JHARKHAND
Rai University
RANCHI

MINING ENGINEERING
LAB MANUAL

MINING GEOLOGY II
(B.TECH)

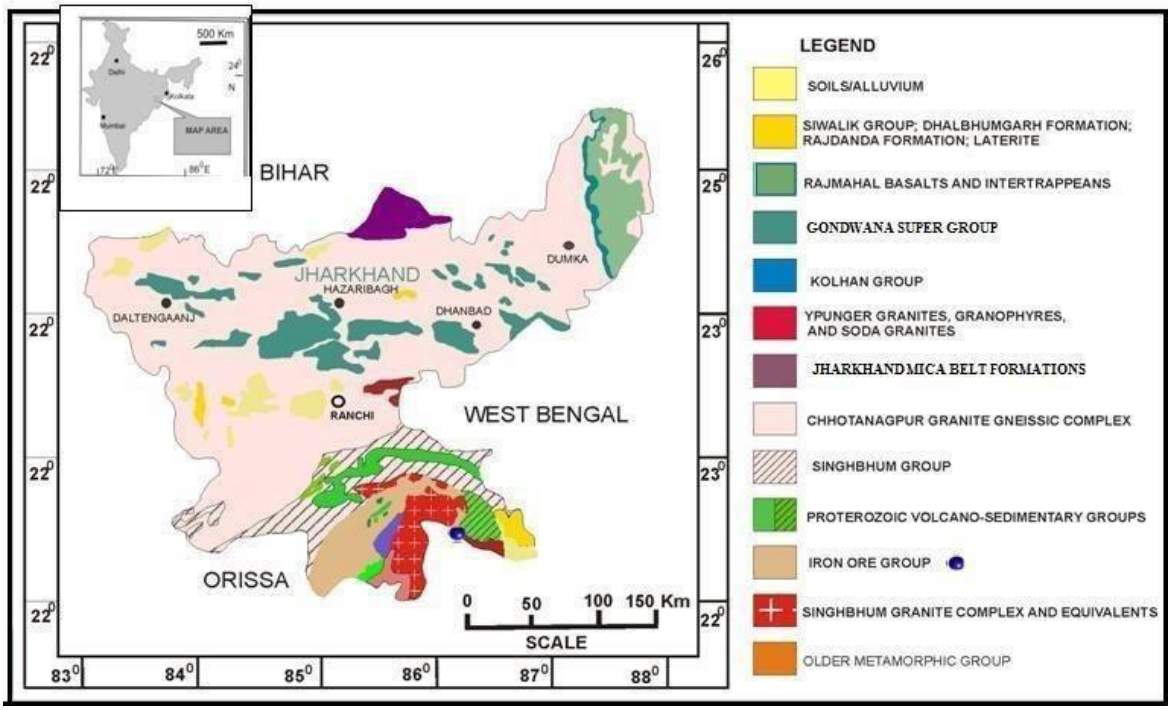
SEMESTER IV

LIST OF EXPERIMENTS

EXPERIMENT NO. – 1

AIM: - Study of Geological maps.

A geologic map is a map of the different types of rocks or structures that are on the surface of the Earth. By mapping different rock types and structures, geologists can determine the relationships between different rock formations which can then be used to find mineral resources, oil, and deposits. Geologic maps are used to interpret the structure, Stratigraphy, mineralogy. Paleontology, and the historical record of the Earth's crust. Geologic maps are our most important and complete compilation of information about the solid Earth we live on, and we cannot understand the Earth without them. We use geologic maps and the fundamental information they provide in many ways.



