unit - 1

Geology: Geology is the science of Technology where Geo means earth and logy means study

Physical Geology: This is also described as dynamic geology. geo-morphology

* It deals with the changes occuring on the earth surface like transgression, marine regression, formation of rivers, springs and lakes
* It deals with natural phenomenon resulting directly or indirectly due to landslides. earthquakes and weathering

Minerology:

It deals with the study of minerals Minerals are the basic units with which diff rocks and ores of the earth are made up of

* Their details made up of formation, composition, occurance, types, association, properties, uses etc

Petrology: Petrology deals with the study of rocks. Here petro - means rocks, logy to mean study of science.

* The earth crust also called as Lithosphere. It is made up of diff types of rocks
* Roe It deals with made of formation, structure, texture Composition occurance types etc of rocks

Structural Geology:

The earth's crust undergoes various deformation, dislocation and disturbances under the influence of tectonic forces

The details of formation, causes, types, classification of geological structures are studied in this branch

Historical Geology :-

The sedimentary rocks on the earth surface represents the entire period of the earth history.

→ The proper investigation of these rocks reveals the chronological sequence of formation rocks

Paleontology :- The study of remnales of ancient life preserved in rocks by natural process is called paleontology

Economic Geology :- Minerals can be grouped in general rocks forming minerals and economic minerals.

→ Some economic minerals are talc, Graphite, mica, Asbestos, Gypsum etc

Engineering Geology: It deals with the application of geological knowlege in the field of civil engg for execution of safe.

Minning Geology:

It deals with the application of geological knowledge in the field of mining

→ It is also necessary to know the physical parameters like depth, direction, inclination, thickness and preserve of ore bodies

Geo-physics:

The study of physical properties like density and magnetism of the earth or its path parts, to known its interior forms the subject matter of Geophysics

Geo hydrology: This may also called hydro-Geology. It deals with the occurance and moment.

Geo-chemistry: This branch is relatively more recent and deals with the occurance., distribution, abudance, mobility, etc of diff elements in the earth's crust

Defination of Geology, Engineering Geology.

Geology is the science of earth (Geo-earth, logos - study of science) It deals with diff aspects of the earth as a whole such as

i) Origin, age, interior structure and history of earth
ii) Evolution and modification of various surface features like rivers, lakes.
iii) Materials making up the earth

Engineering Geology.

This deals with the application of geological knowledge in the field of civil engineering for execution of safe, stable & economic construction like dams, bridges & tunnels.

Imp of geology from civil engineering point of view.

Before constructing roads, bridges, tunnels, tanks, reservoirs and buildings, selection of site is imp from the point of stability of foundation

Geology provides a symm systematical knowledge of construction materials and their properties.

The foundation problems of dams, bridge and building directly related to geology

The knowledge of groundwater is necessary in connection with excavation work, water supply, irrigation and many other purpose.

The knowledge of erosion, Transportation and deposition by surface water helps in soil conservation and river control.

Geological maps and selection helps considerable planning in many projects

Pre geological survey of area concerned to reduce the cost of project

The geological features like faults, folds, joint beds are found they [illegible] treated suitable to Inc↑ the stability of foundation

Imp of physical Geology

This is also described as dynamic Geology Geomorphology etc.

→ Physical Geology deals with diff physical features of mountains, plateau Valleys, rivers, lakes, glaciers, Valleys.

→ It deals with the changes Occuring On the earth Surface like marine Transgression, marine regression, formation or disappearance of rivers, springs

→ It deals with the Geological work of wind, glaciers, rivers, Oceans, groundwater, and their role On constantly Moulding earth surface.

→ It deals with the natural phenomenon resulting directly or indirectly due to land slide, earthquake & weathering

Petrology: Petrology deals with the study of rocks

The earth crust. also called as Lithosphere, is made up of diff types of rocks, petrology deals with made of formation, structure, texture, composition Occurance types etc of rocks

Structural Geology: The rocks which forms earth's crust undergoe's various deformation, dislocation and distrubances under the influence of tectonic forces The results is the Occurances of diff geological structures like Flods, faults, Joints & Unconformities in rocks The details made of formation, causes, types classification of geological structure are studied in these branch

Weathering Of Rocks:

The process by which rocks are broken down and decomposed by action of external agencies such as wind, rivers, rain, temperature is called Weathering of rocks

Weathering of rocks is categorized as

1) Mechanical (or) Physical
2) chemical
3) Biological

Mechanical Weathering: In mechanical Weathering. The process of breakdown of rocks into smaller pieces due to the natural physical forces like water falls. landslides during their fall cause extensive breakdown of rocks

Diff types of Process in Mechanical Weathering

1. Frost Wedging : The presence of water in the cracks of the rocks freezes during the night time and melts during the daytime freezing of water involves an increase in volume because of the which walls of cracks are wedged ultimately results in breakdown of rocks

2. Expansion and Contraction : Solar radiation causes heating which results in thermal expansion during daytime and drop in temp during night time causes contraction the expansion & contraction confined on the surface layer of the rocks and results in fracturing

3. Effects of Vegitation

During the growth of vegatation in rocky terrain the roots pentrate into weak planes and gradually cracks are widened and results in breakdown of rocks

Chemical Weathering : chemical Weathering involves chemical reaction resulting in the alteration of rocks leading to the formation of new alteration products. water is the best fluid that directly affects. rock by dissolution, leaching, hydration & oxidation

1. Dissolution / Carbonation : Incase of carbonate rocks such as limestone, dolomite marble when the river water traverse in these rocks, carbonates are dissolved resulting in the reduction of their sizes

2. Leaching : Leaching means removable of souble content from the rocks by water. Water is the powerful Leaching agent which affects leaching for the most of the material when come in contact with water

3. Hydration : Hydration is the process where in hydroxy molecules are injected into the molecular structure of minerals there by bringing about to decomposition of minerals

Biological Weathering : It involves breakdown of rocks by living Organisms like Bacteria & fungi, Acid, Humic acid which causes decomposition of rocks. Some of the micro-organisms pentrate into minerals. crystals & remove specific ions from the inner layer

Weathering Effects On properties Of rocks.

→ Weathered minerals exhibits changes in colour intensity
→ Their hardness will decrease so that the minerals become softer & weak
→ Due to weathering the rocks are less compact & hence their specific gravity will be less
→ The minerals loss their original shine & exhibits dull luster.
→ Weathered minerals loss their internal cohesion & become easily powdere
→ Weathered rocks usually appears brown, red & yellow colours on surface
→ Minerals become less transparent to become opaque

Minerals : Minerals is a naturally occuring inorganic components and chemical composition and crystalline structure is called a Minerals

Importance of study of Minerals

1. The solid earth consisting of rocks
2. Rocks are made of minerals
3. Understanding minerals help in understanding rock
4. The properties of civil engineering importance such as strength durability
5. Materials such as the raw material for manufacturing of chemical dimension stones, Aggregate rod and Concrete.
6. The civil engineering needs to the properties of rocks to the considered the different rocks for various purpose such as foundation rocks, road metals, building stone.
7. Study of minerals helps in manufacturing of plastic, Pencils, glasses etc

Different method of study of minerals

1) Physical property

Form
- Tabular form → flat, square, Rectangular with uniform thickness
- laminar form → Minerals appears as thin separatable layer

2) Colour :- Colour as they appear

3) Streak :- colour of Mineral in powdered form used for metallic minerals

Luster :- manner in which height reflects off surface of a mineral

Fracture :- Minerals that break uneven rough

cleavage :- Minerals that break along smooth, flat surface

Hardness :- Resistance to scrathing

Specific gravity :- It is the ratio of the weight of minerals to the weight of the equal to the volume of water.

$$G = \frac{w_1}{w_1 - w_2}$$

$w_1 \rightarrow$ wt of mineral

$w_2 \rightarrow$ wt of mineral in water

Degree of Transparency: It is defined as the capability of minerals to pass through light.

→ Depending upon the extent to which light passes through

Taspare. Transparent : Minerals allow the light pass fully through it.

Translucent :- Minerals allow the light to pass through partially

Opaque :- Minerals abstract the light to pass through

Special properties : Beside the above important properties of minerals there are certain other physical properties.

Chemical properties : According to the defination every mineral which is expected to have its own individual chemical composition.

Optical properties :

Colour : distinctly coloured shades of Green, Yellow, Blue

Composition : exhibits a wide range of composition

Study of Common economics minerals such as follow.

S.No	Name of Mineral species with Composition & Crystal system	Form	colour	Luster	Fracture	cleavage	Hardness	Density	Degree of Transparency
1.	Pyrite FeS_2, cubic	Granular	Brass Yellow	Metallic	Uneven	Present	6-7	High	Opaqu
2.	Hematite Fe_2O_3, hexagonal	Massive	steel grey	Metallic	uneven	Absent	5-6	High	Opaqu
3.	Magnetite Fe_3O_4, cubic	Granular	Black	Metallic	Uneven	Absent	5-6	High	Opaqu
4.	Chlorite $(MgFe)_5$	Foliated	Green	pearly	uneven	Present	1.5	Medium	opaqu
5.	Galena Pbs, cubic	Granular	Lead grey	Splendant perfect	Rarely found	Present	2-3	High	Opaqu
6.	Graphite	Massive	Black	Greasy	uneven	Present	1-2	Low	Opaqu
7.	Magnesite $MgCO_3$	Massive	White	Dull	uneven	Absent	4-5	Medium	Opa

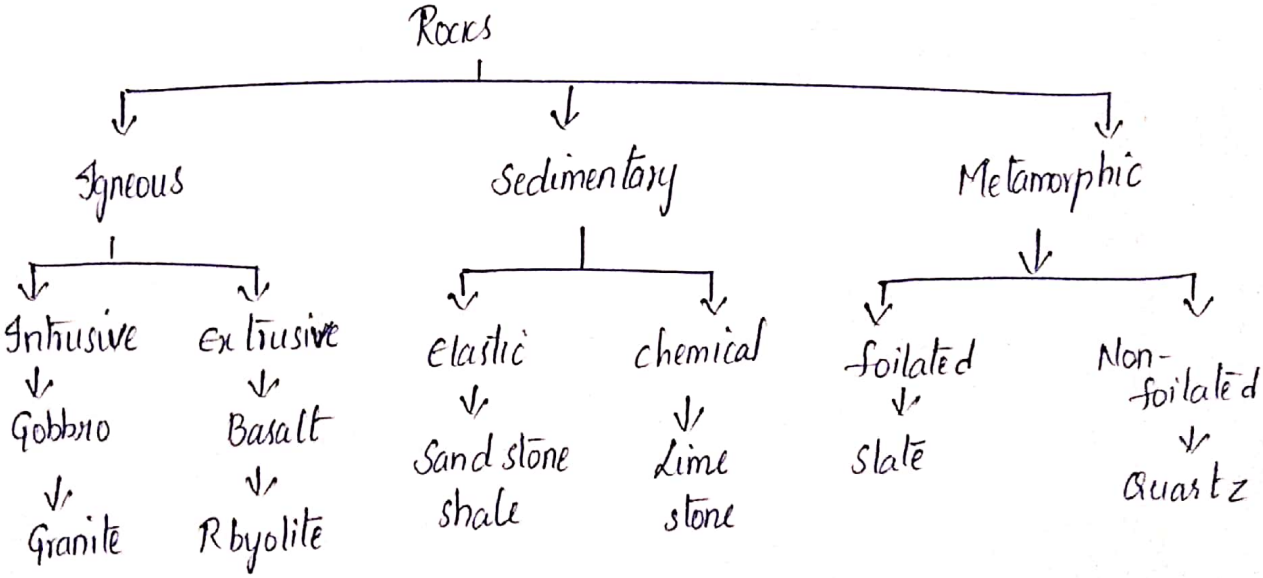
environment, Igneous, metamorphic and Sedimentary rocks

Alteration: May be altered to Biotite, chlorite, silicates.

Advantages of study of Minerals by physical properties

1. Study of minerals in the field itself
2. Does not require any equipment
3. No need of chemicals
4. No loss (or) Wastage of Minerals
5. cheapest, simple and Least Deducts

Role of study of physical properties of Minerals in the identification of Minerals



Igneous Rocks: The rocks formed from the cooling of magma (or) lava and solidification

ex: Basalt, Granite

Sedimentary Rock: The rock formed from the many layer sediments that become pressed and cemented together and Weathering of erosion

ex: Sand stone, silt stone

Metamorphic Rock: The rock formed the extreme heat and pressure and chemical activities is called a metamorphic

Ex: Marble, slate.

Dykes: Magma slices across rock layer and becomes solid and forms a wall of basalt

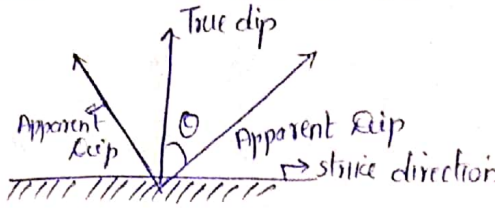
→ It runs ⊥er to the rock layer

Sills: Magma forms its way b/w layers of rocks and becomes solid as large flat areas of igneous rocks

Out Crop: It is defined as geological formation which exposed on the surface area

Strike: It can be explained as when a surface is affected with the any type of force (or) pressure the allignment will be form horizontally then it is known as strike.

Dip: The far line formed along the strike is known as Dip (or) slope



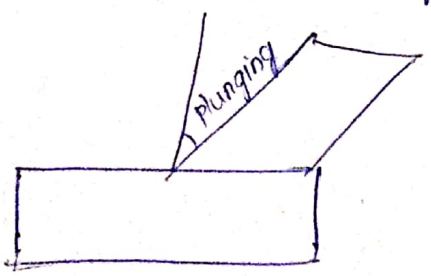
True Dip: Vertical and far line known as True dip

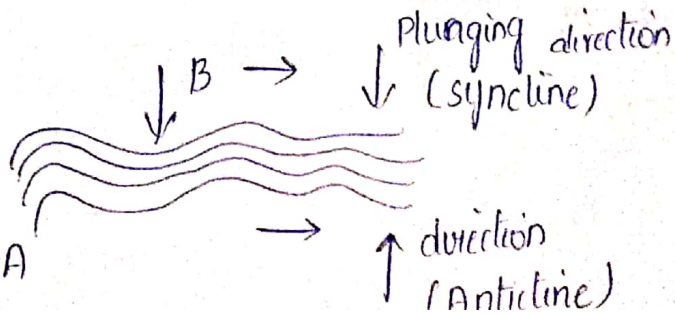
Apparent Dip: True Dip and strike by forming some amount of angle known as apparent dip

Flods: Flods are formed due to heavy compressive and bendi forces from upward & downward direction there types of bends are known as flods

Types of flods:-

1) Anticline - upward direction
2) Syncline - downward direction
3) plunging - when a small angle is made with surface then flod is
4) Monocline - Dipping bends in horizontal rock layer





Types of faults :-

1. Normal faults :- Hanging walls move down (Tension)
2. Reserve faults :- Hanging walls move up (compression)
3. Strike-slip faults :- Rocks move horizontally
   → Little (or) non-vertical movement.
4. Joints : Joints are the cracks which form due to various reasons
   Ex : movement of tectonic plates, Blasting, Nature air pressure.

→ A joint can be open (or) closed & joints may be invisible.

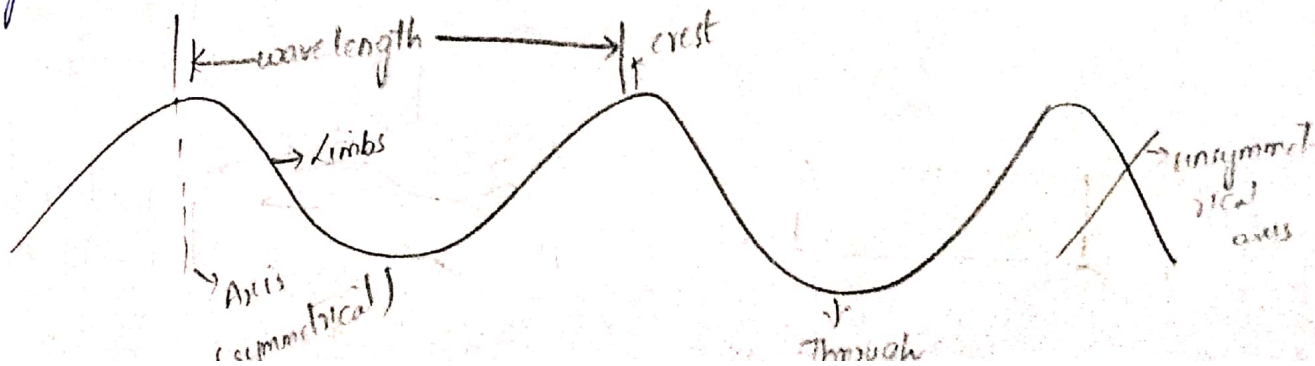
Parts of folds :

1. Crest & Trough : upper part of curve crest & Lower part Trough

2. Limbs & Flanks :- The sides of fold is known as Limbs
3. Axial plane :- It is Imaginary axis passing through crest & Trough
4. Wave length :- The distance b/w two crests or Trough is known as Wave length
5. Axis :- A line which divides wave into two parts

a) symmetrical axis

b) Unsymmetrical axis



Mechanism of folding

Due to Loading from upward and downward

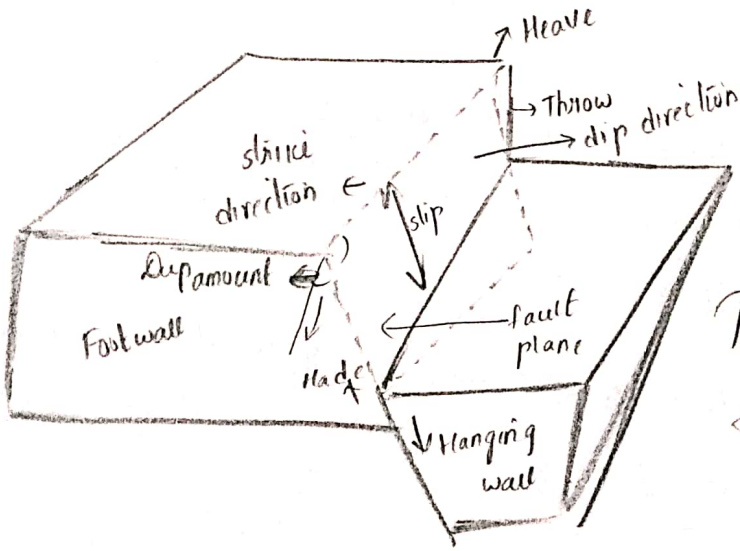
Causes & effects of folding :-

Formation of synclines and anticlines

Faults

Faults are formed when the earth surface is ruptured due to the natural calamity.

Parts of faults.



Parts of faults

Fault plane : adjacent to strike plo direction, when surface is rupted one division will form along the strike direction

Foot Wall & Hanging Wall : The surface below the inclined fault.

Hanging Wall : Surface lying above the fault plane

Slip :- The displacement blw the two blocks.. Overall displacement is net slip. Types of slips

a) strike slip : Two surfaces sliding horizontally

b) Dip slip : Two surfaces sliding vertically

Classification Of Flods:

Classification depends On type of Load (or) amount of Load

1) Anticline & syncline

* Load applied from upwards to down then syncline
* Load applied from downward to upward then Anticline

2) Symmetrical & Asymmetrical flods

* If line divides the flod equally into two parts then it is symmetrical
* If line doesn't divide into two equal parts then Unsymmetrical

3) Open & closed folds :-

* If fold is uniformly thick throughout the flod, then open fold
* If fold is non-uniform in thickness the fold is closed flod

4) similar & parallel folds

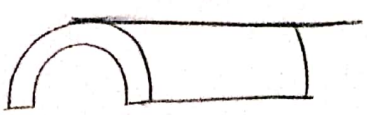
* The shape of flods remains same at depth also similar folds
* In parallel folds shape of flod at crests & troughs becomes pointed

similar folds

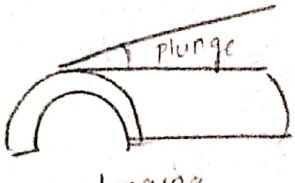
Parallel folds

5) Plunging & non-plunging

* Reference line is attached from intial point of fold to last point of fold is called non-plunging fold
* If Reference line makes some angle with the surface of fold is called plunging fold



Non plunging

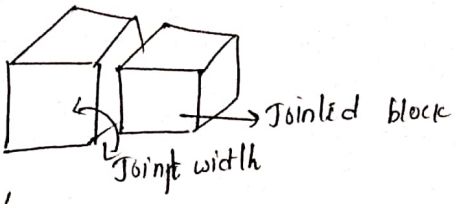


plunging

Joint set: Group of fractures is known as joint set

Master joint: Joints having more length

Parts of a joint



classification of joints

Based on relative attitude of joints & origin of joints

Based on origin of joints: Due to tension forces (or) shearing forces

→ Unconformity :-

* Diff from fold, faults & joints
* It is a product of diastrophism & involves tectonic activity in form of upliftment & subsidence of land mass

Conformity: Layers formed without break

Unconformity: Layers formed with breaks

Parts of an unconformity:

younger set of beds { surface

Heave & Throw :-

Heave : horizontal displacement from upward direction

Throw : Vertical displacement from un

5) Dip amount :- angle blw bedding plane & surface

Classification & Types of faults :

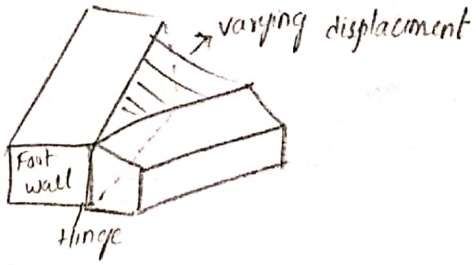
classified base on displacement, movement of foot wall & hanging wall Type of slip, inclination of fault plane

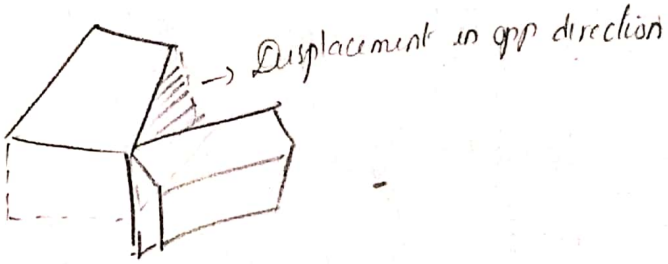
Based On type of displacement along fault plane

i) Translational faults : Uniform displacement blw foot & Hanging Wall

ii) Rotational faults :- displacement Varies & appears hinged

a) Hinge faults b) Scissors faults





Based On relative movement of foot wall & Hanging Wall

Two types based on movement

a) Dextral fault b) sinstral fault

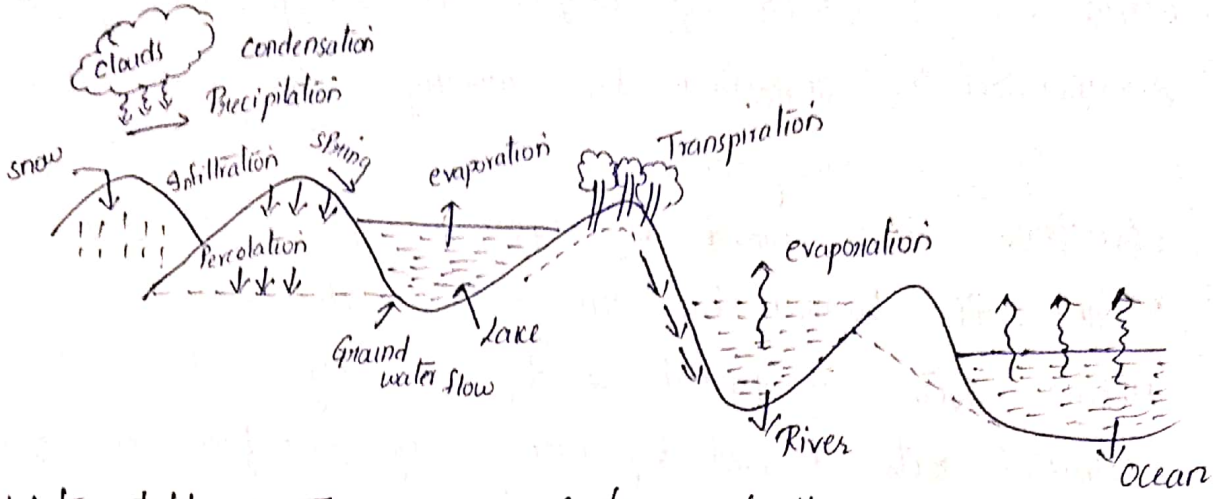
Dextral fault :- Hanging wall moving right side

Sinstral fault :- Hanging Wall moving Left hand side.

Joints :- The cracks which from due to Various reasons

Ex : Movement of Tectonic plates, Natural air. pressure,

Hydrologic cycle / Ground Water Table



Water table :- The upper surface of the zone of saturation

Types of Ground Water Wells :-

1) Dug well : Manually dug well of various large diameters
2) Driven Wells : Wells of small diameters installed with pipes with a pointed end & slotted bottom.
3) Bore wells : Large dia holes put by rogers, (or) other special equipment
4) Jetted Wells : Wells formed by water jetting
5) Hydraulic Rotary drilled wells : The cutting is done by suitable drilled equipment

* Drilling moulds circulation is used to hold the hole & Bring up the soil (or) Rock bed

Diff types of ground water which occurs in the zone of aeration

1. Soil water : Root of plants
2. Gravity water : Percolated water due to gravity reaches the water table

Common types of Soil: unit 3

1. Glacial soil :- Formed by transportation & deposition of glaciers
2. Alluvial soil :- Transported by running water & deposited along streams
3. Lacustrine Soil :- Formed by deposited in quiet lakes
4. Marine soil : Formed by deposited in the seas
5. Aeolian soils : Transported & deposited by winds
6. colluvial soils : Formed by moment of soils from its original place by gravity
7. Clay soil : holds a lot of water & drain well.
8. Loamy : Perfect mix of sandy and clay great for growing plants

What is soil Stabilization :-

Improving the engineering properties of soil used for pavement base course, sub base course & sub grades by the use of additive which are mixing into the soil to effect the desired improvement

Soil type	Sp. gravity
→ Clean Soil & Gravel	2.65 - 2.68
→ slit & silty Sand	2.66 - 2.70
→ Inorganic clays	2.70 - 2.80
→ Soil high in mica, Iron	2.75 - 2.85
→ Organic Soil	Quite Variable may fall below 2.0

Cone of depression : It occurs in the aquifier when ground water is pumped from wells.

* An unconfined aquaffer this is an actual depression of water level

Geological Control of Ground Water Movement :-

→ The movement of ground water takes place at the zone of aeration & zone saturation under the influence of gravity

→ Depends On permability

→ Depends On porosity

→ Depends On Bedding on rocks

→ Dykes, sills

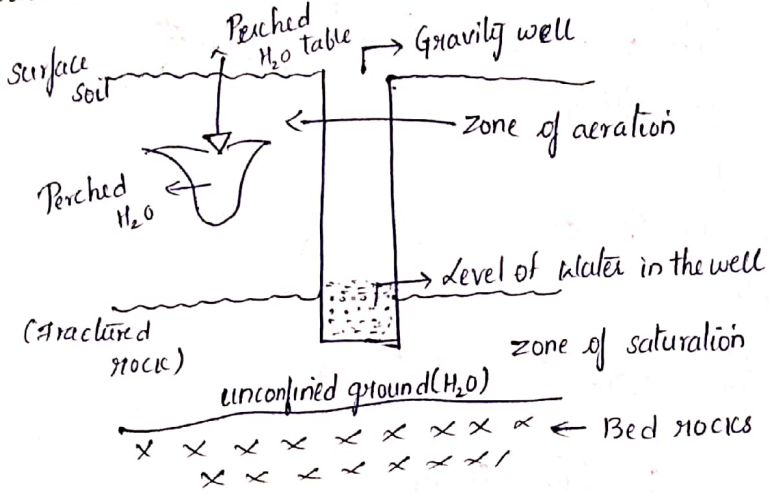
Ground Water Exploration Techinques:-

Scientific Studies

Geological	Geophysical	hydrological
→ study of rocks	→ Folds & faults	→ Water
→ Topography	→ Electrical resistivity	→ Surface Water
→ Weathering	→ Seismic refraction	→ Quality of Water
→ Geological structures	M Ed.	
→ Geological Mapping		

3. perched water : Zone of aeration
4. Capilory water : Waters opening just above in contact with the water table

Diff types of ground H_2O which occurs in the zone of saturation :



Unconfined (or) Free ground water

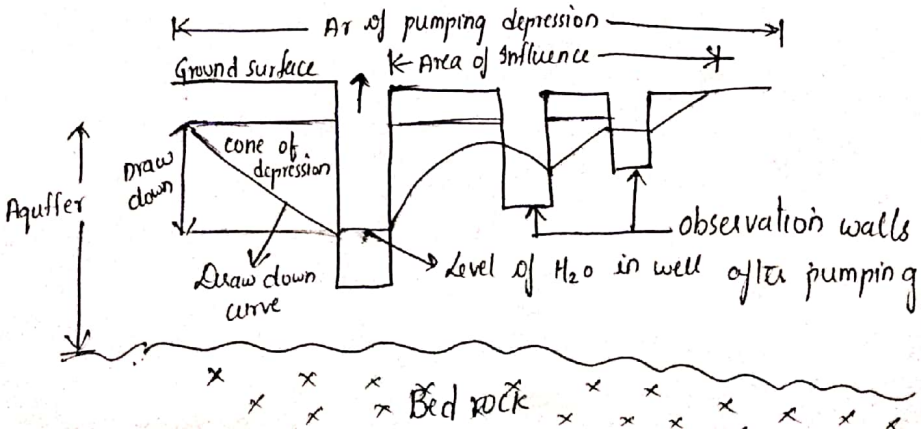
This water below the water table under atmp. pressure Only this water moves freely upward (or) Downward

Confined water : This water below the water table is present btw impervious beds

Connate water : water held within two rocks from beginning

Internal water : water occuring at great depths

* Cone of depression (or) cone of exhaustion



Unit-IV

Earthquakes, Landslides & Ground Water

Earthquake :-

It is defined as the natural force which originates below the earth's surface, works randomly & creates irregularities on the earth's surface

* It is an endogenous geological agent
* Study of earthquakes is known as "seismology"
* The records of earthquakes are known as "seismograms" & instrument as seismographs

Earthquake Terminology

* focus (or) origin (or) centre :- The origin of earthquake in the interior of earth
* Epicentre : The place above the centre of the earthquake
* Anticentre : Point diametrically opp to epic enc centre.
* seismic vertical : Imaginary line joins centre & epicentre
* isoseismal : Imaginary line joining the points of same intensity
* coseismal : Imaginary line which joins the points at which the earthquake waves have arrived
* Seismic wave : Energy released from the origin at the time of earthquake.

Classification and Causes of earthquakes :-

Based on the depth of their origin :-

1) Shallow earthquake - earthquake with origin depth < 60 km
2) Intermediate earthquake - depth > 60 & < 300 km
3) Deep earthquake - depth > 300 km

Based on the causes responsible for their occurance

1) Tectonic earthquakes :- Occurs due to internal causes i.e, due to distrubance, adjustments in geological formability

* Less frequent but more intensity & more destructive

2) Non-Tectonic earthquakes : Occurs due to external causes

- Less destructive & Very frequent, minor intensity.
- Due to Volcanic eruptions, Tsunamis, man-made explosions etc

Effects of earthquake :

- Minor earthquakes are not noticed
- Major ones are responsible for heavy loss of life & property

1) Destruction of various civil engineering constructions like dams bridges, tunnels, roads & railway tracks
2) creation of irregularities on ground
3) Landslides will occur due to this road & railways will be blocked
4) Submarine earthquake cause tsunami's
5) heavy loss of life & property

Seismic Belts & Sheild areas.

→ Seismic Belts are places where earthquake occur frequently
→ Sheild Belts are places where earthquake occurs midly (or) rarely
→ Earthquakes occurs where underground stability is less
→ Earthquakes occurs in the mountain ridges & along steep coasts
→ " " blkl two belts, one is the circum pacific belt which accounts for 68% of earthquake occurance
→ Other belt called "Mediberranean belt' which accounts 21% of E.Q
→ Minor belt of epicimetres occurs along mid Atlantic ridge

→ Richter Scale :- Magnitude of earthquake is measured
→ charles Richter of the california Institute of Techlonogy proposed this scaled, recorded waves are measured by a seismograph
→ E.Q having Richer magnitude from (3 to 9)
→ Magnitude '2' is the smallest earthquake

→ Magnitude '5' may cause damage with in 8 km radius
→ Magnitude '7' may cause damage upto 80 km of radius
→ Magnitude '8' may cause 250 km radius

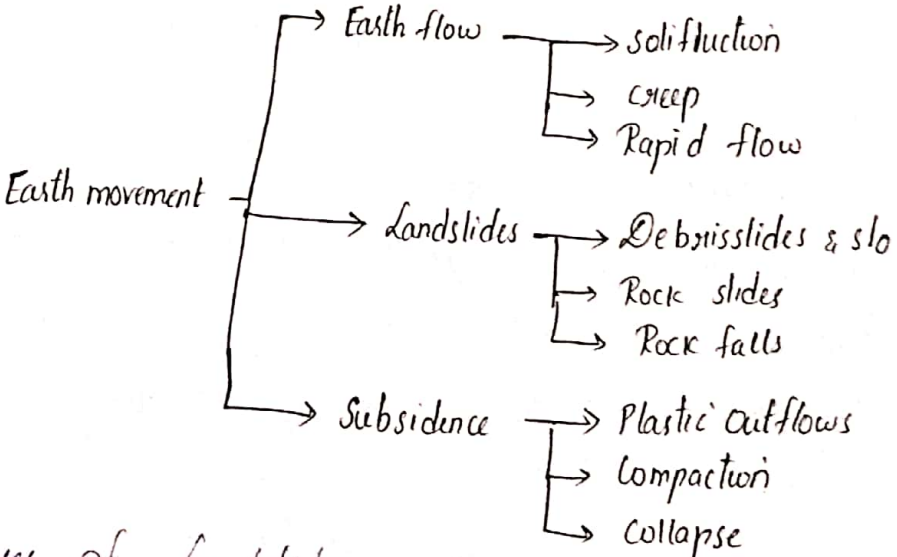
Precautions of building construction in seismic areas

→ Deep foundation & completely rocks foundation
→ Raft & square foundations
→ Continuous walls, minimum doors and windows

Landslides

Downward sliding of huge quantities of land masses. Causes along occurs along steep slopes of hill.

Classification of earth movements



Causes of Landslides

(i) Internal causes: These are responsible for extent of creating favourable conditions for landslides occurance

(ii) Immediate causes: Occurs due to sudden jerk. Due to effect of slope, water, lithology

Effects of Landslides

i) Blocking of transport, communication system
ii) Obstruction to the river flow in valleys
iii) Damage to piplines
iv) Destruction of building

Preventive Measures for Landslides

→ Retaining walls must be constructed against the slopes
→ proper drainage system should be provided
→ The weak materials must be either covered
→ Growing vegetation plants & shrubs on loose ground helps in keeping the loose soil together

Geophysics

Study of earth by using the principles of physics

Branches of Geophysics :-

1) General Geophysics : study of earth as whole & major features
→ Deals with gravity field, Magnetic field, Geothermal field
→ Gives information about physical state, composition of matter
2) Exploration Geophysics :- Study regarding the shallow subsurface in homogeneities & structure

Importance of Geophysical Survey Investigation

→ Large areas can be investigated in short time
→ Instruments used are simple, portable & can be operated easily
→ Economical in gravity, magnetic & electrical methods of investigation

→ If subsurface has a relatively heavier body, the gravity pull is more & spring extends larger

→ If subsurface has relatively a lighter body there the gravity pull is less & spring contracts.

Methods :-

(i) gravity prospecting
(ii) gravity Logging
(iii) Airbone gravimetry
(iv) Shipborne gravimetry

→ The process of applying various corrections which is obviously necessary is known as reduction of gravity data

Equipment :-

1) pendulums : for absolute & relative gravity measurements
2) Gravimeters : for relative gravity measurements
3) Torsion balances : for gradient & curvature measurement
4) Gradientometers :- for gradient & curvature measure.

Applications :-

→ Exploration of ore deposits
→ Exploration of oil & natural gas
→ study of isostasy, shape of earth
→ structural mapping
→ solving regional geological & engineering problems

CGS Units :- g/cc (Density)

→ Exploration Geophysics

i) Regional Geophysics ii) Oil & gas geophysics

iii) Ore geophysics iv) Ground H_2O Geophysics (vi) Engg. geophysics

classification of Geophysical Methods:

1) Gravity methods
2) Magnetic Method
3) Electrical method
   - → Electrical resistivity method
   - → Electro magnetic method
   - → self-potential method
   - → Induced polarisation method
4) Seismic method → Seismic reflection
5) Radiometric method
   - → Gamma method
   - → Emanation method
6) Geothermal Method

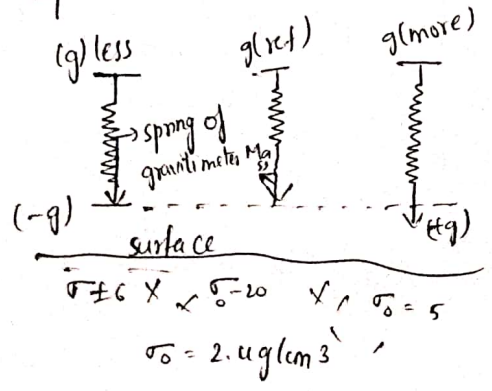
Gravity method :-

→ Natural gravity field of earth is used

→ Density is the controlling physical property

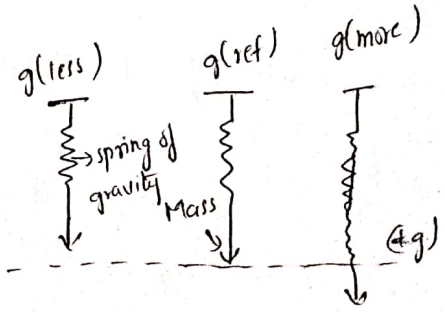
Principle :- The Nature of distribution of gravity 'g' on the surface is analysed

→ Gravity is +ve when body is heavier, larger & occurs at shallow depth



$\sigma \neq 6$ ✗ $\sigma = 20$ ✓ $\sigma = 5$ ✓

$\sigma_0 = 2.4 g/cm^3$

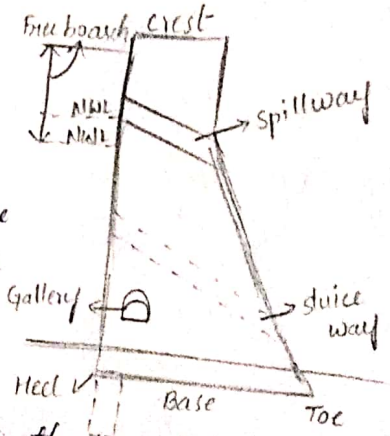


Geology Of Dams, Reservoirs And Tunnels-V-unit

Dam is a prestigious structure, & it is a multi purpose civil engineering constructions.

* It delivers beneficial results for long time to a mankind
* A dam blocks the river channel & it compels the running H_2O to accumulate within the designed reservoirs
* If the H_2O exceeds the desired limit of storage in any reservoir the surplus H_2O is allowed to flow downstream

Dam & its parts :-



Heel : It is the part of the dam which comes in the contact with the ground surface in the upstream side

Toe : It is the part of the dam which comes in the contact with the ground surface in downstream side

Abutments : These are the sides of both the ends of the dam on which it is completed supported

Free board : It is the difference in level b/w the top of the dam wall & storage level is known as free board

Galleries : These are the small rooms located within the dam for checking the operations, if any technical problems will occur.

Spill way : It is the arrangement for controlling the H_2O level of the reservoir

Sluice way : It is the opening in the dam near the ground water level which helps to clear foreign matters (dust, waste)

cut-off wall : It is the underground wall like structure under the

* It is useful in preventing the leakage under the foundation beds & there by it avoids the under cutting the heel as well as the uplift pressure

Types Of Dams :-

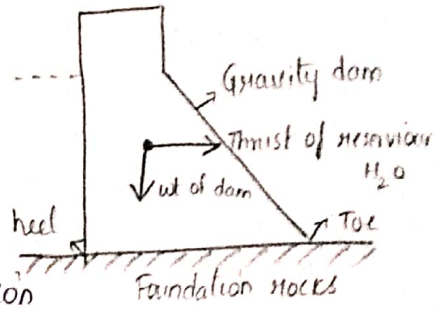
Based on the construction material used, dams are grouped into concrete dams & earth dams.

* Based on design, the concrete dams (masonary dams) may be further grouped into "gravity dams", "buttress dams" & "arch dams".

The following are the different types of dams, they are

1) Gravity Dams
2) Buttress Dams
3) Arch Dams
4) Earth Dams

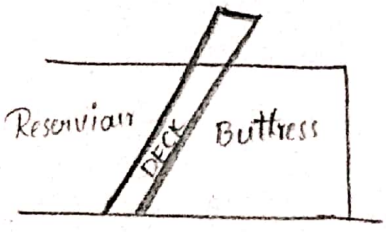
Gravity Dams :-



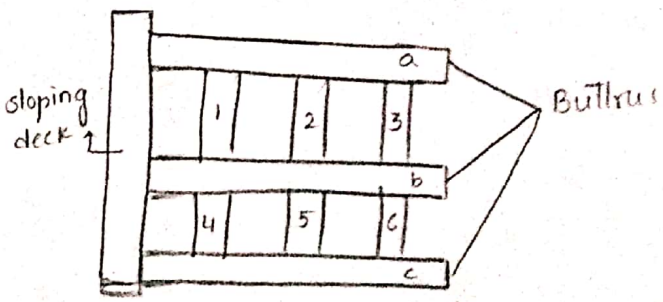
* These dams are heavy & massive wall like structures of concrete in which the whole wt. acts vertically downwards.
* The entire force acting on the dam wall is transmitted on to the small area of the foundation
* Therefore, a dam of this nature is to be selected only in such places where very comple & stable rocks occurs

2) Buttress Dams :-

* It is the dam which consists of concrete structures in which there is a deck sloping upstream
* This deck faces the entire load is supported from behind by walls called buttresses

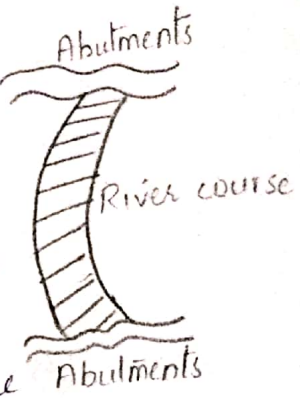


Side View of a buttress dam



Top View of a buttress dam

Arch dam:



It is the dam which will be in the shape of arch

* The two ends arches will be supporting the abutments of the dam
* When ever will the load applied in the middle zone then it will be uniformly transmitted to the two end arch supports, which results the complete dam in the safe zone

Earth dam :-

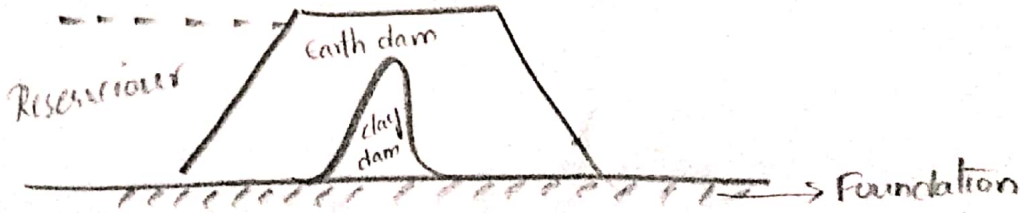
Earth dam is a dam which will be constructed in such places where the underlying eo. material is too weak to support masonry dams

* Earth dams, relatively of smaller height are lighter structures and broad base
* The earth dams are trapezoidal in shape

They are mainly 2 types

a) Earth fill dam b) Rock fill dam

* When most of the material used is earth, it is called an earth fill dam
* When most of the material used is rock, it is called an rock fill dam
* One of the largest earth dams is the famous St. Peter, Wyoming dam



Purpose Of Dams

The purpose of the dams are

1) To provide H_2O supply to meet the domestic, industrial & irrigation requirements
2) To control floods
3) To generate power

4) To provide stream regulation
5) To regulate stream sediment loads

Geological considerations in the selection of a Dam site :-

The success of a dam is not only related to its own safety & stability but also to the based on reservoir

* If a dam stands firmly but if its reservoir leaks then such a dam is to be treated only as a failure because the purpose for which it was constructed has not been served
* The success planning of reservoir & dam is important

* Important Geological considerations in selection of a dam.

1) Narrow river Valley
2) Occurance of the bedrock at a shallow depth
3) Competent rocks to offer a stable foundation
4) Proper geological structures :

Narrow river Valley :-

At the proposed dam site, if the river valley is narrow, only a small dam is required, which means the cost of dam construction will be less

* If the valley is wide, a bigger dam is necessary which means the construction cost will be very high.

Bed rock at shallow depths :

* The safety & stability of a dam is based on very strong & very stable rocks on which the dam rests
* If the competent bed rocks occurs at the foundation, cost of the dam will be less
* If the competent bed rocks occurs at the great depths, costs of the dam will be more

Competent rock for safe foundation:

If igneous rocks occurs at the selected dam site, they will offers a safe base when compared to the sedimentary & metamorphic rocks

* Earth crust contains 95% of rocks, but igneous occupies only 30%. & remaining 70% the sedimentary & metamorphic rocks occupies

Proper Geological structures

* The structure must be free from leakages
* The dams & Reservioirs must be leak proof

Life of Reservioirs.

Due to silting process at the bottom of the reservioir, reduces the capacity of the reservior to store water

* Due to this process capacity of the reservioirs to hold H_2O gradually decreases & finally reservior contains only sediments remains but no water
* The reservior is designed based on the dead storage & live storage
* The Total Volume of silt deposited in the reservior is known as dead storage.
* The remaining storage is known as effective storage (or) live storage
* The dead storage is generally more than ½th of the total capacity.
* If reservior is designed for 200 yrs, then it is used only for 40yrs due to silting
* The period upto which the reservior serves its purpose as expected is described as the "Life of the reservior".
* "If the rate of silting is very low, the life of the reservior will be long".

Tunnels

Tunnels are one type of civil engineering structures similar to that of dams & reservoirs Tunnels are constructed to minimising the distance in the under ground surfaces

Purpose of Tunnelling:

Tunnels are mainly constructed for the human use as per his requirements

1) Traffic & Transporation of goods

2) Diversion of Water :-

Diversion of H_2O referred that while constructing the dam, the dam site should be dry. If there is some flow of H_2O. then the particular flow will be diverted with the help of tunnels

3) Pressure tunnels (or) hydro power tunnels

Pressure tunnels & hydro power tunnels means some tunnels are provided for flowing of H_2O with certain velocity w.r.t that velocities & speed power will be generated

Discharge tunnels :- Discharge tunnels means the rate of flow of H_2O with certain velocity due to high gravity it is very convenience to transport the H_2O from one place to another place

Effects of Tunneling :- Tunneling is done by excavation method due to which it effects the surrounding as follows :-

+ the tunnelling process is done by excavation method. In excavating the method in the blasting process is involved, Blasting is done by inserting the bombs in the boulders area. Due to blasting the rocks get scattered into pieces. This process will reduce the sheas strength of the ground surface

Lining of Tunnels:

The term linning means protecting layer for the structure when tunnels are made through weak (or) Loose formation material then lining will be used. Then lining refers to the highly protective layer for the tunnels. Linings are mostly of steel as well as concrete. The main purpose of providing. Lining is to resist the pressures due to natural calamity.