

## Water's Journey

Adapted from: Exploring the Water Cycle, Incredible Journey, Water Cycle Drama, Water Cycle Game

Resources: <https://authoring.concord.org>, <https://pmm.nasa.gov/education/lesson-plans/exploring-water-cycle>, <https://extension.usu.edu>

**Lesson Concepts:** Water is on a continuous journey around the Earth in a process called the water cycle. Most processes on Earth are interconnected with this system.

Students will discover through activities in this lesson, how the sun's energy drives the processes that of the water cycle, as we gain a deeper understanding of how the functions of living organisms on Earth are linked to this continuous cycle.

## New York State Science Learning Standards

### MS-ESS2-4: Cycling of Water Through Earth's Systems

Develop a model to describe the cycling of water through earth's systems driven by energy from the sun and the force of gravity.

MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and phase (state) of a substance when thermal energy is added or removed.

### Science and Engineering Concepts

Develop a model to describe unobservable mechanisms.

### Disciplinary Core Ideas

Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation, sublimation, deposition, precipitation, infiltration, and runoff.  
Global movements of water and its changes in form are driven by sunlight and gravity.

### Cross Cutting Concepts

Energy and Matter  
Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.  
Systems  
A system can be described in terms of its components and their interactions.

### ELA Connections:

WHST.6-8.9

SL.8.5

RST.6-8.7

### Math Connection:

MP.2

Draw evidence from informational texts to support analysis, reflection, and research.

Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

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).

Reason abstractly and quantitatively.

### Teacher Background:

Water is the natural resource that we have firsthand experience with, yet it may be the natural resource we understand the least. How does the water from the oceans form clouds? What causes precipitation? What happens to the water when it reaches land? How does dew form on grass? Our lives, and those of all other organisms on Earth, are shaped in countless ways by the cycle of water. This repeating sequence of condensation, evaporation, transpiration, and precipitation is powered by the sun's energy as well as the force of gravity. These interconnections form an integrated system, the water cycle. Water molecules are affected by heat energy. Movement through the water cycle is usually dependent upon the physical state

of the water molecule. The sun's energy transfers water from the oceans to land into the atmosphere; water evaporates from oceans, lakes, and rivers, and it transpires from plants on land. This water vapor travels

through the atmosphere, condenses and returns to the earth as snow, rain, sleet, or hail. How? When heat energy is added to water the motion of the molecules will increase; a solid will undergo a phase change to liquid, a liquid will become a gas. When heat energy is removed from water, the motion of the molecules will decrease; a gas will become a liquid, a liquid will become a solid. The water molecules at the surface of the ocean will evaporate, adding moisture to the atmosphere. It can stay in the atmosphere and travel many miles away before returning to surface in the form of precipitation. Another factor that affects the movement of water through this cycle is gravity. When mountain snow melts, the liquid water runs downhill, entering the streams, lakes, and other water systems along the way.

*See the appendix for additional background information, as well as answers to questions presented.*

**Materials Needed:** Computer for internet animations, colored pencils, Reading article, large paper for group water cycles, water cycle drama cards, 1,000 liters tap water, 3 1000-liter beakers, hot plate, several ice cubes, plastic bag, green plant with leaves, 1/2 cup soil, 1/2 cup pebbles, 1/2 cup small rocks, 1/2 cup sand, colored water cycle diagrams

**Prerequisite:** Students should have some understanding of phase change.

### Engage

Prepare the following demos in advance of lesson. Remember to model safety: Goggles, oven mittens.

Place plastic baggie around plant leaf and *let sit for 2 hours before lesson begins.*

Gather 4 beakers or some other clear containers that will hold approximately 500 mL of fluid.

Fill 3 beakers  $\frac{3}{4}$  with water before beginning lesson.

In beaker one, water only.

In beaker two, place the beaker with water onto a hotplate in time for boiling to be observed.

In beaker three, place ice cubes into the water before beginning the lesson.

In beaker four, place rocks, pebbles, sand and soil (in that order) before beginning the lesson.

Place a beaker 1 water onto counter.

