



# Water World

This activity is part of the **Water Science** theme

## Purpose of this activity

This activity will introduce students to the Hydrogeological Cycle. Using visual aids students will learn the various stages of water that can be found on the earth. Using a model the student can observe several parts of the hydrological cycle in action.

## Key Messages:

- Precipitation, evaporation, and condensation are all terms that sound familiar.
- The water cycle is a complex process that not only gives us water to drink, fish to eat, but also weather patterns that help grow our crops.

## Materials

- Landscape model in aquarium
- Hydrogeological Cycle laminated picture
- Lamp
- Ice cubes
- Water
- Plastic wrap

## What will I be doing?

Using the laminated hydrogeological picture, you will explain the various processes and phases of water through the earth.

On the Earth, water maintains a constant cycle of change and motion. This cycle, known as the Water Cycle or Hydrologic Cycle contains five major processes: evaporation, condensation, precipitation, groundwater flow, and surface runoff.

## Activity Set Up:

Aquarium is already set up, just need to do the following steps:

1. Pour water into the aquarium until approximately 1/4 of the mountain slope is covered.
2. Cover the top of the container with the plastic wrap, then place several ice cubes on plastic wrap directly above the clay mountain.
3. Position the lamp over the ice cubes and turn the lamp on. Please be careful, as the lamp will get extremely hot due to the time duration of this experiment.
4. Keep the lamp on for approximately 15-25 minutes (dependent upon size of bulb) and have students observe any changes occurring in the aquarium environment that are water cycle related.

## Background Information

Water is an integral part of life on this planet with a myriad of Earth's water cycle variables; Evaporation, Condensation, Precipitation, Groundwater Flow, and Runoff.

The Earth was formed approximately 4.6 billion years ago. During this formation, gases (water vapor and carbon dioxide) trapped in Earth's core were released by volcanoes, creating the atmosphere. About 800 million years later (3.8 billion years ago), oceans were formed on this planet. Once the Earth cooled enough for the water vapor to become liquid, the water vapor fell as rain, forming the oceans. Once the oceans were formed, the Sun's energy became the driving force of the water cycle. Over Earth's history, the oceans and continents have undergone great transformation, primarily due to an evolving water cycle. Since the evolving water cycle has an impact on everything from environmental concerns to human water demands, there is a crucial need for understanding all the impacting variables of the water cycle.

Only about 3% of Earth's water is salt-free, or fresh. Two percent of the Earth's water (about 66% of all fresh water) is in solid form, found in ice caps and glaciers. Because it is frozen, the fresh water in ice caps is not available for use by people or plants. That leaves about 1% of all the Earth's water in a form useable to humans and land animals. This fresh water is found in lakes,

rivers, streams, ponds, and in the ground. It is also found in the atmosphere in liquid, solid and vapor form. Did you know that if you live in the Canada, there are 40 trillion gallons (1.51416x10<sup>14</sup> liters) of water above your head on an average day? Some of the water that falls to Earth soaks into the ground and provides runoff to rivers, lakes, and oceans. The remainder, more than 2.5 trillion gallons (9.4635x10<sup>13</sup> liters), returns to the atmosphere through evaporation, and the cycle begins again.

The water cycle is a never-ending global process of water circulation from clouds to land, to the ocean, and back to the clouds. To give an idea of how fast or slow water moves through the global system, in the oceans, water takes about 3000 year to completely cycle through. For ice caps and glaciers, it may take up to 15,000 years while for the atmosphere it usually takes a few days. In rivers, the turnover is also a few days to weeks but groundwater flow can take hundreds to thousands of years.

To put some real numbers to this cycle, in the atmosphere, rivers, oceans, groundwater, and elsewhere on Earth there is a total of 326 million cubic miles of water (more than 326,000,000 trillion gallons [1.234x10<sup>15</sup> liters]). Less than one percent of that total is our supply of drinking water. Recent estimates have put the global water demand at 800 cubic miles of water per year, or approximately 800 million Olympic-sized swimming pools per year!

#### **Questions to Ask Students:**

**Q:** Which of the 5 stages of the water cycle were you able to observe in this experiment?

**A:** Precipitation, Evaporation, Condensation, Runoff, and Percolation

**Q:** What is the energy source in this experiment and what does it represent?

**A:** The energy source was the light and it represents the sun, which influences temperature and the hydrological cycle.

**Q:** Was transpiration demonstrated in this experiment? If yes, where? If no, how could we have demonstrated it?

**A:** Transpiration occurs when plants are present. It is the evaporation of water from plants.

**Q:** Where in this experiment does condensation occur more rapidly? How do you know?

**Q:** What are clouds made up of?

**A:** Tiny water droplets that have evaporated in to the air.

#### **Clean Up Procedures:**

Remove the ice and plastic wrap from the top of the aquarium to remove the condensation in the system. Pour out the water and dry out the model with paper towel. Turn off light.