THE WATER CYCLE

The water cycle, also known as the hydrologic cycle, is a naturally occurring phenomenon that describes how water travels between the land, ocean, and atmosphere. The water cycle is comprised of four main stages: evaporation, condensation, precipitation, and collection. The amount of water found on Earth remains fairly constant as it simply changes in form and location due to the affects of the gravitational force of the Earth and the Sun’s energy. The Earth is the largest water recycler known to man and it is estimated that 505,000 cubic kilometers of water goes through the water cycle every year.

Stage 1: Evaporation

Evaporation is the process by which water is changed from a liquid to a vapor. Evaporation is the first step in the water cycle and requires the most energy due to water’s high specific heat capacity. Heat capacity refers to the amount of energy required to change the temperature of a substance by one degree Celsius. Due to water’s high heat capacity, evaporation helps to redistribute heat around the Earth. The heat that is absorbed by water during evaporation is released in the condensation stage of the water cycle. In order for evaporation to occur, water must reach a temperature of 100°C or 212°F. Without the heat of the sun this process could not happen. Water molecules are connected by hydrogen bonds that connect a hydrogen atom in one water molecule to the oxygen atom in another water molecule. At high temperatures these bonds break allowing the molecules to separate and turn into vapor. A similar process also occurs with solid ice in arid climates. When dry winds hit ice caps and snow, they are able to break the bonds and suck moisture out of the ice, which is then deposited into the atmosphere. Since the solid ice turns directly into vapor it is called sublimation. Evaporation and sublimation account for 90 percent of the moisture found in the atmosphere. The other 10 percent of moisture in the atmosphere is given off by plants in a process called transpiration. Additionally, evaporation acts as a natural water filtering system. When water evaporates impurities such as dirt, salt, and other minerals are left behind.

![Figure 1](https://eschooltoday.com)
**Stage 2: Condensation**

Condensation is the process by which water vapor is changed into liquid. This process occurs only in the atmosphere and it is responsible for the formation of clouds that you see in the sky. Condensation is first started when water molecules are evaporated and rise into the atmosphere. As water vapor ascends higher into the sky they combine with tiny dust particles that are referred to as particular matter. The low temperatures in the atmosphere cause condensation and turn the vapor into water droplets and ice crystals. At this point the heat that was absorbed by the liquid water during the evaporation stage is released, warming the atmosphere. The mixture of water droplets, ice crystals, and particular matter is called aerosols. These water aerosols begin to stick together and form clouds. This process is called coalescence. The clouds get heavier as more aerosols bump into them and eventually reach the saturation point. At this point the air unable to hold any additional moisture and the water droplets and ice crystals are ready to fall out of the cloud in the form of precipitation.

**Stage 3: Precipitation**

Precipitation is the process by which water droplets or ice crystals fall back to the Earth from the atmosphere. After condensation, the water droplets get big enough that the wind or air currents can no longer hold them up. The mass of the water droplets and ice crystals coupled with the force of gravity pulls them down to the Earth. The larger the water droplets are, the faster they fall. Precipitation can come in many forms such as rain, snow, sleet, hail, and freezing rain. A common misconception is that rain water is completely pure. Water vapor
needs to mix with particulate matter in order to form rain. Particulate matter is important as it serves as the center for the water vapor to form around. Depending on the kind of particulate matter, the water may contain harmful substances. Rain water that is toxic to the environment is called acid rain.

**Stage 4: Collection**

Collection is the process by which water droplets that have fallen from the sky gather in oceans, rivers, lakes, or underground aquifers, both above and below the surface. When the precipitation falls on land it may either soak into the ground (infiltration) or run on the surface to the lowest elevation which is typically an ocean or river (runoff). The majority of the precipitation infiltrates the Earth. The water moves through cracks in rocks and pore spaces in the dirt and is either absorbed by plants, evaporated back into the atmosphere, or runs all the way down to the water table. From here the water will flow into an ocean, river, lake, or remain in the ground. Finally, the water evaporates again and restarts the cycle. Runoff occurs for water that isn’t absorbed into the ground. It can be harmful to landscapes because it causes soil erosion and can remove essential dirt and wear down rocks that hold up important fixtures. However, runoff can also be beneficial to the environment because it carries seeds and vital minerals needed to fertilize the soil at the bases of mountains and hills. During a heavy shower, water will form small streams on mountain and hill sides that will eventually connect to rivers and lakes where the water cycle process will be repeated once more.

**Summary**

The water cycle is essential to everyday life on Earth. It naturally filters water, redistributes heat, and transports seeds and crucial minerals from mountain tops to suitable areas for growth. It also prevents water from being trapped in one area, such as an ocean or a lake. Without the Sun’s energy and the gravitational force of the Earth, the water cycle would not be possible.
References:


