Water Cycle Interactions
Teacher Facilitation Notes

In General . . .

- Project the slide deck in edit mode–do not show it as a slideshow.
- Hide the speaker notes before projecting. (View/Show Speaker Notes)
- Hide the filmstrip to the left. (View/Hide Filmstrip.)
- Hide the toolbar. (Click on the up arrow at the right end of the tool bar.)
- Call on students to read the various content shown on slides.

Materials Needed Per Group:

Engage: Water Cycle Review

Clear, plastic glass, 1
Hot plate, 1
Beaker (500 mL), 1
Goggles, 1 per student
Water
Aluminum pan, 1
Ice cubes
Stopwatch or timer, 1

Evaluate:

Other Materials

Student Recording Sheets
Student Summative Evaluation
Pencils
Follow a Drip Through the Water Cycle
Science notebooks

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Engage

- Have students complete the Agree/Disagree statements. Do not discuss at this time. Tell the students they will revisit this activity after their explore activities.
- Divide the class into groups and have the groups complete the water cycle investigation.
- Show the slide of the water cycle that is not labeled or titled. Ask them to think about how it might relate to the investigation they just completed.
- Instruct the students to observe the illustration, being careful to notice as many details as they can. Give them about 1 ½ to 2 minutes to observe the illustration.
- Name: Go to the next slide and have students recall features or parts of the illustration from memory. (The words they provide should be nouns.) Make sure they record the items in their science notebooks.
- Describe: Students will add a descriptor to each of the things they recalled from the illustration. (These will mostly be adjectives.)
- Act: Finally, have them describe their functions and how they contribute to the water cycle as a whole. (These responses will be verbs or verbal phrases.)
- Discuss student responses before going on to the next part of the engage activity.
- Show students the illustration again. Ask students to think about how the terms they recorded relate to what they learned about the water cycle from the investigation. For example, if they listed the sun, ask what the function of the sun is in the water cycle.
- Watch the video to review the water cycle processes. Discuss.
- Call on volunteers to drag and drop the processes to the correct places on the diagram.
- Have students complete the labeling activity independently.

*This strategy is based on the thinking routine *Name, Describe, Act* from Project Zero.

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Explore/Explain: The Oceans, the Water Cycle, and Weather

- Read through the title and introductory slides.
- Pair students up to do a Turn and Talk activity with the questions on the next slide. You might remind students of the following when doing a Turn and Talk:
  - Tell your partner your answers in one or two sentences.
  - Listen without interrupting while your partner tells their answers.
  - Be kind and supportive–do not challenge answers–so that everyone feels comfortable sharing their answers.
- Read and discuss the slides about weather and climate. Have students answer the questions on their recording sheets as the slides are read and discussed.
- Call on volunteers to read the text on the clouds and identify if they describe weather or climate. Drag and drop each cloud to the correct section of the Venn diagram. (There will be 4 clouds in each section.)
- Continue in the same manner until all of the slides are read and discussed.

**Turn and Talk* is a commonly used instructional strategy that allows students to discuss content knowledge with a peer. For more information see Turn and Talk Teacher Guide.

Explore/Explain: Putting It all Together!

- As the students read and discuss each slide, annotate the passage pages using the symbols on the left. Have students come to a consensus about the most important fact, key vocabulary, and main ideas. Drag and drop the symbols where the students indicate they should go. Resize as necessary.
- Make sure each student has a copy of the tweet template. Explain as necessary.
- Have students work independently to write their tweets, create their labeled diagram, and create a hashtag for the influence of the sun on the water cycle and weather.
- Use Think-Pair-Share to partner up students. The students share their tweet with a partner. Each person retweets by adding one more idea to the other person's template.
- As students work, circulate around the class, clarifying and verifying thinking as appropriate.
- After reading, annotating, and discussing each slide, go back to the Agree/Disagree statements from the beginning of the lesson. Discuss their beginning answers and how they might want to change any of those answers now that they have studied the water cycle and weather.

