

Introduction to Water:

Water is one of the most important natural resources on Earth. Every living organism needs water to survive. Humans need water for drinking, cooking, cleaning, farming, industries and many other activities. Plants need water for photosynthesis and growth, while animals need it for drinking and maintaining their bodies.

About **71%** of Earth's surface is covered by water, which is why Earth appears blue when viewed from space. However, most of this water cannot be directly used by humans.

About **97%** of Earth's water is saline water, found mainly in oceans and seas. Saline water contains a large amount of dissolved salts and is not suitable for drinking or most agricultural and household uses without treatment.

Only about **3%** of Earth's water is freshwater. Much of this freshwater is frozen in glaciers, ice sheets and permanent snow. Only a small fraction is readily available as liquid freshwater in rivers, lakes, ponds, wetlands and groundwater.



Therefore, although Earth has a large amount of water, **usable freshwater is limited**. Population growth, agriculture, industries, pollution and changing weather patterns increase pressure on freshwater resources.

Did You Know?

Most of the water on Earth is salty seawater, while only a small fraction is freshwater that can be readily used by people

Water: A Renewable but Limited Resource

Water is considered a **renewable natural resource** because it is continuously recycled through the water cycle.

However, renewable does not mean unlimited.

If people use groundwater faster than rainfall can replace it, the groundwater level falls. Similarly, if rivers and lakes become heavily polluted, the amount of safe and usable freshwater decreases.

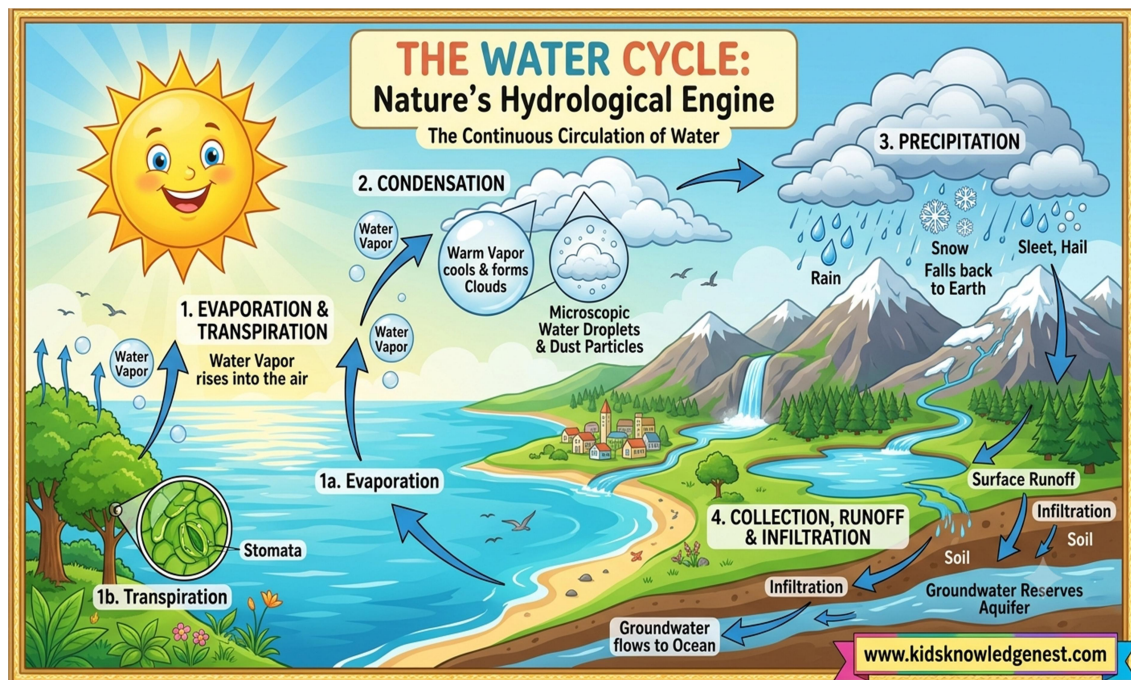
Therefore, we must use water carefully and protect it from pollution.

