9 Water as a Resource

We'll cover the following key points:

- The Change in the States of Water : Evaporation and Condensation
- Water Cycle
- The Impurities in Water and its Purification
- The Importance of Rain Harvesting

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Learning Outcomes

By the end of this chapter, students will be able to:

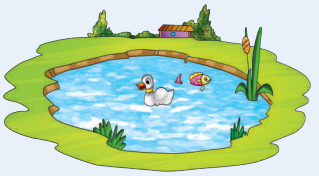
- Understand the significance of water as a vital natural resource and its role in supporting life on Earth.
- Learn about the change in the states of water through the processes of evaporation and condensation.
- Explore the water cycle and its importance in maintaining Earth's water balance.
- Identify common impurities in water and methods of purifying it for safe use.
- Understand the importance of rainwater harvesting as a sustainable practice to conserve water.

Guidelines for Teachers

The teacher can start the chapter by introducing water as a precious natural resource, emphasizing its importance for all living beings. Discussions can focus on the processes of evaporation and condensation, explaining how they lead to changes in the states of water. The concept of the water cycle can be explored to highlight its role in replenishing Earth's water. The teacher can also discuss the impurities found in water and demonstrate simple purification methods. Lastly, the significance of rainwater harvesting can be emphasized as an essential conservation technique for future sustainability.

Warm Up

Write the names of the sources of water.

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Fun Fact

Did you know that in just one gallon of ocean water, you'll find about a cup of salt? But here's the twist—it's not the same everywhere! The Atlantic Ocean, for instance, packs a saltier punch than the Pacific. And yes, most of this oceanic salt is the very same sodium chloride we sprinkle on our fries. But here's the real showstopper: the world's saltiest water isn't in the oceans at all. It's tucked away in Antarctica, in a tiny lake called Don Juan Pond. This lake is so salty, it defies freezing—even in the planet's iciest region!

Water is one of the most precious resources on Earth and is necessary for all living beings. We use water for different purposes like drinking, cooking, bathing, washing and many more activities. The different properties of water are:

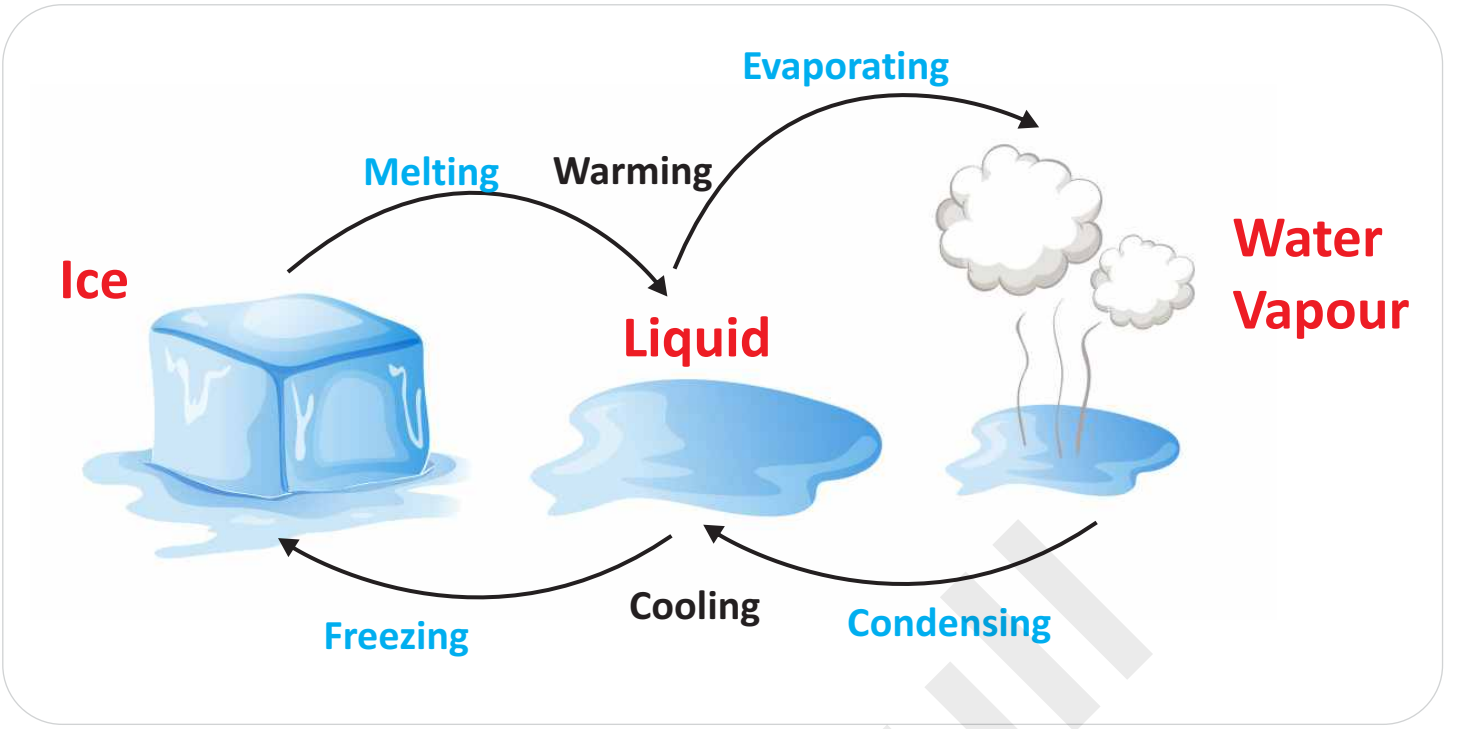
- Pure water is colourless, odourless and tasteless.
- Water exists in three forms-solid, liquid and gaseous.
- Water is a universal solvent.

