GEOGRAPHY

NOTES

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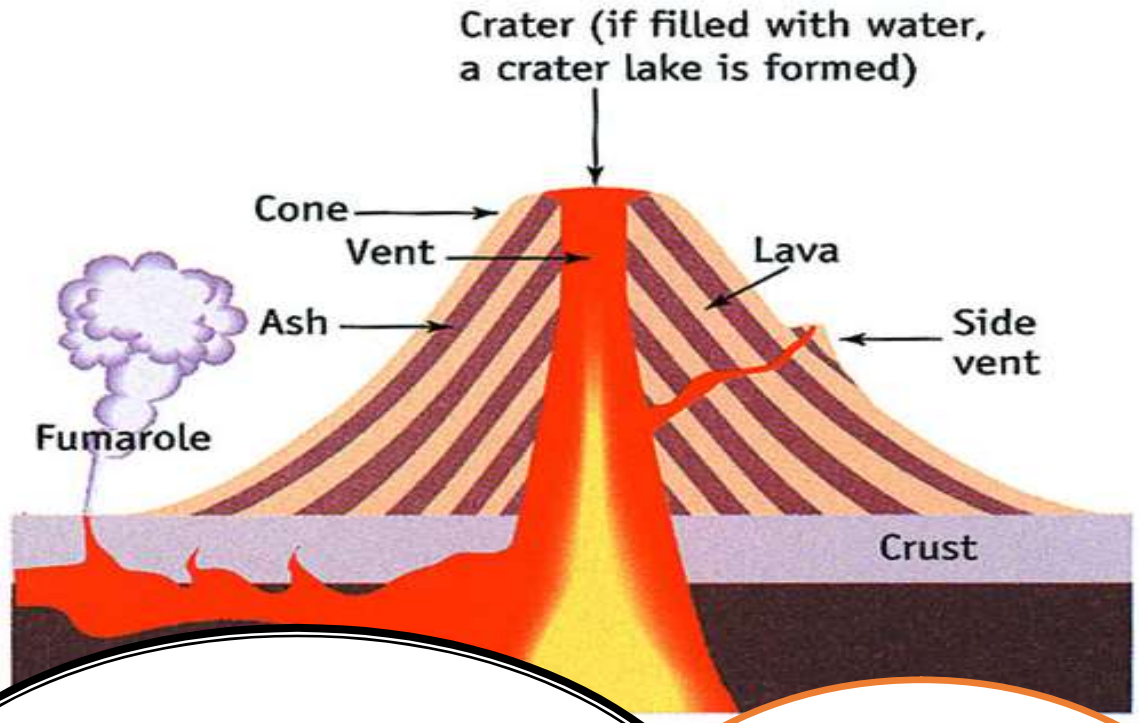
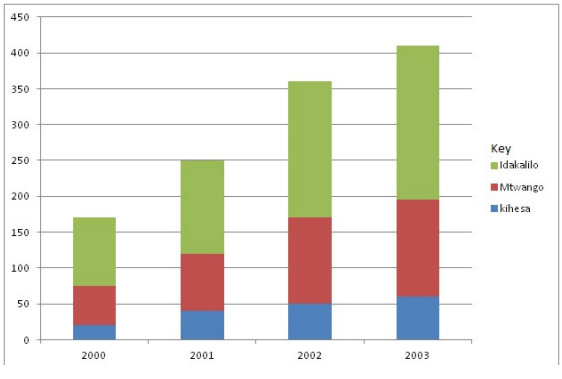
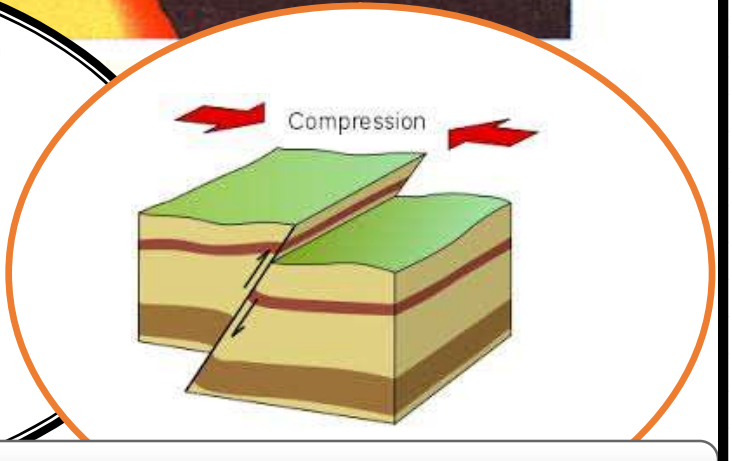






HAPPYNESS .S. DUNIA – TZSHULE GEOGRAPHY EXPERT

STRUCTURE OF THE EARTH

PHYSICAL GEOGRAPHY

TOPIC: - STRUCTURE OF THE EARTH

The earth is a system which composed of two zones. These are

1) Outer zone

2) Inner zone

Thus, the structure of the earth consists of external structure and internal structure.

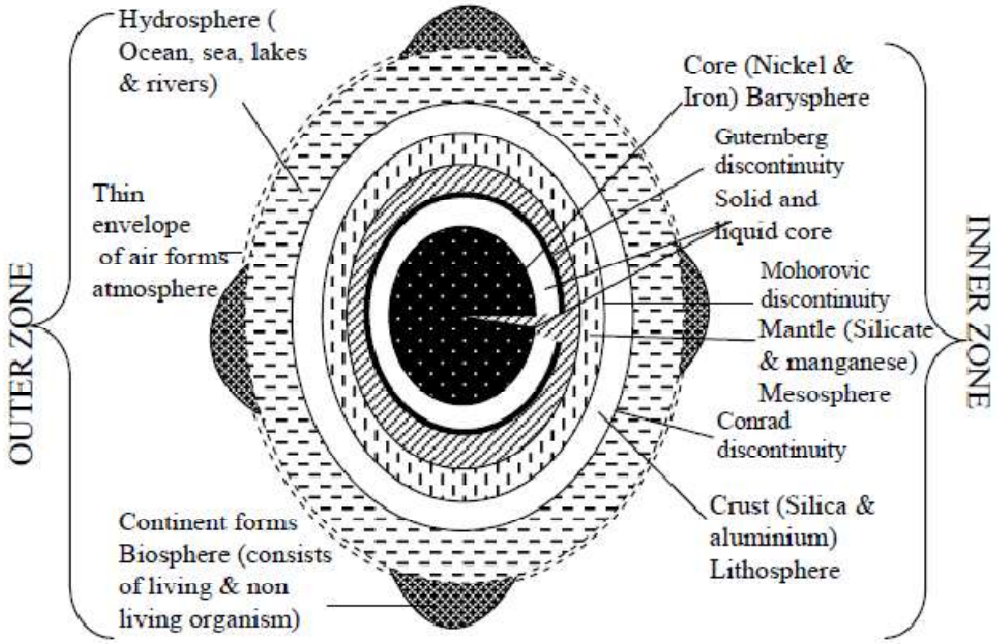
INTERNAL STRUCTURE / CONCENTRIC ZONE OF THE EARTH

The internal structure of the earth consists of three zones. These are

i) Lithosphere/crust

ii) Mesosphere/Mantle

iii) Barysphere / Core.



Structure of the Earth

LITHOSPHERE / CRUST

Is the outermost and thinnest zone of the earth which found between 8 – 50km or 5 – 30 miles.

- It is largely composed of igneous rocks.

- Other types of rocks also exist as a result of changes on the earth's surface. When subjected to forces or any stress.

- Igneous rocks are hard and brittle.
- The crust also consist of two layers are sial and sima layers.

THE SIAL LAYER

Is the outer layer of the crust which rich in silica and Aluminiumminerals.

- The sial layer consist of granites rocks with density of about 2.65.

- The sial for the basis of the continent.

- The presence of silica and aluminium minerals collectively form SIAL layer.

THE SIMA

- Is the layer which found beneath the sial.

- Is the inner layer of the crust which separated from sial layer by the zone called Conrad discontinuity line.

- The sima layer is composed by silica and magnesium.

- It has the density of about

- It forms the basis of ocean floor.

Note: - Sial and sima layer together forms the crust.

MESOSPHERE / MANTLE

Mesosphere or mantle which found between the crust and core.

- It lies beneath the crust

- It separated from the crust by the zone of separation called Mohorovic discontinuity line has temperature which may reaches to.

- It consist of denser rock to about 3.03 –

- It consist of pale green minerals called Olivine (Ferromagnesium silicate) in form of ultra basic rock

- It consists of lower and upper mantle.

- The upper mantle is rigid and crust to form a large layer called lithosphere.

- The lower mantle is less rigid and forms the moltern layer within the earth's interior called asthenosphere.

- Asthenosphere is the molten layer layer which responsible for the balancing movement of the earth's material called isostatic readjustment.

- Asthenosphere has been investigated is found between 100 to 200km below the upper surface.

THE BARYSHERE / CORE

The core is the innermost zone of the internal structure of the earth.

- It has diameter of about 69000km (4300 miles) density of about.

- The core is also classified into two parts i.e. the outer and inner core.

- It separated from the mantle by zone of separation called Gutenberg discontinuity

- The outer core is liquid in nature because of temperature of up to

- The outer core is consist of nickel and Iron (NIFE)

- It estimated to be 2100km

- Its density is about.

- The inner core is solid in nature because of high pressure exerted from different parts toward the center

- It composed mainly by iron

- Its density is about 16 – 17

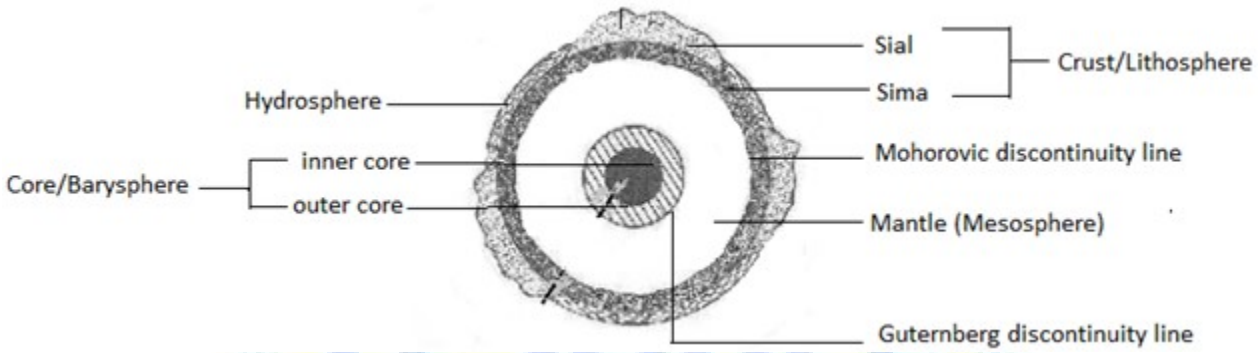
- It has diameter of about 2600 – 2700km. (1600 – 1700 miles)

- The temperature at the center is about

Note

i) The average density of the whole earth is about 5.17gm/cm^3

ii) The total mass of the earth is about 5.976 x 10^{21} tons.



EXTERNAL STRUCTURE OF THE EARTH

External structure of the earth consists of four main layers'. These are

- Atmosphere
- Hydrosphere
- Lithosphere / Land mass
- Biosphere

THE ATMOSPHERE

- Is the thin layer of gases held on the earth by gravitation' attraction.

- It composed by abiotic (non living matter) and biotic living organism.

- Non living matter found in the atmosphere includes mixture of gases, water vapor and dust particles.

- The living organism include the smallest or microscopic organisms like bacteria

COMPOSITION OF ATMOSPHERE

Atmosphere is the outer zone or external structure of the earth composed by Abiotic and Biotic components.

ABIOTIC COMPONENTS OF ATMOSPHERE.

The abiotic components of the atmosphere include the following.

- Mixture of various gases.

These include Nitrogen (78%), oxygen (21%), argon (0.009%) and carbon dioxide (0.03%).

- Other gases include neon, helium, Krypton, xenon and other which are present in minite (small proportion) percentage.

- Water vapor.

Is the colorless and odorless (smell less) gas in the form of water which makes up a perfect mixture with other gases.

- The degree to which water vapor is present in the atmosphere is called humidity.

- Humidity is very important to weather as condensed to form clouds and fog.

- Excess water vapor brings about precipitation in form of rain, hail, snow and sleet.

- Water vapor is capable of absorbing heat which penetrates into the atmosphere in the form of radiant energy from the sun to the earth.

- It is also act as a blanket which prevents the rapid escape of heat from the earth's surface and therefore maintain heat budget.

- Dust particles.

The dust particles may exposed to the atmosphere naturally or artificially

- Natural dust particles are those caused by natural phenomena like winds and volcanic eruptions

- Artificial dust particles are those derived from industrial pollutions such as soot and ashes. It includes the particles caused by other man's activities like construction, mining and farming activities

- The function of dust particles serve as a nuclear or center around which water vapor condenses to produce clouds.

STRUCTURE OF ATMOSPHERE

According to the temperature changes, atmosphere divided into two zones. These are

- Homosphere
- Heterosphere.

HOMOSPHERE

Homosphere is the layer which found between 0 – 80km above the sea level.

- This is the lowest part of the atmosphere which composed of uniform composition gas of uniform composition of gases and temperature

- Homosphere consist of three layers. These are

i) Troposphere

- This layer extends by 0 – 15km above the sea level.

- Troposphere is the first layer of homosphere located nearest to the earth

- It contains water vapor, gases and dust particles

- It is the layer of atmosphere which support life on the earth due to the presence of plenty oxygen gas.

- All processes of rainfall formation take place in this layer and the temperature decreases as the altitude increases at the rate of per every 100 meters or per every 1000 meters.

Note: - This situation where by temperature decreases as altitude increases is called lapse rate and because it occur near to the ground is called environmental Lapse rate.

⇒The upper limit of Troposphere which separates it to the next later is called Tropopause.

Tropopause makes the upper limit of troposphere to the next layer called stratosphere.

ii) Stratosphere

Stratosphere exists between 15 – 48 km above the sea level.

- This is the second layer of homosphere which lies above the tropopause.

- It is also composed of water vapor, dust particles and various gases

- It is the layer of atmosphere which characterized by high concentration of Ozonic gases. This gases form Ozone layer which found particularly at 20 – 35 km in the stratosphere

- The Ozonosphere or ozone layer is the layer which form a shield or cover that prevent the earth's surface from destroying by the sun rays.

- It prevents the direct incoming of harmful rays from the sun to fall direct on the earth's surface.

- The temperature remains unchanged about between 20 – 35 km from the earth's surface. Then temperature increases with height to about at the upper limit of stratosphere called stratopause.

- The increase in temperature with height is referred to as temperature invasion.

iii) Mesosphere

- This layer extends between 48- 80 kilometers above the sea level.

- Mesosphere is the third part of the homosphere where temperature decreases as the altitude increases.

- It separated from the stratosphere by the zone of separation called stratopause.

- The upper limit of mesosphere is called mesopause.

- Mesopause record minimum temperature of this zone that may fall to making this zone to be coldest.

- It is at this zone where strong upper air streams of wind like jet streams are experienced.

HETEROSPHERE

- Is the second layer of atmosphere which extends from 80km towards the interplanetary space

- Heterosphere divided into two layers which include.

- Thermosphere
- Exosphere

THERMOSPHERE

- Is the lower part of heterosphere where temperature increases as the altitude increases from - i.e. temperature invasion. This is because; there is no water vapor or dust particle in this zone.

EXOSPHERE

- Is the part of heterosphere which found above the thermosphere.

- It has high temperature through it has little significance as it has not been greatly researched.

Note: - Within the heterosphere, there is also a scientific significant layer called ionosphere.

- Ionosphere consists of some ions which influence radio waves. This is because, ionosphere is electrically charged with free electrons that allow the passage of radio waves, television waves and telephone or mobile phone waves.

THE HYDROSPHERE

- Is the layer of water bodies of the earth including all oceans, rivers, precipitation and underground water.

- It is estimated that 75% of the Earth's surface is covered by water bodies.

THE LITHOSPHERE / LAND MASS

- Is the whole solid body of the earth with various landforms such as mountains, valleys and plateaus.

- The lithosphere is also known as the crust.

- It includes all land masses. The major land mass is called continent and the minor land mass is called islands.

THE BIOSPHERE

- Biosphere is the complex zone which comprises all living things.

