

The Water Cycle

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 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.
- For each investigation, assemble the needed materials for each group and place in a central location for ease of distribution.
- Duplicate copies of the data sheets for each student.

Materials Needed:

Engage—Water on Earth (For Demonstration)

Glass beaker, 500 mL	Water, 100 mL	Blue food coloring
Clear, plastic glasses, 4	Eyedropper or pipette	Sharpie™

Explore—Water Cycle Processes: Evaporation (Per Group)

Black or dark plastic tray	Beaker (250 mL)	Water
Paint brush, 1 per student	Paper towels	

Explore—Water Cycle Processes: Condensation (Per Group)

Large glass or glass jar	Ice	Water
Paper towels		

Explore—Water Cycle Processes: Precipitation (Per Group)

Large glass or glass jar	Ice	Warm water
Paper towels	Small aluminum pie pan or tart pan	

Elaborate—Modeling the Water Cycle (Per Group)

Gallon-size plastic baggie	Sharpies, different colors	Warm water
Blue food coloring	Packing tape	Paper towels

Evaluation (Per Group)

Chart paper or large sheets of construction paper	
Markers	Tape

Other Materials

Student Recording Sheets	Pencils	Student Evaluations
Electric kettle or other means to heat water		

The Water Cycle

Teacher Facilitation Notes, p. 2

Engage: Water on Earth

- Show the slide with the Earth graphic. Read through and discuss the statements on the slide. Answer the first question as a class. Tell students that about 71% of the Earth's surface is covered with water.
- Fill the beaker with 400 mL of water. Show the beaker to the students.
- Add 3-4 drops of blue food coloring to the beaker. Tell the students that you are making the water blue so that it is easier to see.
- Emphasize to the students that the water in the beaker represents ALL of the water on the Earth's surface—both liquid water, water vapor, and ice found at the North and South Pole.
- Label one of the clear plastic glasses *Oceans*. Ask students if they know how much of the water on the Earth's surface is saltwater—found in oceans and seas. (Allow guesses, but they probably don't know the exact amount.)
- Pour 388 mL of the water from the beaker into the glass marked *Oceans*. Explain that about 97% of all the water on the Earth's surface is salt water found in oceans and seas. The rest of the water (12 mL) represents the Earth's supply of freshwater.
- Label another clear, plastic glass *Frozen Water (Ice)*. Pour 8 mL of the remaining water in the beaker into this glass. Explain that about 2% of the Earth's water supply is unavailable for human use because it is frozen in ice caps, icebergs, and glaciers.
- Tell students that the half of the remaining 1% (4 mL) is groundwater. Label a clear, plastic glass *Groundwater* and pour in 2 mL of water. (If it makes it easier to measure, use an eyedropper or pipette to add the water to the glass.)
- Point out the remaining water in the beaker (0.5% or 2 mL) is freshwater that fills Earth's lakes, streams, and rivers. The water vapor in the air is also part of this 0.5%. This represents how much water is available for humans, animals, and plants to use.
- Posit the question: *If there is so little fresh water on the Earth, why don't we use it up?* Discuss students' ideas to answer the question.
- Go to the next slide and read about the water cycle.
- Watch the video. Tell student they will be learning about each individual water cycle process throughout this lesson.

The Water Cycle

Teacher Facilitation Notes, p. 3

Explore: Water Cycle Processes

Evaporation

- Have students work in groups to complete the simple evaporation experiment.
- Ask students, *What happens to the water on the tray? Does it just disappear?*
- Remind students that after a short time, heat from the air causes the water on the surface of the tray to evaporate and become water vapor in the air.

Condensation

- Have students work in groups to complete the simple condensation experiment.
- Ask students if they have ever seen evidence of condensation before.
- Remind students that clouds are NOT gas, or water vapor. Clouds are made up of water droplets that formed as warm air rose and touched the cold air in the atmosphere. The droplets stick together, forming clouds.

Precipitation

- Heat the water for this investigation so that it is very warm but NOT boiling. Remind students of proper science rules before beginning to investigate.
- Have students work together to complete the investigation. Discuss.
- Leave the system set up to use in the next part of the investigation.

Collection/Runoff

- Read the slide about collection/runoff.
- Ask students what part of the system they made models collection. Discuss.

Discussion

- Facilitate a discussion once the students have completed all of the investigations. The following questions might be used in prodding discussion:
 - Which stage in the water cycle requires the most energy from the sun?
 - How does energy from the sun affect Earth's surface water?
 - What change occurs in water during evaporation?
 - What change occurs in water vapor during condensation? What causes this change?
 - What is precipitation? What are the four forms of precipitation?
 - Which of the stages of the water cycle are most affected by Earth's gravity?
- Discuss as desired.