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Elaborate

- Read and discuss the three different types of severe weather.
- As students discuss the weather events, be sure they point out how the sun influences that type of weather event.
- Have students complete the lists and the Venn diagram for this activity independently. Discuss as desired.

Evaluate

- Review the question on the opening slide for this section. Discuss.
- Call on volunteers to identify the processes in the water cycle.
- Call on a volunteer to read the opening paragraph of the short answer slide. Have students complete the activity as directed.
- Allow time for students to complete the summative assessment independently. Discuss as desired.

Water Cycle Interactions

Name: Key

Evaluation

1. How does the energy from the sun affect the water cycle? (Mark two answers.)

   A By trapping particles of water in high, fluffy clouds

   B By turning liquid water into a gas called water vapor

   C By causing water on the Earth's surface to evaporate

   D By causing liquid water in the atmosphere to precipitate

   E By creating winds high up in the atmosphere

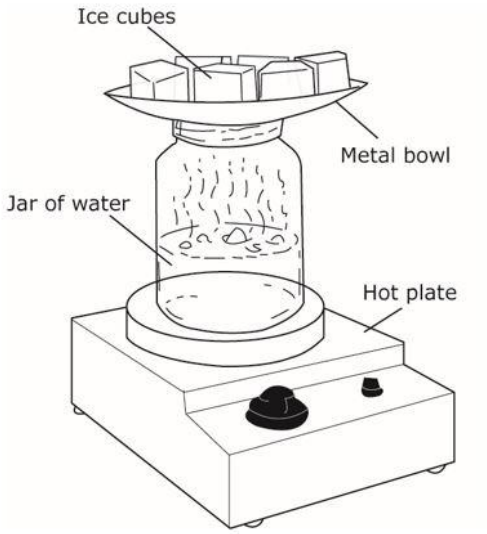
2. The diagram shows a model of the water cycle. What part of the model represents energy from the sun?

   F The ice cubes

   G The hot plate

   H The metal bowl

   J The jar of water



3. The sun drives the water cycle and weather on Earth by doing which of the following?

   A Orbiting the Earth once each year

   B Providing energy through light and heat

   C Giving energy to green plants

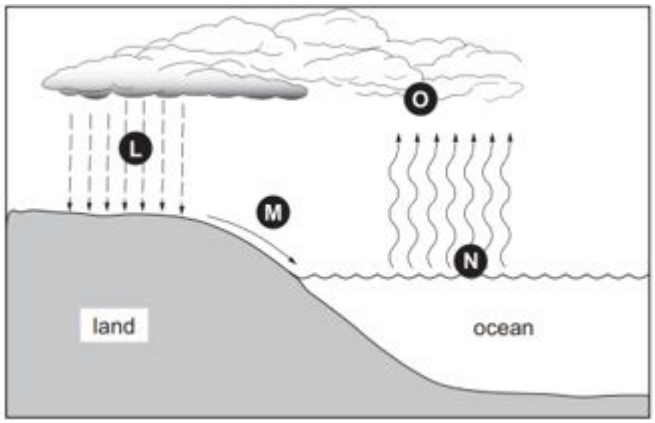
   D Causing the Earth to spin on its axis

Water Cycle Interactions

Name: Key

Evaluation

4. Study the diagram to the right. Which phase of the water cycle is affected most directly by solar energy?



F Phase L

G Phase M

H Phase N

J Phase O

5. During the water cycle, solar energy causes water on the Earth's surface to evaporate. Most of the water that evaporates comes from–

A oceans

B lakes

C rivers

D puddles

6. The sun heats the Earth's atmosphere and land. Some parts of the land are heated more than others. What is caused by the uneven heating of the Earth's surface by the sun?