Curiosity: If the Earth is literally covered in water and looks blue from space, why are we always taught that there is a water shortage?"

Answer: While 71% of Earth's surface is water, roughly 97% of it is salty ocean water that humans, crops, and industries cannot use directly. Of the remaining 3% freshwater, more than two-thirds is trapped in solid ice sheets and glaciers. Humans are left sharing a tiny sliver—less than 1%—found in rivers, lakes, and aquifers

The Water Cycle: Nature's Hydrological Engine

The continuous circulation of water from the Earth's surface to the atmosphere and back to the land and oceans is called the **water cycle** (or hydrological cycle). Powered by solar radiation, the cycle acts as Earth's natural purification and recycling system.



The movement of water through the atmosphere and biosphere occurs via four interconnected processes:

1. **Evaporation and Transpiration:** Thermal energy from the Sun heats up surface water in oceans, lakes, and rivers, converting liquid water into gaseous water vapour that ascends into the air. Simultaneously, plants draw water from the soil through roots and release excess moisture into the air through microscopic pores on leaves called stomata—a process termed **transpiration**.
2. **Condensation:** As warm water vapour rises, it encounters cooler temperatures at higher altitudes. This cooling causes the vapour to change back into microscopic droplets of liquid water. These tiny droplets cluster around airborne dust particles, consolidating into visible clouds and mist.

Find more content @ www.kidsknowledgenest.com
For any support write to us support@kidsknowledgenest.com

3. **Precipitation:** As condensation continues, water droplets merge and grow heavier. When the air currents can no longer keep them suspended against gravity, the moisture falls back to the Earth's surface as rain, snow, sleet, or hail.
4. **Collection, Runoff, and Infiltration:** Rainwater falling onto the ground either flows over the terrain as surface runoff into streams, rivers, and lakes, or soaks directly into the soil to replenish groundwater reserves.

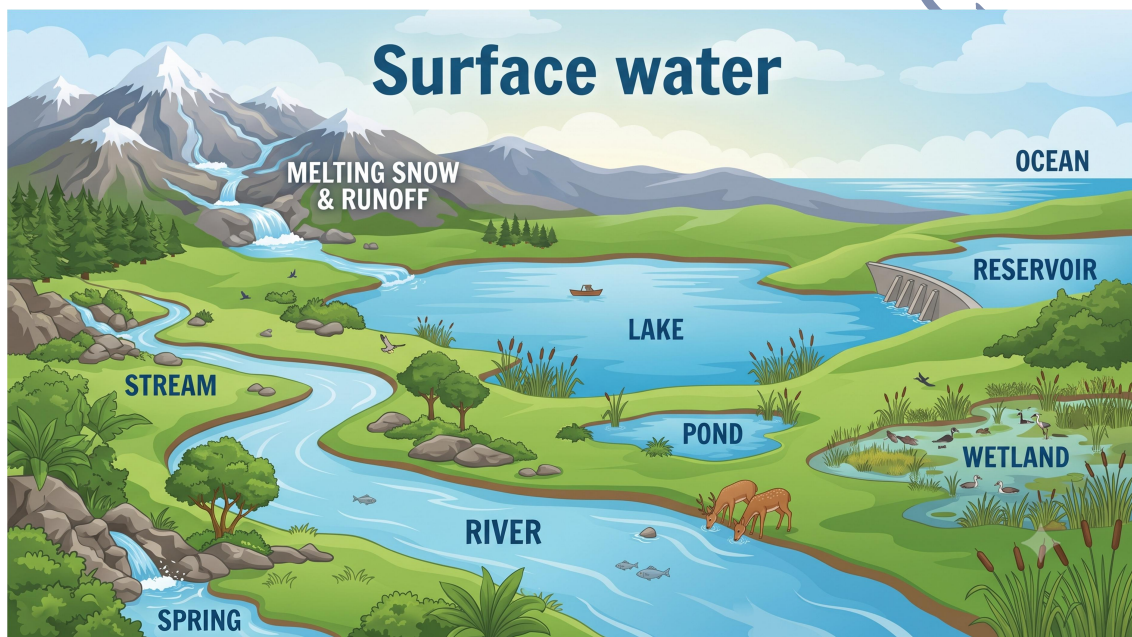
Did You Know?