Change in State

All matter exists as solids, liquids, or gases. These are called the states of matter. Matter can change from one state to another if heated or cooled. If ice (a solid) is heated it changes to water (a liquid). This change is called melting. If water is heated, it changes to steam (a gas). this change is called boiling. The particles of ice, water, and steam are identical, but arranged differently.

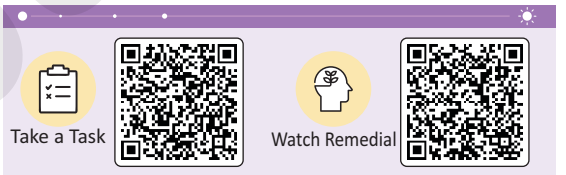
Did you know ?

We Have the Same Amount of Water on Earth now as there was when Earth was formed. The water from your faucet contain molecules that dinosaurs drank? Could be!



There are names for each of the phase changes of water. They are given below:

- Water going from a solid to a liquid: Melting
- Water going from a liquid to a gas: Evaporation
- Water going from a liquid to a solid: Freezing
- Water going from a gas to a liquid: Condensation



Evaporation

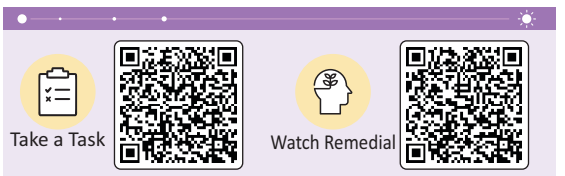
Even without boiling water in a kettle, some of the liquid water changes to gas. This is called **evaporation**. It occurs when a liquid turns into a gas, far below its boiling point. There are always some particles in a liquid that have enough energy to break free from the rest to become a gas. Evaporation is a continuous process in nature.

Condensation

Dewdrops are often found on leaves early in the morning after a cold night. Water that is present as a gas in the air cools down and changes into tiny drops of liquid water on leaves and windows. This change from gas to liquid is called **condensation**.

The Water Cycle

The Earth has a limited amount of water. Water on Earth is constantly moving. It is recycled over and over again. This recycling process is called **the water cycle**. The water cycle is the journey that water takes as



it circulates from the land to the sky and then back again.

