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.

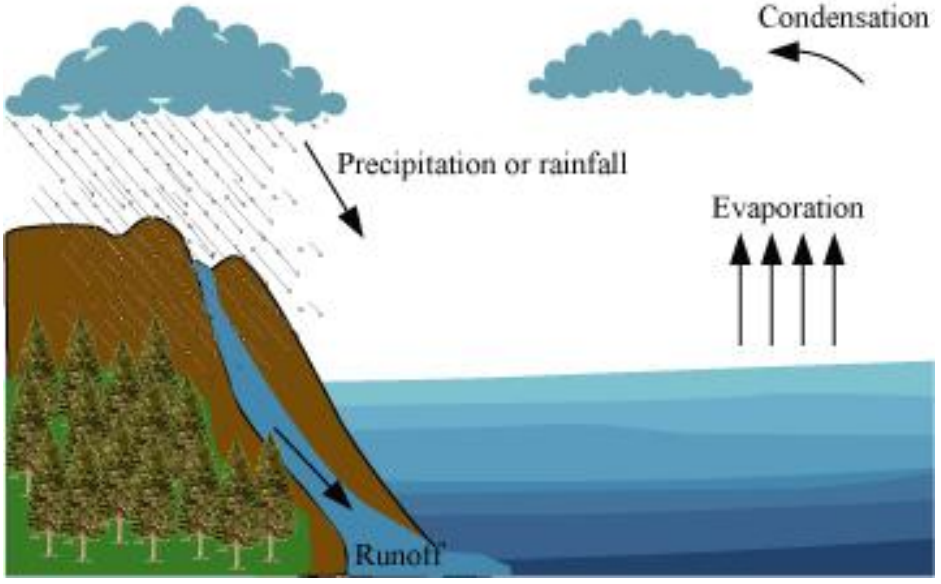
- **Properties of a solution**
    - It is a homogeneous mixture of solutes and solvents
    - The solute particles in a solution are extremely small in size. They are less than 1 nm (10^{-9} m) in diameter.
    - Solute particles are not visible to the naked eye.
    - As a result of the small size 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 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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