ROCKS AND MINERALS

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Subject Name: Geotechniques & Applied Geology

Subject Code: CV0413

Major Rock Groups

- Igneous Rocks
- Sedimentary Rocks
- Metamorphic Rock

Igneous

- Formed from molten rock (magma/lava) that has cooled

1. Extrusive igneous rock is formed from lava (on earth’s surface) and tends to solidify quickly.

2. Intrusive igneous rock is formed from magma (inside the earth) and tends to take a long time to solidify into rock.

Basalt, Gabbro, Pumice, Rhyolite, Granite, Obsidian,






Sedimentary

- All types of rock are continuously being broken down into small fragments called sediment.
- This sediment can be compressed or cemented together to form sedimentary rock

- Limestone, Breccia, Conglomerate, Halite




Metamorphic

- Processes such as extreme heat/pressure can alter the chemical composition of the original rock to form a new rock.

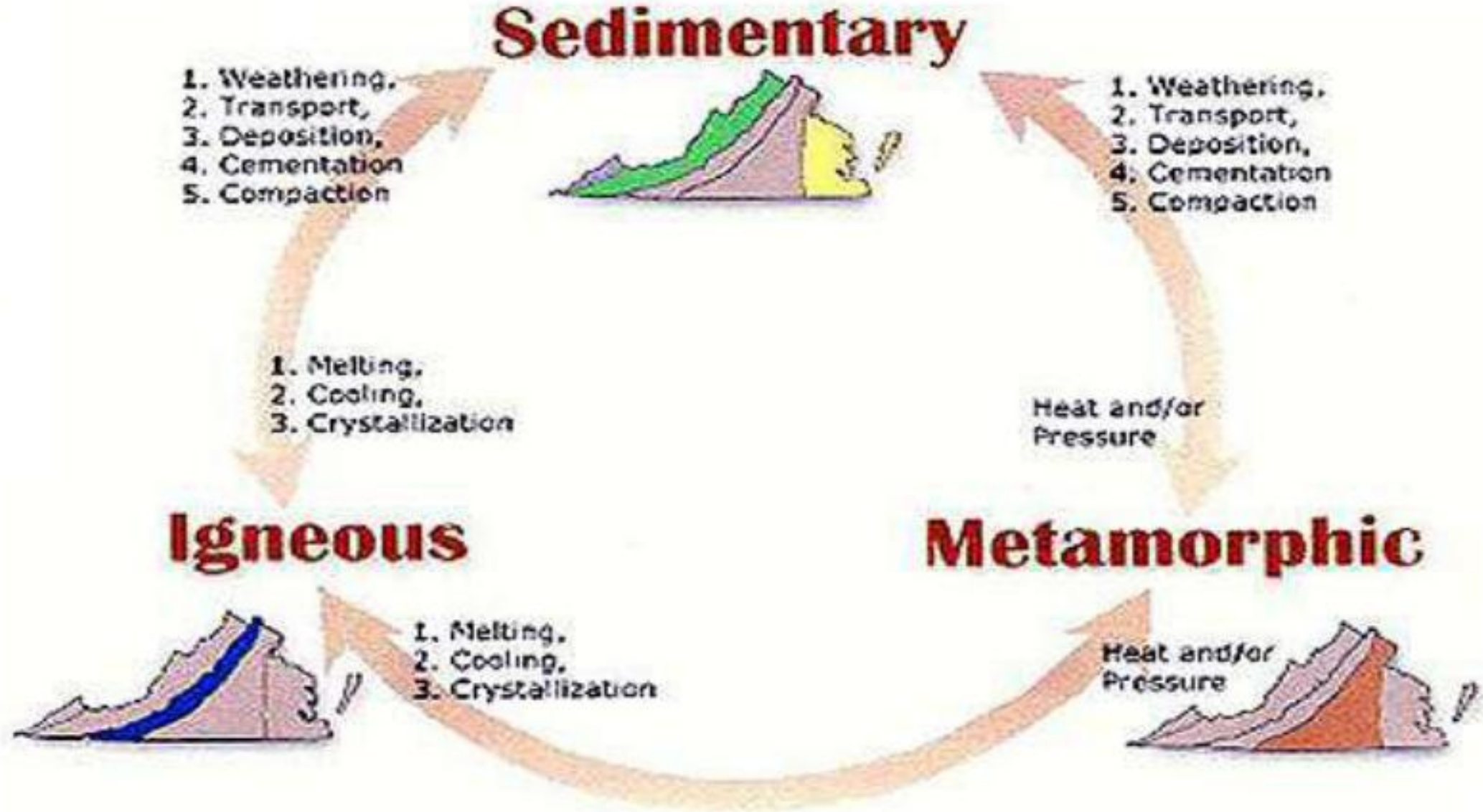
- White Marble, Slate, Schist, Gneiss, Quartzite, Anthracite Coal