Types of Geological Mapping

There are 3 major types of Geologic Maps

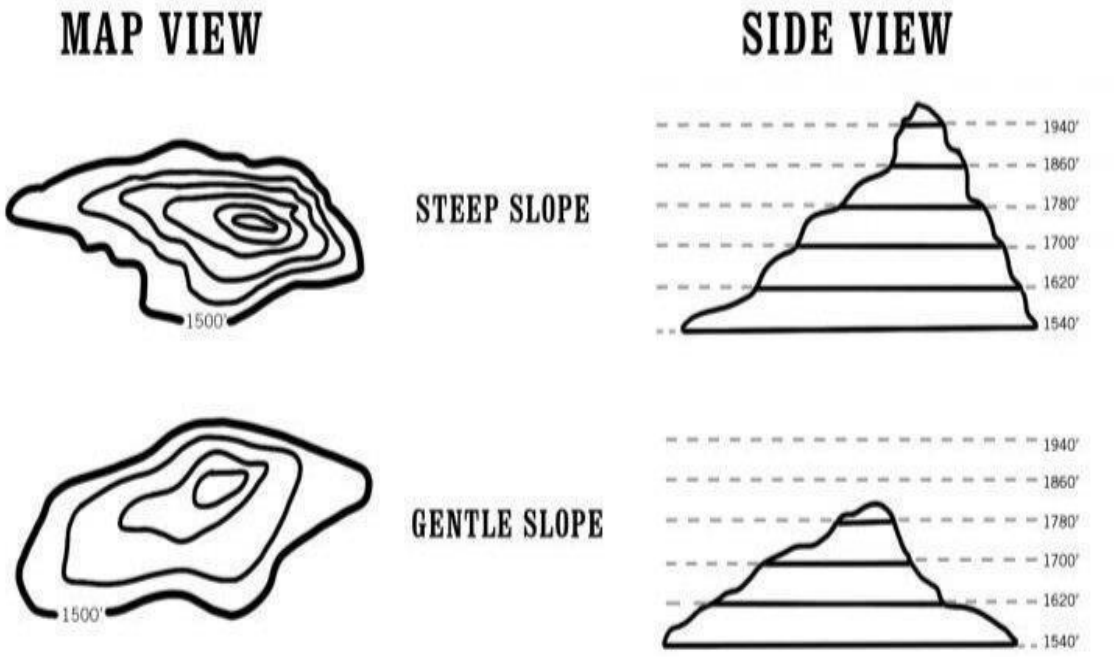
1. Topographic Maps

2. Structural Maps

3. Cross-section map

1. Topographical Maps:

Topographic maps, show a 3 dimensional world in 2 dimensions, by using contour lines (lines of equal elevation).Topographic maps refer to a graphical representation of the three-dimensional configuration of the surface of the Earth. Moreover, such maps show the size, shape, and distribution of landscape feature