Water is continuously recycled in nature. The same water that exists on Earth today may have been part of an ocean, cloud, river, glacier or living organism thousands or millions of years ago.

Sources of Fresh Water: Surface and Underground

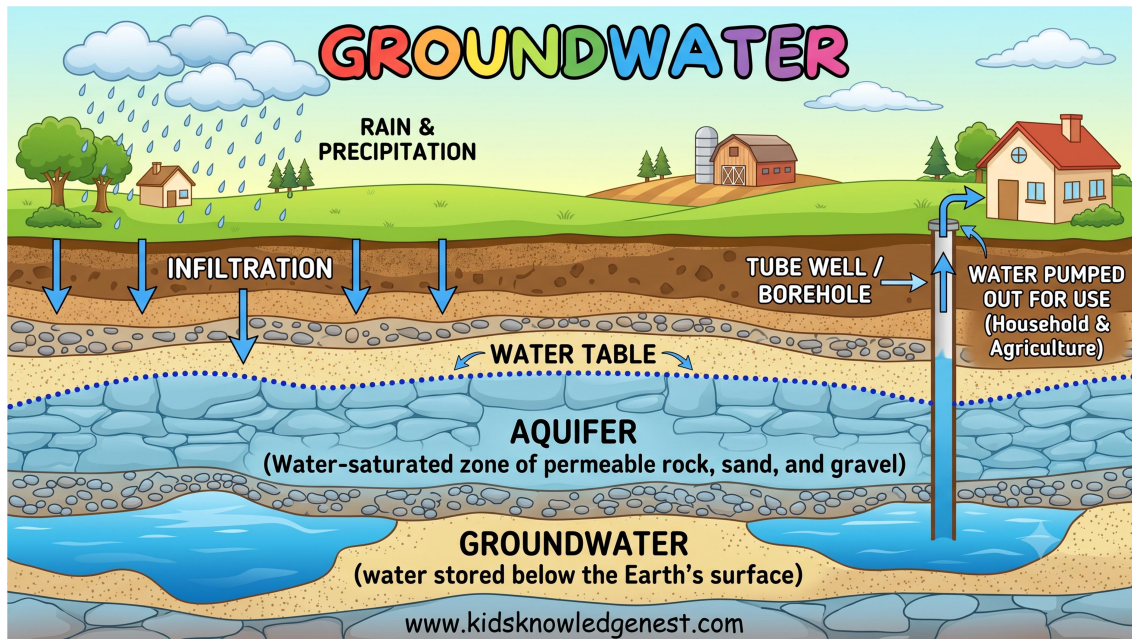
Freshwater is broadly categorized into two reservoirs: surface water and groundwater.

(i) **Surface water** includes all bodies of water openly exposed to the atmosphere—rivers, freshwater lakes, ponds, reservoirs, and natural streams. These bodies depend on monsoon rainfall, glacial melt water, and natural springs for seasonal replenishment.



Surface water is important for Drinking water supplies after treatment, Irrigation, Industries, Domestic activities, Plants and animals. However, because surface water is directly exposed to the surroundings, it can become polluted by sewage, plastic waste, chemicals and agricultural runoff.

(ii) **Groundwater** is water stored below the Earth's surface. It forms when rainwater seeps down through soil layers, gravel, and porous rocks via infiltration. As water filters downward, it accumulates in subterranean reservoirs consisting of permeable rock and sand strata, known as **aquifers**. The upper boundary of this water-saturated zone underground is designated as the **water table**.