- It includes a lower level of atmosphere and the upper level of lithosphere and hydrosphere.

- Biosphere receives substantial supply of energy from the sun which gives it condition necessary for life and does not occur in any part of the solar system.

- The living organisms that inhibit biosphere interact with each other and their environment.

- The sum of all these interaction components is called the ecological system or ecosystem.

- Biosphere comprises all living organism both macro and micro organisms living in water bodies, soils and on air.

FUNCTION OF ATMOSPHERE

1) Insulation

Atmosphere is an insulator it acts as a shield or blanket and therefore regulates temperature during the night and during the winter.

2) Filtration. The atmosphere is the filter. It filters solar insulation and percent ultra violet rays of certain length due to the presence of ozone layer in the stratosphere.

3) Scientific function. Atmosphere is the scientific field

- It is the field through which the scientific experiments and observation carried out. Example ionosphere layer of atmosphere reflects some electromagnetic waves and ration signals back to the earth.

4) It supports much on hydrological cycle.

The surface water, evaporation, condensation and precipitation formation take place in the atmosphere.

5) It support life some gases particularly oxygen is important for living organisms

- Air has weight which contributes to the occurrence of atmospheric pressure variations without which breathing would be impossible.

- Wind movement and direction that balances temperature, humidity and precipitation also result from pressure variations.

MATERIALS OF THE EARTH'S CRUST.

The earth's crust is composed of different materials ranging from elements, minerals and rocks. These materials differ in their physical and chemical composition.

ELEMENTS

They refer to the smallest particles of matter which can not be split into different forms by any means. Examples of elements are magnesium, potassium, sodium, iron, aluminum and silicon.

MINERALS

They are naturally occurring substances which have definite shape, colour and resistance formed due to combination of different elements. They are formed as a result of the combination of two or more elements. Some single elements like gold, silver and diamond may occur as minerals.

Mineral	Element
Quartz	Silicon and oxygen
Feldspar	Potassium, sodium, calcium and aluminum

ROCK

A rock is an aggregate of minerals in a solid state. On the other hand the term rock can include substances like clays, shells, sandstones and corals. Rocks which contain metallic compounds are called ores.

Rocks	Minerals
Lime stone	Mica, feldspar, calcite, iron ore
Granite	Mica, iron ore, quarts and feldspar
Basalt	Calcite, dolomite
Sand stone	Quarts, calcite, feldspar and iron ore

ROCK TYPES AND THEIR CLASSIFICATION

Rocks are aggregates of minerals in a solid state. Examples of rocks are such as lime stone, granite, basalt, sand stone and shale. Rocks can be classified depending on various criteria such as mode of formation, texture, structure, colour, permeability, age and the degree of resistance.

Rocks can be classified as follows:

1) A: ACCORDING TO THE MODE OF FORMATION (GENETIC)
Rocks can be classified into:-

- Igneous rocks
- Sedimentary rocks
- Metamorphic rock

IGNEOUS ROCKS

These are rocks which are formed by the cooling and solidifying of the molten material from the interior of the earth. The molten materials can solidify either intrusively or extrusive. When molten materials are still in the earth's crust are formed as magma but when they reach on the earth's surface are called lava.

CLASSIFICATION OF IGNEOUS ROCKS

Igneous rocks can be classified into two criteria;

1) According to the place of occurrence
2) According to chemical composition.

1.According to the place of occurrence, igneous rocks can be classified as;

a) Intrusive rocks

These are igneous rocks formed when the molten materials cool and solidify within the earth. The cooling and solidification of the molten materials can be near the surface or very deep in the crust. Igneous rocks formed when molten materials cool and solidify near the surface are called hypabyssal igneous rocks. Examples include granite, porphyries, and dolerite. These rocks can be exposed to the surface if there is severe erosion. Some rock masses like lopolith, laccolith, phacolith, sill and dykes are also hypabyssal igneous rocks.

When molten materials cool and solidify deep in the crust they form plutonic igneous rocks. These rocks consist of large grains and they are hard since they cool and solidify slowly. Examples include Granite, diorite, gabbro, pumice, and peridotite.

Extrusive rocks

These are igneous rocks formed when the molten material solidifies on the earth's surface and form lava. These rocks have small grains because they cool and solidify fast due to low temperature on the earth's surface.

- **Hypabyssal igneous rocks**

These are rocks formed when the magma cools and solidifies closely or nearly to the earth's surface. They have medium size particles, example dolerite.

- **Plutonic igneous rocks**

These are formed when the molten material (magma) solidifies deep down in the crust. They are consisted of large grains and they are hard because of the slow cooling process for example granite, diorite, gabbro etc

2.According to Chemical composition, igneous rocks can be classified into;

i) **Felsic (acidic) igneous rocks**: These are igneous rocks which consist of great amount/content of silica and feldspar with a very little or no iron or any other metallic metal for example gramorphyte, granite etc

ii) **Mafic (basic) igneous rocks**: These are igneous rocks which consist of small amount of silica with large amount of magnesium, iron and other minerals like aluminum.

iii) **Ultra mafic (ultra basic**): These are rocks which consist of a very large amount of metallic minerals like iron, magnesium and little amount of silica less than 45% for example peridotite.

iv) **Intermediate igneous rocks**: These are igneous rocks with silica content between basic and acidic degree. That is both acidic and basic oxides are in equal proportions.

CHARACTERISTICS OF IGNEOUS ROCKS

- They are hard and non stratified.
- They are formed by cooling and solidification of the molten materials.
- They can be acidic ,basic, or intermediate depending on the amount of silica.
- They are crystalline (having a definite shape).
- They can undergo metamorphism to form metamorphic rocks.
- They can undergo weathering process and after sedimentation can form sedimentary rocks.
- They contain minerals like iron, magnesium etc.
- They don't consist fossils.

SEDIMENTARY ROCKS

These are rocks formed by the process of sedimentation that is deposition or accumulation and lithification of sediments and some weathered particles and other minerals. These sediments may be deposited by water, wind or moving ice.

The particles are either deposited by running water or by moving ice.

SEDIMENTARY ROCKS CAN BE CLASSIFIED INTO THREE CATEGORIES

a) Originally formed sedimentary rocks.
b) Mechanically formed sedimentary rocks.
c) Chemically formed sedimentary rocks.

a)Organically formed sedimentary rocks.

These are formed from deposition of the remains of living organisms for example they include coral reefs, carbonaceous rocks and siliceous rocks formed as a result of remains of organisms. The remains of once living organisms may accumulate in layers to form sedimentary rocks. They can be classified into the following types;

1) Carbonaceous rocks

These are formed from deposition of plants remains only. They are formed from accumulation of plants which were rich in carbonates and being buried for many years ago. Example Coal

2) Calcareous rocks

These are formed from accumulation of remains of animals only. They are formed from lithification of skeletons and shells of animals. Examples are coral, chalk, limestone etc

3) Siliceous rocks

These are rocks formed from the remains of organisms like diatoms and radiolarians whose skeletons and shells are rich in silica/silicon. Example diatomic rocks

b)Mechanically formed sedimentary rocks.

These are rocks which have been formed by compaction and cementation of sediments which have laid down on sand or on the sea floor. They are formed through accumulation/deposition and lithification of weathered materials e.g.Igneous rock- weathering- sediments- deposition- lithification- sedimentary rocks.
A particular rock is disintegrated and the weathered materials formed are deposited in layers to form sedimentary rocks. These rocks can be classified into the following;

1) Arenaceous

These are formed through deposition of particles with medium size of sand e.g. Sand stone

2) Argillaceous

These are formed from deposition and lithification of weathered materials of very fine or small particles e.g. clay and silt. Argillaceous particles may include clay stone, salt stone, mud stone etc.

c)Chemically formed sedimentary rocks.

These are rocks formed through chemical process or decomposition. The basic chemical process includes carbonation which is the reaction between weak carbonic acid with rocks containing calcium carbonate.

Calcium carbonate + Water + Carbon dioxide → Calcium bicarbonate

$CaCO_3 + H_2O + CO_2 \rightarrow Ca(HCO_3)_2$

Other processes include those of sulfates, chlorides, silicates, iron stone etc

Mechanically rocks	Organically rocks	Chemically rocks
Shale	Chalk	Gypsum
Mud stone	Limestone	Rock salt
Silt stone	Coal	Flint
Grit	Coral reef	Ironstone

CHARACTERISTICS OF SEDIMENTARY ROCKS

- They are stratified and young rock layers overlay the old rock layers.
- They are non crystalline.
- They contain fossils as a result of accumulation of skeletons and shells of once living organisms.
- They can undergo changes to form metamorphic rocks when they are influenced by pressure and temperature.
- They are consisted of some fragments which were deposited and then cemented to form a rock.

METAMORPHIC ROCKS

These are rocks which are formed when one type of rock change into another type of rock after being subjected under intense heat or pressure or both. Any rock can change to form metamorphic rock. For example :-

- Sedimentary rocks to metamorphic rock.

a) Sand stone to Quartzite.

b) Lime stone to Marble.

c) Coal to Graphite.

d) Clay/Shale to Slate.

e) Mud stone to Slate.

- Metamorphic rock to metamorphic rock,example slate to schist.

- Igneous rock to metamorphic rock.

a) Augite to Hornblende.

b) Granite to Gneiss.

The process which involves the change of one rock type to another rock type is called Metamorphism.

TYPES OF METAMORPHISM

There are three kinds of metamorphism;

(i)Dynamic metamorphism.

This is influenced by pressure because of the earth's movement and brings about mountain formation. Examples;

- Shale to Schist
- Clay to Slate
- Granite to Gneiss

(ii) Thermal or contact metamorphism.

This is caused by intense heat. This can take place when the rock comes into contact with hot molten material like magma or lava. Examples

- Lime stone to Marble
- Sand stone to Quartzite

(iii) Thermal dynamic metamorphism

This is the process that takes place as a result of a combination of heat and pressure. It is when the existing rocks are subjected to both pressure and heat to change their shape and appearance. Example Coal to Graphite

CHARACTERISTICS OF METAMORPHIC ROCKS

i) They are more hard and more resistant than the original rock.

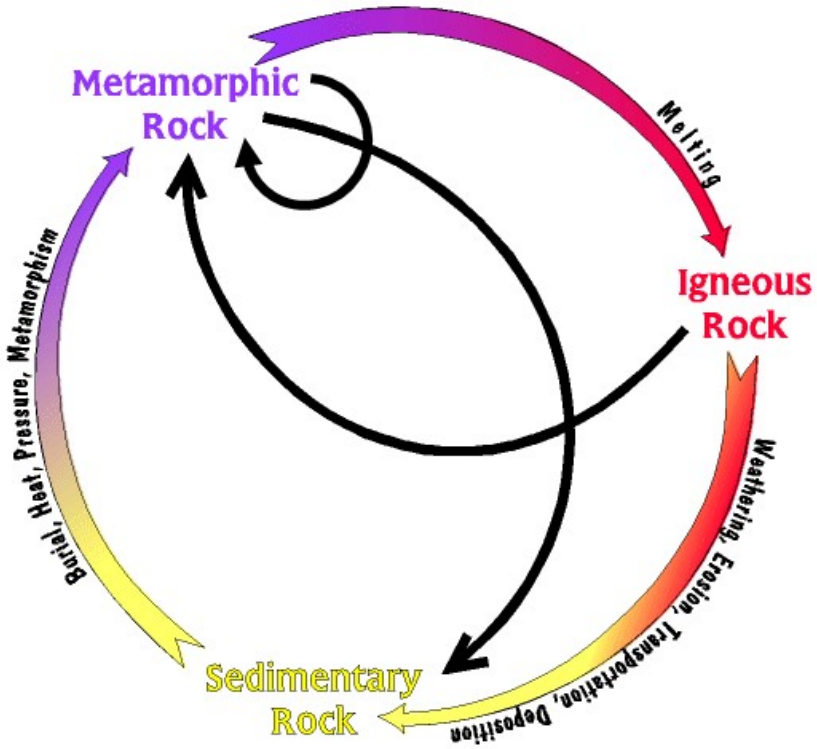
ii) They are formed when any type of rock even the other metamorphic rock changes into other types of rocks

iii) It can undergo weathering to form sedimentary rock or after melting and cooling it can form igneous rock.

iv) Most of them are foliated (they are composed of thin layers)

ROCK CYCLE

It is the relationship into which rocks tend to change from one type to another type of rock . For example the rock can change from igneous rock to sedimentary to metamorphic and go back to igneous. In the rock cycle, any type of rock can form another type of rock through different processes



Processes in the rock cycle

i) At first igneous rock may be formed due to cooling and solidification of magma or lava.

ii) Then igneous rock can be attacked by weathering agents to form sediments which can be deposited and compacted or cemented together to form a sedimentary rock.

iii) It is the igneous rock or sedimentary rock can undergo metamorphism due to the influence of pressure and heat to form metamorphic rocks.

iv) Likewise metamorphic rocks can undergo further metamorphism to form either another or more metamorphic rock like Slate which is changed to form slate.

v) Lastly only rock that is either sedimentary or metamorphic when subjected to heat under high temperature can melt and cool to form an igneous rock.

1) B. CLASSIFICATION OF ROCKS ACCORDING TO AGE

Rocks can be classified according to age. The age of each rock can be indicated on the geological time scale. Geological time scale is a chat used for dating the history of the earth including rocks. This chart attempts to describe different periods and eras which rocks can be formed. The geological time scale divides geological time extending to about 600 million years.

According to the ages rocks can be classified into;

i) Pre Cambrian era

ii) Paleozoic era - ancient life

iii) Mesozoic era – middle life

iv) Cenozoic era – recent life

The last three eras are described as primary, secondary and tertiary eras respectively. The quaternary era represents rocks aged 1-2 million years ago. Each era is divided into period/system which in turn may be divided into series of formation.

GEOLOGICAL TIME SCALE

Era	Period	Years in Million	Major Geological event in Africa	Ages
Cenozoic	Neocene Miocene Oligocene Eocene	70	Main period of volcanic activity in E.A began Main period of faulting in E.A, Alpine earth movement formed Atlas mountains and lava flow in Ethiopia.	Age of Primates
Mesozoic	Cretaceous	135	Deposition of Marine sediments in Sahara and S. Nigeria. Formation of Enugu Coal Fields.	
	Jurassic	180	Break up Pangaea into Gondwanaland and Laurasia; Marine invasion in E.A and separation of Madagascar from mainland.	
	Triassic	225	Drankesberg lava formation of upper Karroo and volcanic activity in W. Africa	

Paleozoic	Permian	230	Formation of lower Karroo beds; Formation of Coal deposits in TZ, Zimbabwe, and South Africa; Ice ages in C. Africa and S. Africa	
	Carboniferous	280	Formation of Cape fields	
	Devonian	345	Marine invasion in Libya, Sahara and West Sudan, Continental basins formed by warping.	
	Silurian	405	Continental sedimentation in Zaire, Tanzania, and S.Africa followed by folding.	
	Ordivian	425	Deposition of sediments, formation of sandstones in Guinea, Volta basin and North-West Ethiopia.	Ages of Fish
	Cambrian	500	Marine invasion of West Sahara and Kalahari basin.	Age of int verted brutes
Pr-Cambrian	Upper Middle Lower Azoic	600	Ancient mountains building and ancient glaciation in south of equator Oldest recorded rocks of 3500millions years from S. Africa.	Age of Alg

Advantages of the geological time scale

i) It shows the ages of the rocks when they were formed i.e. other rocks were formed by deposition of igneous rocks etc

ii) It helps to understand when and how various land forms were formed for example the mountains of different types like the volcanic and the Fold Mountains have been accounted for.

iii) It can help one to know and predict the occurrence of crustal development likely to take place.

iv) It helps in the recording of plant and animals by so doing this helps to understand the relationship between living things and the geological process.

Disadvantages of the geological scale

i) The method used in determining the age of rocks were largely based on estimation

ii) Crustal deformation like over folding and gaps caused by denudation.

iii) It is not certain.

VALUES / IMPORTANCE OF ROCKS

i) They help in soil formation which can be good for agricultural activities.

ii) Storing underground water. Water is stored in the water holding stratum and can come out as a spring.

iii) Some rocks are used for fuels like coal and mineral oil.

iv) Rocks are used for building. A wide range of rocks like limestone are used for building houses and for manufacturing of cement.

v) Salt extraction, various salts are obtained from rocks occurring in some places.

vi) Manufacturing of some chemicals. Some rocks have salt such as nitrate or phosphate.

vii) Mineral deposits. Mineral ores occur in veins of some rocks such as igneous rocks.

viii) Some rocks are so impressive such that they attract some tourists to come and view them.