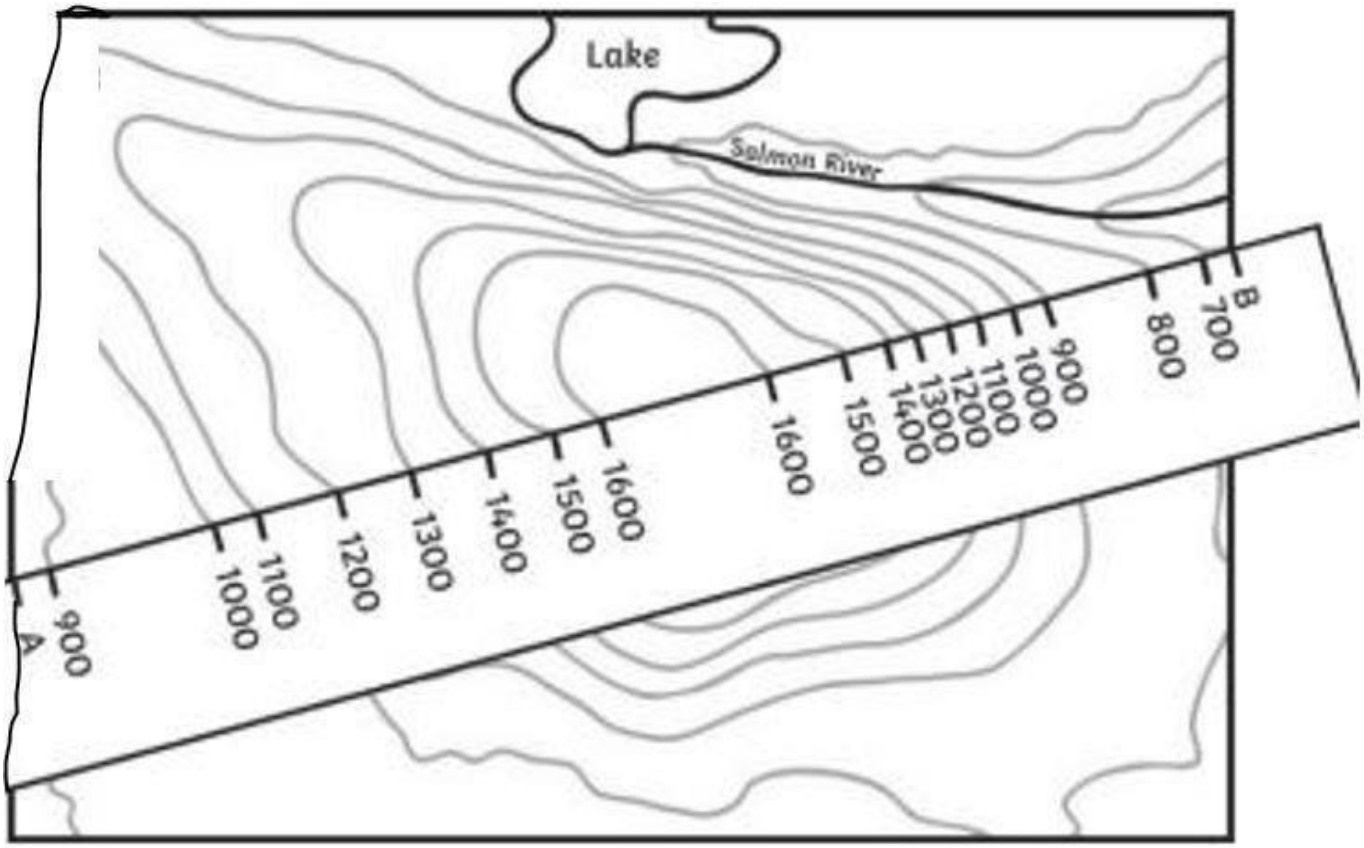


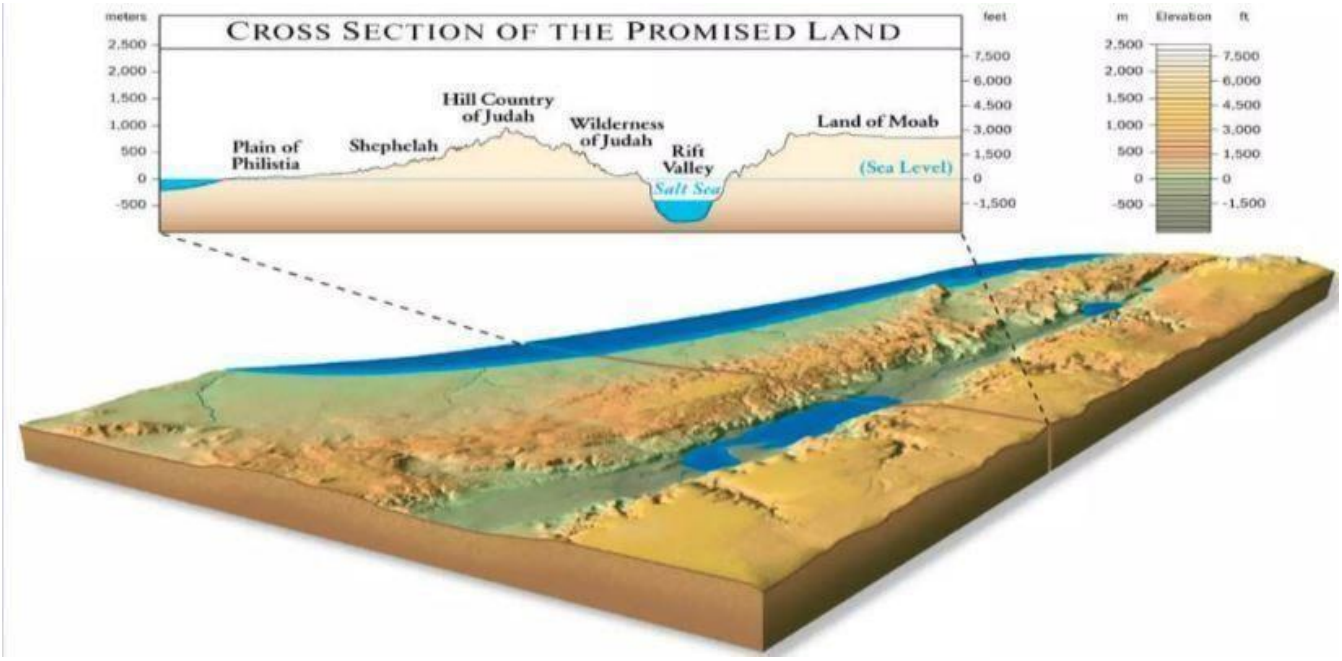
2. Structural mapping

Structural mapping is the identification and characterization of structural expression. Structures include faults, folds, synclines and anticlines and lineaments. Understanding structures is the key to interpreting crustal movements that have shaped the present terrain. A synoptic view of regional scale is a much different perspective than point ground observations when trying to map structural elements. Remote sensing offers this perspective and allows a geologist to examine other reference ancillary data simultaneously and synergistically, such as geo-magnetic

3. Cross-sectional map

Cross-section maps or block diagrams is not a map actually but sometimes it is also considered as a geological map, because of showing data similar to a geological map A cross-sectional map shows the cross-section from the side. The cross-sectional maps shows the changes along the line shown on the map.


Lake
Salmon River
A
B
900
1000
1100
1200
1300
1400
1500
1600
1600
1500
1400
1300
1200
1100
1000
900
800
700


CROSS SECTION OF THE PROMISED LAND
meters
feet
2,500
2,000
1,500
1,000
500
0
-500
7,500
6,000
4,500
3,000
1,500
0
-1,500
Plain of Philistia
Shephelah
Hill Country of Judah
Wilderness of Judah
Rift Valley
Salt Sea
Land of Moab
(Sea Level)
m
Elevation
ft

EXPERIMENT NO.-2

AIM:- Study of Contour maps.

Scale – 1"=1000'

TOPOGRAPHIC FEATURE

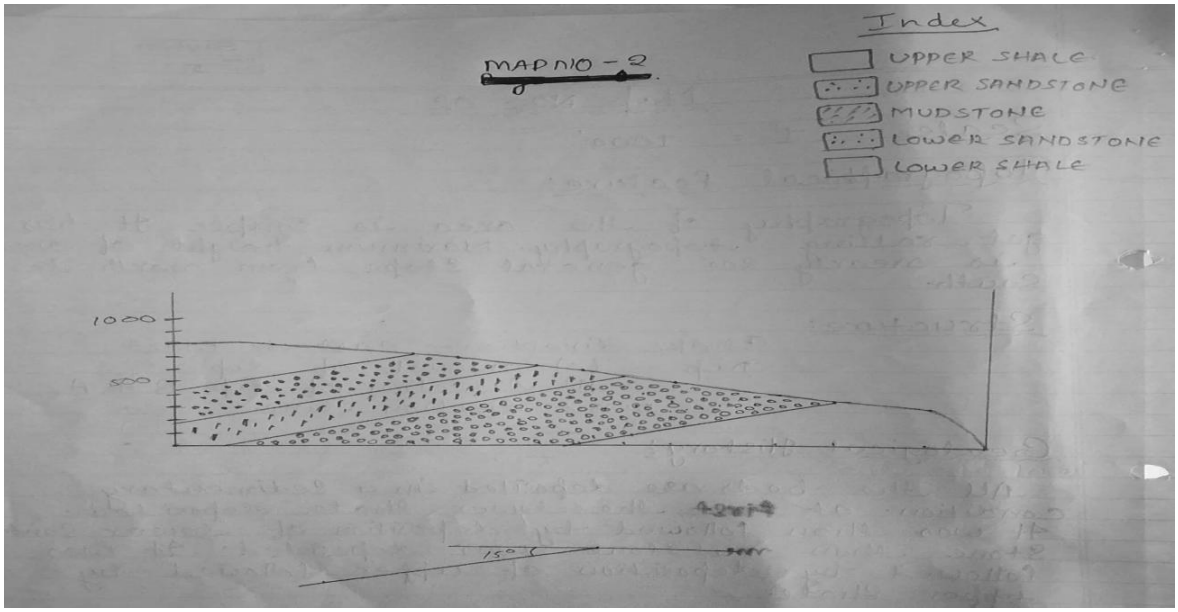
Topography of the area is simple. It has got rolling topography. Maximum height of area isnearly 800'.General slope from North to South.