Rock Cycle

- Geologic forces cause rock to constantly change from one type to another
- Complete the rock cycle diagram by adding the appropriate processes that connect each rock type to the others


Sedimentary
1. Weathering,
2. Transport,
3. Deposition,
4. Cementation
5. Compaction
1. Weathering,
2. Transport,
3. Deposition,
4. Cementation
5. Compaction
1. Melting,
2. Cooling,
3. Crystallization
Heat and/or
Pressure
Igneous
Metamorphic
1. Melting,
2. Cooling,
3. Crystallization
Heat and/or
Pressure

Minerals

- A mineral is defined as a naturally occuring inorganic solid substance that is characterized with a definite chemical composition and very often with a definite atomic structure.

- To classify a mineral resource, the minerals in the rock should first be identified. Minerals can be identified through their physical properties.

- In some cases, some minerals may be found in different places and in different forms but their fundamental physical properties remain the same.

Physical Properties of Minerals

• Color:

- The most evident characteristic of and is usually the first property used to identify minerals.
- It is a result of the way minerals absorb light.
- When a mineral absorbs all the color of spectrum except that of a certain color, the mineral will appear in that color

Luster:

- Shows how much light is reflected in a mineral.

- This depends on the brilliance of light used to observe the surface of the mineral.

- **Classifications of Luster:**

- **Metallic:** mineral is opaque and behaves like metal when reflecting light.
- **Adamantine:** luster of diamonds; very brilliant
- **Vitreous:** Shine typical of glass, ice
- **Pearly:** resembling shine of pearls
- **Resinous:** Waxy, mineral looks like paraffin
- **Dull or earty or Nonmetallic**: mineral does not reflect light like a metal

Streak:

- The color of mineral in powder form.
- Usually the mineral is rubbed on a streak plate to determine its color.

Hardness:

- The measure of the mineral’s resistance to scratching.
- To quantify the hardness of a mineral, the Moh’s Scale is used.
- The harder the mineral, the less prone to scratches.

Mohs Relative Hardness	Mineral	Common Objects
1	Talc	powder
2	Gypsum	fingernails
3	Calcite	tooth
4	Fluorite	Iron nail
5	Apatite	Window glass
6	Feldspar	Steel file
7	Quartz	porcelain
8	Topaz	Hardened steel
9	Corundum	Sapphire and ruby
10	Diamond	none

Cleavage and Fracture:

- Cleavage and fracture are used to describe how minerals break into pieces.

CLEAVAGE/FRACTURE

- Cleavage- when a mineral break along a flat, smooth surface

- Fracture- when a mineral breaks along an irregular surface

- **Even**: When the broken surface is smooth and flat
- **Uneven**: When the broken surface is irregular and full of ridge and depression
- **Conchoidal**: The broken surface of the mineral shows broadly concentric rings
- **Splintry**: When the mineral breaks with a rough woody fracture resulting in rough projection at the surface
- **Hackly**: The broken surface is highly irregular with numerous sharp, fine, pinching projection
- **Earthy**: The surface is smooth, soft and porous.

Crystalline structure/crystal lattice:

- The periodic array of atoms This is a unique arrangement of atoms in a crystal.
- A hand lens is used for checking the crystalline structure.
- Non crystalline structure minerals are called “amorphous”; special lenses are needed to validate this.

Tenacity:

- The behaviour of a mineral towards the forces that tend to break, bend, cut or crush it is described by the term tenacity.

- Sectile: When mineral can be cut with a knife

- Brittle, flexible, plastic and elastic

Odor:

- The distinct smell of a mineral that is usually released from a chemical reaction manifested when the mineral is subjected to water, heat, air and friction.

- Sulfur, for example smells like what is emitted when lighting a match.

- The strength of this smell increases when heated or stuck, giving off an odor similar to rotten eggs.