FORCES THAT AFFECT THE STRUCTURE OF THE EARTH

What are forces ?

Forces are the processes that operate (work) within or on the earth's crust
There are different forces that affects the earth's but can be grouped into two major types :-

1.Internal forces (endogenetic/endogenic processes)
2.External forces(exogenetic /exogenic forces)

INTERNAL FORCES (ENDOGENETIC/ENDOGENIC)

These are forces that operate within (inside) the earth's crust
OR
These are forces which operates beneath (under)the earth's surface. These forces are generally referred to as TECTONIC FORCES.

A word tectonic is derived from a Greek word tecton which means builder

♦ Tectonic means building

- internal forces(tectonic forces) which are divided into

(1)Earth movement (Diastrophism)

(2)Vulcanism/ Vulcanicity/Volcanic erruptions

EARTH MOVEMENTS
These are also known as Diastrophism
Definition: is the movement of the solid parts of the earth towards each other or away from one another or side way.

Types of Earth movement.
Earth movements are classified into two (2) main groups:-
(i) Vertical or radial movements
(ii) Lateral or horizontal movements or tangential.

I) VERTICAL OR RADIAL MOVEMENTS.

⇒These are the upward and downwards movements or forces .These forces cause the uplift (epeirogenic) and the downward movement (cymatogenic).

⇒These forces which causes the vertical earth movements operate from the interior upward toward the surface or downward from the surface to the interior.

These forces cause

(a) The crustal rock to fault. When faults develop produce feature like plateaus, basin, Block Mountain (host) and escapements.
(b) Sea level changes due to the upward lift of the land or sinking of the land.

NB: This changes in the sea level is not eustatic change (not eustatic movement)but is due to vertical forces.

⇒The eustatic change is the changes of the sea level due to ice melt during ice ages

II LATERAL/HORIZONTAL MOVEMENTS

These are also referred as organic forces (movement) because they are responsible for the build of the mountains (Orogenesis means the process of mountain building)
lateral forces are of two(2) types:-

1) Compressional forces
2) Tensional forces.

Compressional forces: - Are forces which move towards each other ie move against each other.
- They tend to shorten the crust (the land) i.e. they squeeze the land.

They normally cause :-

(i) Folding of land hence fold mountains
(ii) Break the land to form faulting which may produce features like block mountains, rift valley and faults.

Tensional forces: - Are forces that tend to stretch the land i.e. the force move away from each other, they pull the land away.

–The forces cause faulting of the crust and produce features like faults, Block Mountains, rift valley.

FEATURES PRODUCED BY COMPRESSIONAL FORCES

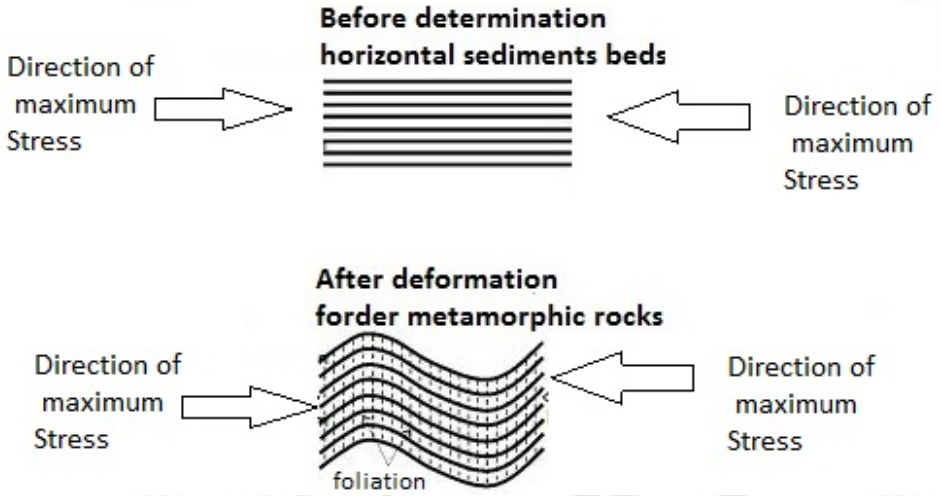
1.Fold Mountains.

Fold Mountains are formed when a piece of the crust is subjected to compressional forces. These forces tend to shorten the crust so the land end up in folding(wrinkling or crumpling)

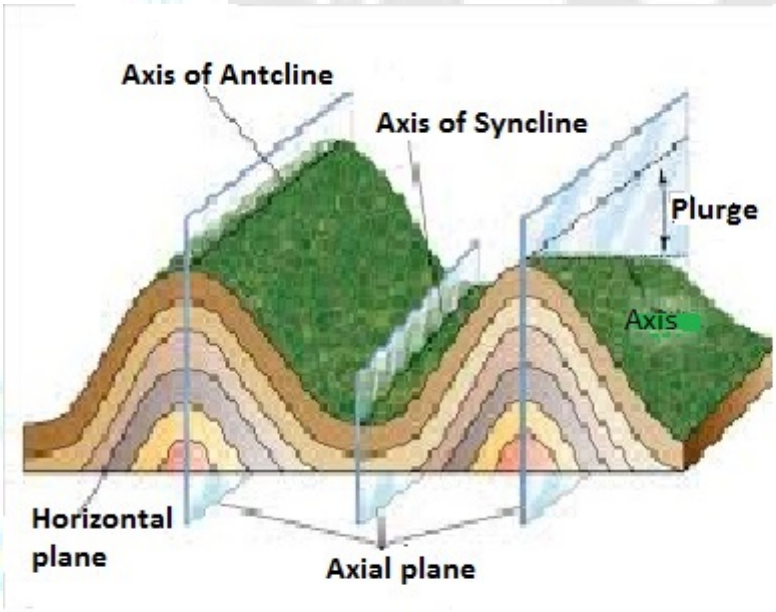
hence develop fold.

-The earth's crustal rocks produced upward fold known as anticlines (up fold) and downward folds known as synclines (down fold)

(a)Before folding (b)After folding



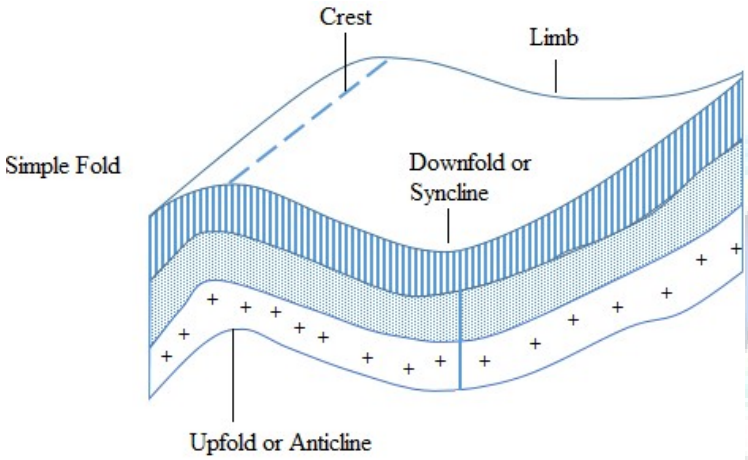
The anticline the crest part while the syncline is the trough part.



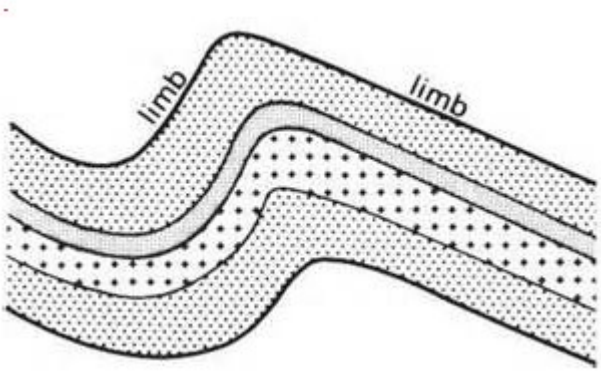
B

TYPES OF FOLDS

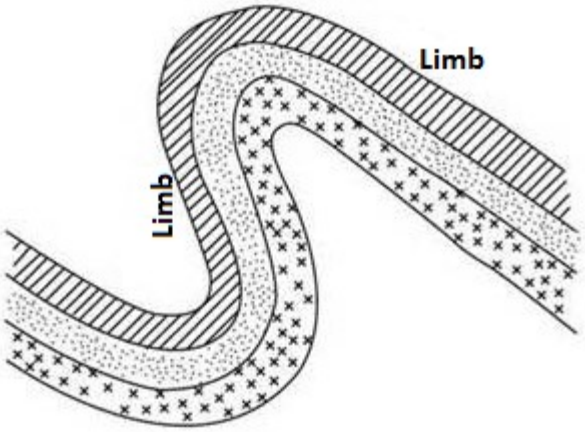
i)simple folds or symmetric fold:- the fold has equal limbs.



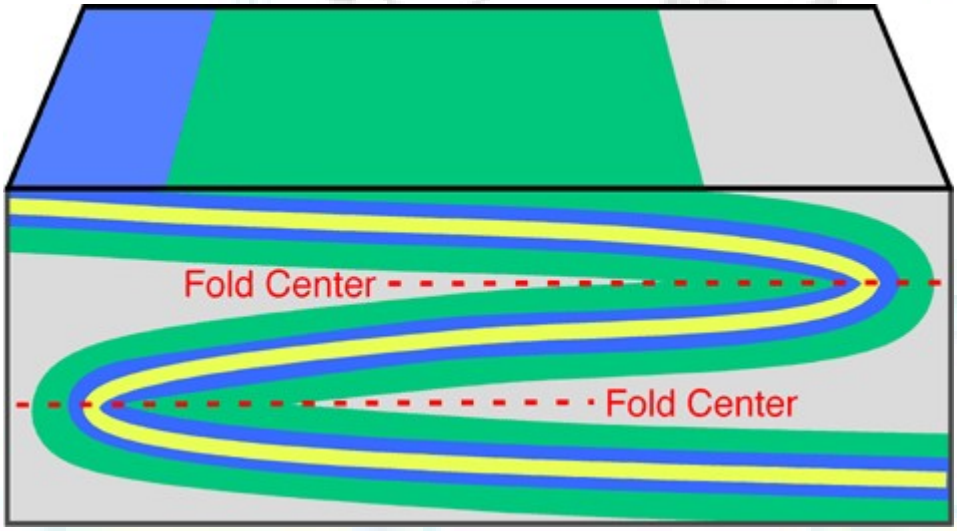
ii)Asymmetric fold :-is the fold with one limb steeper than the other.



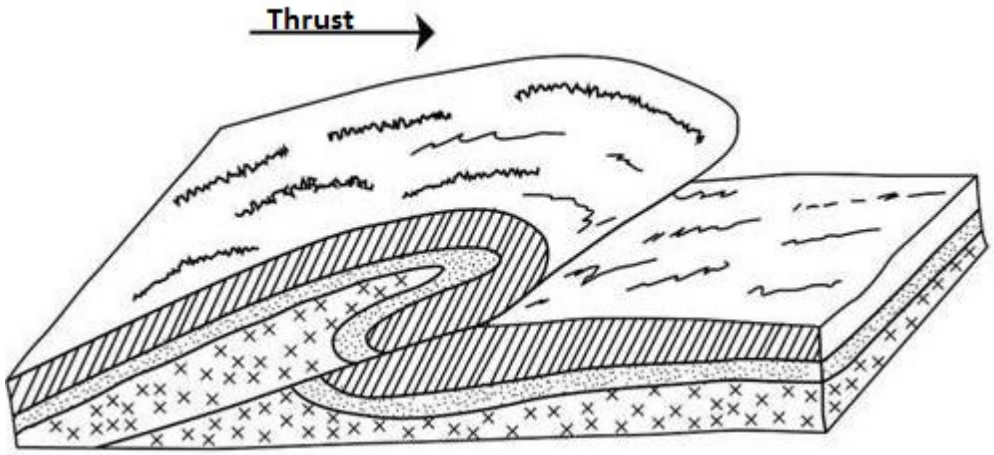
iii) Over fold:-one limb is pushed over the other.



iv) Recumbent fold:-the limb is pushed over the other completely.



v)Overthrust fold(nappe):- when temperature is very great a fracture occurs in the fold (such that one limb breaks off)and the one limb is pushed over the other limb along the line of thrust plane



Example of fold mountains are Atlas (N. Africa), Aplas(in cape ranges in s. Africa),Himalayas(in Asia),Urals(in Rocky of N.America), Andes(s. America), Appalachian(U.S.A) Great divide range in Australia.

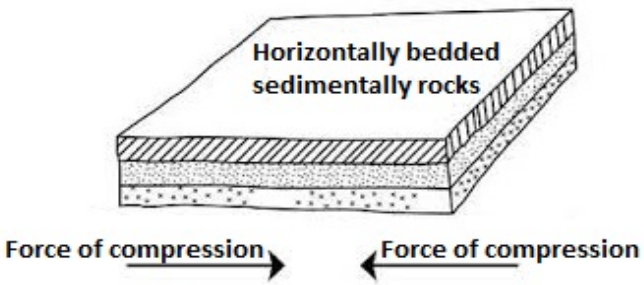
2) Rift valley (grabens).

This can be formed by both tensional and compressional forces.

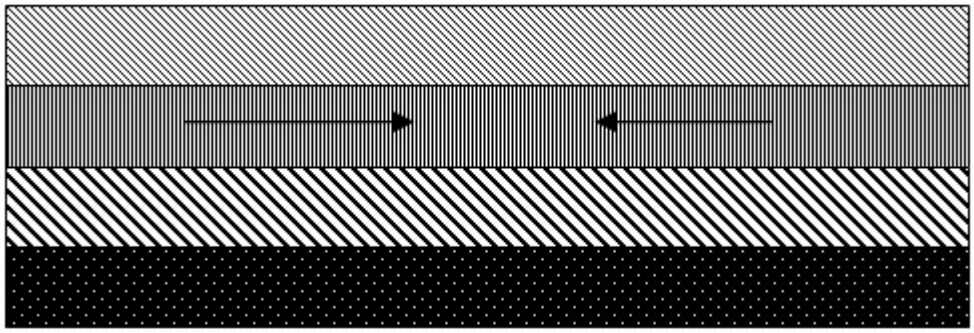
Rift valley formed by compressional forces

How it formed:-

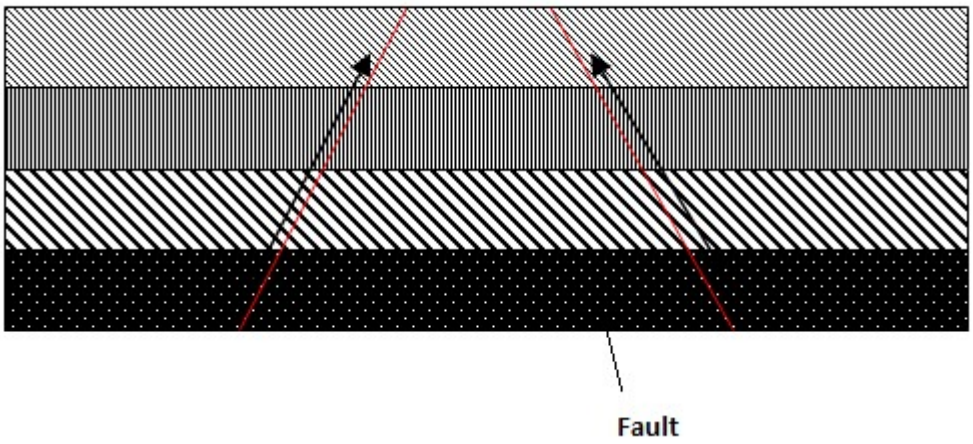
(a)layers of rocks are subjected to compressional force