1. Water evaporates into the air

The Sun heats up water on land, in rivers, lakes and seas and turns it into water vapour. The water vapour rises into the air. This is the process of evaporation.

2. Water vapour condenses into clouds

Water vapour in the air cools down and changes back into tiny drops of liquid water, forming clouds. This is the process of condensation.

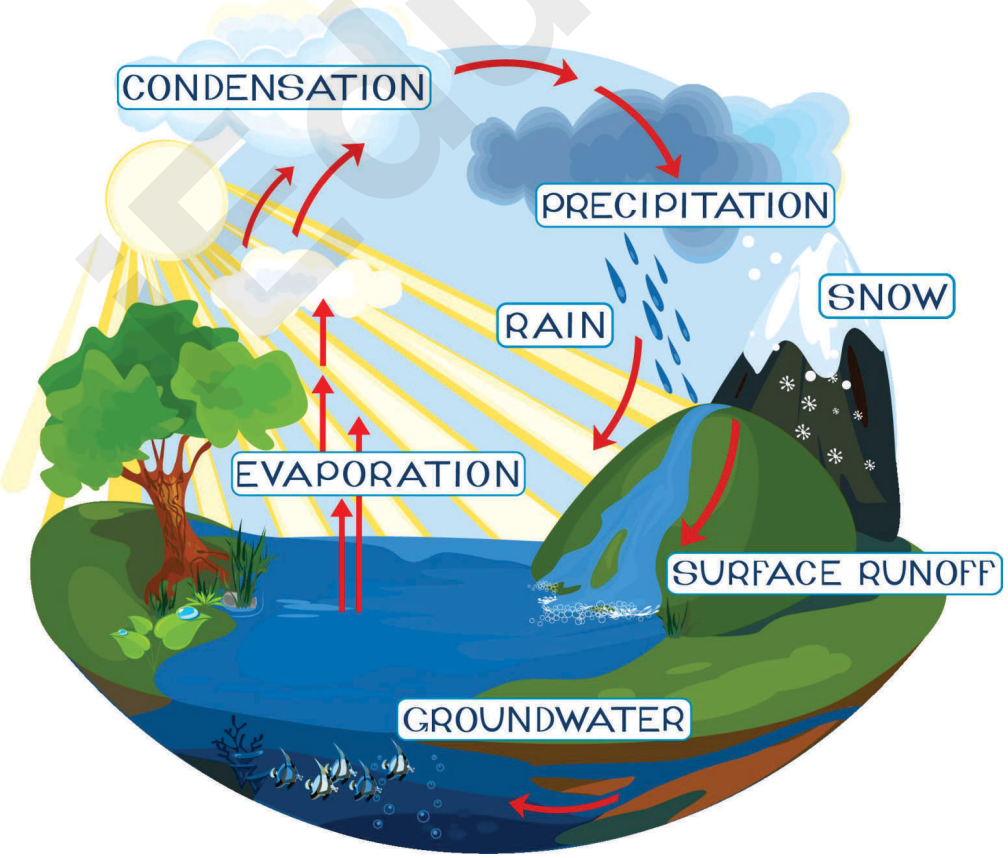
3. Water falls as precipitation

The clouds get heavy and water falls back to the ground in the form of rain or snow. This is the process of precipitation.

4. Water returns to the sea

Rain water runs over the land and collects in lakes or rivers, which take it back to the sea. The cycle starts all over again.

The continuous cycle by which water circulates by the process of evaporation, condensation and precipitation is known as water cycle.