Ask what is in the glass? What is water? What does it look like? Feel like? Where did it come from?

Show water boiling in beaker 2 to students.

What do you see taking place in this beaker? Is this in a solid, liquid or gas state?

Why is the water changing state?

If the beaker is removed from the heat source, what will eventually happen to all the water in this beaker if it is left on counter overnight?

Show ice in beaker 3 to students.

Ask: what is in this glass? Is this water in a solid, liquid, or gas state?

Do you observe anything happening on the outside of this beaker? Can you explain what is happening?

What might happen to this water if it is left to sit on counter overnight?

Place plant with plastic bag attached to leaf.

Ask: What do you see? Is this water a solid, liquid, or gas?

Ask: How did it get there? If the baggie was not on leaf, where would this water go?

Ask: Where does rain come from?

Finally, place beaker 4 with mixture of soil, rock, pebbles onto counter. Pour water over soil.

Ask: What do you observe? Where is the water going? Where might it end up?

## Explain

Ask: How does water travel around and through the Earth? List your ideas.  
Discuss the state of matter that water takes in each of these places; solid, liquid or gas?

Inform students that they may be using the same water today that was used by dinosaurs 75,000,000 years ago. Ask: How can this be?

Show water cycle animation: <http://www.youtube.com/watch?v=i0hKd5FWZOE>

Instruct students to observe the movement of water through the water cycle and then construct a flow chart listing the possible path water may have taken from then to now.

After the flow chart has been completed, instruct students to identify each type of water (evaporation, transpiration, condensation, precipitation, etc.) as either a solid, liquid, or gas.

Ask: Which of the processes listed on your flow chart require energy from the sun?

Which of the processes release heat energy?

Which of the processes are driven by the force of gravity?

## Explore

Show video: Water, Water, Everywhere

Distribute water cycle vocabulary activity.

Instruct students to use both resources to identify processes in diagram and answer questions that follow.

## Elaborate

### Water Cycle Drama

This interactive game offers opportunities to rehearse processes involved with and deepen understanding of the water cycle. Students will act out, pantomime, the processes found on five water cycle processes: evaporation, infiltration (percolation), condensation, precipitation, the Sun.

Inform students that they will pick a card out of shoebox, acting out the process. Explain that they may not talk at all; they must pantomime their role. (Think charades.) Their goal is to find all the other cards that are the same as theirs to form a group; i.e., five different processes, five different groups in all.

Instruct students to pick a card from a shoebox.

When all students have chosen a card, inform students to begin acting out their process.

When all students have formed their water cycle groups, they are to sit.

Class discussion: How did you find each other?

Using vocabulary you have developed today, define your process.

## Evaluate

Ask students to look back at the flow chart tracing the path of water from a dinosaur using it 75,000,000 years ago. Discuss purpose of models... Explain activity:

Draw a model of the water cycle, showing the path water took from then to now.

Remind students that their model must be labeled, have color and show movement.

Include as many of the following words as you can in your explanation how water cycles around the Earth.

Construct one explanation that discusses at least 3 of the following questions:

- How does the sun influence the processes of the water cycle?
- Why does precipitation fall in different forms?
- What is the role of gravity in the water cycle?
- How might human development change the water cycle?
- How does the water cycle affect water quality?
- How long does it take for one water drop to travel through the water cycle?
- Why is the movement of water around the Earth referred to as a cycle?

**Extensions:**

Journey through the water cycle game

Pretend you a drop of water. Write a short story, cartoon, or poem about your adventures.

Phase change investigations modeling evaporation, transpiration, condensation

Build a model of the water cycle showing one or more process.