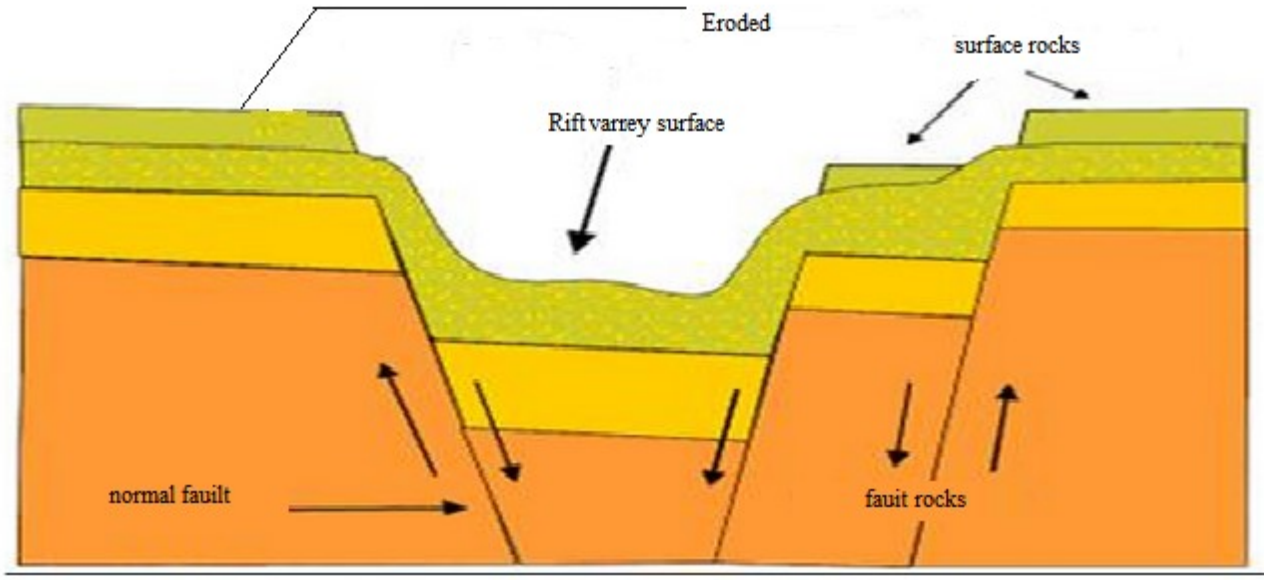
b)Fault develop



c)The side blocks(outer blocks) move (thrust)upward over the center block



(d)later the over-hanging sides of the rift valley are removed (worn & back)by erosion

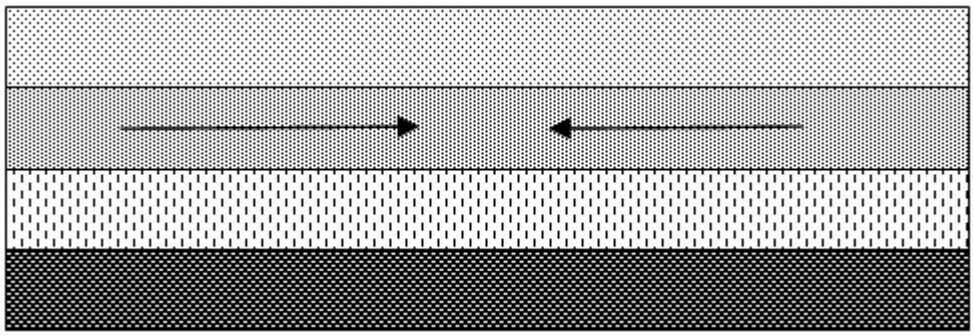


3) Block mountains (Horst) by compressional

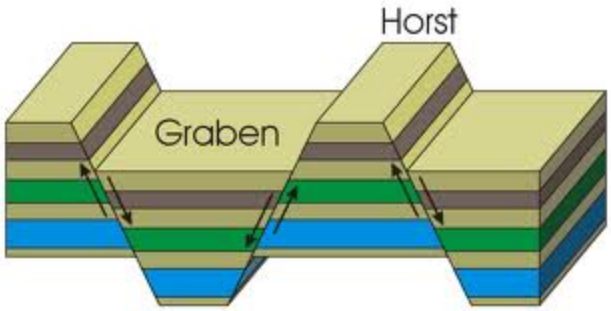
Are formed when compressional force cause the formation of series of fault, such that the central block forced up (to form a block).Examples usambara, Ruwenzori, Vosges and Black forest.

How is block mountains formed by compressional force:-

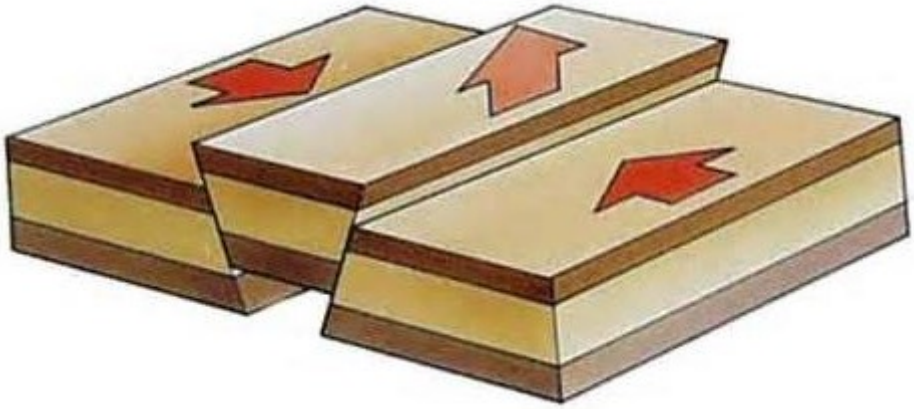
a)A piece of crustal rock is subjected to compressional force



b) A series of fault develops.



c) The side blocks (outer blocks)and central block move (thrust) upward.



NB: Where series of faults occur both block mountain and rift valleys develop.

FEATURES PRODUCED BY TENSIONAL FORCES

Tensional forces can frm due to fault there are several features which may be produced they include Rift valley, block mountains(horsts) and fault.

1)Rift valley (Grabens)

⇒ A rift valley is an elongated trough with steep sides.

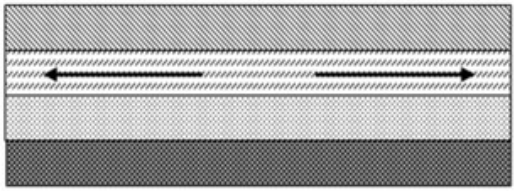
⇒A rift valley can either be formed due to tensional or compressional forces .

Formation of a rift valley by tensional forces

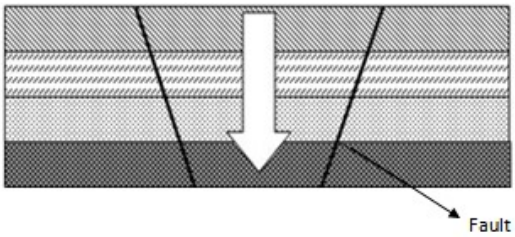
a).The line of weakness develop to form normal fault (Normal faults are formed)

b). The central block subsides(sinks)to form a rift valley

(a) Movement of tensional forces



(b) Submergence (subsidence) of the central block between the forces



3. Block mountains (horsts) by tensional

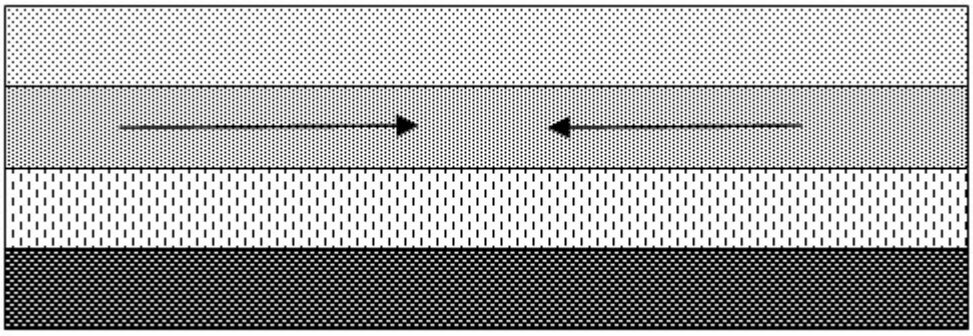
These are tables like mountains formed due to fault

They are note extensive like fold mountains ,they have almost flat surface

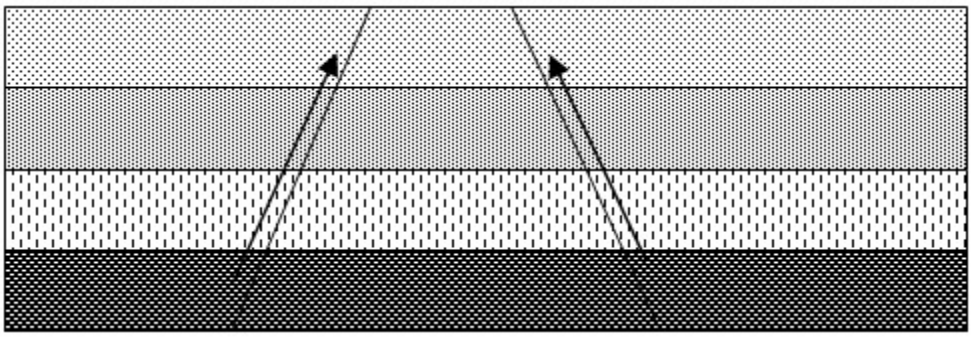
Example Vosges and Black forest mountains(Europe) -Usambara, Uluguru in -Ruwenzori and Uganda boarder-Mount Sinai in asia.

Formation of blocks(horsts)by tensional forces.

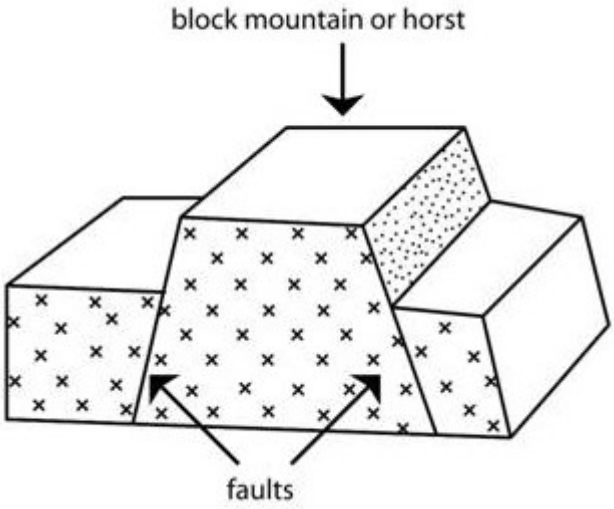
a)A piece of crust is subjected to tensional force.



b)A series of fault develo



c)some parts subside leaving some standing high as block

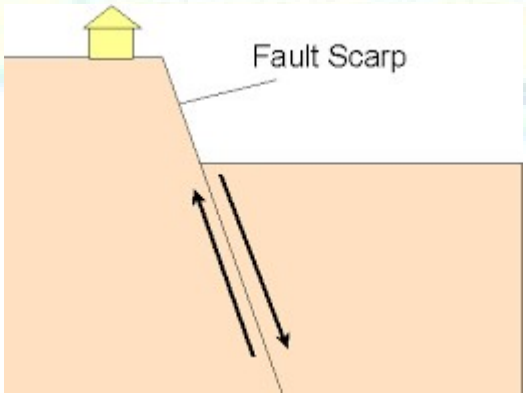


where series of fault develop both block mountains and rift valleys are formed.

Fault scarp.

This is an escapement which is a steep slope when the land falls from a higher to a lower level

-it is formed soon after displacement



Note

First -Tensional forces cause fault only

-Tensional forces cause the normal fault

Second-compressional forces cause faulting and folding
-compressional force causes the reverse fault

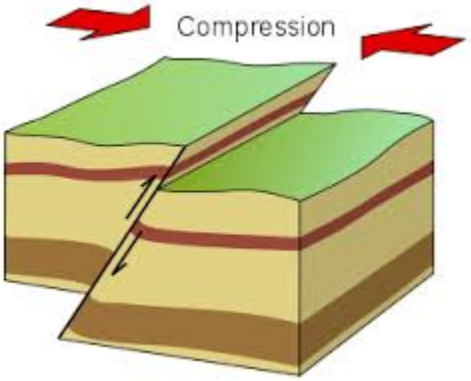
Faulting: is the process which involves the fracturing of the crust rock due to tectonic forces to form faults.

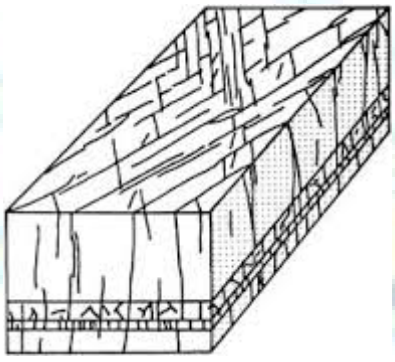
This process is associated with the movement. The rock block (i.e. rock displacement

A fault –is a fracture in the crust due to stress or strain associated with rock displacement.

Fault is cause by both tensional and compressional forces

Joint: is a crack in the rock due to stress but is not associated with rock displacement





-The paths of a fault on the surface of the earth s called the fault line (line of fault)

-some of the fault line may cover hundreds of kilometers.

FOLDING :is the wrinkling ,bending or crumpling of the earth crut producing upward folds(anticlines) and downward folds (synclines)

-folding is caused by compressional forces.

Significance of features produced by earth movements(effect of feature produced by earths movement).

-Both vertical and lateral force cause either folding and or faulting which in turn from fold and block mountains ,plateaus , rift valley basin and other feature s

These different features have the following positive (good)effects and negative(bad)effects.

Positive (good) effects

1.climatic influence mountain both fold and block receive orographic rainfall due to relief influence the windward side receive heavy rain at ll temperature are modified into cool(cold)

2.source of river : d to heavy rains and snow on mountains many rivers originate from them. Water used for irrigation.HEP generation, industrial and domestic uses.

3.source of minerals:-different minerals are obtained from fold mountain such as coal in Appalachian mountain gold in Colombia, silver in Peru.

-other mineral from block mountains example dolomite

4.attract tourism

Mountain skimming attract a lot of tourists for sporting activities (skidding) e.g. the cross Alps

-also rift valley forms a very attractive area due to presence of different lakes like Tanganyika , Natron, Manyra, Naivasha, etc ,presence of different volcanic cones and crater within it

5.slope of mountains have fertile soils for agriculture

Negative (bad) effects

1.The leeward side receive little or no rainfall hence hinder agricultural and a lot

2.sometimes folding causes some minerals to be buried deeper hence not easy to exploits

3.fault may cause some rivers to disappear I the ground

4.both mountains and rift valley hinder communication network

some mount sides are too steep or ruge, or have thick fog hidering both land and air transport

-earth movement also cause earthquakes and volcanic

EARTHQUAKE

These are sudden earth movements or vibration in the earth's crust; they are caused by.

i. When one tectonic plate sliding over/or past another plate along the line of a faulty

ii. Volcanic eruption- The movement of molten rock below or onto the earth's crust which in turn is caused by the movement of plates.

Nature of Earthquakes

•The point of which on earthquake is originate is called focus. And sometimes it is several kilometres below the surface.

•The point on the earth's surface immediately above the focus is called the Epicentre, This is where the shock waves first hit the surface. It is the shock waves which gives rise to an earthquake.

Types of shock waves

There are two types of shock waves:-

1.Body waves.

Are waves which travel through the erust and are of two types

i. Primary waves- which cause the crustal rock to move back and forth in the direction of wave movement

ii. Secondary waves- Are waves which cause the crustal rock to move side to side ie right angles to the direction of wave movement.

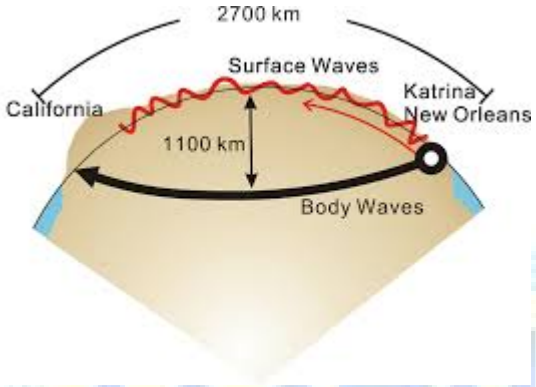
2.Surface wave.

These travel through the surface and are of two types

i.Love wave;- Which cause the surface rock to move side to side of right angles to the direction of wave movement.