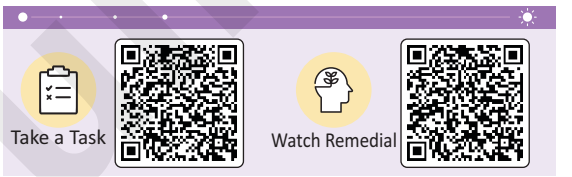


Making Water Fit for Use

Water is known as a 'universal solvent'. As it is such a good solvent, it dissolves almost everything that comes into contact with it is. Water that is available to us from rain, well, streams, rivers, etc. is not in its pure form. Drinking water also known as potable water, as this water is safe to drink or to use for other purposes. The impurities present in water can be of the following types:

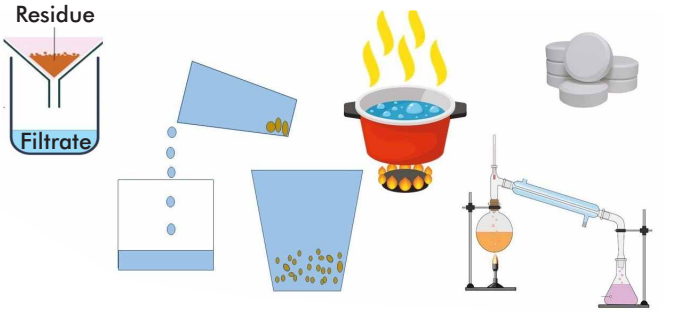
- **Insoluble impurities:** These are the solids which are insoluble like dust, fine sand, clay, rust, etc. They remain suspended in the water and cause muddy water.
- **Soluble impurities:** Dissolved gases, salts, minerals and chemicals are some impurities that are soluble in water and make the water impure.
- **Germs:** Certain tiny living organisms are present in water that cannot be seen but can cause harmful diseases like typhoid, dysentery, cholera, etc.

How to Purify Water



Nearly 97% of the world's water is salty or otherwise undrinkable. Another 2% is locked in ice caps and glaciers. That leaves just 1% for all of human needs .Clean water is essential for drinking, cooking and other daily uses. Even after removing insoluble and soluble impurities from water, it may still contain germs. The process of removal of harmful substances and germs from water to make it fit for drinking is called water purification.

Drinking water can be purified by the following methods:



Boiling

Boiling is the simplest and best way of purifying water. Water is boiled for about 10-15 minutes to kill most of the germs in water and make it safe for drinking. Boiled water is then stored in clean and covered vessels.

Chlorination

Germs present in water can be killed by using chemicals like chlorine to it. This method kills germs in water and prevents the spread of water borne diseases. The process of purifying water by using chlorine tablets is called **chlorination.**

Water Filters

Many households nowadays use water filters and domestic water purifiers which remove harmful substances and even bad flavour from water. They use advanced technologies and micro-filters to do this.