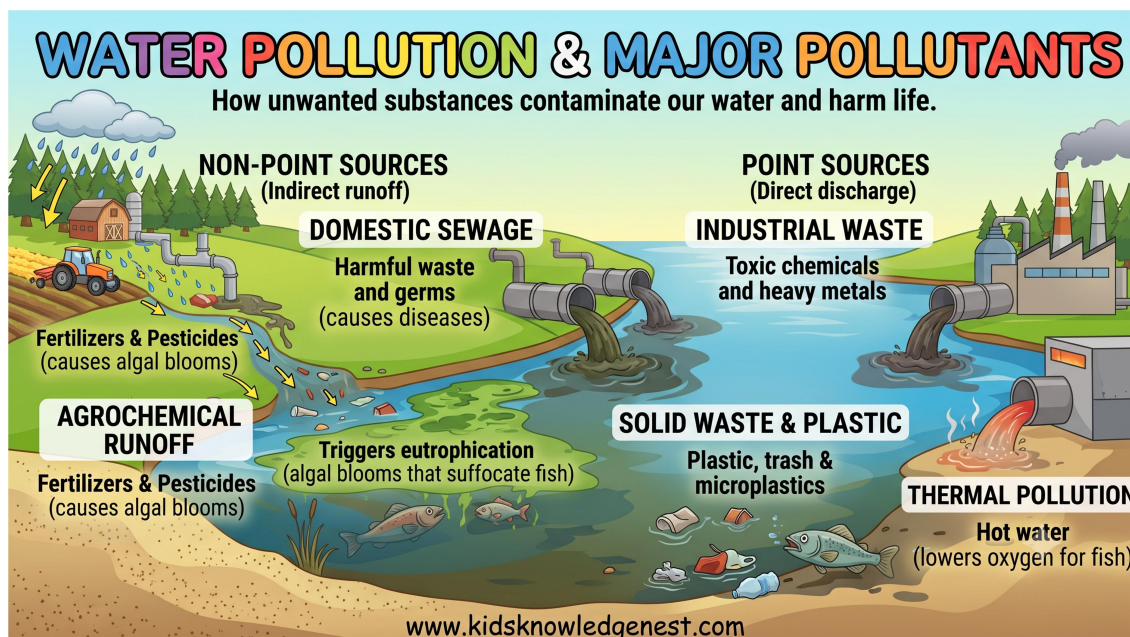
When a borehole or tube well is drilled beneath the depth of the water table, groundwater can be pumped out for household and agricultural needs.

Did You Know?

An aquifer is an underground layer of rock, sand, gravel, or other permeable material that stores and allows groundwater to move through it.

Water Pollution and Major Pollutants

Water pollution occurs when unwanted chemical, biological, or physical substances contaminate water bodies, making the water toxic, unhygienic, or harmful to aquatic ecosystems and terrestrial life.



Pollutants enter water systems through point sources (direct, identifiable discharge pipes like an industrial drain) and non-point sources (diffuse runoff over wide agricultural lands or urban roads). The main water pollutants include:

- **Untreated Domestic Sewage:** Household wastewater contains human waste, laundry detergents, and food scraps. When discharged raw into rivers, it introduces harmful pathogens (bacteria, viruses, and parasites) that cause waterborne diseases like cholera, typhoid, and dysentery.
- **Industrial Effluents:** Chemical manufacturing, textile dyeing, tanning, and metal plating plants often discharge wastewater rich in toxic heavy metals (such as lead, mercury, and cadmium), strong acids, and synthetic solvents directly into waterways. These poisons bioaccumulate in fish and enter the human food chain.

- **Agrochemical Runoff:** Excessive application of synthetic nitrogen and phosphorus fertilizers, along with chemical insecticides and weedicides, washes off fields during heavy rain. High nutrient levels in water bodies trigger **eutrophication**—rapid algal blooms that block sunlight and deplete dissolved oxygen as the algae decompose, suffocating fish and other aquatic organisms.
- **Solid Waste and Plastics:** Discarded plastic wrappers, bottles, and non-biodegradable debris choke riverbeds and drainage systems, leaching harmful plasticizers and degrading into microplastics that are ingested by aquatic species.
- **Thermal Pollution:** Thermal power plants and heavy factories draw cold river water for equipment cooling and return hot water back into the river. Warmer water holds significantly less dissolved oxygen, causing respiratory distress and mortality among aquatic animals.

How to Control and Stop Water Pollution

Water pollution can harm people, animals, plants and entire ecosystems. It can be controlled when governments, industries, farmers and ordinary citizens work together.