Specific Gravity:

- It is the measure of the density of the mineral.
- It determines how heavy the mineral is by its weight to water.
- Specific gravity is used especially when two minerals have the same size and color.

Optical Properties of Minerals

- properties of mineral which are related to the behaviour of light while being transmitted through or reflected from it are grouped under optical properties.
- Following are the common phenomena connected with light which are used for investigating the optical properties of minerals.

- Light
- Ordinary light
- Polarised light
- Refractive index
- Dispersion
- Optic Axis
- Total reflection

Laboratory testing of rocks

- uniaxial compressive strength
- Tensile strength
- Shear strength
- Modulus of elasticity
- Triaxial test

Field and in-situ test for rocks

- Jack test
- Shear test
- Seismic test

Site improvement in rocks and soils

Methods used for strength and stability condition in rocks are:

- Grouting
- Backfilling
- Rock bolting

Methods used for improve the bearing capacity of soils:

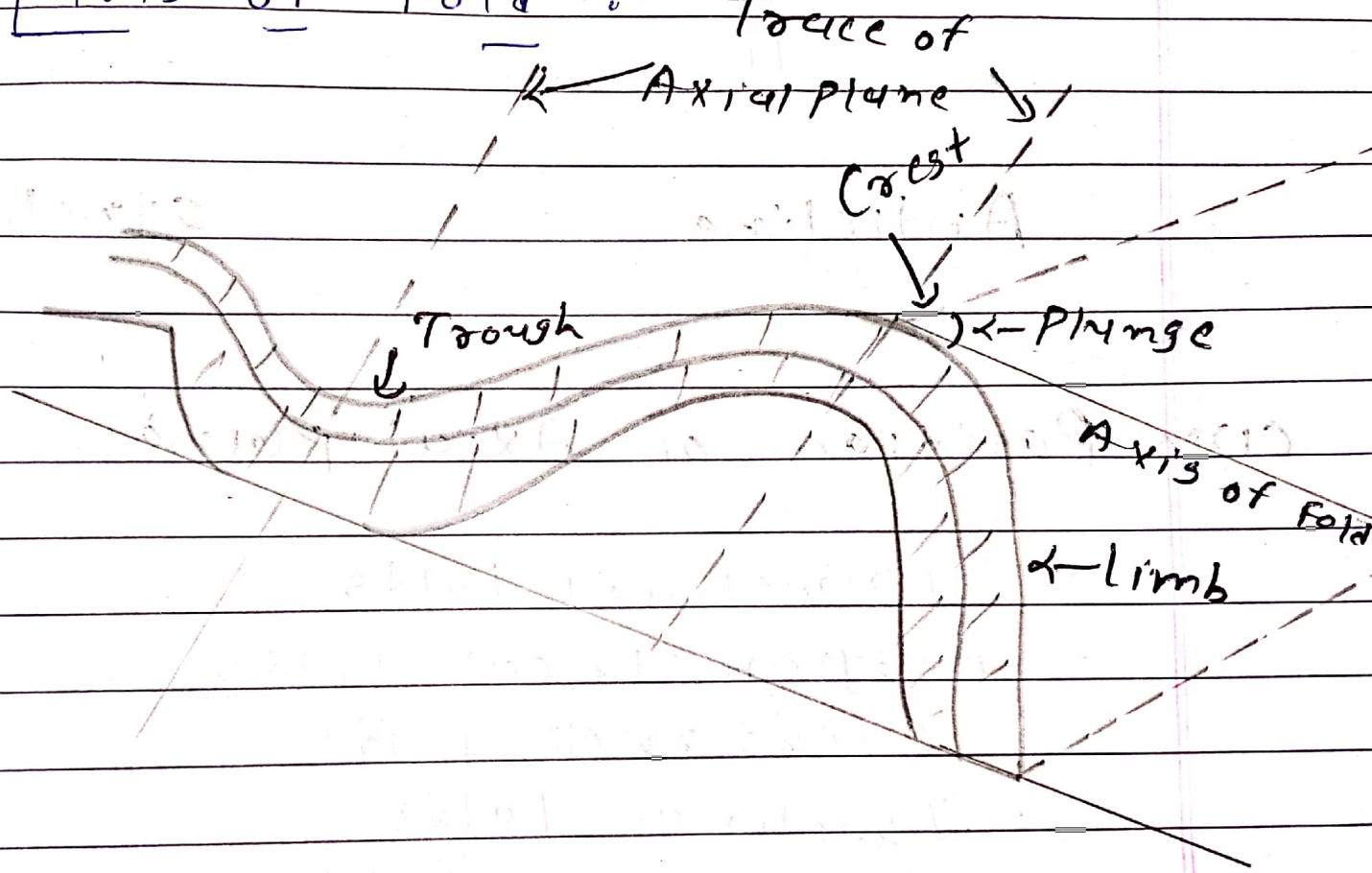
- Cement stabilization
- Bituminous stabilization
- Electro osmosis