F Floods

G Winds

H Earthquakes

J Glaciers

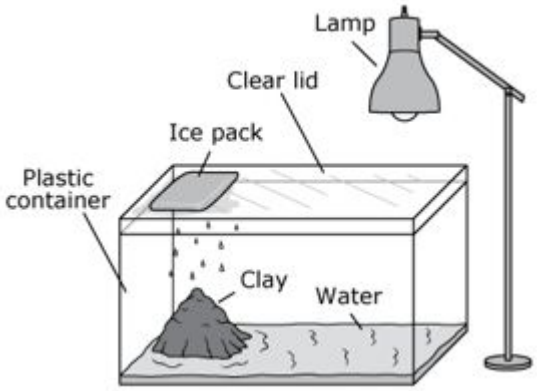
Water Cycle Interactions

Name: Key

Evaluation

This question has three parts.

A student used a closed container model to show how fresh water cycles through the water cycle. The model is shown below.



In the model, the water represented a lake and the clay represented land. A lamp shone through the lid of the container and onto the water. The student placed an ice pack on top of the clear lid. Water droplets formed under the ice pack and dropped onto the clay.

Part A

7. What part of the water cycle does the lamp represent in this model? _____

The lamp represents the sun (or energy from the sun).

Part B

8. What part of the water cycle was represented by the water as the lamp shines on it? Be sure to describe what happened to the water.

Evaporation is represented by the water as the light shines on it. The water changes from a liquid to a gas.

Part C

9. What part of the water cycle was represented by the droplets of water forming on the bottom of the lid under the ice pack? Explain your reasoning. **Condensation was represented by the droplets of water forming on the bottom of the lid. The water vapor changed to liquid water.**

Water Cycle Interactions

Name: _____

Engage: Water Cycle Review

Directions: Place a checkmark next to *agree, disagree,* or *it depends* for each statement. Then explain your decision.

Statement	My Thoughts	Statement	My Thoughts
1. In the water cycle, water changes from one state of matter to another. _____agree _____disagree _____it depends		**5.** The water cycle has nothing to do with weather. _____agree _____disagree _____it depends	
2. Cooling air causes condensation. _____agree _____disagree _____it depends		**6.** More clouds in the sky means more precipitation will fall in that area. _____agree _____disagree _____it depends	
3. Most evaporation from oceans is caused by heat from the sun. _____agree _____disagree _____it depends		**7.** The hotter the air temperature, the more evaporation that will occur. _____agree _____disagree _____it depends	
4. The four types of precipitation that occur in the water cycle are rain, snow, sleet, and dew. _____agree _____disagree _____it depends		**8.** The water cycle is important to weather because clouds form due to condensation in the air. _____agree _____disagree _____it depends	

Water Cycle Interactions

Name: _____

Engage: Modeling the Water Cycle

Procedures:

1. Making sure that it is turned off, plug in the hot plate. Be sure it is in a safe place and no one can trip over its cord!
2. Measure and pour 200 mL of room temperature water into a glass beaker Place the beaker on the heating surface of the hot plate. Turn on the hot plate to medium and begin heating the water. Heat the water for 10 minutes.
3. While the water is heating, take turns reading *Follow a Drip Through the Water Cycle* with your group members.
4. Put about 300-400 mL of ice cubes in the aluminum pie pan.
5. Place the pie pan on top of the jar of hot water that is on the hot plate.
6. Observe what happens as the pie pan sits on the jar of hot water.
7. What happens to the water in the beaker as it heats? _____

