Water Cycle: Teacher Guide

Level: Beginning

Subject: Geography

Duration: 30 minutes

Type: Classroom discussion

Learning Goals:

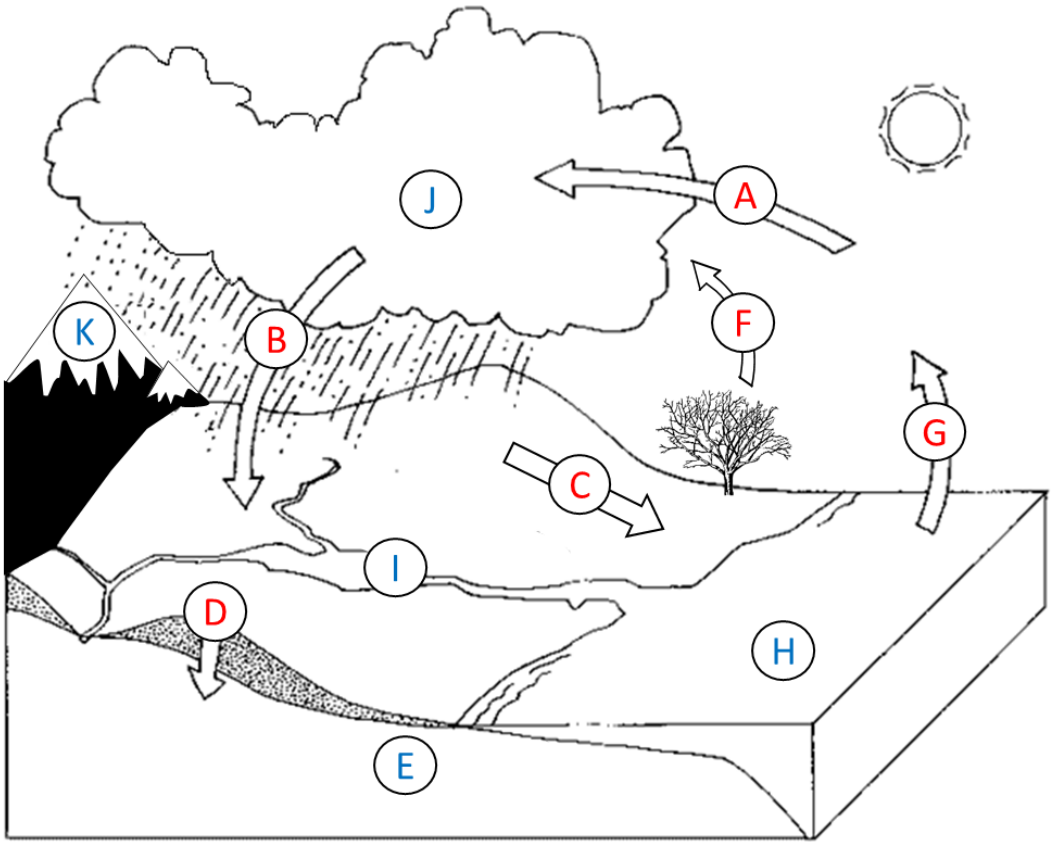
- Define each component of the water cycle
- Investigate the movement of water through the different stages of the water cycle
- Be able to explain the driving forces of the water cycle

Background:

- Water is found almost everywhere on Earth, from high in the atmosphere (as water vapor) to low in the atmosphere (precipitation, droplets in clouds) to mountain snowcaps and glaciers (solid) to running liquid water on the land, ocean, and underground. Sunlight causes evaporation and propels oceanic and atmospheric circulation, which transports water around the globe. Gravity causes precipitation to fall from clouds and water to flow downward on the land through watersheds.
- Energy from the sun and the force of gravity drive the continual cycling of water among these reservoirs. As the water is heated, it changes state from a liquid to a gas. This process is called evaporation. As more energy is added to the water, the water molecules move faster and farther apart. When water vapor is warmer and less dense than the surrounding air, it rises.
  Transpiration is the process that a plant takes up water through its roots and then gives off unused water from their leaves.
- As water vapor cools it condenses. This process changes the water's state from vapor to liquid. When a cloud's droplets join together and get too big to overcome gravity, they fall from the clouds as either rain or snow. When excess water falls on the land it will flow downhill as runoff.
- Infiltration occurs when water seeps into the land surface. The water fills pockets of air in the soil and rock. Water infiltrates because of the force of gravity. When the water reaches an impermeable layer, it creates an aquifer.