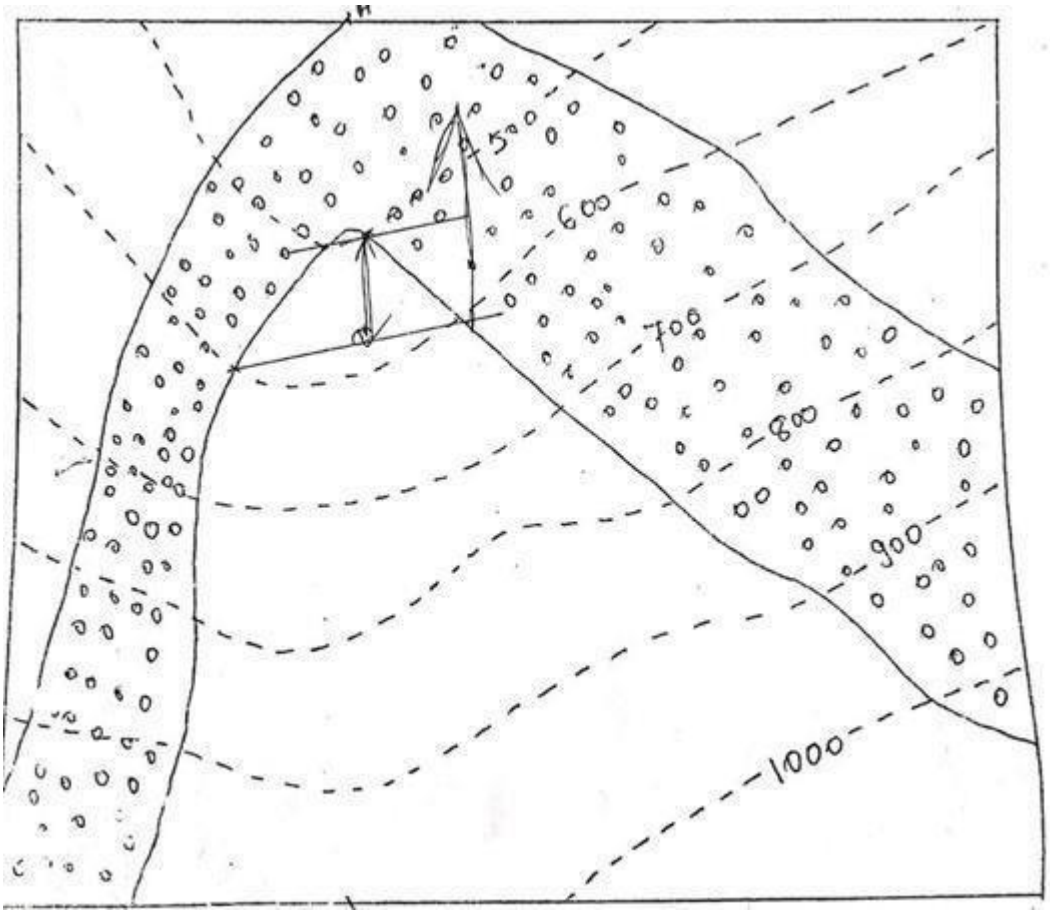
STRUCTURE

GEOLOGICAL HISTORY:

All the beds are deposited in sedimentary condition. At first the lower sale deposited it was thenfollowed by the position of lower sandstone then mudstone was deposited, it was followed by deposition of upper Shale.

Map number 1





Scale 1” = 1000’