   _____
8. What does the steam in the jar do as the water boils? _____

   _____
9. What happens to the water vapor as it rises higher in the jar and cools?

   _____
10. What do we call the process of water vapor becoming a liquid? _____

    _____
11. What happens when the water droplets on the bottom of the pan get large?

    _____
12. What does each element in the model represent? (For example, what does the hot plate stand for?) _____

    _____

    _____

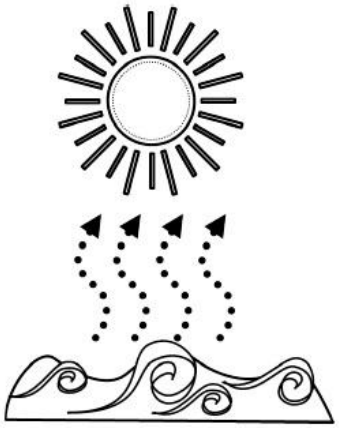
Water Cycle Interactions

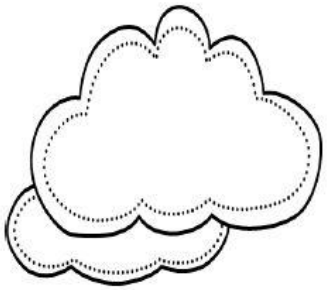
Engage: Modeling the Water Cycle

Follow a Drip Through the Water Cycle

You may be familiar with how water is always cycling around, through, and above the Earth, constantly changing from liquid water to water vapor to ice and back to liquid water. One way to see the water cycle in your mind is to follow a drop of water around as it moves on its way. I could really begin this story anywhere along the cycle, but I think the ocean is the best place to start, since that is where most of Earth's water is.

If the drop wanted to stay in the ocean, then it shouldn't have been sunbathing on the surface of the sea. The heat from the sun found the drop, warmed it, and evaporated it into water vapor. This process is called **evaporation.** The water vapor rose into the air and continued rising. As it rose, strong winds high in the air grabbed it and took it hundreds of miles away until it was over land. There, warm air rising from the heated land surface took the water vapor up even higher, where the air is quite cold.





When the water vapor got cold, it changed back into a liquid (**condensation**). If it was cold enough, it would have turned into tiny ice crystals. The vapor condenses on tiny particles of dust, smoke, and salt crystals to become part of a cloud.

After a while our droplet combined with other droplets to form a bigger drop and fell to the earth as **precipitation**. Earth's gravity helped to pull it down to the surface. Once it starts falling, there are many places for water drops to go. Maybe it would land on a leaf on a tree, in which case it would probably evaporate and begin its process of heading for the clouds again. If it misses a leaf, there are still a lot of other places to go.

Water Cycle Interactions

Engage: Modeling the Water Cycle

The drop could land on a patch of dry dirt in a flat field and soak into the ground. The drop will continue moving (mainly downhill) as groundwater, but the journey might end up taking tens of thousands of years until it finds its way back out of the ground. Then again, the drop could be pumped out of the ground from a water well and be sprayed on crops (where it will either evaporate, flow along the ground into a stream, or go back down into the ground). Or, the well water containing the drop could end up in a baby's drinking bottle or be sent to wash a car or a dog. From these places, it is back again either into the air, down sewers into rivers and eventually into the ocean, or back into the ground.

Our drop may be a land-lover. Lots of precipitation ends up staying on the earth's surface to become a part of surface water. If the drop lands in a city or town, it might hit your house's roof or go down your driveway to the curb. If a dog or squirrel doesn't lap it up, it will run down the curb into a storm sewer and end up in a small creek. It is likely the creek will flow into a larger river and the drop will begin its journey back towards the ocean.

If no one interferes, the trip will be fast (speaking in "drop time") back to the ocean, or at least to a lake where evaporation could again take over. But, with billions of people worldwide needing water for most everything, there is a good chance that our drop will get picked up and used before it gets back to the sea.

Some surface water is used for irrigating crops or by power plants to cool their electrical equipment in a cooling tower to be evaporated. Talk about a quick trip back into the atmosphere as water vapor! A town might pump the drop out of the river and into a water tank. From there the drop could go on to help wash your dishes, fight a fire, water the tomatoes, or flush your toilet. Maybe the local movie theater will grab the drop, or it might end up at a fancy restaurant mopping the floor. The possibilities are endless–but it doesn't matter to the drop, because eventually it will get back into the environment. From there it will again continue its cycle into and then out of the clouds, this time maybe to end up in the water glass of the President of the United States.

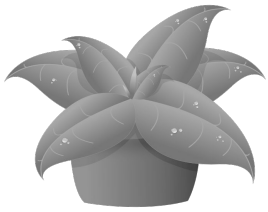
Water Cycle Interactions

Name: _____

Engage: Water Cycle Review

Directions: Use terms from the Term Bank to label each picture or description of events that occur in the water cycle. (Each term may be used more than one time.

Term Bank		
evaporation	condensation	precipitation
transpiration	runoff	accumulation

1.  _____

2. A farmer dug a lake on his land to catch rainwater that fell from the sky _____

3. Cooling water vapor rises into the sky and changes into tiny water droplets _____

4.  _____

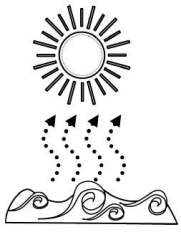
5. The sun warms the ocean's surface, changing the water into water vapor _____

6.  _____

7.  _____

8. After a heavy rain, a student noticed that a lot of water was running through the ditch in front of his house _____

9. A large storm dropped 10 inches of rain in the Fort Worth area _____

10.  _____

Water Cycle Interactions

Name: _____

Explore: The Oceans, the Water Cycle, and Weather

Answer these questions as you read and discuss the slides in this part of the lesson.

1. What is weather? _____

   _____

2. What conditions in the atmosphere most affect weather? _____

   _____

3. How does the sun contribute to the formation of wind on Earth? _____

   _____

4. What is another way that the sun affects Earth's weather? _____

   _____

5. What is climate? _____

   _____

6. What is the most important difference between weather and climate?

   _____

   _____

7. How do ocean currents affect weather around the Earth? _____

   _____

8. What is an air mass? How does an air mass affect weather? _____

   _____

9. What are the two different types of fronts that move across the United States? How are they alike? How are they different? _____

   _____

   _____

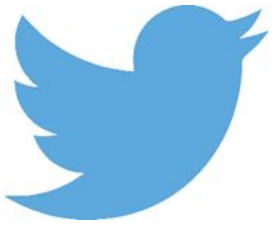
   _____

   _____

Water Cycle Interactions

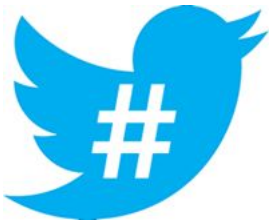
Name: _____

Explain: Putting It All Together



How does the sun affect climate and the water cycle? (280 characters to describe what you just learned)

Sketch it! (labeled sketch of the water cycle–be sure to include the sun!)



Hashtags? (how can you summarize the Sun's effect on weather in a hashtag phrase)

Share and Retweet! (share your tweet with a friend and get him/her to "retweet" by adding one more idea)