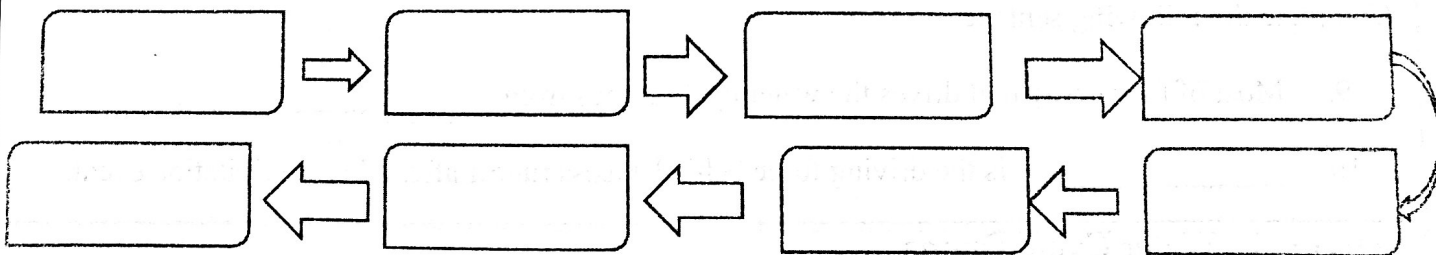
### Activity 1: Changing Phase Observations

What is water?	Response
Water on hotplate	What do you see?  What is this process called?
Water with ice	What do you see?  What is this process called?
Plastic Baggie on Plant Leaf	What do you see?  What is this process called?
Water Poured over Soil Mixture	What do you see?  Why did the water flow down to bottom of beaker?

### Activity 2: Traveling Places

How does water travel around and through the Earth? List your ideas below:

Carefully observe the movement of water through water cycle during the video.  
 Complete the following flow chart listing a path water may have taken from then to now.



Which of the processes listed in your flow chart require energy from the sun?

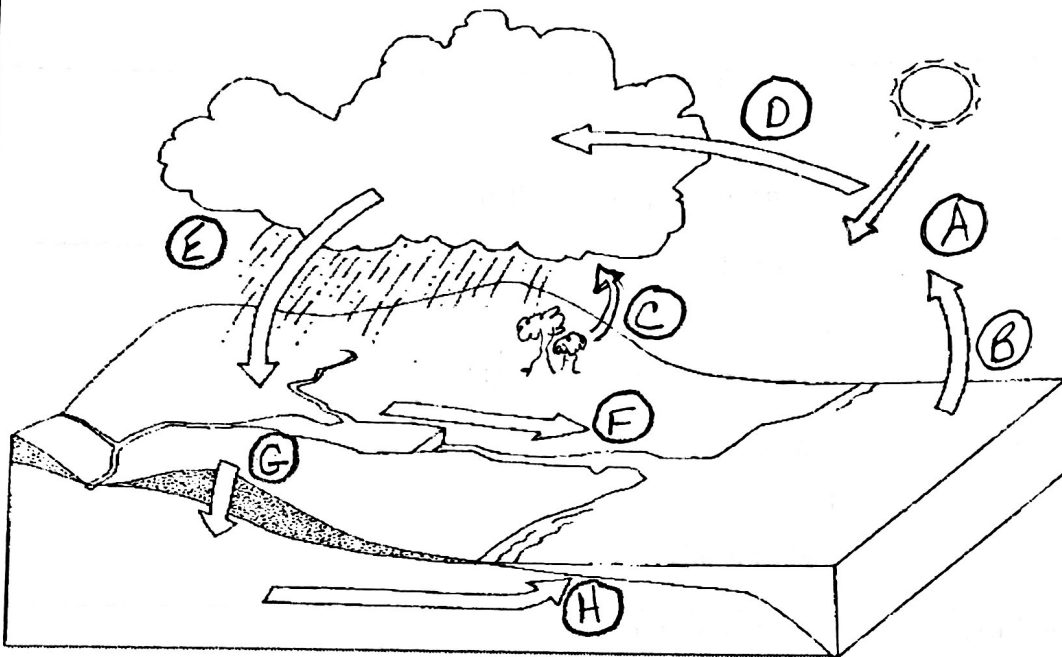
Which of the processes release heat energy?

Which of the processes are driven by the force of gravity?

### Activity 3: Water, Water, Everywhere

Watch video: Water, Water Everywhere.

Complete the following water cycle diagram and questions that follow.