Map number 2

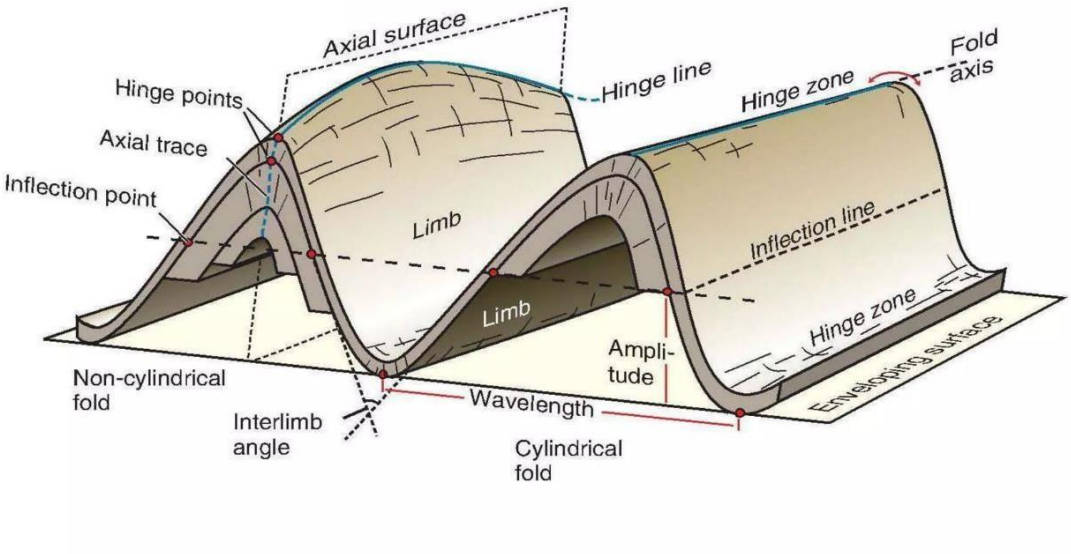
EXPERIMENT NO.-3

AIM:- Study of fold, fault and unconformity

FOLD Folds are one of the most common geological structures found in rocks. When a set of horizontal layers are subjected to compressive forces, they bend either upward or downward. The bend noticed in rocks are called folds.

In terms of their nature too, folds may occur as single local bends or may occur repeatedly and intricately folded to the tectonic history of the region.

Different Parts of a Fold



Anticline

- In geology, it is an area of ground where layers of rock in the earth's surface have been folded into an arch.
- A typical anticline is convex up, with the hinge or crest being the point of greatest curvature, and the limbs being the sides of the fold that dip away from the hinge.

Syncline

- A syncline is a fold with younger layers closer to the structure's center.
- It is a downward fold; however, synclines that point upwards, or perched, can be found when strata have been overturned and folded (an antiformal syncline).

Symmetrical Fold

A symmetrical fold is one in which the axial plane is vertical.In a symmetrical fold both the limbs are equal and inclined at the same angle.

Asymmetrical fold

An asymmetrical fold is one where one limb in an old structure is steeper than the other.An asymmetrical fold is one in which the axial plane is inclined.

Overturned Fold

An overturned fold is formed when one limb occupies the normal position, while the other bends more than 90 degrees.

An overturned fold has a highly inclined axial plane such that the strata on one limb are overturned.

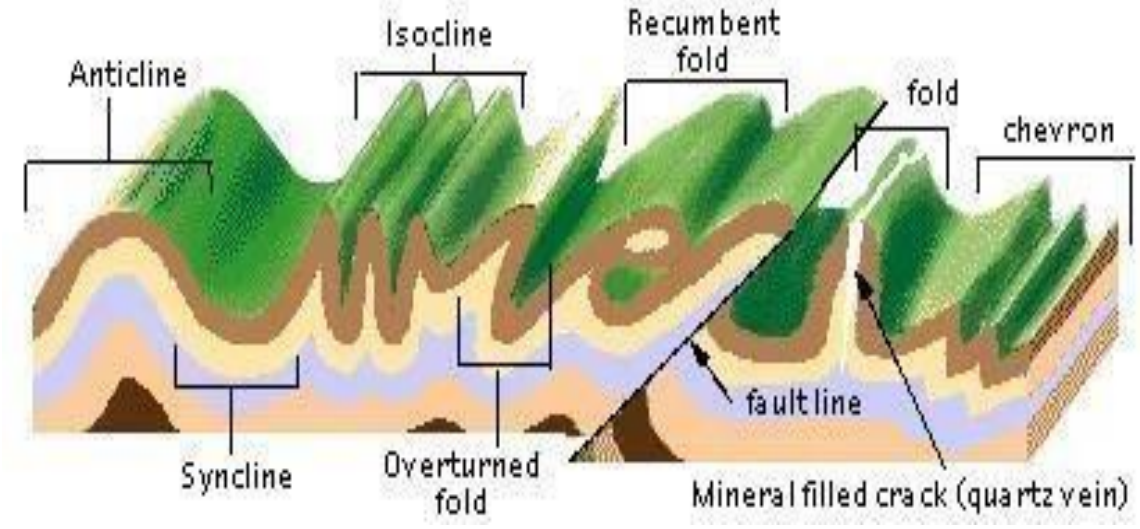
Isocline Fold

An isocline fold results from the continued lateral compression upon an overturned fold and crowing it upon the adjacent overfold. Here both the limbs dip at equal angles in the same direction.An isoclinal fold has limbs that are essentially parallel to each other and thus approximately parallel to the axial plane.

Recumbent fold

A recumbent fold is literally a fold lying down, resulting from the continuation of pressure. The axial plane and both limbs of a fold lie roughly and horizontally.

A recumbent fold has an essentially horizontal axial plane.

