

GROUND WATER

→ Introduction:-

The H_2O which is available under the ground is known as ground water.

- * 97.2% of H_2O occurs in sea.
- * 2.0% of H_2O occurs in ice bodies
- * 0.8% of H_2O occurs as surface H_2O & ground H_2O in this $\frac{1}{3}$ rd is in the form of surface H_2O & $\frac{2}{3}$ rd is in the form of ground H_2O .
- * 99.2% of available H_2O on earth is saline (or) as solid ice, so it is unsuitable for direct use.
- * Remaining 0.8% of water is available for direct use.

→ uses of water:-

- * 75% of water is used for irrigation purpose
- * 20% of water is used in industries.
- * Only 5% of water is used for domestic purposes.

So as the earth contains 0.8% of fresh water they must be used carefully without any wastage of H_2O .

- * 1000 tons of H_2O - For producing 1 Ton of grain
- * 2000 tons of H_2O - " " 1 Ton of rice
- * Seas & oceans contains 330 million cubic miles of H_2O .

→ Water Table:-

Due to weathering of rocks, the land surface is covered by a loose soil. Below the loose soil there is a fractured zone of rocks exists below the soil zone.

- * Below the fractured zone the bed rocks occurs which is free from fractures.
- * It consists of a vertical section containing of loose soil (at top), fractured rock (in middle), Bedrock (at bottom).
- * When rainfall occurs, some percentage of H_2O moves downwards through fractures, under the influence of gravity, until it reaches the bedrock.
- * Then, the percolation of rain H_2O leads to the development of a zone of saturation above the bedrock, in which all openings are filled with H_2O . This water is known as "ground water".
- * The upper surface of this zone of saturation is called "water table".
- * Above the zone of saturation & below the ground surface is the "zone of aeration" in which H_2O fills only a portion of the pore space.
- * The different types of ground H_2O which occurs in the zone of aeration:-
 - 1) Soil water - (Root of plants)
 - 2) Pellicular H_2O - (sticks to the sides of fracture).

3) vadose H₂O (or) gravity H₂O - (Percolated H₂O due to gravity reaches the water table).

4) Perched H₂O - (zone of aeration)

5) Capillary H₂O - (H₂O in openings just above & in contact with the water table).

* The different types of ground H₂O which occurs in the zone of saturation:-

1) unconfined (or) free ground water:-

This H₂O lies below the water table under atmospheric pressure only. This H₂O moves freely upwards (or) downwards.

2) confined H₂O:-

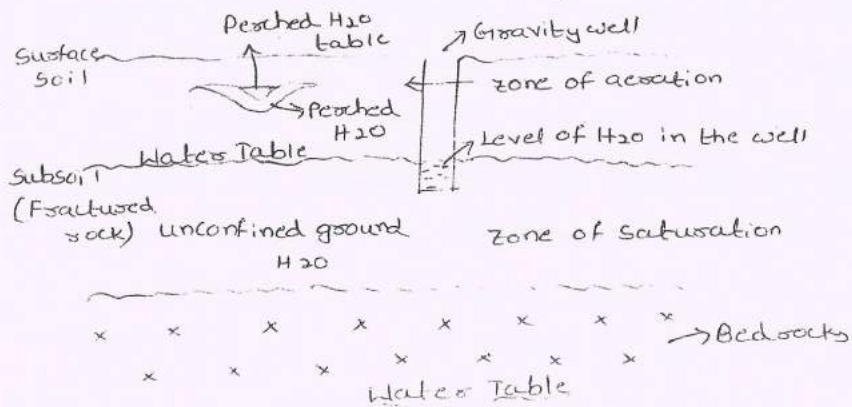
This H₂O lies below the H₂O table & is present b/w impervious beds.

3) Fixed ground H₂O.

4) Connate H₂O :- H₂O held within the rocks from beginning.

5) Interstitial H₂O :- H₂O occurring at great depths.

6) Juvenile H₂O :- (Magmatic source)



→ Porosity:-

It is defined as the ratio of volume of the voids in a rock mass to the total volume of the rock.

* It is denoted by 'n'.

$$n = \frac{V_v}{V}$$

* It is expressed in %.

* There are two types of porosity :-

a) Primary porosity b) secondary porosity.

↓
(Right from formation)

↓
(In middle like joints, faults, folds).

* If porosity is < 5% - Less (or) small porosity

* " " > 20% - More porosity

* " " b/w 5-20% - Medium porosity.

→ Permeability:-

It is defined as the ability to transmit the water to pass through it.

* The coefficient of permeability is denoted by 'k'.

* Permeability depends upon the porosity.