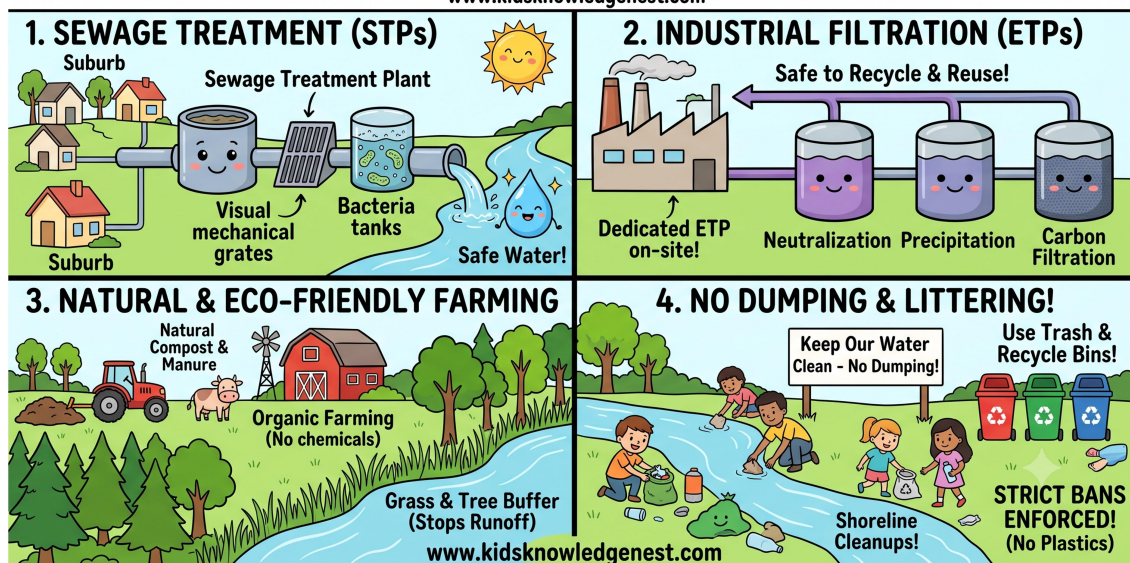
The main ways to control water pollution are treating wastewater, reducing harmful chemicals, managing agricultural runoff and disposing of waste properly.

1. Sewage Treatment Plants (STPs)

Municipal corporations must ensure that domestic sewage is directed through multi-stage wastewater treatment facilities before discharge. Sewage treatment involves mechanical screening to remove large floating solids, biological digestion using aerobic bacteria to decompose organic toxins, and chemical chlorination or ultraviolet treatment to neutralize infectious disease-causing microbes.

HOW TO STOP WATER POLLUTION: Let's Keep Our Water Clean!

www.kidsknowledgenest.com



2. Effluent Treatment Plants (ETPs) for Industries

Factories must install dedicated effluent treatment plants on-site. These facilities utilize chemical neutralization, precipitation, and activated carbon filtration to remove toxic heavy metals, synthetic dyes, and hazardous

chemical residues from industrial wastewater, allowing treated water to be safely recycled within the factory.

3. Sustainable and Organic Farming Practices

Farmers can protect nearby water tables and streams by adopting integrated pest management (IPM) and organic fertilizers like compost, vermicompost, and green manure in place of synthetic agrochemicals. Establishing vegetated buffer strips of grass and trees along field margins traps sediment and absorbs chemical residues before runoff enters nearby streams.