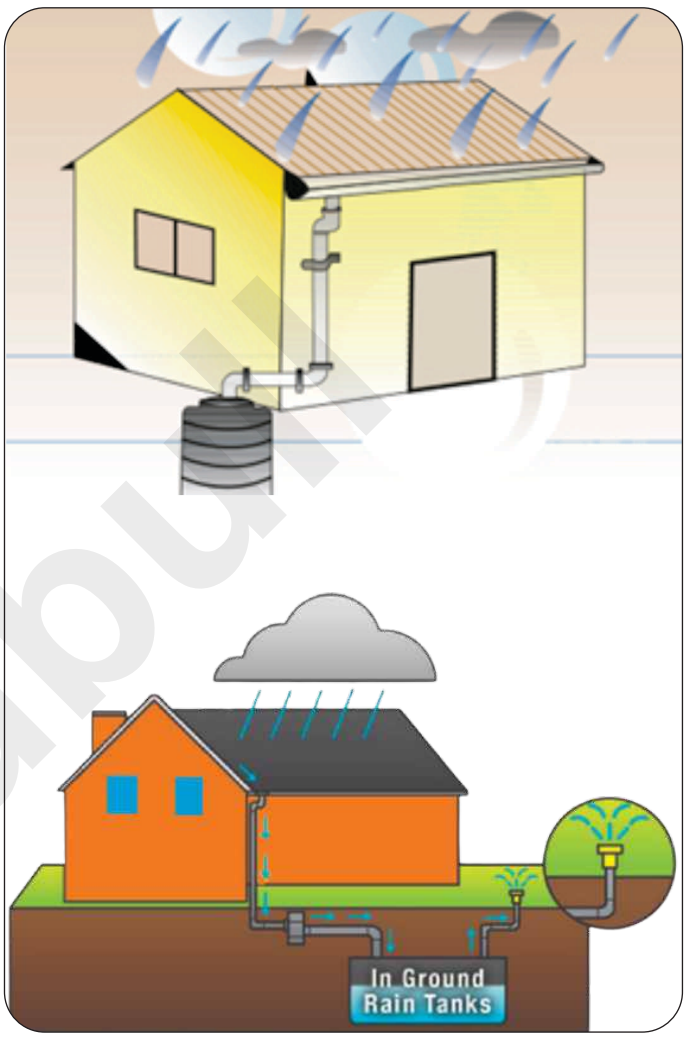
Rainwater Harvesting

Water is a precious natural resource and it is very important for us to conserve it so that we can use it during scarcity or drought.

Rainwater harvesting is a method of collecting and storing rain water that runs off from roof tops, parks, roads, open grounds, etc. and use it for various purposes and also for future use. The harvested water can be used in irrigation, gardens, domestic use and also for drinking purposes. The water is not allowed to run into the drains and go waste.

There are various ways in which rainwater can be harvested:

✦ The most common and easy method of rain water harvesting is the rooftop harvesting. Using this technique we can collect lots of clean rain water in water tanks. Stored water can be used for both indoor and outdoor activities.



Rooftop Harvesting

✦ We can also collect rainwater in large containers like buckets, tubs, drums and use it later.

✦ Rainwater harvesting also includes digging wells and bore wells for increasing the groundwater levels.

✦ It can also be done by making tanks and check dams.

Did you know ?

You can live without food for a month, but can live only a few days without water.

Take a Task

Watch Remedial

In a Nutshell

- Water impurities can be of three types-soluble, insoluble and also germs.
- Water purification is the removal of harmful substances and germs to make water fit for drinking.
- The water cycle is the journey that water takes as it circulates from the land to the sky and then back again.
- Water can be purified by boiling, chlorination and by using water purifiers at home.
- Rainwater harvesting is a method of collecting and storing rainwater for future use.