(GPM.NAS.GOV/EDUCATION)

Match the letters in the diagram above to the correct term in the list below:

- |                       |                          |
|-----------------------|--------------------------|
| 1. Condensation _____ | 5. Transpiration _____   |
| 2. Groundwater _____  | 6. Precipitation _____   |
| 3. Infiltration _____ | 7. Runoff _____          |
| 4. Evaporation _____  | 8. Solar Radiation _____ |

Complete the following sentences.

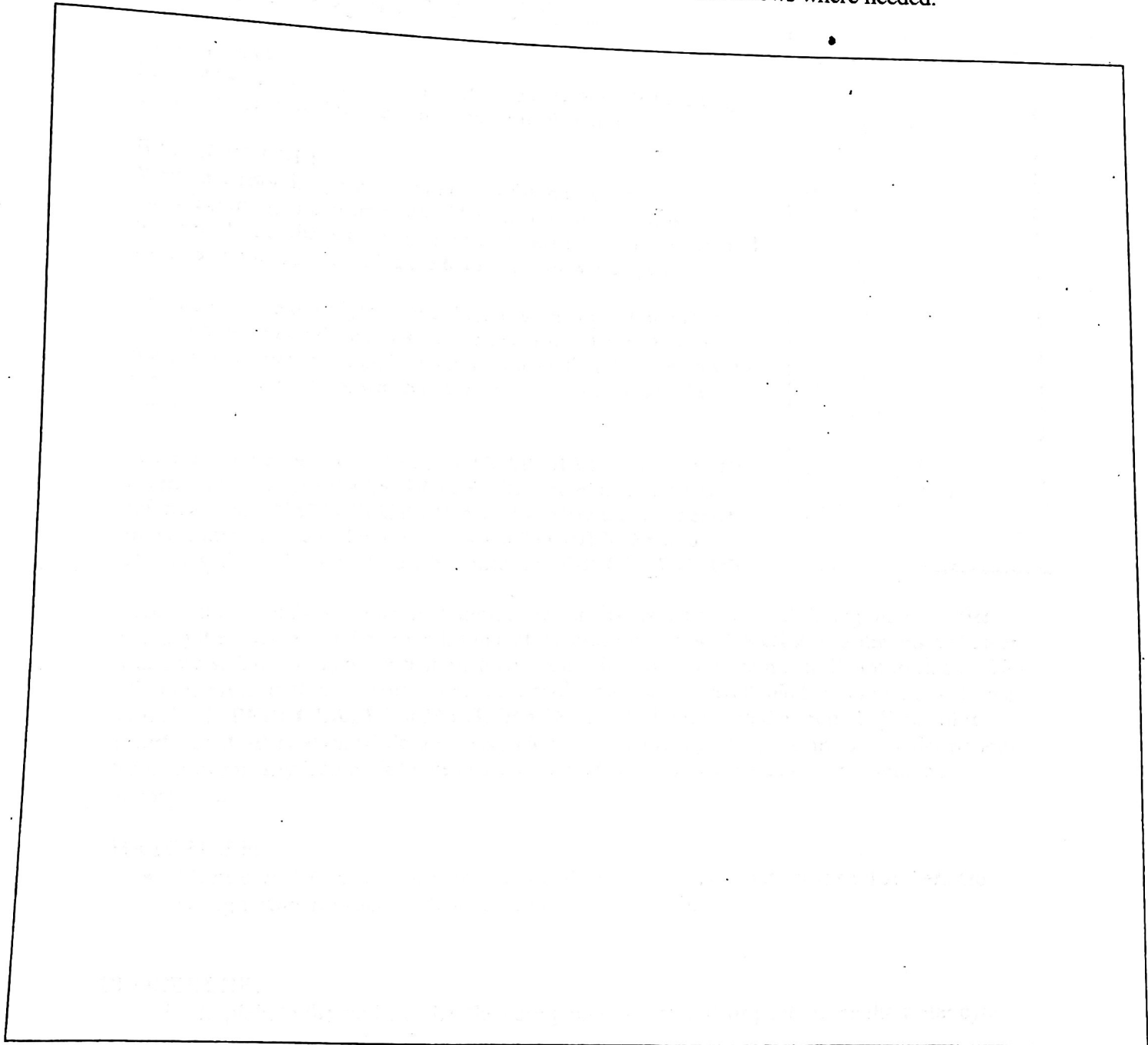
9. Most of the energy that drives the water cycle comes from \_\_\_\_\_.
10. \_\_\_\_\_ is the driving force behind excess runoff after a big precipitation event.

