



# The Science of Water

## 1. The Role of Water in Earth's History

Water has been present on Earth since its formation, around 4.8 billion years ago. Initially, Earth was extremely hot, and water existed as vapor. Around 3.8 billion years ago, as the planet cooled, water vapor condensed into liquid, leading to rainfall. Rain accumulated to form oceans, covering much of Earth's surface. The presence of water played a crucial role in shaping Earth's geology, climate, and early life development. The cooling process stabilized temperatures, making Earth more habitable.

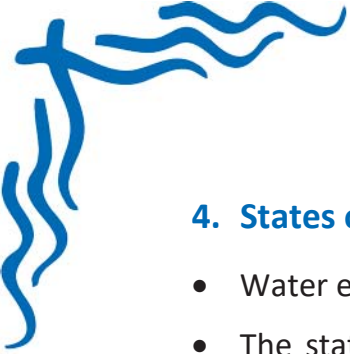
## 2. Water in Daily Life

- Water is essential for all living organisms and human activities such as drinking, cooking, and cleaning.
- It is a tasteless, odorless liquid at room temperature.
- Acts as a universal solvent, dissolving a wide variety of substances.

## 3. Distribution of Water on Earth

- 97.5% of Earth's water is found in oceans (saline and not suitable for human use).
- Only 2.5% of Earth's water is freshwater.
  - 68.9% is stored in ice caps.
  - 30.8% exists as groundwater.
  - 0.3% is found in lakes and rivers.
- Due to the limited availability of freshwater, conservation is necessary to sustain future generations.

Water Source	Percentage	Description
Oceans	97.5%	Covers 70% of Earth's surface; saline
Freshwater	2.5%	Suitable for human use; limited supply
Ice Caps	68.9%	Largest freshwater reserve
Groundwater	30.8%	Underground water
Lakes & Rivers	0.3%	Easily accessible freshwater



## 4. States of Water

- Water exists in three states: solid, liquid, and gas.
- The state of water depends on the molecular arrangement and intermolecular forces.
- **Intermolecular Space:** Space between molecules, allowing movement or close packing.
- **Intermolecular Force of Attraction:** The force holding molecules together.
- **Cohesive Force:** A type of intermolecular attraction among similar particles.

### States of Water and Their Properties

#### 1. Solid (Ice)

- Water freezes and becomes solid at low temperatures.
- Molecules are tightly arranged in a fixed structure.
- Ice has a definite shape and volume.

#### 2. Liquid (Water)

- Water exists as a liquid at room temperature.
- Molecules are loosely packed, allowing movement.
- Retains a fixed volume but takes the shape of its container.

#### 3. Gas (Water Vapor)

- Water turns into vapor when it evaporates or boils.
- Molecules are widely spaced and move freely.
- No fixed shape or volume.

State	Description	Shape	Volume	Molecular Arrangement
<b>Solid (Ice)</b>	Exists as ice or snow	Fixed	Fixed	Tightly packed, minimal movement
<b>Liquid (Water)</b>	Free-flowing at room temperature	Takes container's shape	Fixed	Loosely packed, moderate movement
<b>Gas (Water Vapor)</b>	Exists as steam or vapor	No fixed shape	No fixed volume	Widely spaced, rapid movement