The Water Cycle

Teacher Facilitation Notes, p. 3

Explain: The Importance of the Sun in the Water Cycle

- Call on volunteers to read the paragraphs about the water cycle. Discuss, emphasizing the role of the sun in the water cycle.
- Work through the questions together as a class. For each statement, remind students that this is a CAUSE. They are looking for what happens (EFFECT) because of this.
- Discuss as desired.

Elaborate: Water Cycle Model

- Read through the directions with the students.
- Let them work in groups to complete the investigation. Circulate among the groups as they work, asking questions and redirecting thinking as needed.
- Visit the water cycle models several time over the course of a few days.
- Discuss as desired.

Evaluate

- Divide the class into 5 groups. Each group will be responsible for creating an anchor chart on one aspect of this lesson:
 - The Water Cycle
 - Evaporation
 - Condensation
 - Precipitation
 - Collection/Runoff
- Go over the slide showing the directions and tips for making these anchor charts. Give students time to create and present their charts.
- Display the charts around the classroom or in nearby hallway.
- Let students complete the quiz independently.
- Discuss evaluation as desired.

The Water Cycle

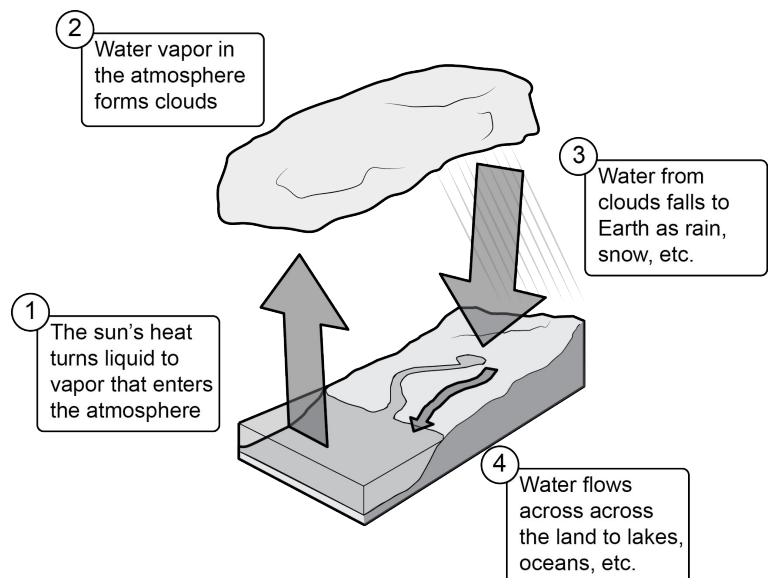
Name: KEY

Evaluation

1. Evaporation is–
- A a gas changing to a liquid
 - B water running across the land
 - C** a liquid changing to a gas
 - D a gas changing to a liquid

2. The illustration shows the processes that move water through the water cycle. Write the vocabulary term for each process on the correct line.

1. Evaporation
2. Condensation
3. Precipitation
4. Runoff



3. During which water cycle process does a gas change to a liquid?
- A Evaporation
 - B** Condensation
 - C Precipitation
 - D Runoff
4. Which of the following would best model how the sun's energy drives the water cycle?
- F A hair dryer blowing warm air
 - G A pan of water heating on the stove
 - H** A light warming the water and organisms in an aquarium
 - J An electric kettle keeping water inside it hot

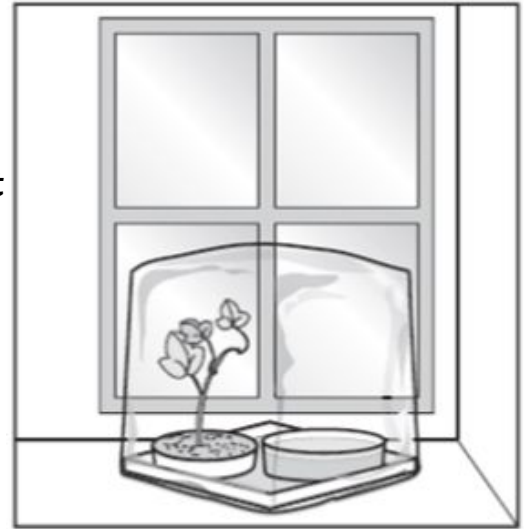
The Water Cycle

Name: KEY

Evaluation

5. Some students made a model of the water cycle by covering a plant and a tray of water with a clear plastic bag. They placed the set-up near a window and left it there for several days. What two processes can make it possible for the plant to use the water in the tray?