### Activity 4: Water Cycle Drama

How did you find each other?

Using vocabulary you have developed today, define your process.  
(What role did you play??)

How does water travel around the Earth?  
Use as many words and illustrations as you can think of to construct a model representing your ideas. Be sure to label your model, indicating movement with arrows where needed.



Checklist:

Pictures:

- Rivers, Lakes, Oceans
- Condensation
- Evaporation
- Precipitation
- Transpiration
- Runoff
- Sun
- Groundwater

Processes:

- Labeled Diagram
- Labeled arrows showing movement
- Model explains how water moves through cycle
- Gravity

# Water Cycle Drama

Reviewed February 2013

## SUMMARY:

Students will learn the different parts of the water cycle by acting them out. They will play a game similar to charades.

## BACKGROUND:

Water does not disappear with our use of it in irrigation, manufacturing, or consumption. The water we have now is the water we had at the beginning of time. Water forms, dissipates, and forms again in a cycle called the hydrologic or water cycle.

The water cycle is a gigantic circulation system operating in the atmosphere and on the earth's lands and oceans. Being a cycle, there is no beginning or ending, but for illustration, let's begin with the waters of the ocean, which cover about three-fourths of the earth.

Water from the surface of the ocean **EVAPORATES**, while water given off by plants **TRANSPIRATES**. This combined water is referred to as **EVAPOTRANSPIRATION**. Here the water enters into the atmosphere and in turn cools and **CONDENSES** into clouds, and falls back to the earth's surface as **PRECIPITATION**.

Precipitation that falls as rain, hail, dew, snow, or sleet is important to all living things. After wetting the foliage and the ground, some of the precipitation **RUNS OFF** into streams and other waterways. This is the water that often causes erosion and is the main contributor to floods. Not all of the precipitation runs off. Some of it pools and becomes available for evaporation. Some of it slowly **PERCOLATES** or **INFILTRATES** (soaks in) through the ground. Some of it resurfaces at **SPRINGS**, while some seeps to maintain and replenish streams during dry periods. Streams eventually lead back to the oceans, where the water is again evaporated into the atmosphere.

## MATERIALS:

- "Note cards" (see appendix on pages 50-52). Copy and cut out cards so that there are enough cards for each student in the class to have one.

## PROCEDURE:

1. Explain to the students that they are going to "act out" or pantomime the water cycle.
2. Have the students blindly pick a note card.
3. Have the students begin to act out the word on their card. Without talking to anyone, they are to group themselves with students they think have the same card (they will

**Grade Level**  
K-6<sup>th</sup> Grade

**Subject Areas**  
Science

**Duration**  
15-20 minutes

**Setting**  
Classroom  
Outdoors



know this by watching the actions of the rest of the group). When everyone has found a group, have the students sit down.

4. One at a time, have the groups stand and show the rest of the class their action. Have the other students guess what their word was.
5. Have the students in each group choose a leader. The leader from each group will then dramatize the entire water cycle. Suggestions: 1) the water cycle is not linear, so the students should not be standing in a line, 2) the water cycle is not two dimensional, encourage up and down variations, and 3) there is no proper beginning or ending – it's a cycle.

#### **| EXTENSIONS:**

- Have each group draw its water cycle element on a large sheet of butcher paper. Fill in the cycle with homes, schools, mountains, highways, industries, construction sites, etc., and discuss how each area affects the water cycle.

#### **WRAP-UP:**

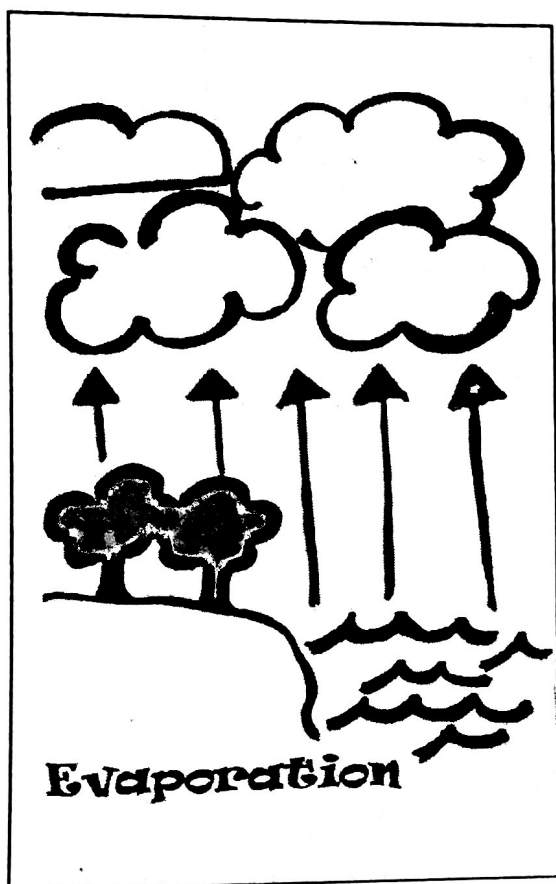
Discuss the water cycle with the students. Ask them how they chose the action for each part of the water cycle. Were some actions easier to figure out than others? Did all the people in the individual groups have the same actions? Remind the students of this activity at a later time. Can they still remember the water cycle?

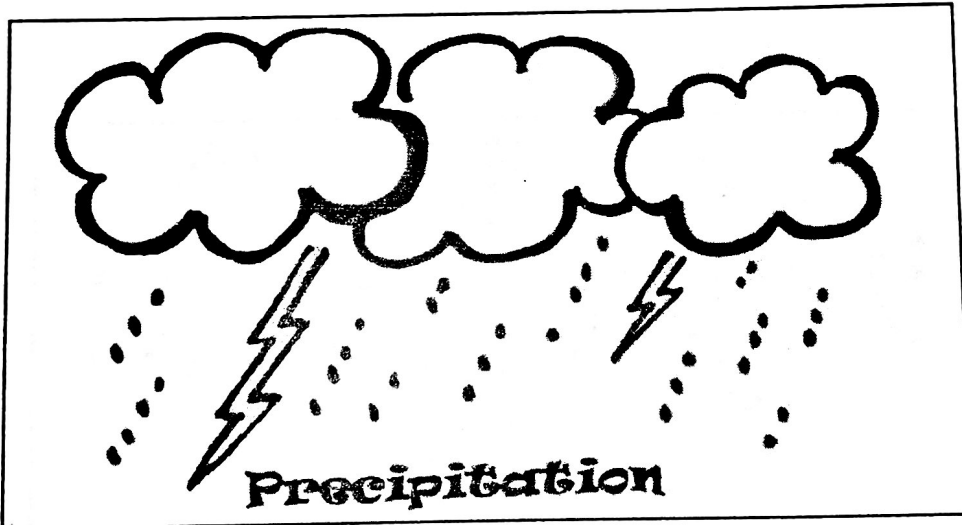
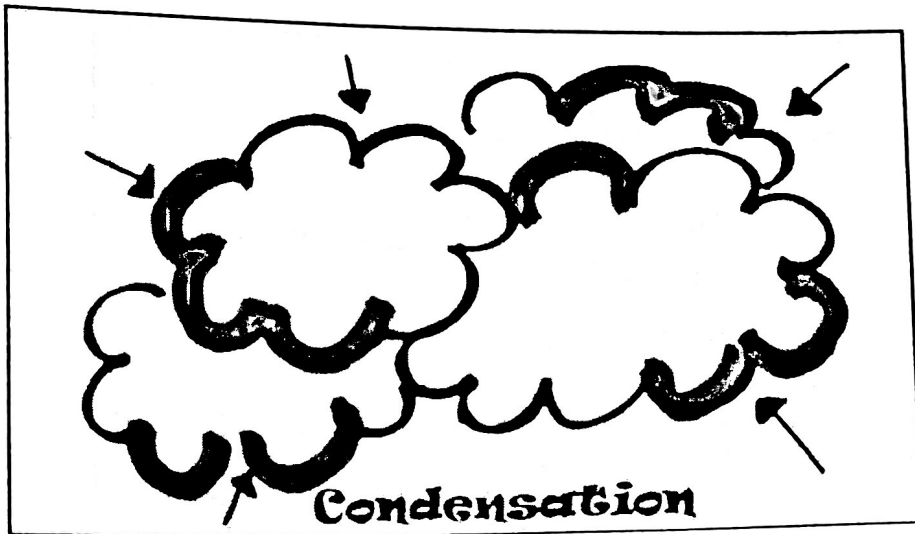
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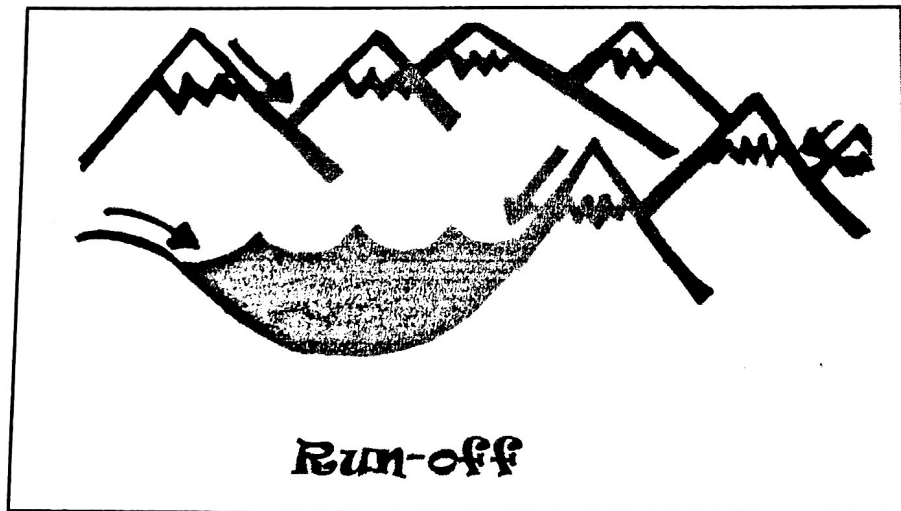
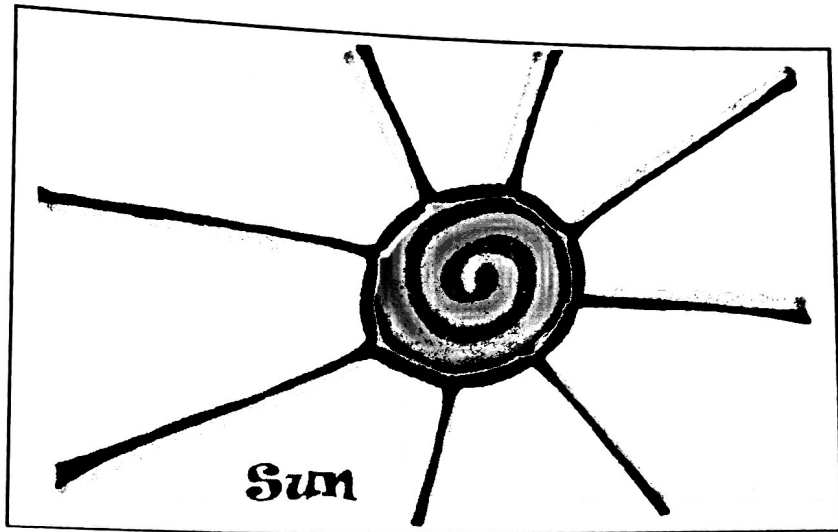
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Water Cycle Drama - note cards







Water Cycle Cartoon