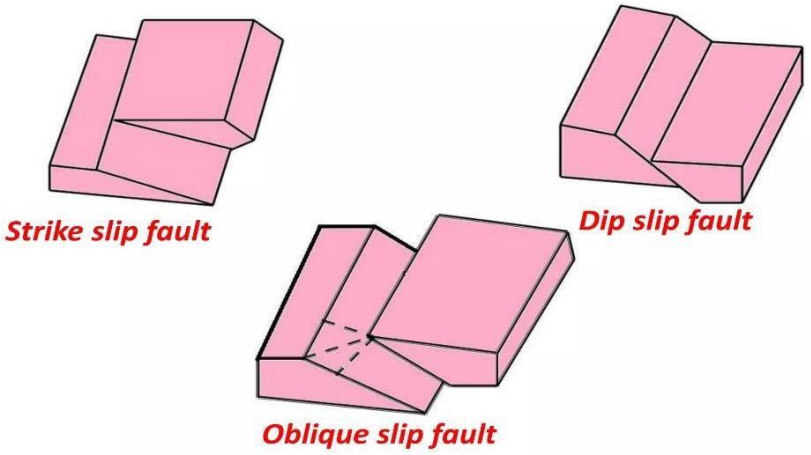


FAULT

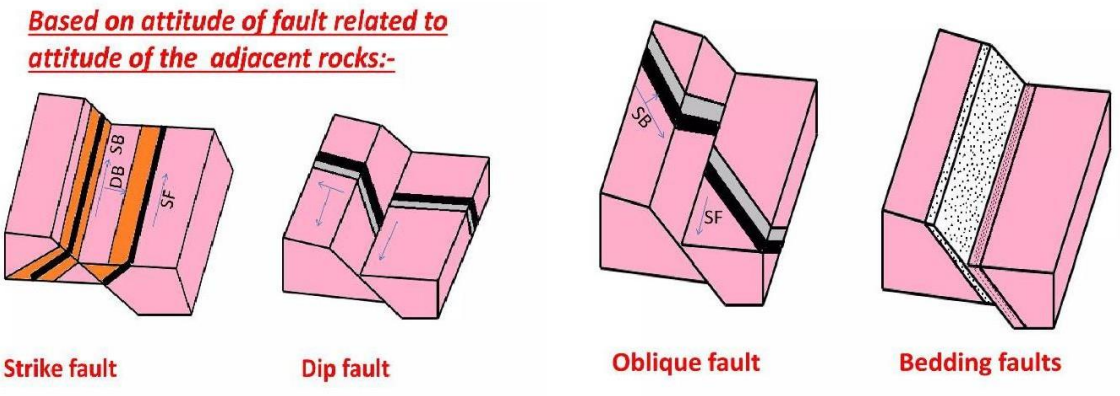
Faults are rupture along the opposite walls have move past each other. The essential feature is differential movement parallel to the surface fracture. Caused by the brittle deformation. Depending upon the nature and magnitude of stresses and the types of the rocks, the rock bodies may get fractured into different parts, and relative displacement of blocks may occur for different distances. These are varying from a few centimeters to many meters and this displacement may occur in any direction.

Causes of faults:-Faults are essentially the shear or sliding failures, resulting from tensional, compressional, rotational stress acting the crustal rock masses. They may be due to the shrinking Earth; or due to the convection currents produced in the Earth. Normal faults are assumed to have been formed under the horizontal tension. Thrust faults may be assumed to be originating from compressive stress, which may throw the rocks into folds, and these intensely folded getting fractured and faulted under shear.

Based on the rake of the net slip.



Based on attitude of fault related to attitude of the adjacent rocks:-



Unconformity

Angular unconformity

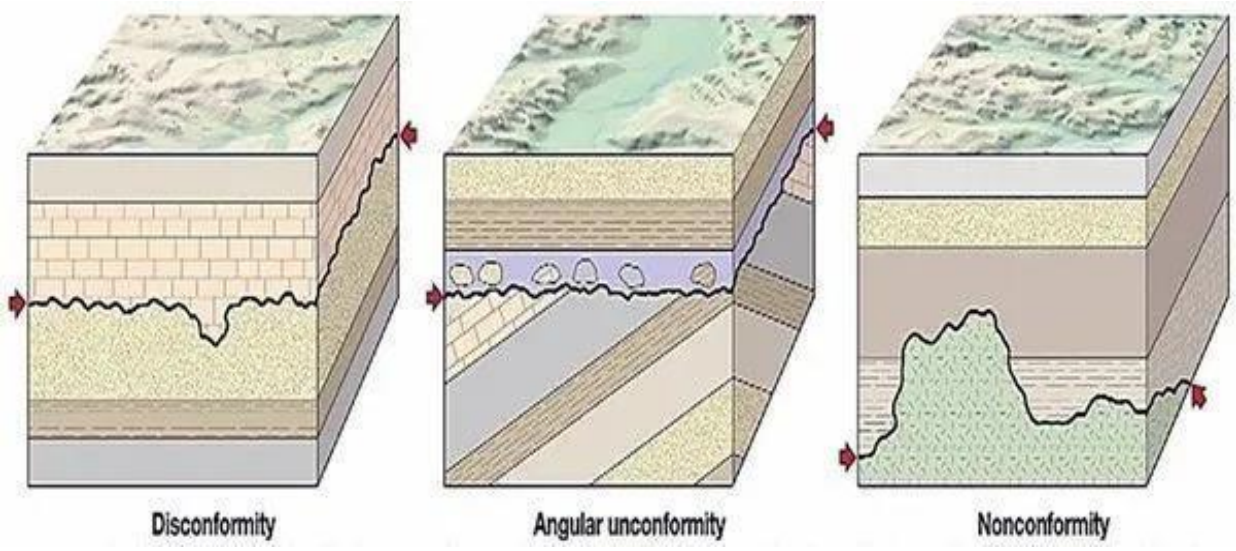
An angular unconformity is an erosional surface and separates an older sequence of rocks, in which bedding is inclined to the unconformity, from a younger sequence in which bedding is essentially parallel to the unconformity. The term "angular" expresses the fact that layers above and below angular unconformities are not parallel.