A Precipitation and runoff
B Heating and evaporation
C Cooling and condensation
D Evaporation and condensation



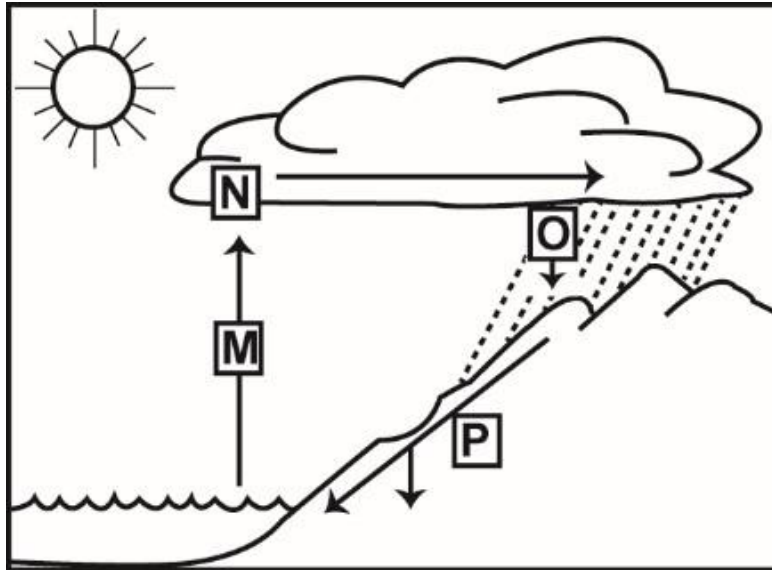
6. Which water cycle process is directly responsible for the formation of clouds?
- F** Transpiration
G Condensation
H Collection
J Precipitation
7. In the water cycle, water is returned to the Earth's surface through the process of—
- A** Precipitation
B Deposition
C Condensation
D Accumulation
8. As water moves through the water cycle, it may be found as a—
- F** Solid
G Liquid
H Gas
J All of the above

The Water Cycle

Name: KEY

Evaluation

Use the diagram below to answer questions 8-9.



8. In which location on the diagram is water changing from a liquid to a gas?
- F Location M G Location N
 H Location O J Location P
9. What process does O represent in the diagram?
- A Precipitation B Deposition
 C Condensation D Accumulation
10. What is the sun's role in the water cycle?
- F The sun is the main source of gravity that causes precipitation to fall to Earth's surface.
 G The sun provides energy to turn liquid water into water vapor in the atmosphere.
 H The sun gives energy to plants, allowing them to grow and reproduce.
 J The sun makes deserts hot so that the plants growing there can store a lot of water.

The Water Cycle

Name: _____

Explore: Water Cycle Processes

Question

How does water change state as it moves through the water cycle?

Evaporation

1. Record your observations about what happened after you painted your name on the tray with water.

2. What happened to the water?

Condensation

3. How does the jar feel? Is it warm? Is it cold? Is it dry? Is it wet? Is it hard? Is it soft? Record your observations below.

4. Sketch the jar/glass filled with ice water in the space below. Label the parts of your sketch.

The Water Cycle

Name: _____

Explore: Water Cycle Processes, page 2

Question

How does water change state as it moves through the water cycle?

Precipitation

1. Sketch the jar and pie pan system in the space below. Be sure to label the parts of the system in your sketch.

2. Record your observations about what happened as the cold pie pan sat on top of the jar of very warm water.

Condensation

3. How does the jar feel? Is it warm? Is it cold? Is it dry? Is it wet? Is it hard? Is it soft? Record your observations below.

4. Sketch the jar/glass filled with ice water in the space below. Label the parts of your sketch.

The Water Cycle

Name: _____

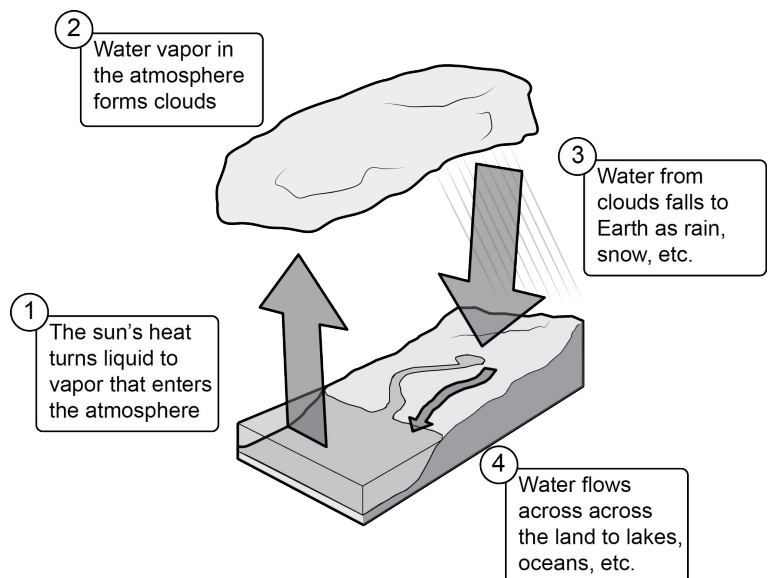
Evaluation

1. Evaporation is–

- A a gas changing to a liquid
- B water running across the land
- C a liquid changing to a gas
- D a gas changing to a liquid

2. The illustration shows the processes that move water through the water cycle. Write the vocabulary term for each process on the correct line.

