investigations.
a. Follow correct procedures for use of scientific apparatus.
b. Demonstrate appropriate techniques in all laboratory situations.
c. Follow correct protocol for identifying and reporting safety problems and violations.

S6CS4. Students will use tools and instruments for observing, measuring, and manipulating equipment and materials in scientific activities.
c. Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates, and temperature, and choose appropriate units for reporting various quantities.

S6CS5. Students will use the ideas of system, model, change, and scale in exploring scientific and technological matters.
a. Observe and explain how parts are related to other parts in systems such as weather systems, solar systems, and ocean systems including how the output from one part of a system (in the form of material, energy, or information) can become the input to other parts. (For example: El Nino's effect on weather)
Adapted from: http://www.ucar.edu/learn/1_1_2_4t.htm

b. Identify several different models (such as physical replicas, pictures, and analogies) that could be used to represent the same thing, and evaluate their usefulness, taking into account such things as the model's purpose and complexity.

S6E3. Students will recognize the significant role of water in earth processes.
b. Relate various atmospheric conditions to stages of the water cycle.

S6E4. Students will understand how the distribution of land and oceans affects climate and weather.
a. Demonstrate that land and water absorb and lose heat at different rates and explain the resulting effects on weather patterns.

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