Water Cycle Interactions

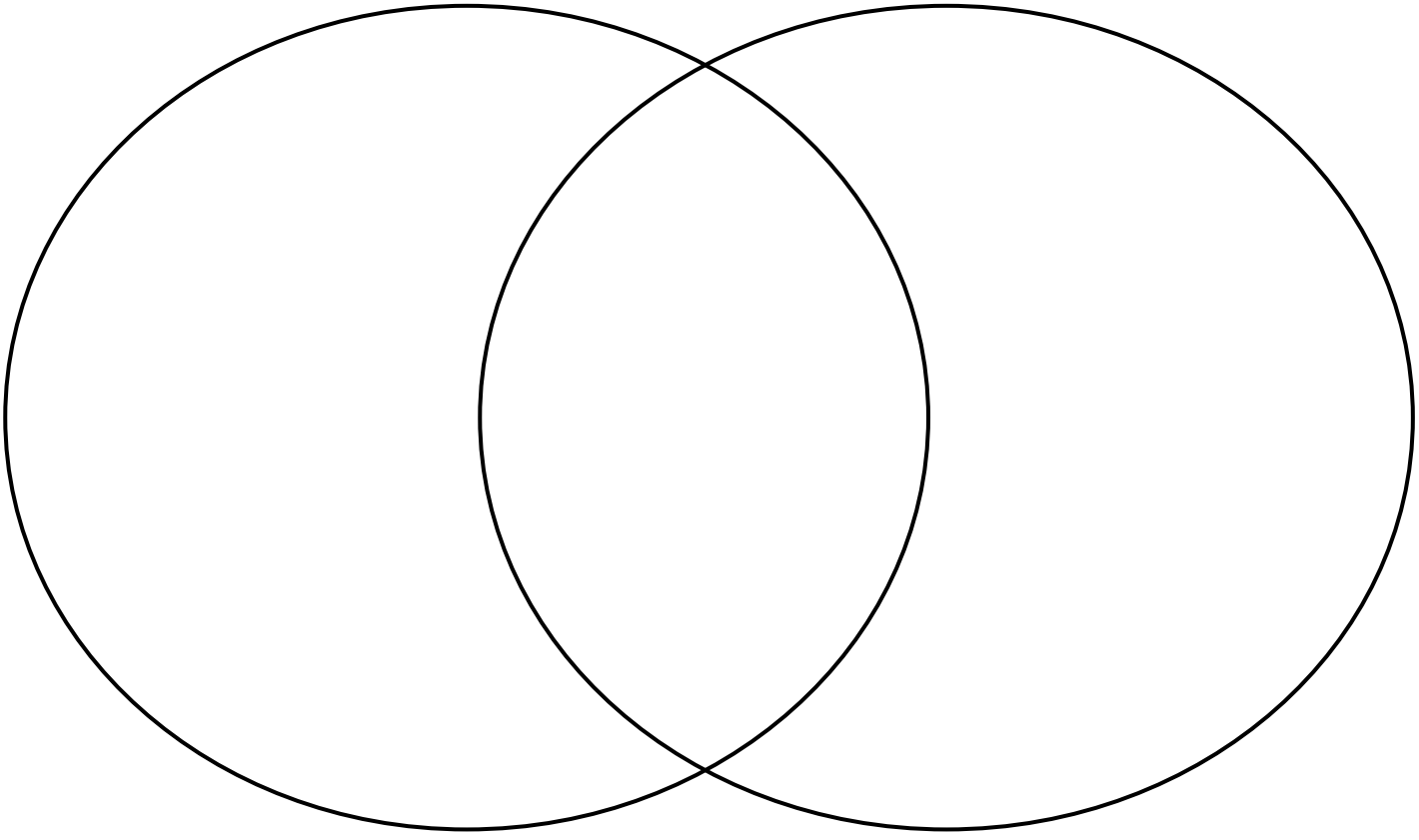
Name: _____

Elaborate: Hurricanes, Thunderstorms, and Tornadoes, Oh My!

Comparing the Effects of Different Kinds of Severe Weather

Directions: Choose two of the different kinds of severe weather you studied (Hurricane, Thunderstorm, or Tornado). List two characteristics and two effects of each type of severe weather. Then, complete the Venn diagram, showing how the kinds of weather are similar or different.

Severe Weather #1:	**Severe Weather #2:**
Characteristics: (List 2)	**Characteristics:** (List 2)
Effects: (List 2)	**Effects:** (List 2)



Water Cycle Interactions

Name: _____

Evaluation

1. How does the energy from the sun affect the water cycle? (Mark two answers.)

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   B By turning liquid water into a gas called water vapor