4. Banning Direct Waste Dumping

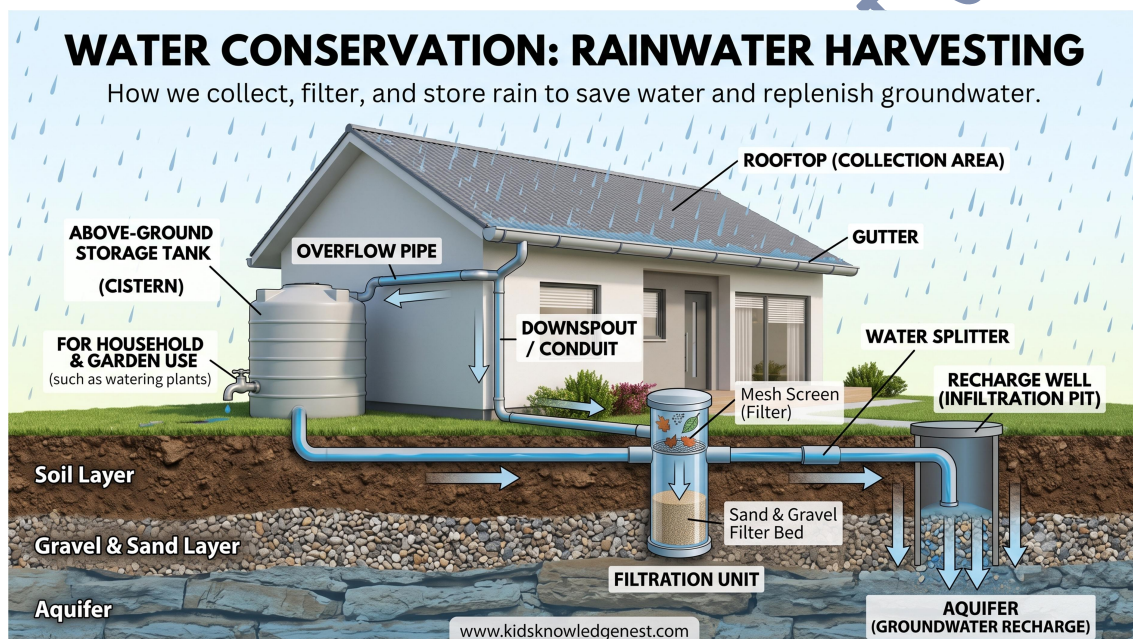
Strict municipal bans against dumping unsegregated solid trash, plastic bags, religious offerings, and dead organic matter into rivers, lakes, and drainage channels must be actively enforced. Shoreline cleanups and public trash receptacles near riverbanks help prevent urban litter from entering stormwater drains.

Water Conservation

Conserving water means using available freshwater resources judiciously to minimize waste and actively recharge natural aquifers.

1. Rainwater Harvesting

Rainwater harvesting involves collecting, channeling, and storing rainfall from rooftops, paved courtyards, and open surfaces for future use or groundwater recharge. Instead of allowing stormwater to rush into drains and wash away, it is routed through wire-mesh screens and sand-gravel filter beds into storage cisterns or deep recharge wells. This method reduces urban flooding and replenishes local water tables.



2. Modern and Efficient Irrigation Techniques

Conventional flood irrigation submerges entire fields, losing up to 60% of water to surface evaporation, weeds, and deep seepage. Modern farming replaces this with conservation techniques:

- **Drip Irrigation:** A network of narrow tubing and micro-emitters delivers water drop-by-drop directly to the root zone of each plant. This eliminates surface runoff, suppresses weed proliferation, and reduces overall agricultural water consumption by 50% to 70%.
- **Sprinkler Irrigation:** Overhead pipes fitted with rotating nozzle heads spray water evenly across crops like natural rainfall,

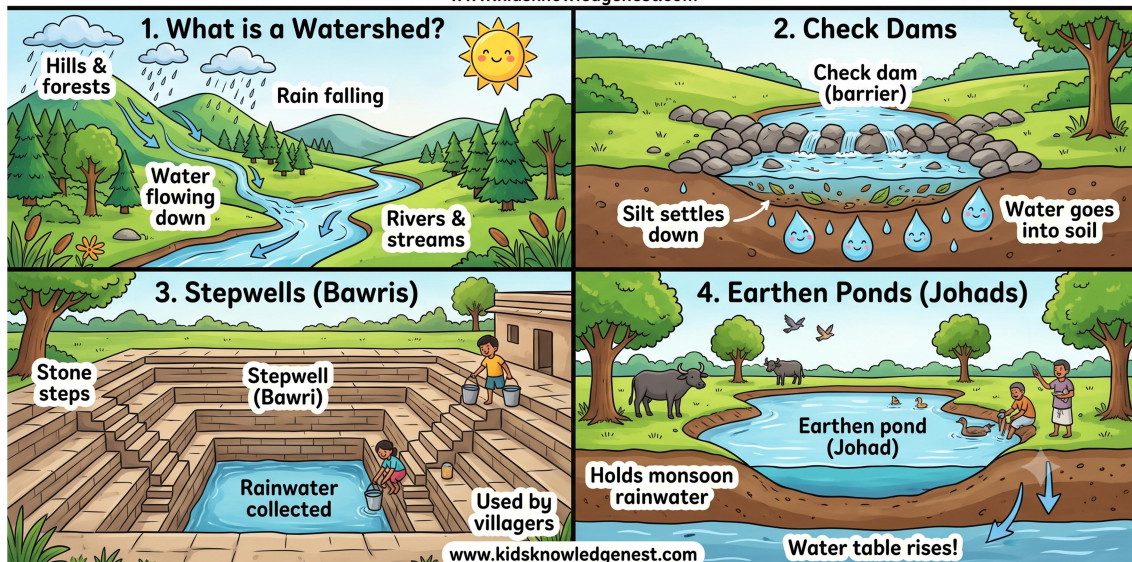
distributing moisture uniformly across uneven and sandy soils without pooling.

3. Watershed Management and Traditional Structures

Reviving traditional water collection infrastructure—such as stepwells (*bawris*), check dams, and earthen village ponds (*johads*)—slows monsoon runoff across rural landscapes. Small check dams built across seasonal streams hold back storm runoff, allowing silt to settle and forcing standing water to percolate downward into the subsoil, steadily lifting the water table of surrounding villages.

Watershed Management & Traditional Structures!

www.kidsknowledgenest.com



4. Household Water Auditing and Daily Habits

Individual actions add up to significant municipal water savings:

- **Fixing Leaks:** A dripping faucet leaking one drop per second wastes over 2,000 litres of treated water every year. Replacing worn rubber washers stops unnecessary waste.
- **Turn Off Running Taps:** Shutting the tap while brushing teeth, scrubbing hands, or lathering soap saves up to 10 to 15 litres of water per routine.

- **Bucket Baths Over Hosepipes and Showers:** Using a standard 15-litre bucket instead of running an overhead shower or using a garden hose to wash cars cuts domestic consumption by half.
- **Greywater Recycling:** Water used for washing fruits and vegetables or clean discharge water from domestic reverse osmosis (RO) purification units can be collected in buckets and reused for mopping floors and watering potted plants.

www.kidsknowledgenest.com

Question and Answer Section:

Question 1

What percentage of Earth's total water is freshwater?

- A) About 71%
- B) About 97%
- C) About 3%
- D) About 50%

- **Correct Answer:** C) About 3%
- **Explanation:** While water covers roughly 71% of the Earth's surface, about 97% of that total water is saline (found in oceans and seas). Only approximately 3% exists as freshwater, and most of that is locked in glaciers, ice sheets, and permanent snow.

Question 2

Which process describes the release of excess moisture into the atmosphere through microscopic leaf pores (stomata)?

- A) Infiltration
- B) Transpiration
- C) Precipitation
- D) Condensation

- **Correct Answer:** B) Transpiration
- **Explanation:** Plants draw water from the soil through their roots and release excess moisture into the air through pores called stomata. Evaporation refers to the thermal heating of open water bodies, while transpiration is specifically plant-driven moisture release.

Question 3

What causes water droplets to fall to Earth as precipitation (rain, snow, sleet, or hail)?

- A) Air currents can no longer keep the heavy, merged droplets suspended against gravity
- B) Solar radiation directly pulls droplets toward the land
- C) Microscopic dust particles dissolve completely in the air
- D) Plants absorb all surrounding moisture from clouds

- **Correct Answer:** A) Air currents can no longer keep the heavy, merged droplets suspended against gravity
- **Explanation:** In the condensation phase, tiny droplets gather around dust particles. As condensation continues, these droplets merge and grow

heavier until atmospheric currents can no longer support their mass against gravity, causing them to fall as precipitation.