Key Words

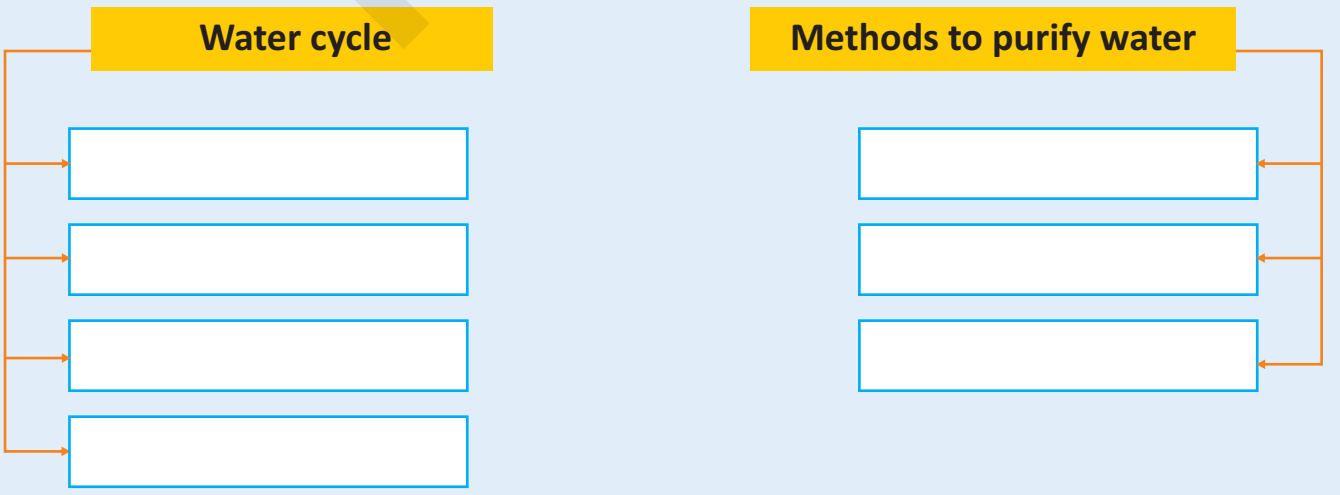
Improving Vocabulary

Odourless	:	Having no smell
Suspended	:	Attached to something
Drought	:	A prolonged period of abnormally low rainfall, leading to a shortage of water.
Irrigation	:	The supply of water to land or crops.
Groundwater	:	Water found under the Earth's surface.

Time to Recall

Remembering and Analysing

Recall and complete the concept map given below.



Gap Analyzer™
Take a Test

EXERCISE

That turn curiosity into confidence—let's begin!

A. Objective Type Questions:

1. Clouds form through this process:

   (A) Condensation (B) Evaporation (C) Transpiration

2. Rain, snow, and hail are examples of:

   (A) Evaporation (B) Condensation (C) Precipitation

3. What is the only thing in nature that can be a solid, a liquid, or a gas?

   (A) Water (B) Oxygen (C) Carbon dioxide

4. What are the three stages of the water cycle?

   (A) Evaporation, condensation, precipitation

   (B) Condensation, precipitation, hibernation

   (C) Precipitation, dehydration, evaporation

B. Match the following:

1. The huge source of salty water	A. Flood
2. Main source of water	B. Sea
3. Solid form of water	C. Drought
4. Too much rain causes	D. Ice
5. No rain causes	E. Rain

C. Very Short Answer Questions:

Name the following:

1. The continuous cycle by which water circulates by the process of evaporation, condensation and precipitation _____
2. Water that is safe to drink is called _____
3. The simplest and best way of purifying drinking water _____
4. The process of purifying water by using chlorine tablets _____
5. A method of collecting and storing rain water for various purposes and also for future use_____

D. Short Answer Questions:

1. Write the different properties of water.
2. What is water cycle?
3. What are impurities? What are the different impurities in water?
4. What is water purification?
5. What is rain water harvesting?

E. Answer the Following Questions:

1. Differentiate between:
   (i) Evaporation and Condensation
   (ii) Boiling and Chlorination
2. With the help of a neat labelled diagram, explain the water cycle.
3. What are the various ways in which rainwater can be harvested?

Time to Apply

Applying and Creating

1. RO (Reverse Osmosis) water purifiers have become very common in the households in the past few years. Although they get rid of all dirt and germs and make water safe for drinking, a lot of water gets wasted in this process.

   (i) Find out ways in which this water can be used.

   (ii) Also find out whether there are any RO filters available in the market that do not waste any water while purification.

Time to Discuss

Pondering and Communicating

1. A bottle of cold water was taken out of the refrigerator and kept outside. After a while tiny droplets of water could be seen on the walls of the bottle. Why?

2. If the Earth's surface is covered with 3/4th of water then why there is scarcity of water?

Time to Observe

Observing, Critical Thinking, Analysing

What uses of water and air do the pictures depict? Discuss.

1 

2 

3 

4 

5 

6 

MAKE YOUR WATER FILTER:

Materials:

- Gravel
- Sand
- Blotting paper or 3 or 4 coffee filters
- Clean flower pot
- Transparent jug
- Large measuring cup or pouring jug

Procedure:

- Put blotting paper or 3 or 4 coffee filters, then sand, and finally gravel in a clean flower pot.
- Place the flower pot in a larger transparent container so the filtered water can drip through and the children can observe it.
- In a large measuring cup, place dirt, bits of plant matter and water.
- Mix it up to make muddy water.
- Pour the muddy water into the flower pot as shown in the image above.
- Observe the colour of the water dripping out the bottom of the pot into the transparent container.
- Ask questions – Where did the dirt go? Why did cleaner water come out?
- Take the filter apart and try to find the dirt and bits of plant matter.

Try arranging the layers in a different order and compare the colour of the filtered water.