   C By causing water on the Earth's surface to evaporate

   D By causing liquid water in the atmosphere to precipitate

   E By creating winds high up in the atmosphere

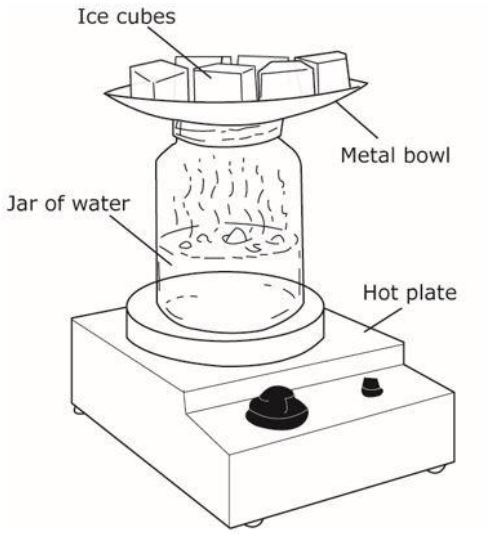
2. The diagram shows a model of the water cycle. What part of the model represents energy from the sun?

   F The ice cubes

   G The hot plate

   H The metal bowl

   J The jar of water



3. The sun drives the water cycle and weather on Earth by doing which of the following?

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   C Giving energy to green plants

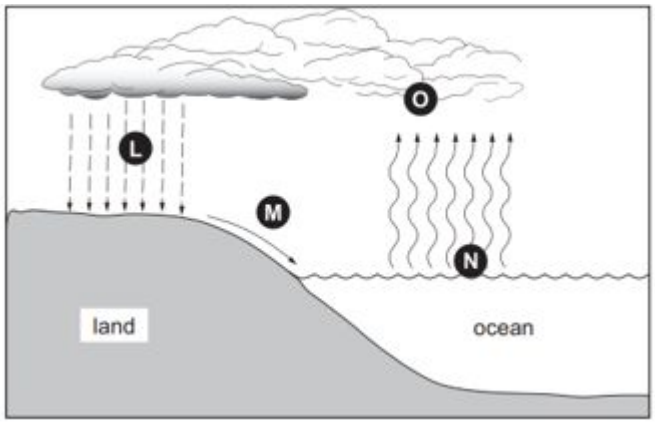
   D Causing the Earth to spin on its axis

Water Cycle Interactions

Name: _____

Evaluation

4. Study the diagram to the right. Which phase of the water cycle is affected most directly by solar energy?



F Phase L

G Phase M

H Phase N

J Phase O

5. During the water cycle, solar energy causes water on the Earth's surface to evaporate. Most of the water that evaporates comes from–

A oceans

B lakes

C rivers

D puddles

6. The sun heats the Earth's atmosphere and land. Some parts of the land are heated more than others. What is caused by the uneven heating of the Earth's surface by the sun?

F Floods

G Winds

H Earthquakes

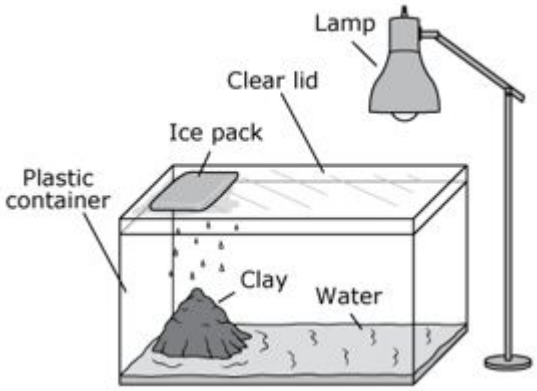
J Glaciers

Water Cycle Interactions

Name: _____

Evaluation

This question has three parts.
A student used a closed container model to show how fresh water cycles through the water cycle. The model is shown below.



In the model, the water represented a lake and the clay represented land. A lamp shone through the lid of the container and onto the water. The student placed an ice pack on top of the clear lid. Water droplets formed under the ice pack and dropped onto the clay.

Part A

7. What part of the water cycle does the lamp represent in this model? _____

_____

Part B

8. What part of the water cycle was represented by the water as the lamp shines on it? Be sure to describe what happened to the water.

_____

_____

Part C

9. What part of the water cycle was represented by the droplets of water forming on the bottom of the lid under the ice pack? Explain your reasoning. _____

_____

_____