Question 4

What is the upper boundary of the underground water-saturated rock and soil layer called?

- A) Aquifer
- B) Subsoil stratum
- C) Water table
- D) Catchment basin

- **Correct Answer:** C) Water table
- **Explanation:** Rainwater seeps underground via infiltration and collects in subterranean permeable rock layers known as aquifers. The upper boundary of this fully saturated underground zone is designated as the water table.

Question 5

How does agricultural runoff containing excessive synthetic fertilizers lead to eutrophication?

- A) It increases salt levels until freshwater turns saline
- B) It triggers rapid algal blooms that block sunlight and deplete dissolved oxygen upon decomposing
- C) It raises water temperature directly by absorbing solar radiation
- D) It introduces toxic heavy metals like lead and cadmium into the water

- **Correct Answer:** B) It triggers rapid algal blooms that block sunlight and deplete dissolved oxygen upon decomposing
- **Explanation:** High levels of nitrogen and phosphorus from fertilizers cause explosive growth of algae (algal blooms). These blooms block sunlight from reaching aquatic plants and, when the algae die and decompose, bacteria consume large amounts of dissolved oxygen, suffocating aquatic life.

Question 6

Why does thermal pollution from power plants and factories harm aquatic ecosystems?

- A) Warmer water dissolves and holds significantly less dissolved oxygen
- B) Heated water causes immediate evaporation of entire river systems
- C) Hot water chemically alters harmless salts into toxic heavy metals
- D) Warm water completely blocks sunlight from entering water bodies

- **Correct Answer:** A) Warmer water dissolves and holds significantly less dissolved oxygen

- **Explanation:** When factories draw river water for equipment cooling and return it heated, the elevated temperature lowers the water's gas solubility. Warmer water holds less dissolved oxygen, causing respiratory distress and mortality among aquatic organisms.

Question 7

What is the primary role of aerobic bacteria in a Sewage Treatment Plant (STP)?

- A) Mechanical screening of floating solids
- B) Chemical precipitation of heavy metals
- C) Biological digestion of organic matter and toxins
- D) Ultraviolet disinfection of treated effluent

- **Correct Answer:** C) Biological digestion of organic matter and toxins
- **Explanation:** Multi-stage wastewater treatment uses mechanical screens for large physical debris, biological treatment tanks with aerobic bacteria to decompose organic wastes and toxins, and chlorination/UV irradiation for final disinfection.

Question 8

How can farmers establish a natural physical barrier to trap sediment and absorb agrochemicals before runoff enters streams?

- A) Flood irrigation trenches
- B) Vegetated buffer strips of grass and trees
- C) Direct borehole recharge lines
- D) Tube well drainage channels

- **Correct Answer:** B) Vegetated buffer strips of grass and trees
- **Explanation:** Planting vegetated buffer strips composed of grasses and trees along field margins traps eroded soil and filters chemical residues before surface runoff washes into nearby streams and ponds.

Question 9

Which modern irrigation method saves 50% to 70% of agricultural water by delivering moisture directly to plant root zones?

- A) Flood irrigation
- B) Overhead sprinkler irrigation
- C) Furrow inundation
- D) Drip irrigation

- **Correct Answer:** D) Drip irrigation
- **Explanation:** Drip irrigation uses narrow tubes with micro-emitters to supply water drop-by-drop right at the root zone. This minimizes surface

evaporation, prevents deep percolation loss, suppresses weed growth, and cuts water consumption by 50% to 70%.

Question 10

Which traditional Indian water harvesting structures are small barriers built across seasonal streams to slow storm runoff and recharge aquifers?

- A) STPs
- B) Check dams and johads
- C) Micro-emitters
- D) Boreholes

- **Correct Answer:** B) Check dams and johads
- **Explanation:** Check dams and traditional earthen village ponds (johads) slow monsoon runoff, trap silt, and allow water to percolate downward into the subsoil, raising the local water table across surrounding communities.

Thanks for reading lesson, If you like our efforts please like and share our website in facebook, Instagram and other social platforms:

Copyright @www.kidsknowledgenest.com