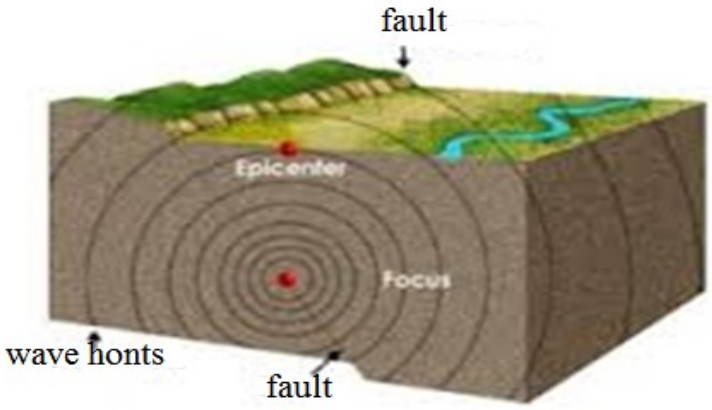
ii. Rayleigh wave;- Wave which cause the surface waves to have a circular movement very similar to that of water wave movement.

I/



II/

THE EPICENTER



DETECTING MAGNITUDE AND INTENSITY

The intensity of an earthquake is measured by an instrument called seismograph, This is the instrument which record the vibration produced by an earthquake.

The magnitude of an earthquake -refer to the total amount of energy released and the scale which gives the magnitude is called the Richter scale, The scale range from 0 to 8.9

Effects of Earthquake

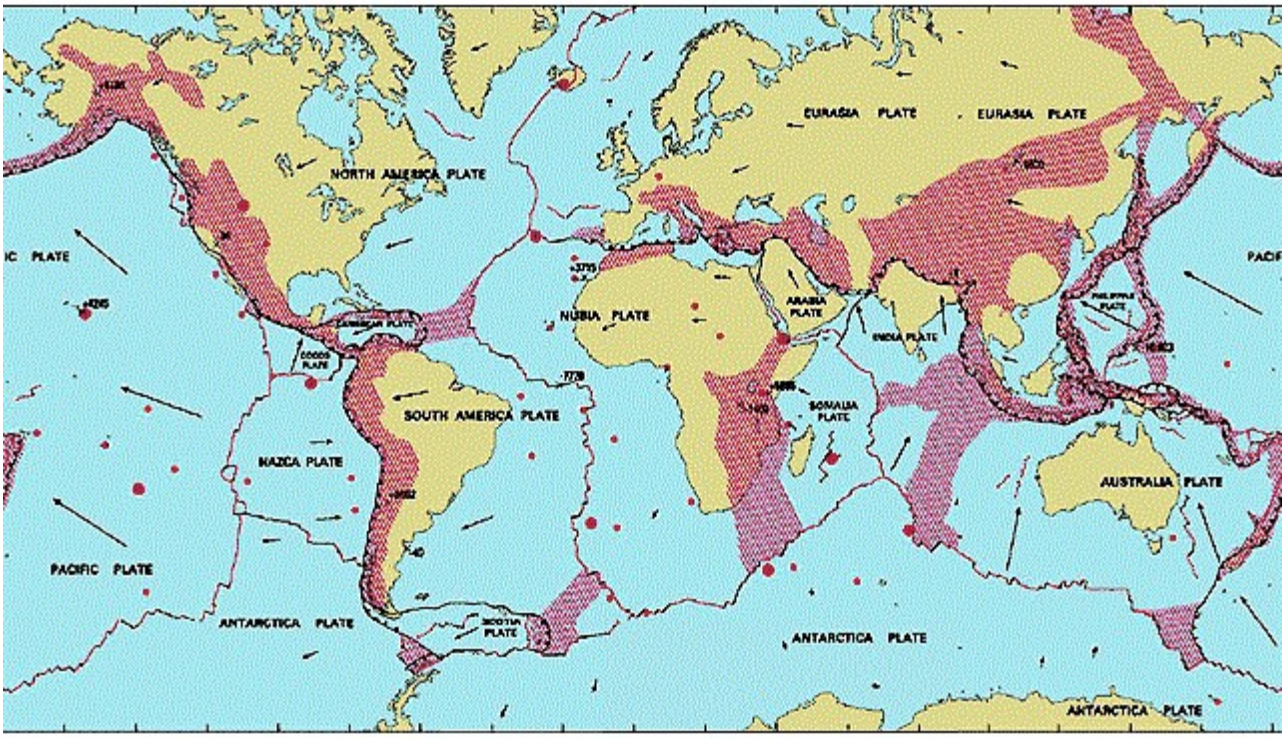
•Rise and fall of the sea floor Eg. Agadir Earthquake in Morocco in 1960

- Displacement of the earth's crust, it can happen vertically or laterally.
- Land slides and open up deep cracks in the surface rocks eg. The El Asnam earthquake in Algeria 1954 destroyed an area of radius 40km and open surface cracks up to 3m deep.
- Destruction of infrastructure and properties
- Loss of life, can lead to death's
- They can raise or lower erosion rocks eg. In Alaskan the earthquake of 189 lead to raise of some rock for about 16km.

2. VOLCANIC ERRUPTIONS/VULCANICITY/VULCANISM

The map above is a part of a recently released world map that shows, in blue, the presence of the underground water

ACTIVE VOLCANIC CENTERS WORLDWIDE



The map above is a part of a world map that shows, in red, the presence of Active volcano centers

VULCANICITY

Vulcanicity is the range of processes by which molten materials and gases are either intruded (injected) or extruded (ejected) into the earth's crust or into the earth's crust respective

- Vulcanicity is the formation of various feature due to the intrusion or extrusion of molten materials, and gases.
- The molten materials are called magma when found within the earth's crust and magma when poured on the earth's crust.

Vulcanism/Vulcanicity – Is a broader term which includes both extensive and intrusive igneous activities while volcanicity – Refers to the extensive volucancity in which the materials are forced at onto the surface.

Origin of magma

Origin of magma is within the earth's crust where it kept as a molten rock due the influence of temperature.

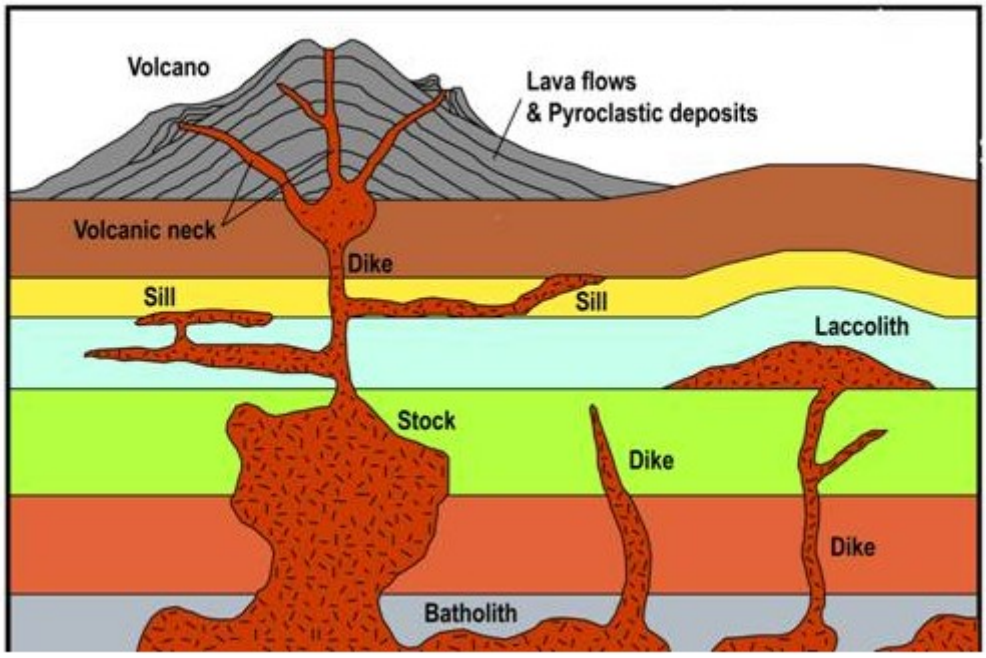
Magma can be ejected out through fissures or vent.

- Magma when passed through vent result the formation of volcanic features like volcanic cones.
- Magma when passed through fissures leads to the formation of lava plateau.

Types of vulcanicity

There are two types of vulcanicity which are classified as follows

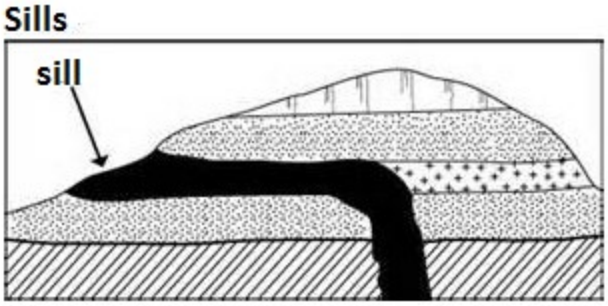
1. INTRUSIVE VOLCANIC FEATURES



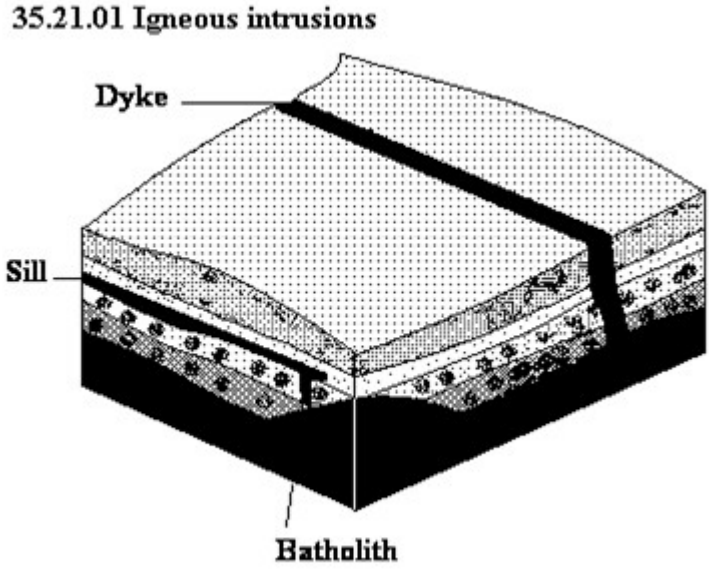
This is when magma intruded within the earth's interior. The features resulted due to the intrusive volcanic erruption is called intrusive features.

The intrusive volcanic features are the features which are found within the earth's interior. The following are intrusive volcanic features.

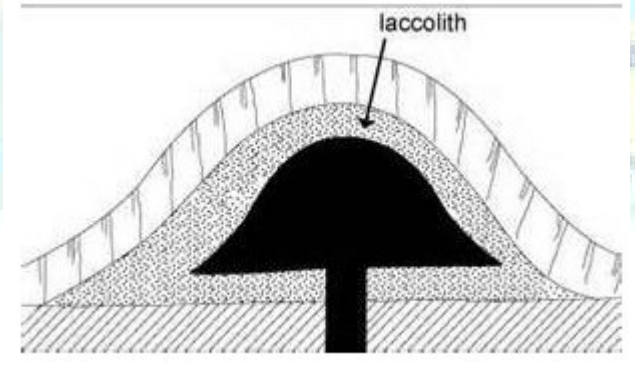
- Sill – is a rock sheet formed when the magma solidifies horizontally along the bedding plane.Eg:- Tyolo scarp in Malawi



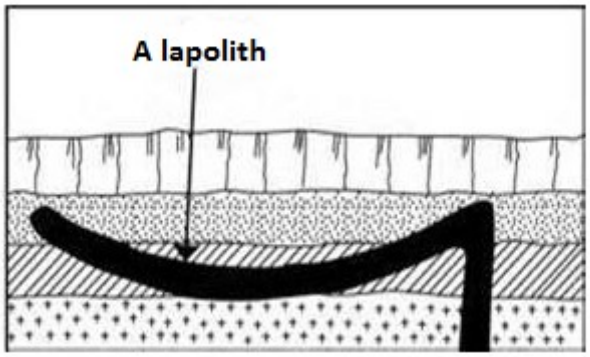
- Dyke- is a rock sheet formed when the magimasolifies vertically across the bedding planes. Eg:- Kinkon



Laccolith is the cone dome shaped mass of rock with flat formed of viscus lava. It look like a mushroom. Eg:- Laccolith found in Morafonobe in Madagases.

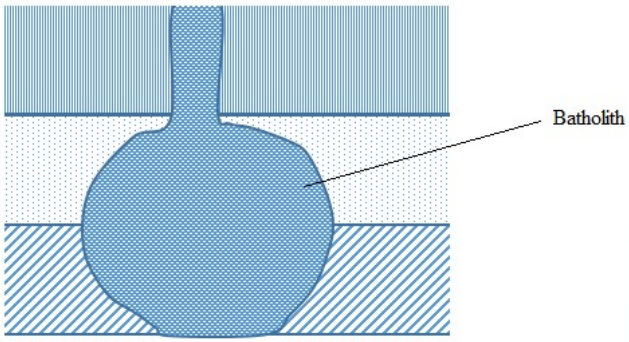


- Lapolith –is a scar shaped mass of rock formed in glosyncline. It forms a saucer – like shape may be due to the increased weight of the deposits



- Phacolith – is a leans shaped strip of igneens rock formed when the magimasolidies along the anticline or syncline. Eg: Cordon wills in U.K Phacolith

- Batholith is the large mass of solidified rock formed when magma cools plutonically at the great deptEg: at the heart of the mountain ranges. Eg:- ChiluBatholic in Gabon



2.**Extrusive volcanic features**

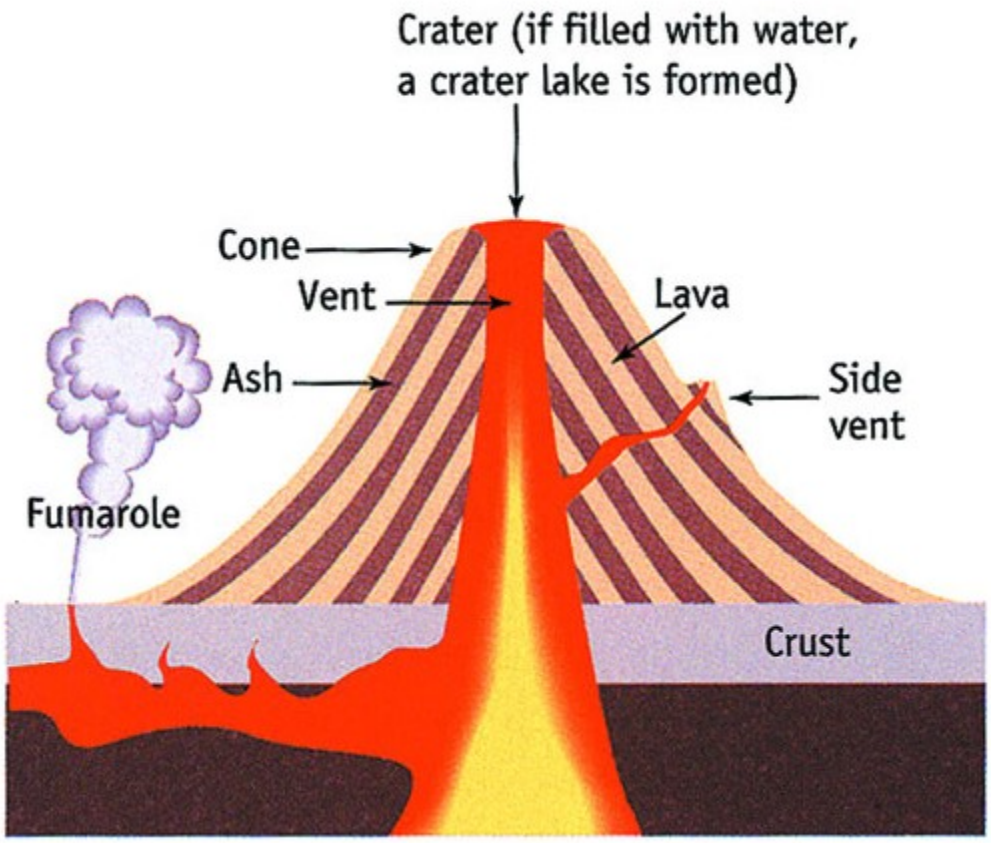
Are the features formed when the magma cools and solidifies on the earth's surface.