Date :

* Folds & Folding :-

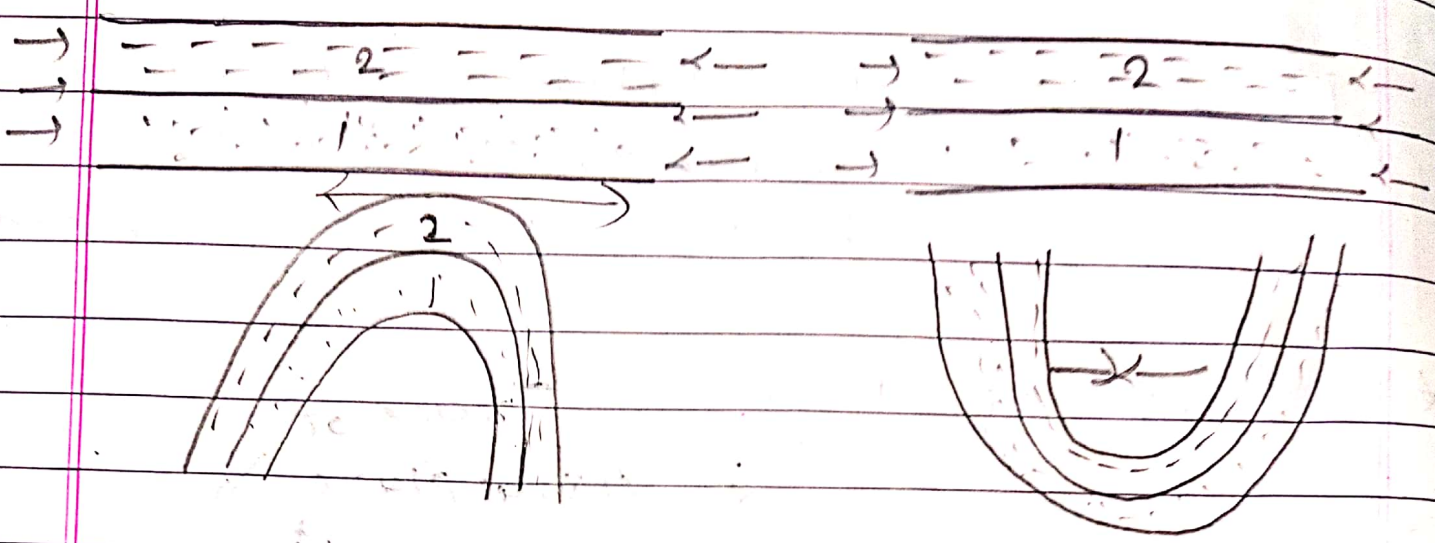
Folds ⇒ undulations or bends or curvatures developed in Rocks due to stresses.

* Parts of Fold :-



1) limbs
Hing
Axial plane
Axial Surface
Axis of fold
plunge of a fold
Crest & trough

Classification of folds:-



Anticline

Syncline

(1) Position of Axial plane:-

- Symmetrical folds
- Assymmetrical folds
- Overturned folds
- Isoclinal folds
- Recumbent folds.
- Conjugate folds
- Box folds.

2) Degree of Compression:-

Open Fold & close fold.

(3) Behaviour with depth:-

- Concentric folds
- Similar folds
- Superintendous folds

(4) Relative curvature:-

class I, class 2, class 3.

(5) Plunge as Basis:-

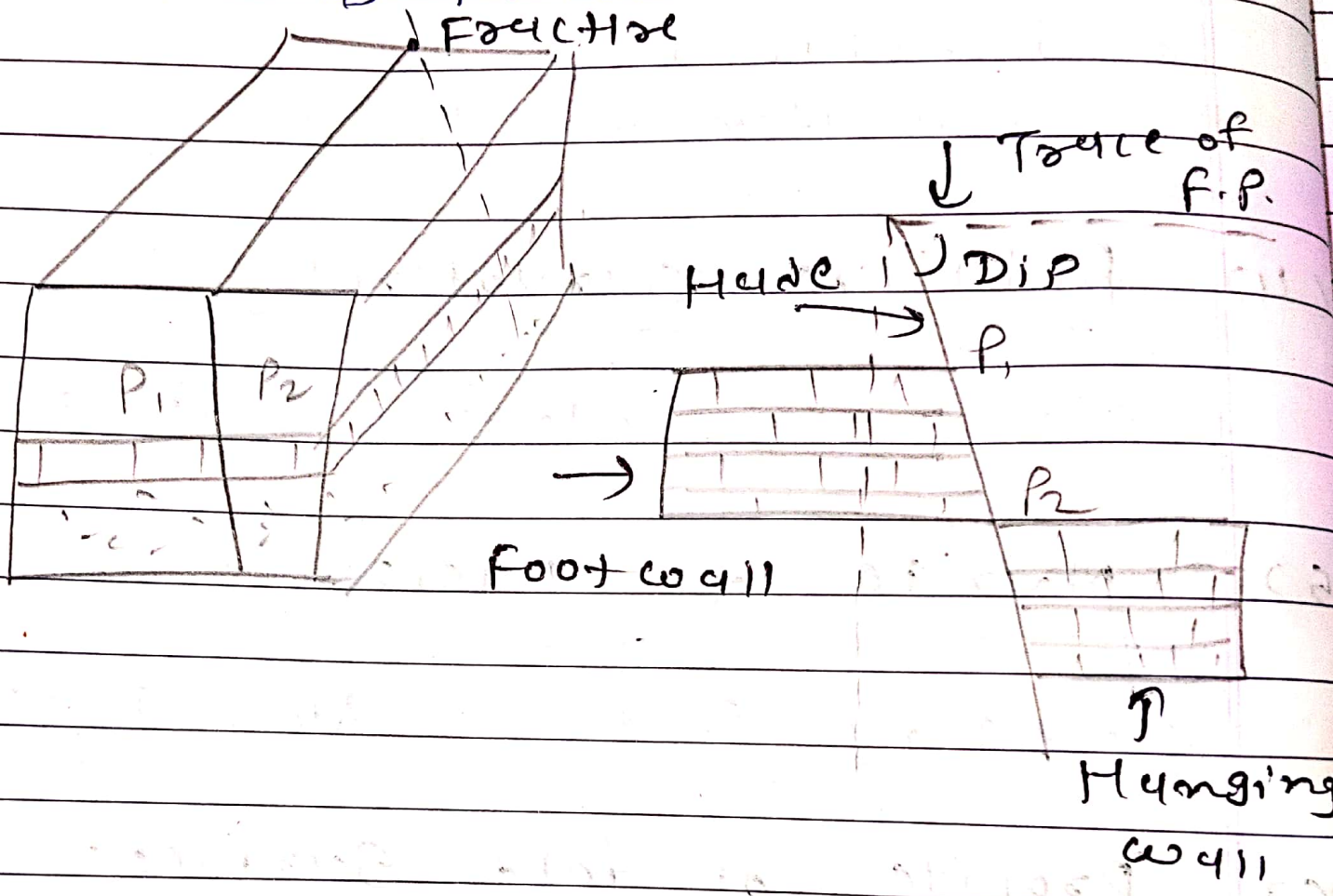
Plunging Fold & Non-plunging fold

(6) Profile of fold Surface:-

- Cheveron Fold
- Conjugate "
- Cuspate "
- Cylindrical "

Fault & Faulting :-

Fault ⇒ Fracture & movement.



⇒ Fault plane
Dip & Hade
The walls
Fault zone
Shear zone
slip & seperation
The slikensides
Grouge, Fault Breccia

Classification of faults:-

1) Apparent movement as Basis:-

- Normal fault
- Reverse "
- Strik-slip "
- Hinge "

2) Attitide of fault as Basis:-

- Strike faults
- Dip "
- Oblique "

3) Slip as Basis:-

- strike-slip faults
- Dip "
- Oblique "

4) Mode of Occurence:-

- Parallel faults	- peripheral fau
- Enechelon "	- Radial "