

Q: Describe water cycle and briefly explain the major processes involved in water cycle?

What is water cycle?

- Water is essential to life on Earth. The water cycle describes the continuous movement of water within the Earth and atmosphere.
- The hydrologic cycle does not stop.
- Water is always changing forms (liquid, solid, gas) and moving between the ground, oceans and atmosphere.
- In water cycle, we study how cycling water moves through oceans, land, air and underground reservoirs.
- The total amount of water remains essentially constant, but its distribution among different reservoirs changes dynamically through multiple processes.
- The cycle is driven primarily by solar energy.

Key Processes of Water Cycle

Stage 01: Input of energy

Solar Energy:-

- The Sun is the primary driving force of the water cycle.
- Solar heat provides the energy needed to change liquid water into vapor.
- Without solar radiation, evaporation and atmospheric circulation would not occur.

Stage: 02 Water reaches Atmosphere

i. Evaporation:-

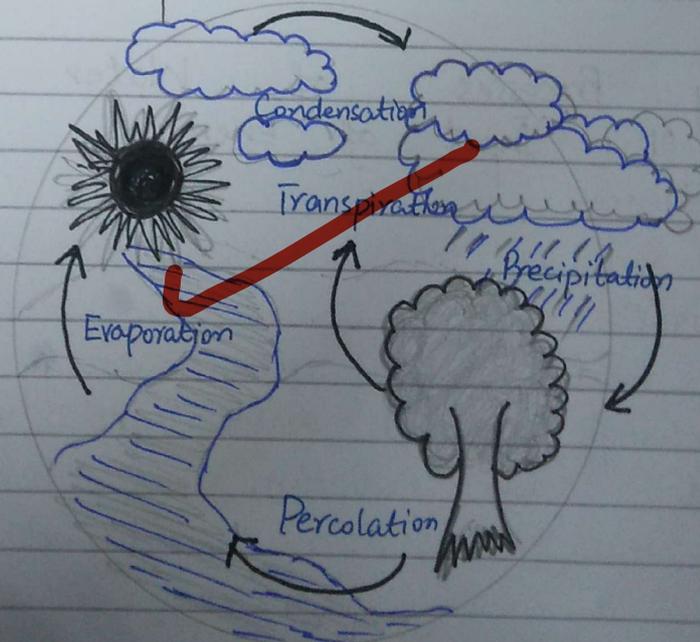
- In evaporation, liquid water from ocean, lakes, rivers and soil changes into water vapor.
- It happens when heat breaks hydrogen bonds between water molecules.
- Oceans contribute the largest share of atmospheric water vapor.

ii. Transpiration:-

- Plants absorb water from soil.
- Water escapes as vapor through tiny openings (stomata) in leaves.
- Together with evaporation, this process is called as Evapotranspiration.

iii. Sublimation:-

- It is the process in which ice or snow changes directly into water vapor without becoming liquid. This phenomenon occurs mostly in polar and mountainous regions.



Stage 03: Transformation within Atmosphere

iv- Condensation:-

The rising water vapor cools at higher altitudes. The vapor changes into tiny liquid droplets or ice crystals. These particles gather to form clouds and fog.

Cool Water vapor → Ice crystals → Clouds / Fog.

Stage 04: Return of Water to Earth

v- Precipitation:-

When the clouds particles grow heavy, gravity pulls them down. It occurs as

- i- Rain
- ii- Snow
- iii- Sleet
- iv- Hail

This is the primary mechanism of returning atmospheric water to Earth's surface.

Stage 05: How water is distributed on land?

i- Surface Runoff:-

The water flows over land into streams, rivers and lakes, which ultimately returns to oceans.

ii- Infiltration:-

Water seeps into soil, and moves into aquifers becoming groundwater.

iii- Percolation:-

The water moves deeper through soil. It is the downward movement of water through soil and rock pores, driven by gravity.

This acts as a critical filter in the water cycle.

iv. Groundwater Flow:-

- The water is stored underground in aquifers.
- It slowly moves toward springs, rivers or oceans.

Stage: 06 Reservoirs of Water

Water may be stored in oceans, glaciers, ice caps, groundwater aquifers, lakes, rivers, atmosphere, and living organisms.

The storage time varies from hours (atmosphere) to thousand of years (glaciers, groundwater).

In conclusion, the water cycle drives other cycles - it is important in itself and patterns of water cycling and rainfall have major effects on Earth's ecosystem. For instance, the surface water runoff helps move elements (like carbon, nitrogen, phosphorus, sulfur etc) from terrestrial, land-based, to aquatic ecosystems.

good answer!

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