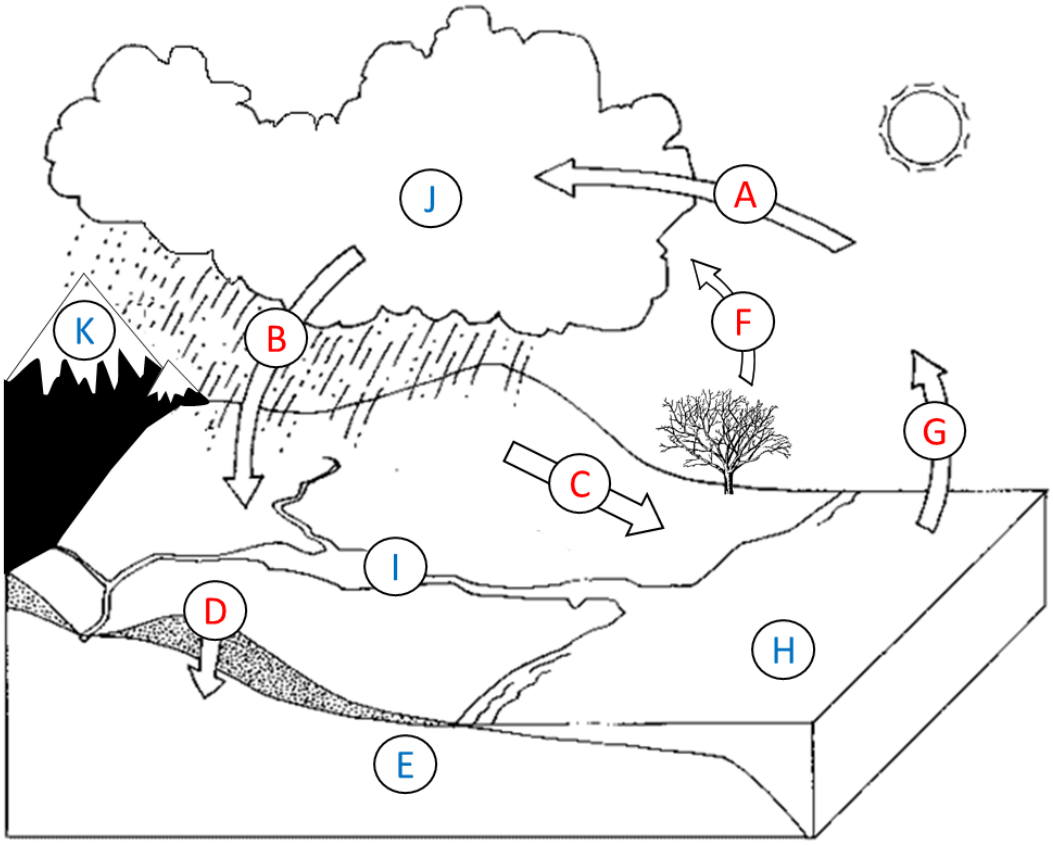
Optional Follow-up Lesson Plan the "Water Cycle Game" lesson plan that more deeply looks into the complexities of the water cycle. Look for it on the S2S website under Teaching Materials.

Discussion:



- Start by asking the class what the water cycle is, be sure to let multiple students give their interpretations. [Answer: The water cycle, also known as the hydrological cycle or the hydrologic cycle, describes the continuous movement of water on, above and below the surface of the Earth.]
- In small groups, ask students to come up with a list of places that we find water on the Earth. You may want to mention that water can be in the form of a gas (water vapor), a liquid (water), and a solid (ice) and that students should include all of the forms of water. [Answer: Clouds and atmosphere (liquid water and water vapor), river and lakes (liquid water), oceans (liquid water), glaciers and icebergs (ice), and groundwater (liquid water).]
- Identify the water sources on the water cycle plot. [Answer: H is Ocean, J is atmospheric water, I is surface water, K is snowpack, E is groundwater]
- Of these sources of water, which do you think there is the most of? [Answer: 96.5% Ocean, 1.7% glaciers/icebergs, 1.7% groundwater, 0.1% rivers/lakes, 0.01% clouds/atmosphere]
- What are the processes that move water between the different sources of water? These processes are shown with arrows in the water cycle diagram, ask the class think about each of these arrows and decide what sort of things are happening at each arrow. [Answer: at G the water is evaporating from the oceans and changing state from liquid to gas; at A the water is condensing and changing state from gas to liquid; in B the water is falling from the cloud to the land surface as precipitation; at C the excess water is flowing on the surface as runoff; at D the precipitation is being infiltrated into the soil and groundwater]

The Water Cycle: Student Worksheet



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

1. Condensation _____
2. Groundwater _____
3. Infiltration _____
4. Evaporation _____
5. Transpiration _____
6. Rivers and Lakes _____
7. Precipitation _____
8. Snow and Glaciers _____
9. Clouds _____
10. Runoff _____
11. Ocean _____

Which stages of the water cycle require solar radiation?

_____

Which stages of the water cycle are driven by the force of gravity?

_____

Describe at least two different paths that water can take in the water cycle using the figure above. Start in the ocean.

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