

Groundwater :

↓
Water present in the zone of saturation below the ground.

Aquifer: The zone of saturation is called aquifer.

Types of Geological formation

① Aquifer: A geologic formation, or a part of formation that yield significant quantity of water is defined as aquifer.
Eg: sand, gravels etc.
Porosity ↑, Permeability ↑.

② Aquiclude: Geologic formation that can store significant amount of water but does not have capability to transmit a significant amount of water.
Eg: clay.

Permeability ↓, Porosity ↑

③ Aquitard: Geologic formation that can store some water as well as can transmit water at a relatively low rate compared to aquifers.
Eg: sandy clay.

Permeability ↓ Porosity ↑.

④ Aquifuge: Geologic formation that can neither store nor transmit water.
Eg: solid Granite

Types of Aquifer :

① **Confined Aquifer:** Are those in which an impermeable dirt / rock layer exists that prevents water from seeping into the aquifer from the ground surface.

sandwiched b/w two impermeable layers.

Also known as pressure aquifer / artesian aquifer.

Confined aquifer completely filled with water and they do not have free water table & aquifer will be under pressure.

② **Unconfined Aquifer:**

It is a permeable bed saturated with water table serves as the upper surface of the zone of saturation — water table aquifer.

— Water which is present in an unconfined aquifer is called an unconfined or phreatic water.

③ **Leaky Aquifer:**

If an aquifer loses or gains water through adjacent semi-permeable layers, it is called a leaky aquifer.

④ **Perched Aquifer:** can't be recharged. limited water.

Threats to water resources:

Water pollution, Flooding, Overexploitation



Groundwater decline
Drying of springs
Decrease of river flow
Increased pollution
vulnerability.

Effect of Groundwater Usage:

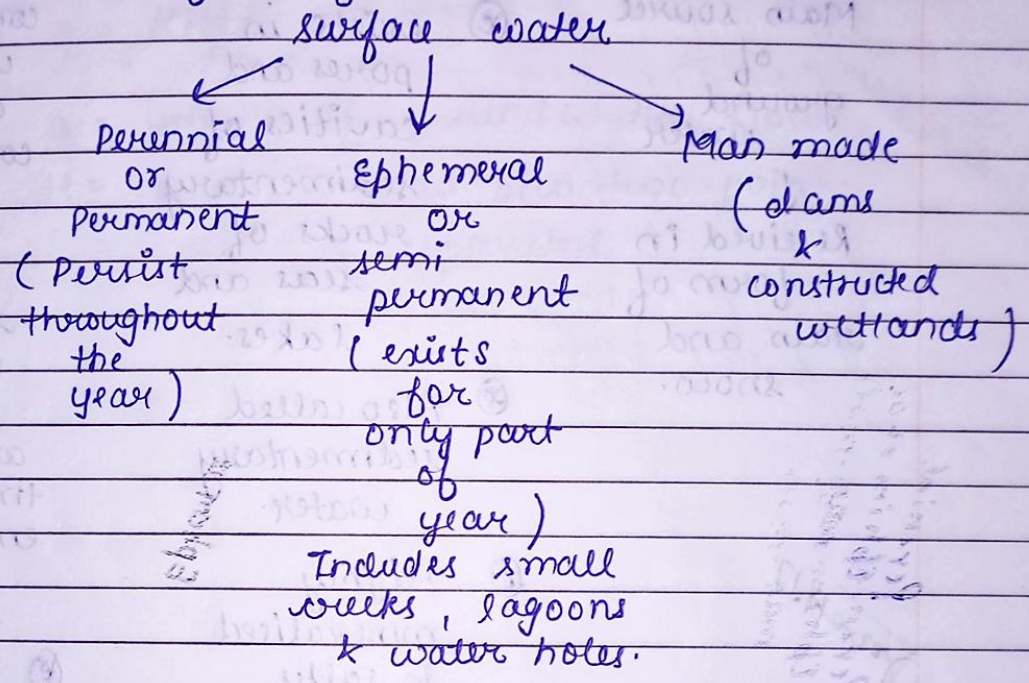
- Groundwater depletion will force us to pump water from deeper within the Earth.
- Large bodies of water will become more shallow from groundwater depletion.
- Saltwater contamination can occur.
- As large aquifers are depleted, food supply and people will suffer.
- A lack of groundwater limits biodiversity and dangerous sinkholes result from depleted aquifers.

Types of water Resources:

Surface water:

- * Surface water is the water that is available on land in the form of rivers, oceans, seas, lakes and ponds. (both saltwater & freshwater)

- * surface water participates in hydrologic cycle which involves movement of water to and from the earth's surface.
- * Precipitation and water runoff feed bodies of surface water.



