Water

- Sources of water: The common sources of water are ponds, lakes, rivers, wells, and reservoirs.
- Water cycle: Water undergoes different processes in the environment and is found in different states during these processes. This cyclic process through which water circulates in the environment is called the water cycle.

• Importance of water

- Water is necessary for germination of seeds, transportation of nutrients from soil and food from the leaves to different parts of the plant, in preparation of food through photosynthesis.
- Aquatic animals and plants get their nutrients as well as oxygen supply from the water. These substances are present in water in dissolved form.
- Water is used for many other purposes such as in cooking, cleaning, industrial work, running hydroelectric and thermal electric power plants. Sea water is also used as a medium of transportation.
- A solution has two components, namely the solvent and the solute.
- **Solvent** is that part of the solution in which the other component is dissolved. In other words, solvent is that component of a mixture that is present in large amounts.
- **Solute** is that part of the solution that is dissolved in the solution. This is present in a lesser quantity as compared to the solvent. Also, more than one solute can be present in a solution.

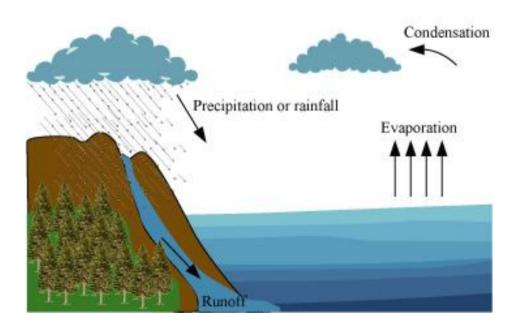
• Properties of a solution

- It is a homogeneous mixture of solutes and solvents
- The solute particles in a solution are extremely small in size. They are less than 1 nm (10^{-9} m) in diameter.
- Solute particles are not visible to the naked eye.
- As a result of the small size of the solute particles, a solution does not scatter light.
- Solute particles being small in size get dissolved in the solvent. Hence, the solute cannot be separated from the solution by filtration.
- Solute particles do not settle down when left undisturbed.
- The addition of harmful substances to water which causes its physical, chemical and biological properties to change is called **water pollution**.

Uses of Water

Water is used for many purposes like drinking, washing clothes and utensils, generating electricity, bathing, irrigation etc.

- Water is essential for life.
- About 71% of the earth's surface is covered with water. It is present as ground water, in seas, oceans, rivers, lakes, ice caps, and in atmosphere.
- Wells, rivers, ground water reservoirs or lakes are sources of fresh water.
- Ocean and sea water is not potable because they contain large amount of dissolved salts.
- Water is a necessity for every form of life. It is used for domestic activities, irrigation, industrial purposes, etc.
- 22nd March is celebrated as World Water day.
- Water Cycle: The circulation of water between water bodies, lands and clouds is known as water cycle.



- The change of water into its vapour is known as **evaporation**.
- The change of vapour back into water is known as **condensation**.
- Fall of water from clouds is known as **precipitation** or **rainfall**.

- **Runoff** is the process by which rain water returns back to the water bodies.
- Clouds are formed during the process of condensation.
- Rain, snow, hail, etc. replenish rivers, lakes, and wells and recharge the ground water.
- 1. Water is present in three forms.
- 2. Solid form snow and ice
- 3. Liquid form oceans, lakes, rivers, and underground water
- 4. Gaseous form water vapour in the atmosphere
- 5. The three forms of water circulate through the water cycle and keep the total amount of water constant on the earth.
- In free state, water occurs in solid, liquid, and gaseous state while in combined state, it is found in proteins, carbohydrates, etc.
- It is colourless, odourless, and tasteless.
- It boils at 100°C and freezes at 0°C.
- Pure water is a poor conductor of electricity. It has high latent heat of vaporisation and fusion and specific heat capacity.
- Water is a universal solvent as it dissolves maximum number of substances.
- It is stable to heat.
- Water has anomalous expansion property, i.e. it expands on cooling below 4 0 C and it has maximum density at 4 0 C

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- o The change of water into its vapour is known as evaporation.
 o The change of vapour back into water is known as condensation.

- o Fall of water from clouds is known as precipitation or rainfall.
- o **Runoff** is the process by which rain water returns back to the water bodies.
- Clouds are formed during the process of **condensation**.
- Rain, snow, hail, etc. replenish rivers, lakes, and wells and recharge the ground water.
- In India, most of the rainfall occurs during the monsoon season.
- Heavy rain in a short period of time causes flood. No rain for a long period causes **drought.**
- Most of the potable water becomes available to us as **ground water.**
- As the number of tube-wells in an area increases, the level of ground water decreases.
- There is an immediate requirement to harvest water. The basic idea behind rainwater harvesting is 'Catch water where it falls'.
- In rainwater harvesting method, the stored rainwater is used to recharge ground water.
- In rooftop rainwater harvesting system, the rainwater is collected from rooftop in a storage tank. It allows the water to go into the pit through pipes. This water seeps and refills the ground water.
- The addition of harmful substances to water, as a result of which its physical, chemical, and biological properties get altered, is called **water pollution**.

• Types of water pollutants

• Domestic sewage

- It is composed of food wastes, detergents, and disease-causing pathogens.
- The bacteria present in faecal matter of mammals indicate the pollution levels in a river and if such water is consumed, it may cause various diseases.

• Industrial waste

- It is rich in toxic chemicals such as arsenic, fluorides, and lead.
- It causes toxicity in plants and animals.
- It affects the soil by causing changes in its acidity and growth of worms.

Agricultural waste

- It is rich in agricultural pesticides and weedicides.
- It causes ground water pollution.
- It causes an increase in the population of algae in water.

- When these algae die, they are acted upon by decomposers, which use lots of oxygen dissolved in water leading to depletion of dissolved oxygen.
- This results in the death of fish and other aquatic organisms.

• Release of Superheated Water

- The release of superheated water from some industries and nuclear power plants causes thermal pollution of the water bodies.
- The abrupt change in the temperature of water body can kill the fish and other organisms adapted to particular temperature range.

Methods of preventing water pollution

- Industrial waste must be chemically treated to remove harmful substances before dumping into the water bodies.
- Disposal of human and animal excreta into water should be avoided.
- Sewage water must be treated before releasing into the rivers.

Conservation of water

- Reusing the waste water from the kitchen (water that has been used to wash vegetables, etc.) to water the plants in the garden
- Turning the tap off while brushing or shaving
- Checking for leaky taps and fixing them up
- Rainwater harvesting
- Using improved farming and irrigation techniques
- Preventing pollution of water
- Conserving and replenishing ground water
- Proper removal of silt from water bodies
- Preventing cutting of trees

• Prevention of water pollution

- Proper treatment of industrial waste and domestic waste before their disposal into rivers.
- Strict implementation of environmental laws in industrial units.

- Reusing water used in kitchens (such as to wash vegetables) for watering plants.
- Getting the leaky taps checked and preventing wastage of water.

Potable water

- Water that is fit for drinking is called potable water.
- Methods of obtaining potable water.

• Physical methods

- Sedimentation and filtration
- Boiling of water
- Use of domestic filters such as candle type filter

Chemical method

- Use of chlorine tablets
- Infusion of ozone gas
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