Non-conformity

Non conformity are depositional surface which separating younger sedimentary or volcanic rocks from underlying older crystalline rocks(metamorphic rock or igneous rock).They usually indicate that a long period of erosion occurred prior to deposition of the sediments.

Disconformity

It is also known as parallel unconformity. A disconformity separates two sequences, both of which are bedded parallel to the unconformity.



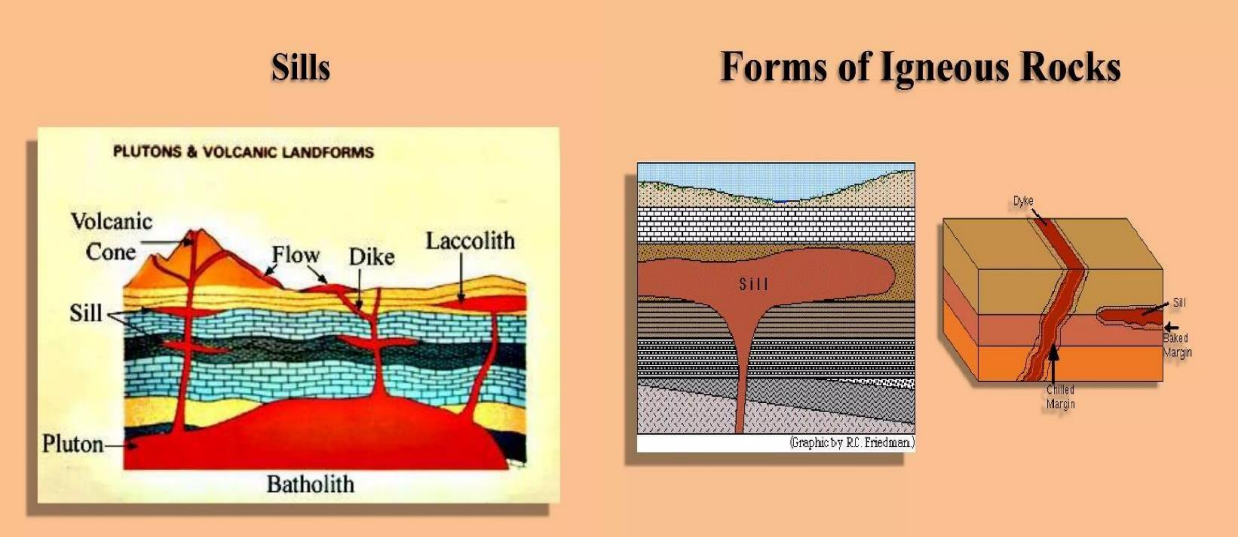
EXPERIMENT NO.-4

AIM :- Demonstration of igneous intrusions: Dykes, Sills, & Batholiths

Igneous intrusions form when magma cools and solidifies before it reaches the surface. Three common types of intrusion are sills, dykes, and batholiths

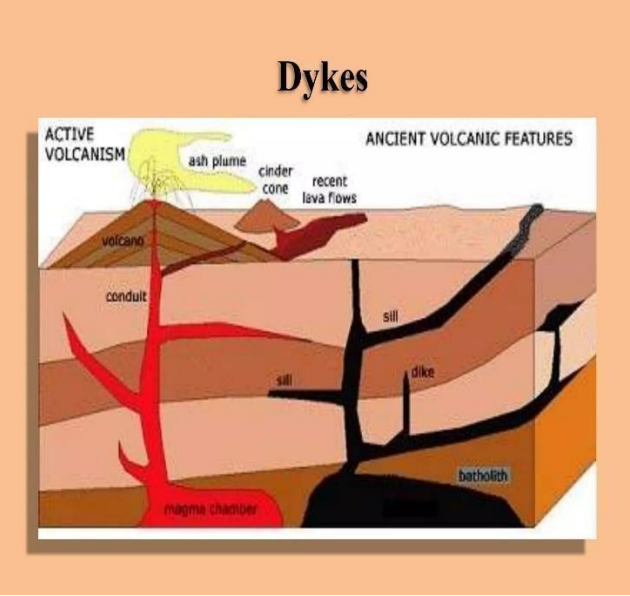
Sills

form when magma intrudes between the rock layers, forming a horizontal or gently-dipping sheet of igneous rock. The Sill (top left image) provided a defensive cliff-line on which the Romans built Hadrian's Wall.