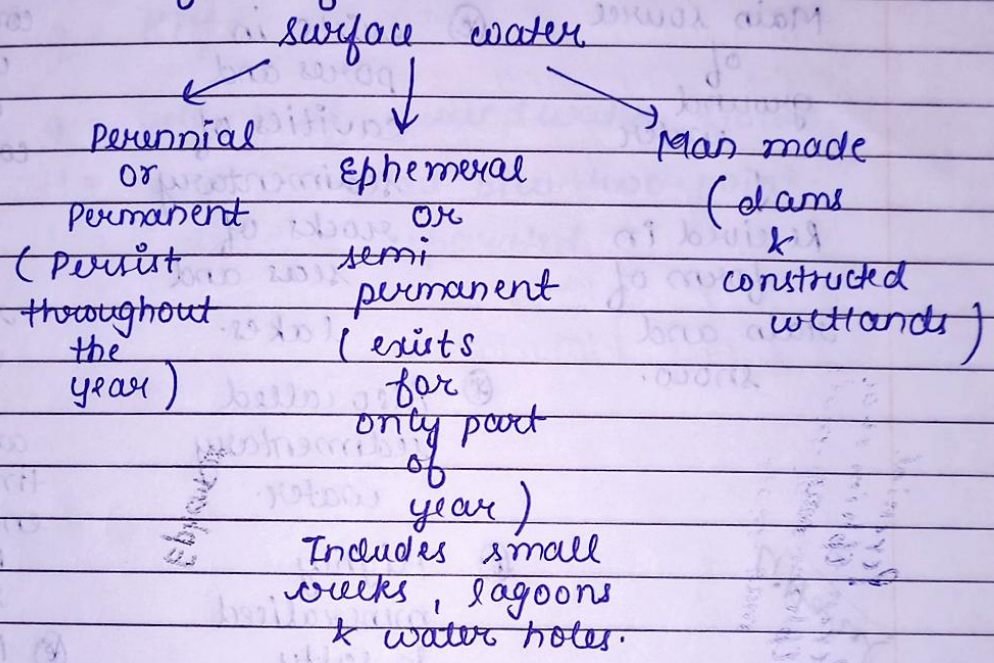
Groundwater : Water existing in the voids of the geological stratum below the surface of earth is called groundwater.

- * It is regulated by the quantum and speed of rains, extent of vaporization at the time of rain, temp., slope of land, dryness of air, porosity, permeability of rocks, vegetative cover & water absorbing capacity of the soil.

Surface water & groundwater are reservoirs that can feed into each other.

While surface water can seep underground to become groundwater, groundwater can resurface on land to replenish surface water.

- * surface water participates in hydrologic cycle which involves movement of water to and from the earth's surface.
- * Precipitation and water run off feed bodies of surface water.



Groundwater: Water existing in the voids of the geological stratum below the surface of earth is called groundwater.

- * It is regulated by the quantum and speed of rains, extent of vaporization at the time of rain, temp., slope of land, dryness of air, porosity, permeability of rocks, vegetative cover & water absorbing capacity of the soil.

Surface water & groundwater are reservoirs that can feed into each other. While surface water can seep underground to become groundwater, groundwater can resurface on land to replenish surface water.

Origin of Groundwater

Shooting star water

Meteoric water

Connate water

Magmatic water

↓
Main source of ground water

↓
Received in form of rain and snow.

↓
① exists in pores and cavities of sedimentary rocks of seas and lakes.

② Also called sedimentary water.

③ Highly mineralised & salty and doesn't mix readily with meteoric water.

④ Found in deep down lower layers of zone of saturation.

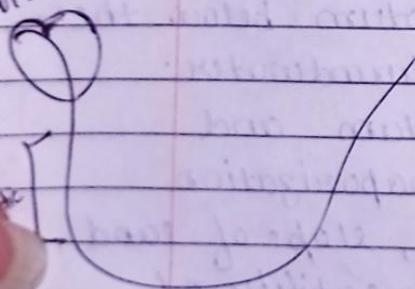
↓
converts into water after condensation of vapour as a result of volcanic action at the time of entering hot rocks.

⑤ Mainly springs, wells

⑥ Generated in interior of earth.

~~Marine~~

Littoral



~~///~~ Movement of Groundwater is influenced by gravity just like surface water. Darcy confirms the law to movement of groundwater through natural materials.

$$q = KH/L$$

q = velocity of groundwater flow

H = diff. in head b/w two point.

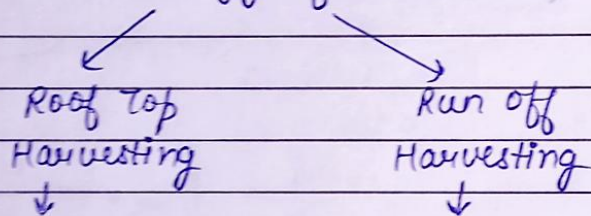
L = distance separated.

Water conservation and management practices, Rain water Harvesting

Rainwater Harvesting:

A simple process or technology used to conserve rainwater by collecting, storing, conveying, and purifying of rainwater that runs off from rooftops, parks, roads, open grounds etc. for later use.

Technology of Rainwater Harvesting



It include the catchment area as the roof top in rural and urban area.

Here, the run off water is collected. Gardens, landscapes, parks, roads, open fields, and other areas of env. can be used.

→ More advantageous in areas of low rainfall.

Components of Rain water Harvesting:

①

Catchment area:

Rainwater can be collected from most forms of roof.

②

Gutters and pipes / conveyance system:

In roof top system gutter & pipes are used to ~~catch~~ collect and transport water to

-the storage tanks.

③ Filter: Used to filter out debris that comes with the roof top water.

④ Storage facility: where water is stored.

⑤ Delivery system

Several factors play a vital role in the amount of water harvested. Some of these factors are:

- * Quantum of runoff
- * Feature of catchment
- * Impact on the environment
- * Availability of the technology
- * Capacity of the storage tanks
- * Types of roof, its slope, its materials
- * Speed and ease with which the rainwater penetrates through the subsoil to recharge the groundwater.

Rooftop Rainwater Harvesting Techniques.



- Direct Use storage
- Groundwater Aquifer Recharge
- Filling up bore wells
- Recharge pits
- Filling up of dig wells.
- Trenches for recharge
- Tank percolation

