



# **SNS COLLEGE OF TECHNOLOGY**

**An Autonomous Institution  
Coimbatore - 35**

Accredited by NBA – AICTE and Accredited by NACC – UGC with 'A++ Grade  
Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai.

## **DEPARTMENT OF AGRICULTURAL ENGINEERING**

**19AGB303 – IRRIGATION AND DRAINAGE ENGINEERING**

**III – YEAR VI SEMESTER**

**UNIT 1 – SOIL WATER TENSION AND MEASUREMENT OF SOIL WATER**

**TOPIC 3 – SOIL WATER RETENTION-INFILTRATION-FACTORS INFLUENCING INFILTRATION  
RATE**



# SOIL WATER RETENTION



- The soil holds moisture due to their colloidal properties and aggregate qualities.
- The water is held on the surface of the colloids and other particles and in the pores.
- The forces responsible for retention of water in the soil (after the drainage due to gravity has stopped) are surface tension and surface attraction (surface moisture tension) and are described in terms of different energy concepts.
- The force with which water is held is also termed as suction.





# Soil water retention

## Water-Holding Capacity of Soil Effect of Soil Texture





# Retention - Ways

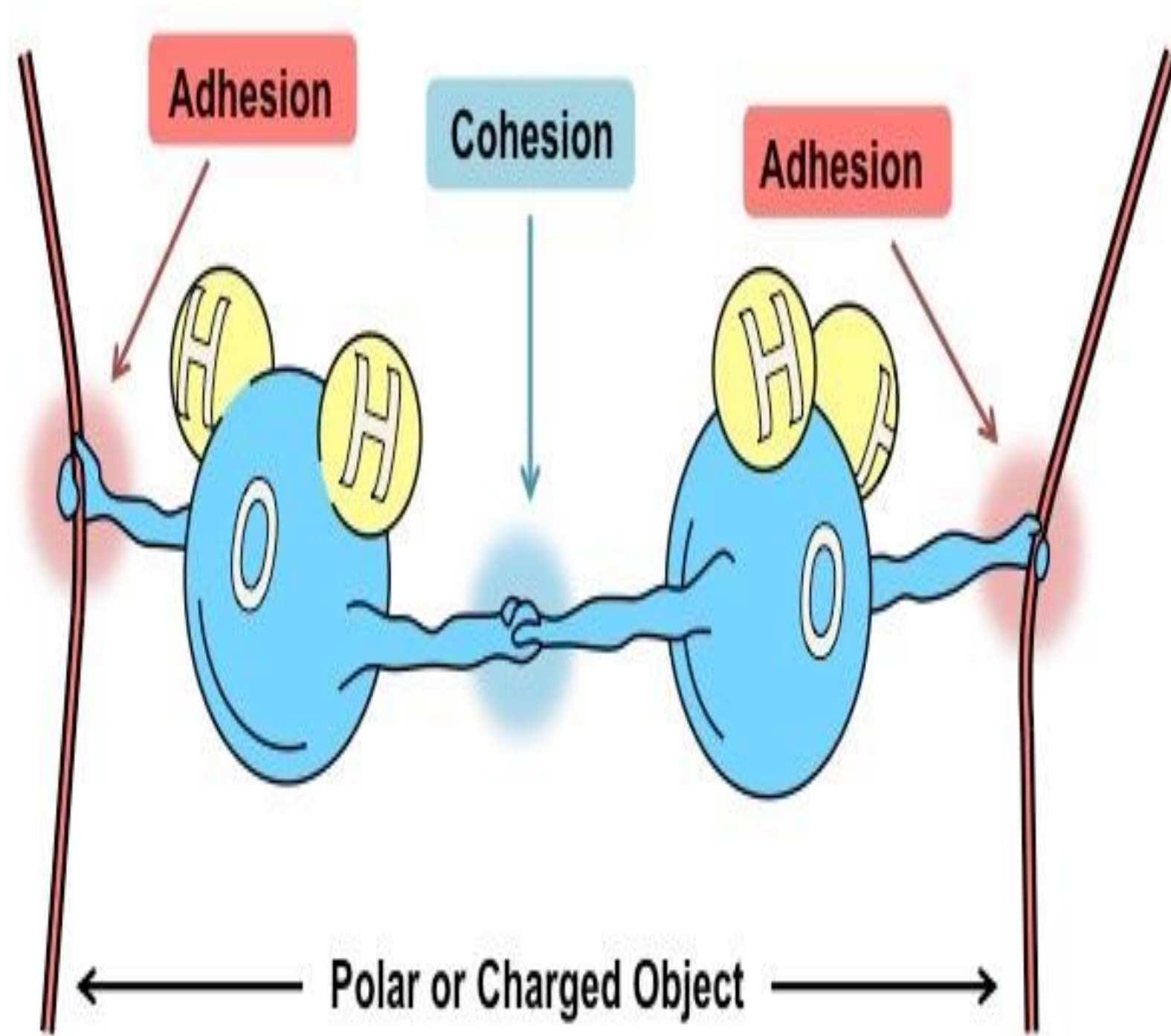
The water retained in soil by the following ways:

## 1. Cohesion and adhesion forces:

- ❖ These two basic forces are responsible for water retention in the soil.
- ❖ One is the attraction of molecules for each other ie. Cohesion.
- ❖ The other is the attraction of water molecules for the solid surface of soil ie. Adhesion.
- ❖ By adhesion, solids hold water molecules rigidly at their soil –water interfaces.
- ❖ These water molecules in turn hold by cohesion.
- ❖ Together, these forces make it possible for the soil solids to retain water.is



# COMPONENTS!!!!



## COHESION AND ADHESION FORCES

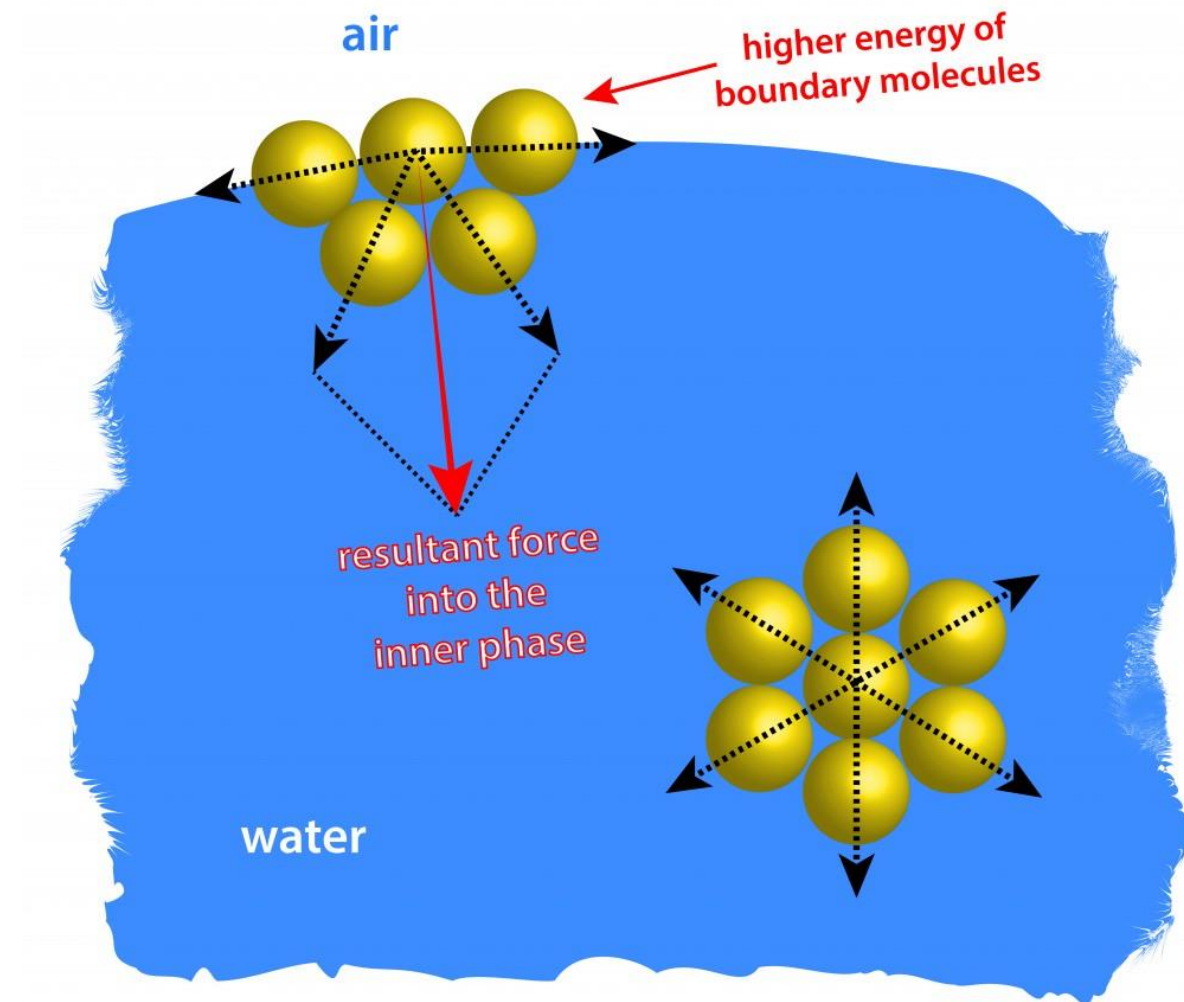


# Retention - Ways



## 2.Surface Tension:

- This phenomenon is commonly evidenced at water-air interfaces.
- Water behaves as if its surface is covered with a stretched elastic membrane.
- At the surface, the attraction of the air for the water molecules is much less than that of water molecules for each other.
- Consequently, there is a net downward force on the surface molecules, resulting in sort of a compressed film(membrane) at the surface.This phenomenon is called surface tension.





# Retention - Ways

## 3.Polarity or dipole character:

- The retention of water molecules on the surface of clay micelle is based on the dipole character of the molecules of water.
- The water molecules are held by electrostatic force that exists on the surface of colloidal particles.
- By virtue of their dipole character and under the influence of electrostatic forces, the molecules of water get oriented on the surface of the clay particles in a particular manner.



# Factors Affecting Soil Water

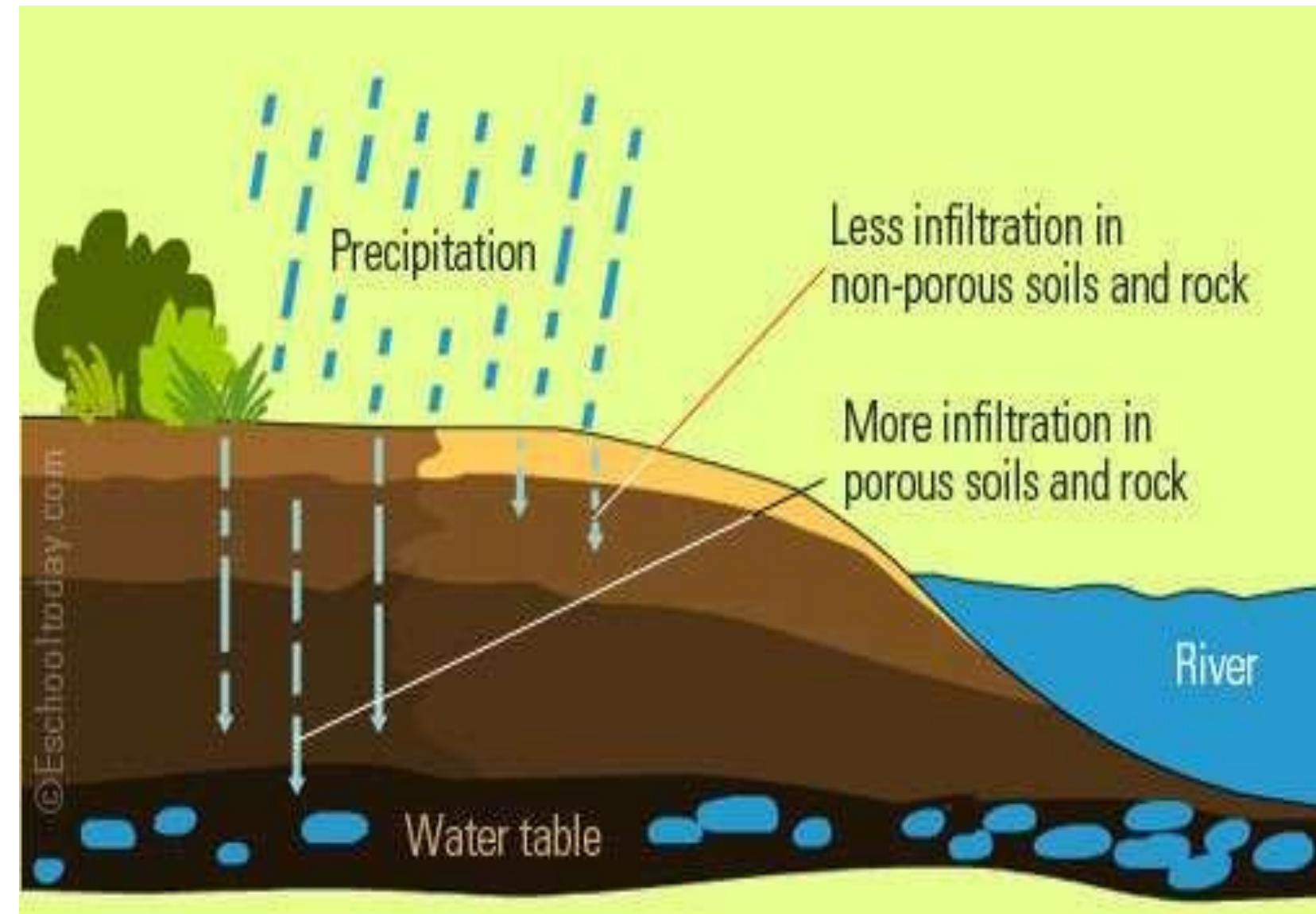
- 1. Texture:** The finer the texture, the more pore space and also surface area, greater the retention of water.
- 2. Structure:** Well-aggregated porous structure favors better porosity, which in turn enhances water retention.
- 3. Organic matter:** The higher the organic matter more is the water retention in the soil.
- 4. Density of soil:** The higher the density of the soil, the lower the moisture content.
- 5. Temperature:** The cooler the temperature, the higher the moisture retention.
- 6. Salt Content:** The more the salt content in the soil the more water available to the plant.
- 7. Depth of soil:** The more the depth of soil more is the water available to the plant.





# SOIL WATER INFILTRATION

- ❖ It is defined as the downward movement of water from soil surface, into the soil mass through the pores of soil.





# Infiltration Capacity

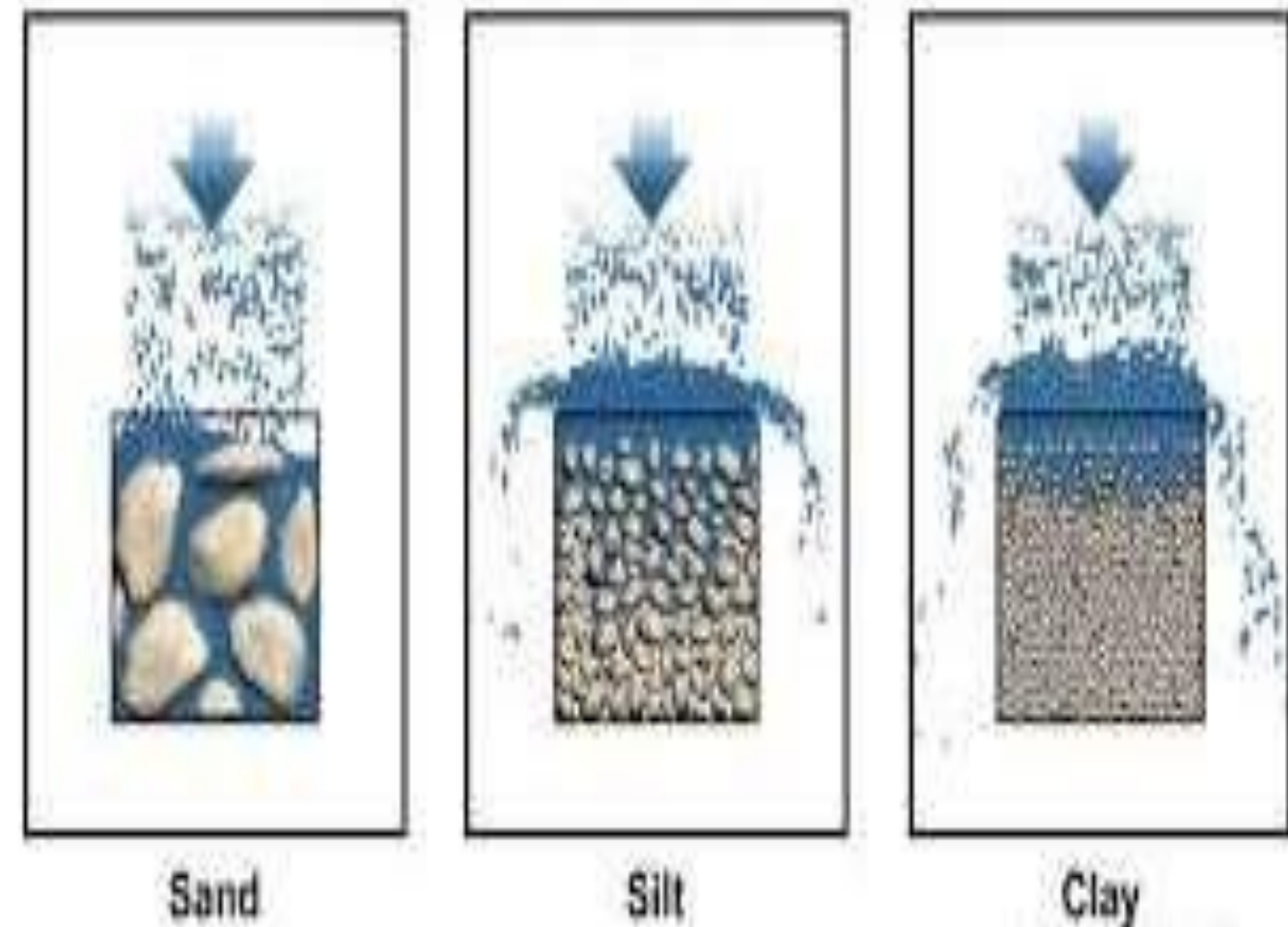
- ❖ The maximum rate at which soil can absorb the water is known as Infiltration capacity.

**Actual rate of infiltration ( $f_a$ ) = infiltration capacity ( $f$ ), When  $i \geq f$**

**Actual rate of infiltration ( $f_a$ ) = Intensity of rainfall ( $i$ ), When  $i < f$**

## Field Capacity

- ❖ The volume of water that the ground/soil can hold is known as field capacity.





# Factors Affecting Infiltration



## 1. Vegetation Cover –

- dense vegetation increase the infiltration
- Bare land will cause washing of fine particles of soil.

## 2. Moisture content –

- Infiltration rate depends on initial moisture condition of soil.
- When **soil moisture is high, infiltration rate is slow.**
- But Soil moisture is low, infiltration rate is high.

## 3. Temperature –

- Viscosity of water changes with temperature. Increase in temperature cause reduction in viscosity. **So, Infiltration is higher when temperature is high.**

## 4. Intensity of rainfall –

- High intensity rainfall cause mechanical compaction of soil. So, heavy intensity rainfall cause less infiltration, Lesser intensity rainfall cause higher infiltration.

## 5. Human activity –

- Cultivation on bare land will increase infiltration, Construction of roads and buildings will decrease in infiltration capacity.

## 6. Quality of water –

Silt and other impurities in water resulting in reduction of infiltration



# Reference Videos





**See You at Next Class!!!!**