The extrusive volcanic features can be classified into the following

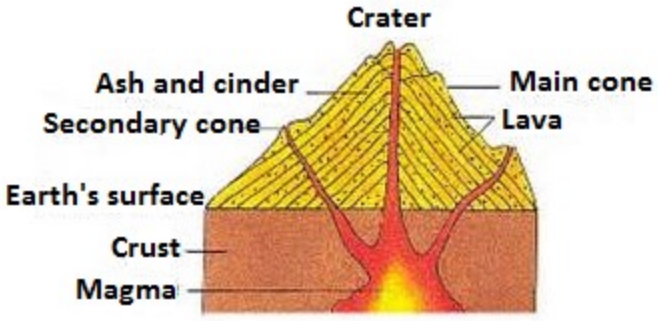
I. Central features

II. Fissure features

- The central features due to the violent eruption include



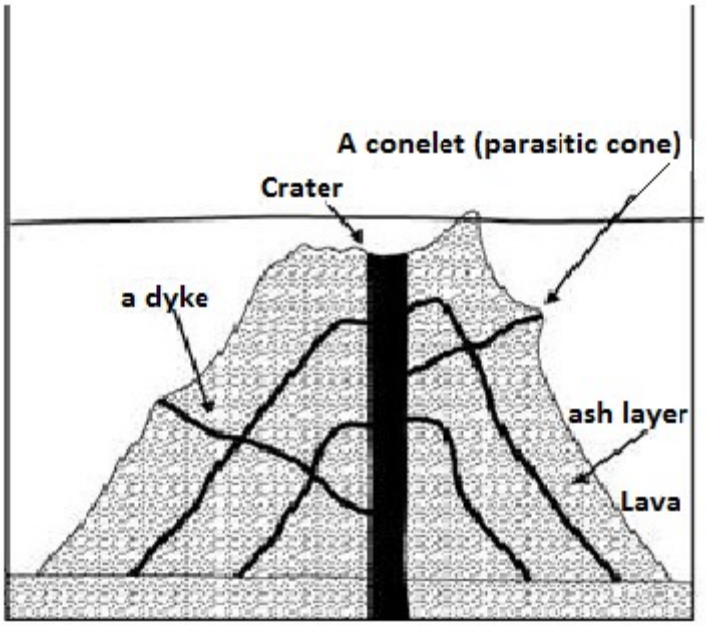
- Ash and cinder cone. Lava is blown to great heights when it is violently ejected and it breaks into small fragments which fall back to earth and build up a cone, example Busoka and Bitale in South west Uganda.



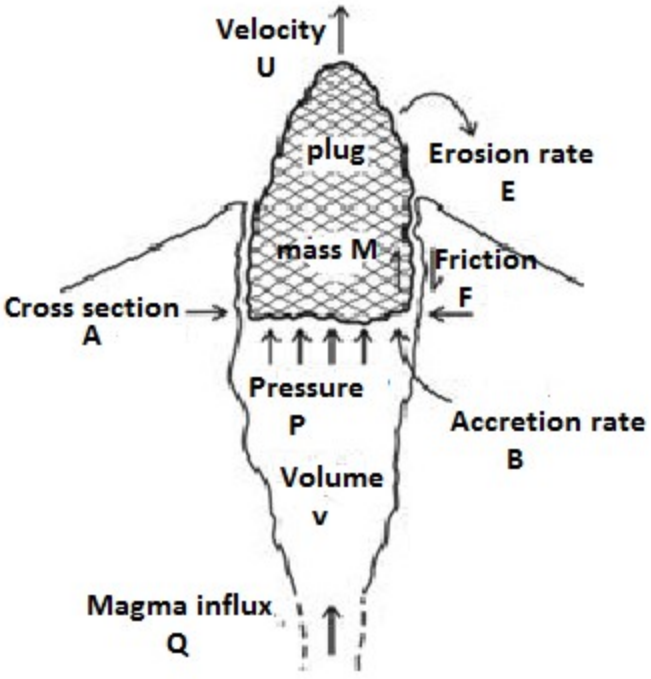
• Composite cone

This type of cone is formed of alternate layers of lava and ash. The volcano begins each eruptions with great violence forming a layer of ash. As the Eruption proceeds the violence ceases and lava pours out forming a layer on top of the ash, Lava often escapes from the sides of

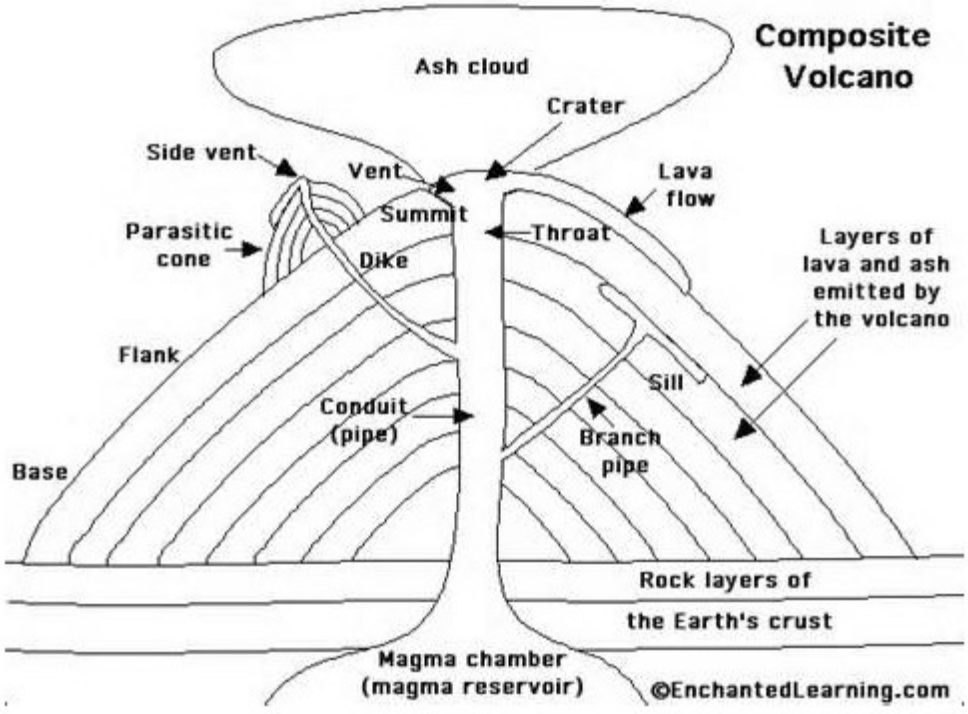
the cone where it builds up small conelets.Example mount Kilimanjaro in Tanzania and mount Cameroon



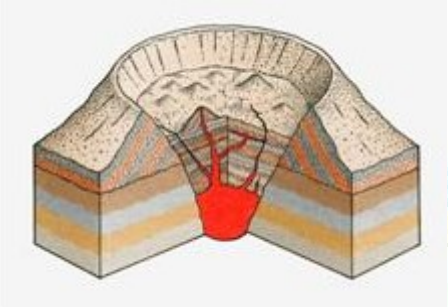
• Volcanic plug/plug dome volcano. Is a rigid cylindrical plug formed when very viscous lava is forced out of the volcano and form a plug dome that may completely block the vent. Good examples of a plug dome occurs in the Atakor volcanic area of Haggar mountains in Algeria. These are almost 300 plug domes in these region



• Crater is a depression formed on the summit of the cone after the plug dome has been blown off on the top of the cone.



• Caldera is a large crater formed when the upper part of the volcano is either bombarded away by a violent eruptions or subsides into the crust. Eg:- Alaska, Ngorongoro in Tanzania, Eboga in Cameroon

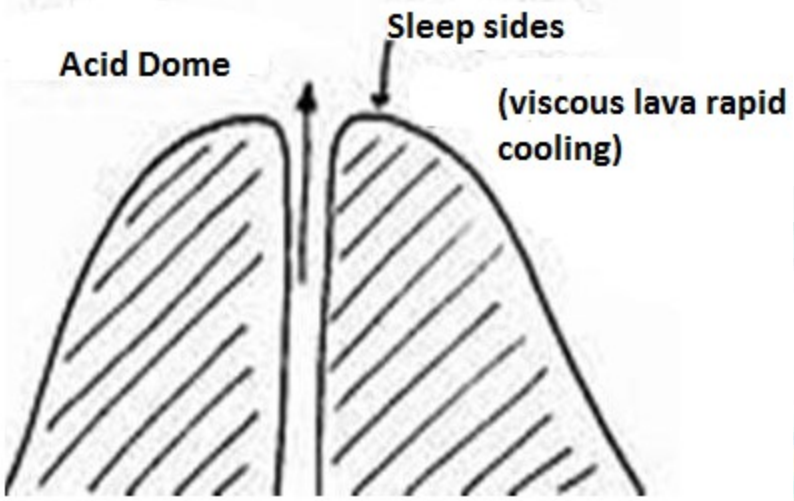


Central features due to peacefull eruptions

The lava coming onto through the vent can be acidic and hence viscous or basic and hence less viscous.

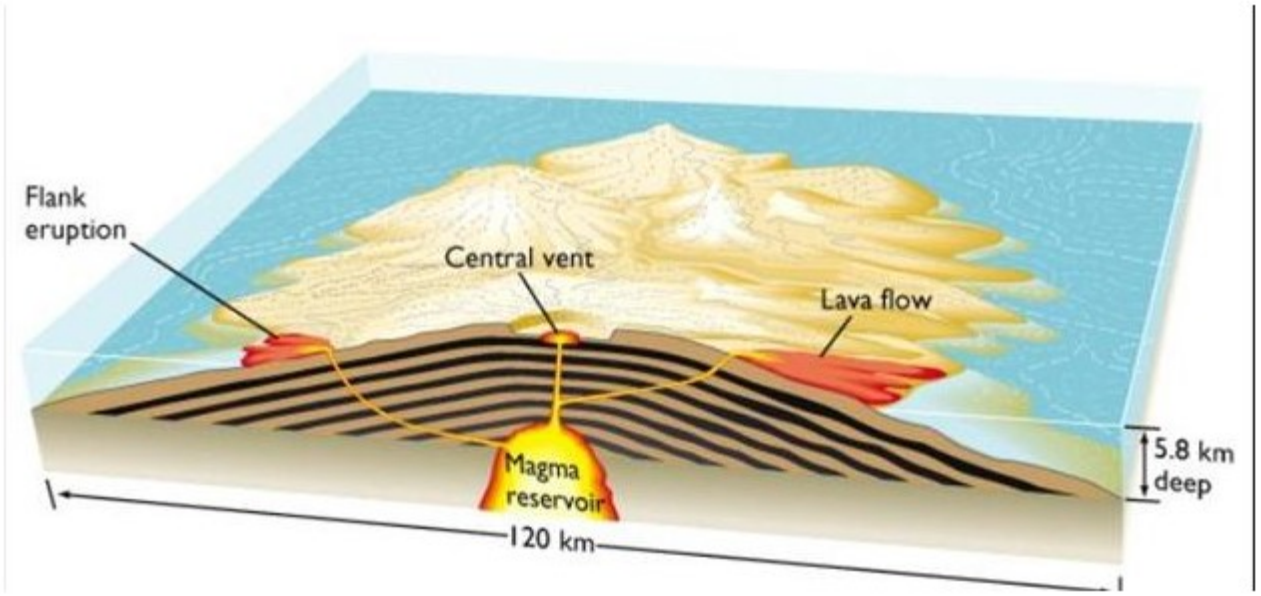
The following are the central features due to peacefull eruptions

• Acid lava cone/comulo dome volcano- is the dome shaped volcano with convex slopes formed when acidic lava solidifies around the vent Eg:-Ntumbi dome (Mbeya)



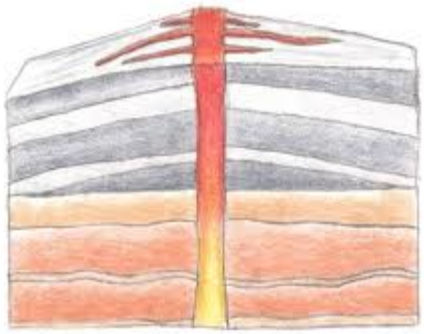
•Shield volcano:- is an extensive cone with gentle sloping sides formed when basic (basalt) is poured on the surface and spread to occupy large area.

Sometime times these features can be formed when lava comes out through a single fissure or many fissures.



- **Fissure eruption**

The fissure eruption involve lava coming out through a crack or fault. The feature formed is called lava plateau.



Minor volcanic features

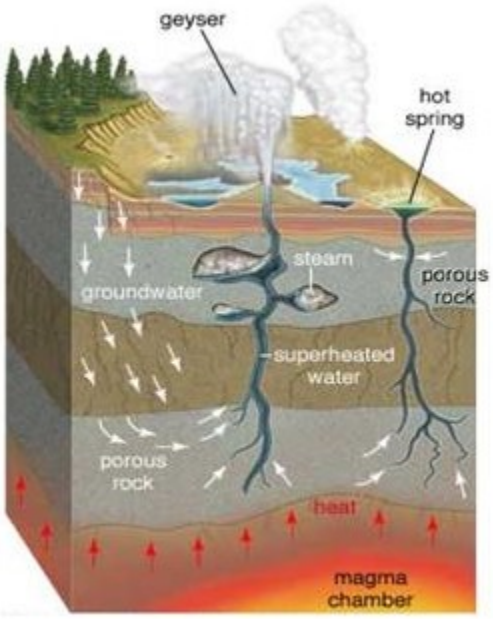
A variety of minor volcanic forms can be distinguished, usually though not necessarily associated with volcanoes approading extinction**.** They include the following

- •Mofettle – is the volcano which emit carbondioxide gas.
- •Hot spring – is the volcano which emits hot water.
- •With dissolved minerals suspension.Salfatara – is the volcano which emits sulphur gas.
- •Fumerole – is the volcan which emits steam, mud and other gas than sulphur.

OR:-

Is the outflow of superleated water from the ground which contains some mineral substances in solution or in suspension

Hot springs mostly occur in island or in some of the African countries such as Kenya and Ethiopia.



1.Geysers – are the forceful omission of hot water from the ground to high level in the atmosphere when emitted contains fine material forms mud volcano which later can lead to the formation of very fertile soild

- Types of volcanoes according to the activity

There are three types of volcanoes according to the activities. These include:-

I. Active volcano: is the volcano which erupts frequently. Eg:-OldonyoLengai in Tanzania and Mount Cameroon.

II. Dormant volcano is the one which has stopped erupting but not extinct and it is expecte to erupt.

The dormant volcano is also known as sleep volcano.

III. Extinct volcano. Is the volcano which has stopped erupting for a very lon time in history and is not expected to erupt.

It is also known as dead volcano.

INFLUENCES OF VOLCANIC ERUPTION TO MAN AND ENVIRONMENT

The following include the economic importance of volcanic eruptions to man.

i. Lava on weathering head to the formation of very fertile soil which support agriculture.

ii. Volcanicity eruption lead to the formation of mineral deposits like copper deposits of butte in USA, diamond of kimberley in South Africa.

iii. Volcanic eruption provide geothermal power for electric generation

iv. Some hot hot springs utilized for heating homes in glaciated region

v. Volcanic features attract tourist

vi. Volcanic cones are the source of rivers.

DISTRIBUTION OF VOLCANIC ACTIVITIES IN THE WORLD

Distribution of volcanic activities corresponds to the earthquake belts. They are common along the zones of convergence like in the circum pacific ring and Alpine – Himalayan belt, zones of divergence like Atlantic ridge belt and along the fealty belts like the African rift valley.

EARTHQUAKE

These are sudden movements or vibration in the earth's crust caused by

i) One tectonic plate sliding over another along a line of a features

ii) Volcanic eruption – The movement of molten rocks below or on to the earth's crust.

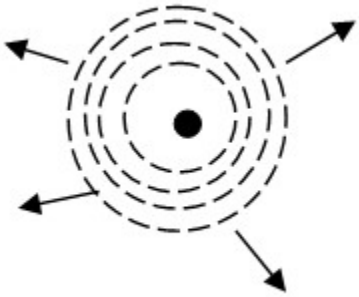
iii) Mass movements like landslides and rock falls. Can causes earthquake but in local scale.

iv) Falling of large objects from the atmosphere such as meteorites lead to the shaking of the earth's crust.

v) Man's activities or influence, such as quarrying rocks using explosive like dynamite, transept vellsel'se.g trains and heavy trucks

THE NATURE OF EARTHQUAKE

FOCUS: Is the point at which an earthquake originates and sometimes it is several kilometer below the surface



EPICENTRE: Is the point as the earth's surface immediately above the focus. This is where the shock waves first lit the surface. It is the shock waves which give rise to an earthquake.