→ Geological control of ground H₂O movement:-

The movement of ground H₂O takes place at the zone of aeration & zone of saturation under the influence of gravity.

* Depends on permeability.

* Depends on porosity.

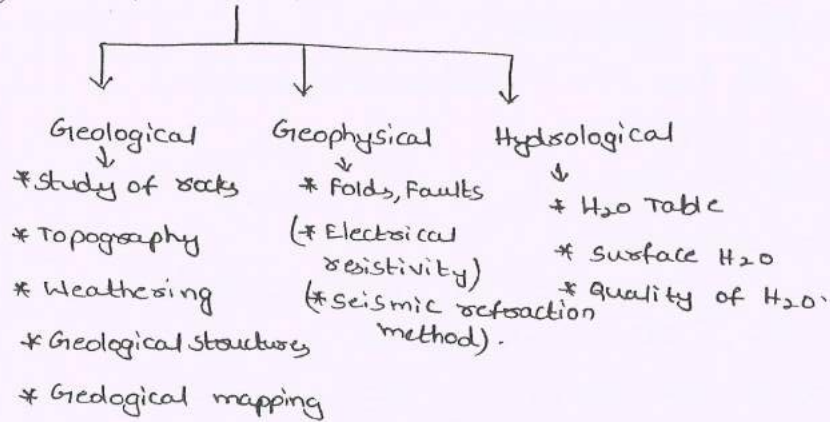
* " Bedding on rocks

* Dykes, sills etc.

→ Ground H₂O exploitation techniques :-

The ground water can be exploited by using two methods

- 1) H₂O diving → (Y-shaped twig) Sometimes
- 2) scientific studies



→ Classification of rocks based on porosity & permeability :-

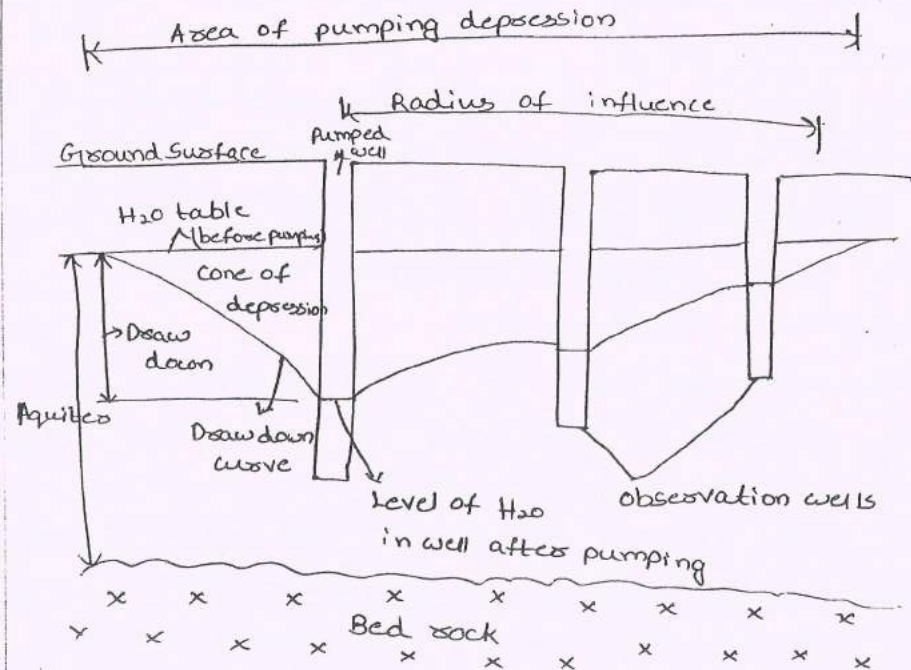
Based on porosity & permeability properties, rocks are grouped into four types namely :-

- 1) Aquifers — Both porous & permeable.
- 2) Aquifuges — Neither porous nor permeable
- 3) Aquicludes — porous but not permeable.
- 4) Aquibards — (both Aquifuge & aquicludes).

→ Fluctuation of the H₂O table level in unconfined aquifers :- Two types they are :-

- 1) Seasonal — (Rainy season)
- 2) cone of depression

→ Cone of depression (or) cone of exhaustion :-



In any gravity well (i.e. well dug in an unconfined aquifer), the level of H₂O coincides the H₂O table level of the surrounding aquifer

* When H₂O is pumped out from well, the level of H₂O decreases in the well & the depression in the H₂O table around the well is in the form of an inverted cone.

* This phenomenon is called the cone of depression.

* This is a temporary fluctuation in the level of H₂O table because the original position is restored within a short period