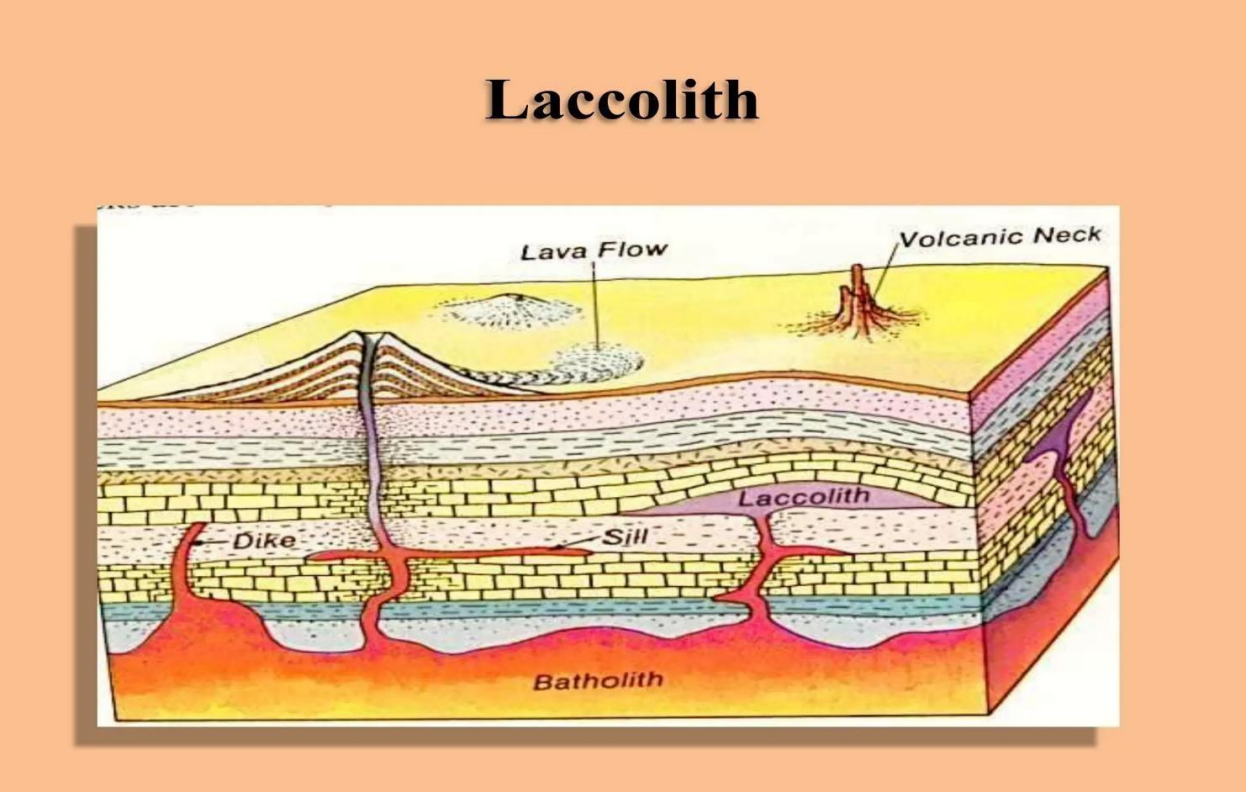
Dykes

form as magma pushes up towards the surface through cracks in the rock. Dykes are vertical or steeply-dipping sheets of igneous rock. This example, (bottom left image) in the Channel Islands, shows several criss-crossing dykes of different ages.



Batholiths:

Batholiths are large, deep-seated intrusions (sometimes called Plutons) that form as thick, viscous magma slowly makes its way toward the surface, but seldom gets there! Dartmoor (bottom right) forms part of a large batholith that extends under Cornwall and beyond.



EXPERIMENT NO.5

AIM :- Demonstration of streaks in different minerals.

Streak is color of the mineral in powder form. It is tested by rubbing a metallic mineral across a piece of unglazed porcelain called a streak plate. Hematite (Fe2O3) has a reddish-brown streak whether the sample is metallic or non-metallic in appearance.
Minerals Streak Examples The streak test is a valuable tool for mineral identification, and a single mineral can offer various clues depending on its composition and structure. Here are some examples of different minerals and their unique streaks:

Hematite: Color: Blood red Reason: The high iron content in hematite oxidizes during the test, revealing its characteristic red color, even though the mineral itself appears black or reddish-brown.

Fluorite: Color: White Reason: Despite its diverse color range (green, blue, purple, yellow), fluorite always gives a white streak because its chemical composition lacks elements that produce a colored powder.

Galena: Color: Gray Reason: Despite its metallic silver appearance, galena's lead sulfide composition leaves a characteristic gray streak due to the presence of sulfur.

Malachite: Color: Pale green Reason: This bright green mineral produces a paler green streak, reflecting its copper hydroxide composition.

Pyrite: Color: Black Reason: Often mistaken for gold due to its brassy yellow color, pyrite reveals its metallic iron sulfide nature with a black streak.

White Streak:

Calcite: Commonly found in sedimentary rocks, calcite has a white to light grey streak.

Quartz: This abundant mineral, found in various forms like amethyst and citrine, always leaves a white streak.

Feldspar: A group of common rock-forming minerals, different types of feldspar have white streaks, like orthoclase and plagioclase.

Black Streak:

Galena: This lead sulfide mineral has a characteristic metallic grey to black streak. Graphite: This soft, black mineral leaves a black streak that can be used to write on paper.
Magnetite: This black, magnetic mineral has a black streak and is attracted to magnets.

Red Streak:

Cinnabar: This mercury sulfide mineral is bright red and has a red streak, making it easily identifiable.

Realgar: This arsenic sulfide mineral is orange-red and has a red to orange-red streak.