There are two types of shock waves.

i) Body waves

ii) Surface waves

i) ***Body waves*** – this travel through the crust and is of two types.

a) Primary waves – Which cause the crustal rock to more back and forth in the direction of wave movement.

b) Secondary waves – Which cause the crustal rock to more from side to side that is at right angles to the direction of waves movement.

ii) ***Surface waves*** – These travel through the surface rocks and of two types

a) Love (L) waves which cause the surface rocks to more from side to side , at right angles to the direction of wave movements

b) Rayleigh (R) waves which cause the surface rocks to have a vertical circular movement very similar to that of water in a sea were. The vibrations caused by the surface wave produce

most of the damage that occurs in an earthquake. The violent shaking of the surface rocks often cause great damage to buildings and sometimes considerable loss of life.

HOW TO DETECT AN EARTHQUAKE

The intensity of an earthquake is measured by an instrument called a **seismograph.** This instrument records the vibrations produced by an earthquake. The magnitude of an earthquake refers to the total amount of energy released and the scale which gives the magnitude s called the **Richter scale.** This scale ranges from O to 8.9. A magnitude of 2.0 is ten times greater than that of 1.0 and one of 5.0 is 10,000 times greater than one of magnitude 1.0.

The intensity of an earthquake – refers to the effect produced by the earthquake of course these varies from place to place so while the intensity of a specific earthquake varies its magnitude does not vary. It is important not to confuse magnitude with intensity.

EFFECTS OF EARTHQUAKES

1) Development of rift valley or basins

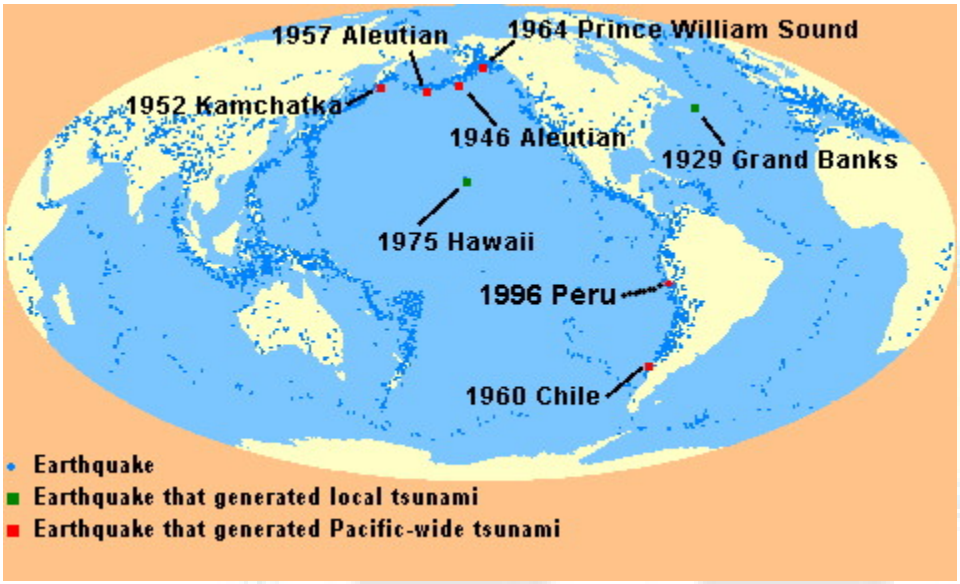
2) Landslides can occur and these in turn can lead to land degradation

3) Collapse of houses and other structures as well as loss of life. E.g in 1906 the earthquake killed a number of 700 people in San – Transits

4) Fire outbreak in cities, San – Transits damage due to fire outbreak.

5) Tsunamis (waves in the ocean due to earthquake)

POSSIBLE AREAS WHERE EARTHQUAKE IS LIKELY TO OCCUR ON WORLD MAP.



EXTERNAL FORCES THAT AFFECT THE EARTH

External forces are the forces that operate on the surface of the Earth. The external forces leads to the modifications and formations of various land forms or land scape.

These external forces that operate on the earth′s surface include:-

WEATHERING

Is the disintegration of rock exposed on the earth's surface by the agents of weather particularly temperature and pressure release.

TYPES OF WEATHERING

There are three types of weathering. These are

I.Physical or mechanical weathering

Is the disintegration of rocks into smaller particles by mechanical means but without involving changes in temperature.

Mechanical weathering include the following processes

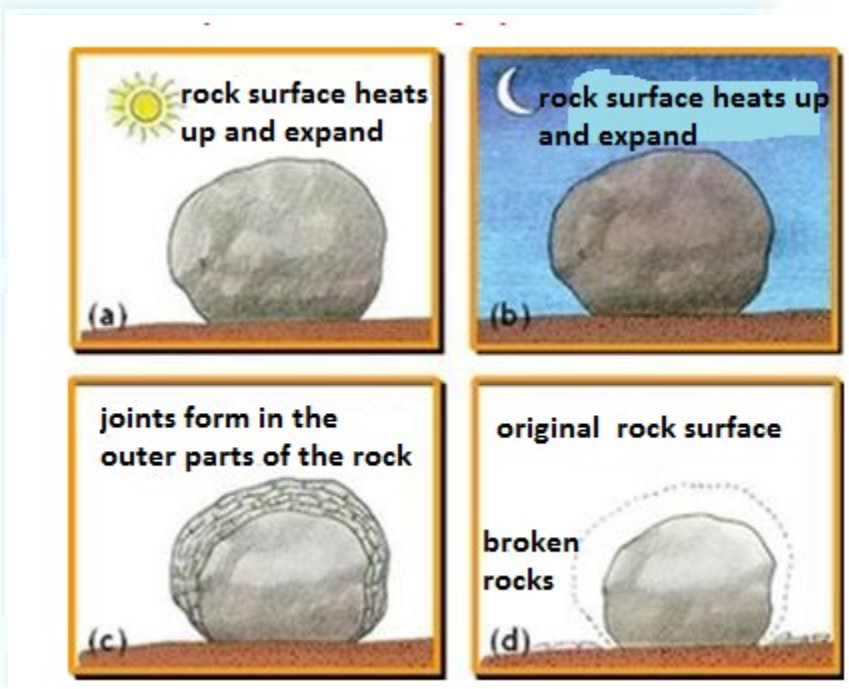
a)Insulation thermal expansion weathering - is the weathering which brought by temperature change.

During the day time the rocks expands and contract during the night leading to the creaking and breaking of the rock into small particles.

b) Exfoliation is the peeling off of outer layer of the rock like onion.

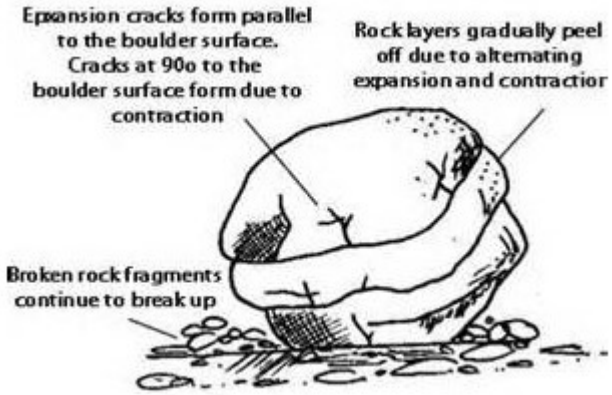
This is due to the fact that when the temperature is high the outer layer of rock warm faster than the inner layers and cool more rapidly. This cause the outer thickness to peel and form the smooth round hill called Exfociationdumes.

The rock particles deposited around the bottom of the dome is called Talus or scree



c) Granular disintegration

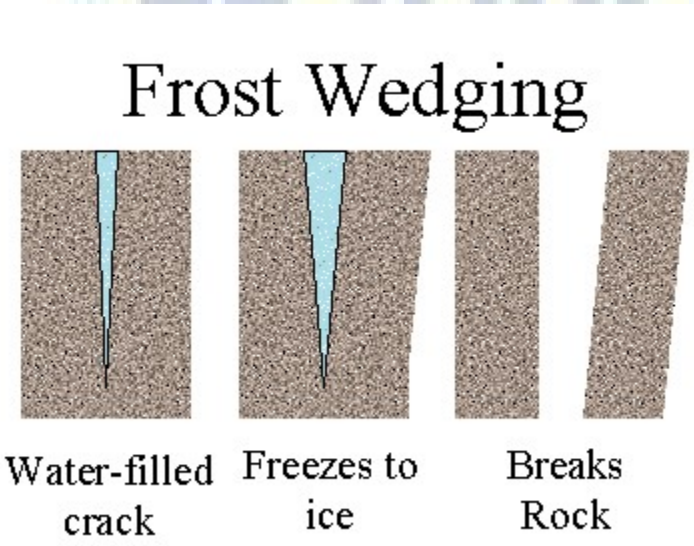
Is the breaking up of the rock which is consist of different minerals. These mineral contracts and expand separately through temperature changes.



d) Frost action

This is common in temperature areas well as highlands and deserts.

When the temperature falls water in the cracks of the rock freezes. On free zing it expands leading to the widdening of the cracks. As the freezing repeating rocks breaks into fraguments or particles.



e) Pressure release

This take place where denudation has taken place to a great extent. As the materials are removed in certain area the pressure is released due to the reduction in weight. The rocks become weak and easlydisentegrated by other process like exfoliation.

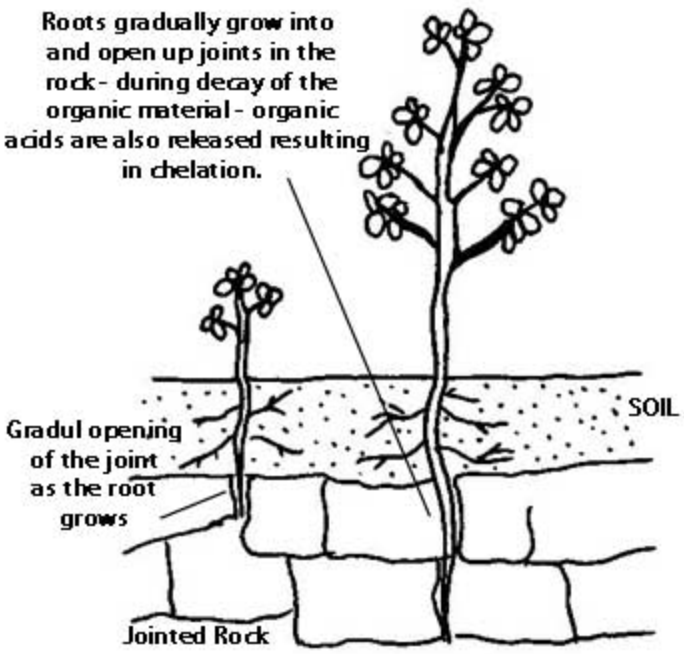
f) Salt crystallization

This take place when salt crystals deposited in the rock cracks or pores during evaporation. As the deposition goes on the crystals become large and exert stress upon the rock cause it to disintegrate.

This process is common in desert where there is capillary action or along the coast where there is constant supply of salt.

Biological weathering

Is the weathering where by the disintegaration of rock into small particles is influenced by plants and animals



Chemical weathering

Is the process which involves the decomposition or decay of the rock by chemical means.

FACTORS EFFECTING THE RATE OF WEATHERING

1.Nature of rock. The nature of rock include

- •Mineral composition
- •Plane of weakness
- •Cementation
- •colour

2.Climate. This is concerned with rainfall distribution. Areas with heavy rainfall the rate of weathering is h3.Plants and animals.Plant root penetration result disintegration of rocks. Animals borrowings and decaying of dead animal result rock decomposion.

4.Reliefs steepness of the land also determines the rate of weathering is high compared to low lands where deposition is common.

Chemical weathering processes

a) Oxidation. Is the oxidation of rock minerals particular iron when combine with oxygen in the presence of water.

b) Carbonation. Is the decomposition on of rocks particularly limestone with carbondioxide gas.

c) Solution Some rocks such as salt rocks are soluble in water and simply dissolve leading to the disappear once of the rocks.

d) Hydration is the process in which certain minerals absorb water and well causing internal stress and fructuring of rocks.

e) Hydrolysis. Is the reaction between water and mineral elements that is between hydrogen ion (H^+) and the ions of minerals. It is common in felspar minerals which compensation potash soda or lime and silica

Effects of Weathering

1.Formation of various
2.features Soil formatioEg:-Clints and Grikes in limestone region
3.It influences the rate of erosion.
4.It provide building material Eg:- Cement, blocks
5.It attract tourist since weathering result the formation of various features

MASS WASTING.

Mass wasting is the down slope movement of weathered rock materials due to the influence of gravity. The movement is not influenced or effected by transport agents such as wind or running water.

- When the movement of this nature occurs after the materials have been lubricated by rainwater or water from melting snow, it is referred to as mass movement. This force involved in mass wasting is that of gravity.

- In mass wasting, water acts as a lubricant and helps the materials to overcome the initial resistance where by the initial resistance is the friction between the materials and the underlying rock mass.

The movement can either be slow or sudden and rapid. The type (nature).

TYPES OF MASS WASTING

There are two types of mass wasting

I. Slow wass wasting

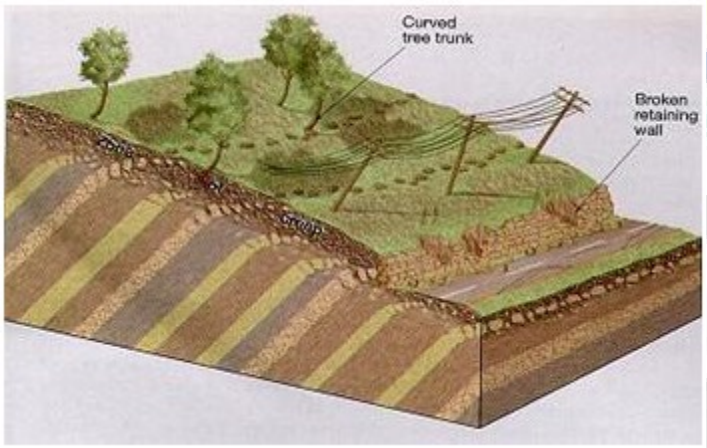
II. Rapid mass wasting

Slow mass wasting

This is the slow but stendy movement of rock debt is and soil down the stop.

This form involve the following processes.

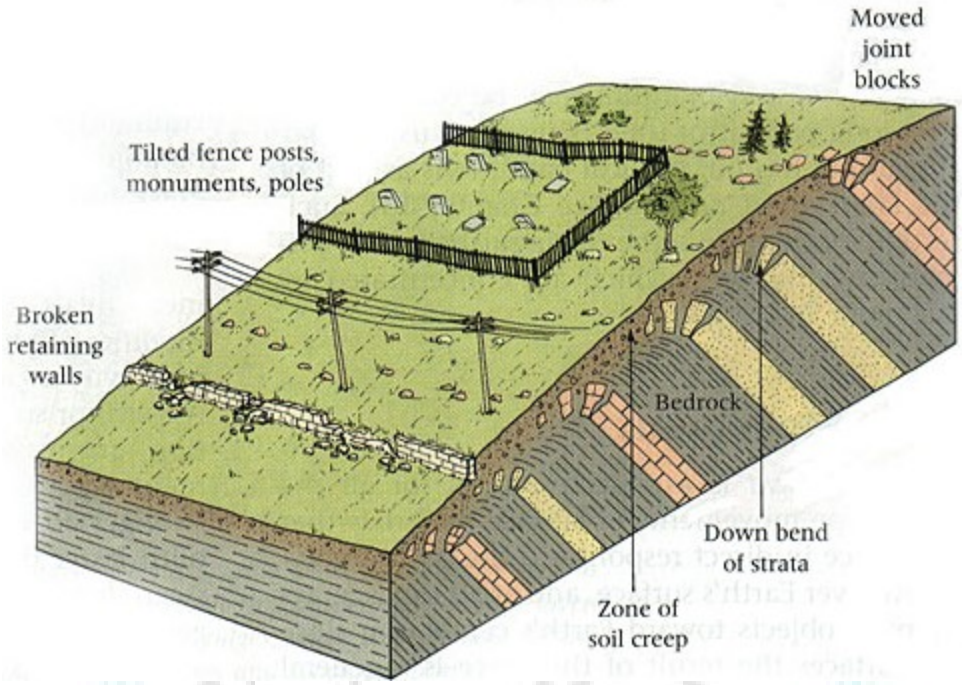
a) Soil creep. This is the steady movement involving soil and other fine materials along a very gentle slope.