1. _____
2. _____
3. _____
4. _____



3. During which water cycle process does a gas change to a liquid?

- A Evaporation
- B Condensation
- C Precipitation
- D Runoff

4. Which of the following would best model how the sun's energy drives the water cycle?

- F A hair dryer blowing warm air
- G A pan of water heating on the stove
- H A light warming the water and organisms in an aquarium
- J An electric kettle keeping water inside it hot

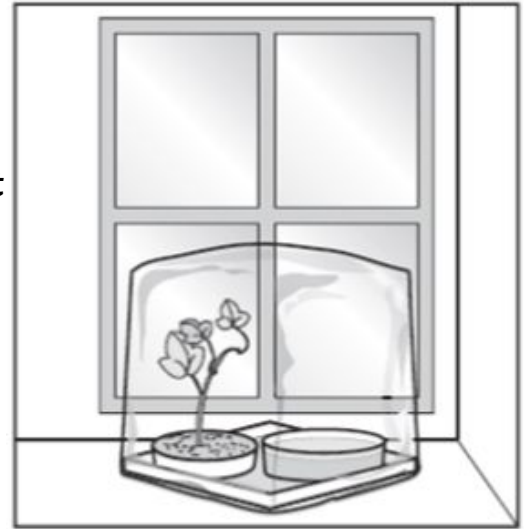
The Water Cycle

Name: _____

Evaluation

5. Some students made a model of the water cycle by covering a plant and a tray of water with a clear plastic bag. They placed the set-up near a window and left it there for several days. What two processes can make it possible for the plant to use the water in the tray?

- A Precipitation and runoff
- B Heating and evaporation
- C Cooling and condensation
- D Evaporation and condensation



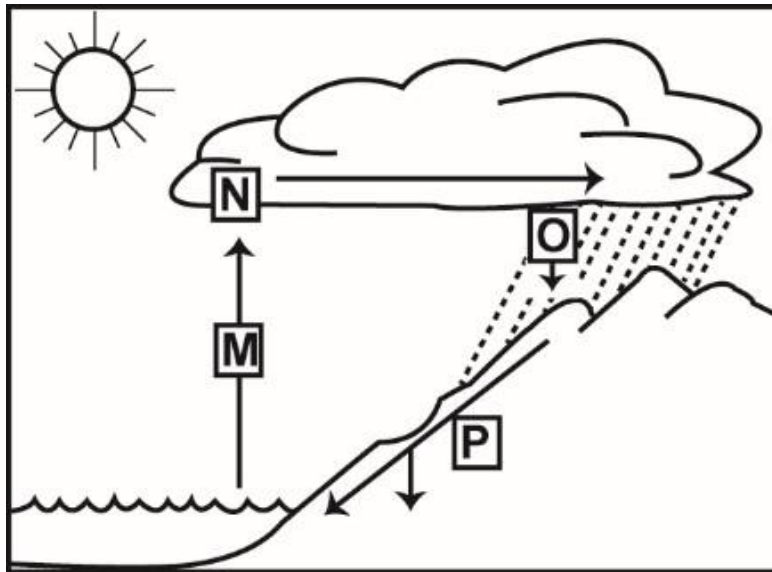
6. Which water cycle process is directly responsible for the formation of clouds?
- F Transpiration
 - G Condensation
 - H Collection
 - J Precipitation
7. In the water cycle, water is returned to the Earth's surface through the process of—
- A Precipitation
 - B Deposition
 - C Condensation
 - D Accumulation
8. As water moves through the water cycle, it may be found as a—
- F Solid
 - G Liquid
 - H Gas
 - J All of the above

The Water Cycle

Name: _____

Evaluation

Use the diagram below to answer questions 8-9.



8. In which location on the diagram is water changing from a liquid to a gas?
- | | |
|---------------------|---------------------|
| F Location M | G Location N |
| H Location O | J Location P |
9. What process does O represent in the diagram?
- | | |
|------------------------|-----------------------|
| A Precipitation | B Deposition |
| C Condensation | D Accumulation |
10. What is the sun's role in the water cycle?
- | |
|--|
| F The sun is the main source of gravity that causes precipitation to fall to Earth's surface. |
| G The sun provides energy to turn liquid water into water vapor in the atmosphere. |
| H The sun gives energy to plants, allowing them to grow and reproduce. |
| J The sun makes deserts hot so that the plants growing there can store a lot of water. |