Evidence that soil creep is taking place are

- Fence posts and telephones poles
- Stone walls
- Accumulation of soil at the base of slope.

b) Talus creep – is the mass of broken rock particles rock pieces that accumulated at the base of a rock mass such as a cliff.

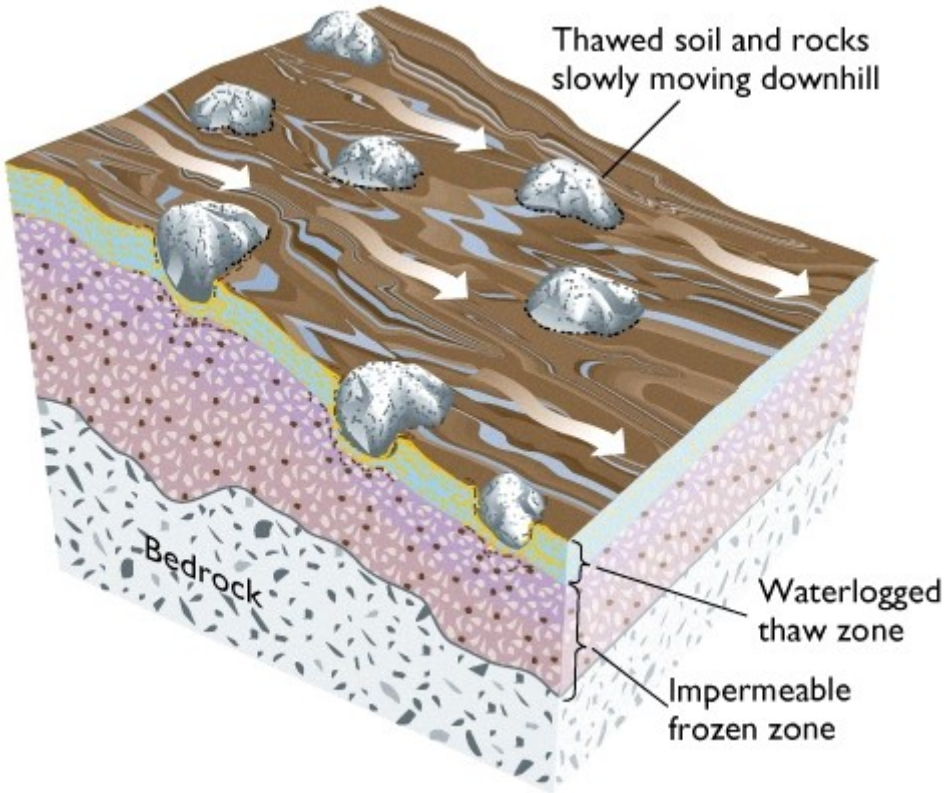


c) Rock creep

Individual rock blocks moves down the slope slowly especially where the rock block lying over clay materials.

d) Solifluction

This is the movement of a mixture of soil, gravels and weathered rock down a moderate slope and the materials aare saturated with water.



Rapid mass wasting

This is the movement of materials in sudden and very fast way.

It involves processes like flowing, sloding or falling. Rapid mass wasting include the following.

a)Earth flow.

Materials on the earth's surface get so saturated with water that they begin to flow down the will under the influence of gravity. This occurs in hummid region.

b)Mudflow.

This is a flow of large quantities of mud down the slopes especial where the soil is bare

c)Landslide

This is a rapid movement of a large mass of earth and rocks down a hill or mountain inside.

Forms of landslide.

i. Slump

This is the shearing or tearing away of rock materials. Usually occurs along a concave plance. It involve the large mass of soil, rock and other loose materials and vegetation.

ii.Debris slide.

This involve the movement of a whole mass of accumulated rock debris and other loose materials that produced through wealthering down a hill slope.

iii. Rock slide

The movement of rock mass sits on a fault or a weakened bedding plane on relative gentle slope.

iv. Rock falls

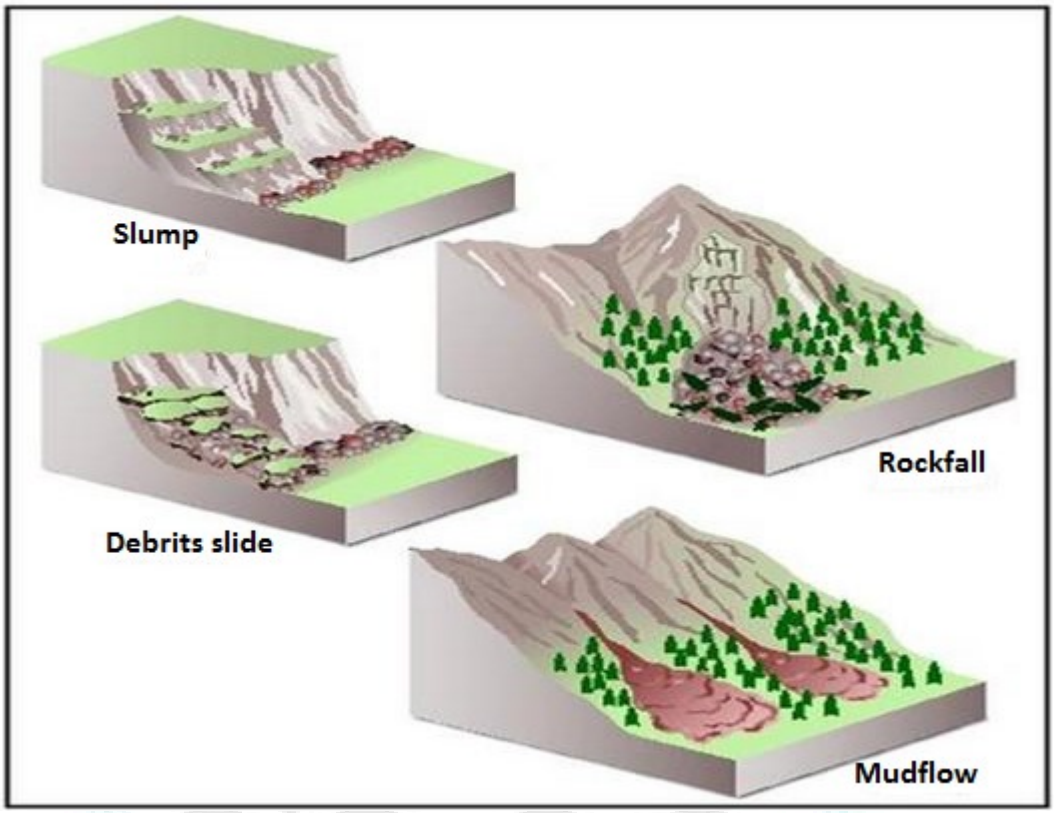
This is the rapid falling of individual rock brocks or boulders fleely form a steep slope.

v. Debris fall

This is the free falling of loose materials of various size from the top of a very sleep slope and cliff to the bottom of the slopes due to growty.

vi. Avalanches

This is the sudden sliding and falling of a large mass of snow Ice and loose rock materials down a montariside.



Factors influencing mass wasting

a) The nature and weight of the materials rapid mass wasting will occur 18 the weathered rock materials are very deep

b) Amount of water

If materials are more saturated with water are more likely to move than they are dry

c) The angle of slope

The steeper the slope, the faster the movement of materials

d) Climate

Mass wasting can be determined by the amount and nature of rainfall of an area receives. Areas receiving heavy experiences massive mass wasting.

e) Vegetation

Plant cover hold materials hence reduce amount of movement, hence bare surface experience active mass wasting.

f) Human activities

Eg. Cultivation Construction grazing animals mining and clearing of vegetation render the surface bare and unprotected, shake the land cause materials to move.

Effects of mass wasting on the environment

1) Soil erosion. As materials move down the slope especially where rapid movement is involved, they remove some soil to other area.

2) Formation of new landforms.The process can lead to the formation of scars and depression.

3) Formation of lakes.Materials of land slides can be accumulated and form a barrier to the flowing river hence eventually form lake due to accumulation of water blocked.

4) Formation of fertile soil.The material from fertile land accumulated at destination form fertile soil. At the place.

5) Demage of property.Various forms of mass wasting lead to the damage of propartly like telephone lines and power transmission

6) Loss of life.

□Μυδφλοωσ, σλυμπσ, ροχκ φαλλσ ανδ αωαλανχηεσ χαν χαυσε γρεατ λοσσ οφ πεοπλε□ σ.

iii. (a) **EROSION AND DEPOSITION BY RUNNING WATER.**

Erosion – Refers to the breaking and wearing a way of exposed rocks by moving water (rives and waves), the wind and moving ice and wind. Water, wind and ice are called effects of erosion.

Deposition – It is the process which sediment, soil, rocks is accumulated to a certain place.

Running water - The process associated with running water fluvial process. Running water can take form of over land flow (surface runoff) or channel them (river). In the surface runoff water flows on the surface forming uniform cover while in channel flow (river) water flows in the specific channels.

i. **Over land flow (surface Runoff)**

Is more effective on bio and upper slopes and undergo the following types of erosion

(a) Sheet erosion

- Remove the uniform cover of the soil

- It is common in gentle sloping areas, which are bare of vegetation.

(b) Rill erosion

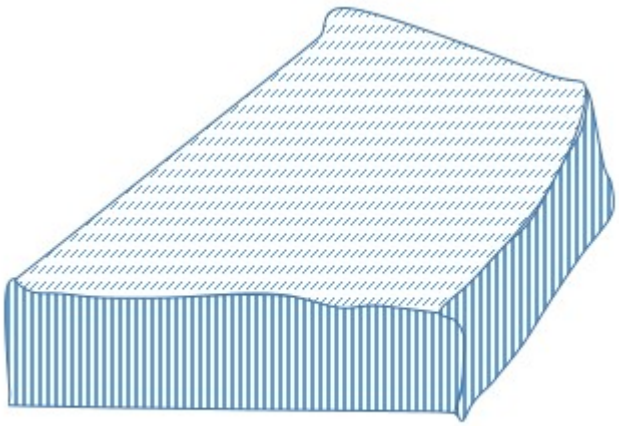
- Produces small groves on the surface called mills and it takes place after sheet erosion has produced a mumble of tiny streamlets.

(c) Gully erosion

- Take place leading to the production of deep trough into land, this is more concentrated, if vell erosion has not been checked by planting trees.

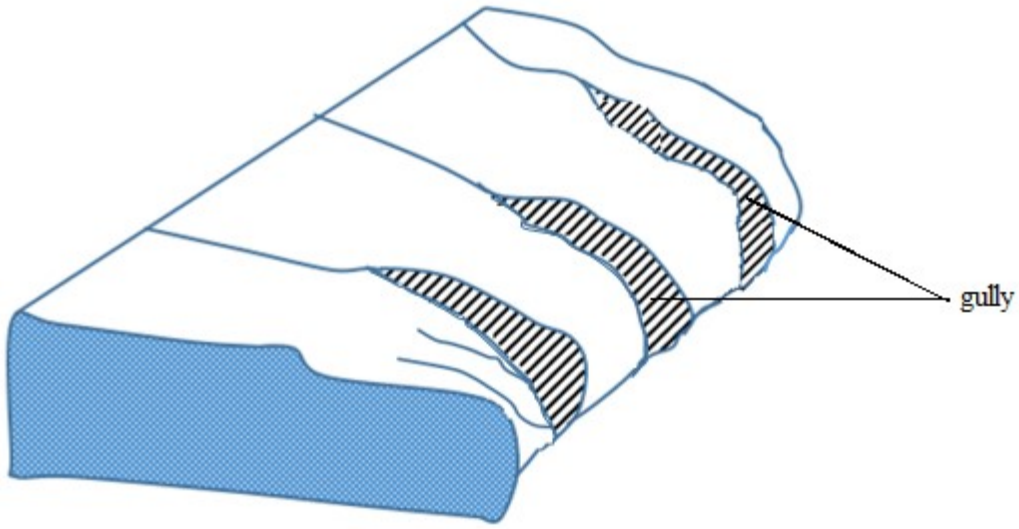
Surface Run –off and its features Produced

i. ***Rills*** – These are small channels produced on the surface due to rill erosion



ii. Gullies

Are deep steep – Sided through produced by gully erosion, they are formed when rills are depended and widened by more concentrated erosion.

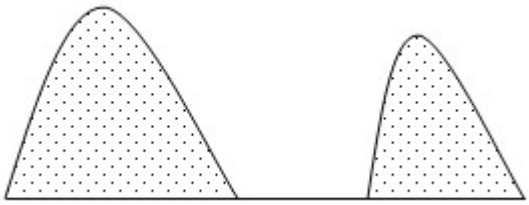


iii. Bad lands

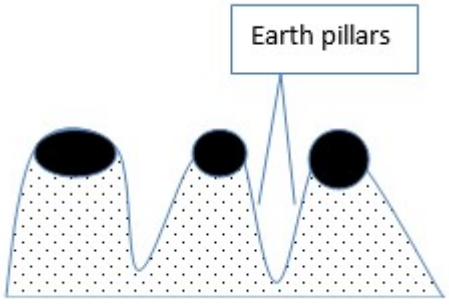
This is the landscape which has been proken up by many gullies and channels due to erosion.

iv. Inserbeng

Round topped hills produced as remounts of hard rock after All other pants have been eroded.



v. Earth pillars are columnar (tower like) structures standing vertically on the surface due to the removal or erosion of clay and boulders on soft rocks.



RIVER AND RIVER SYSTEM

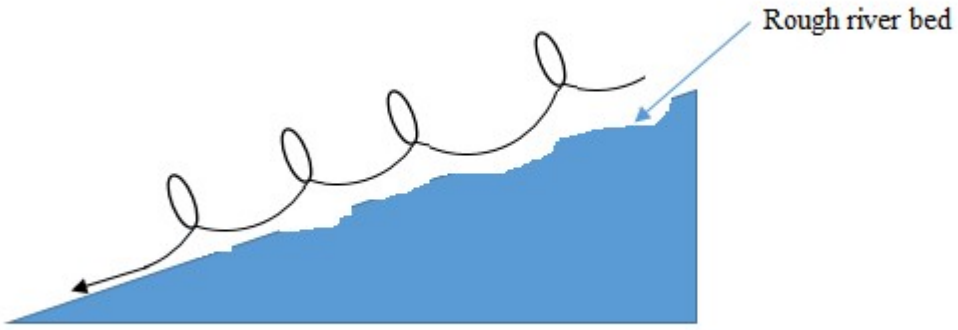
Rivers are the most widespread agent of denudation. They transport and deposited material for very great distance, after hundreds and sometimes thousands of kilometers.

The amount of erosion, transportation and deposition that a river achieves depends on the flow of water through its channel and this flow is determined by several factors.

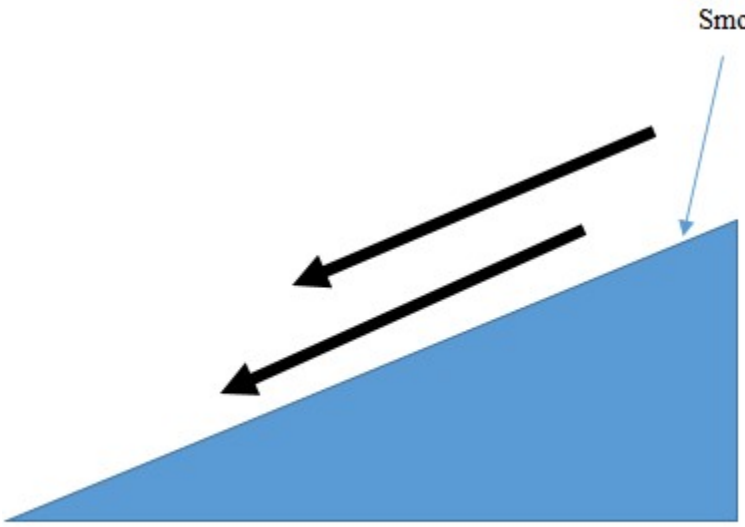
The energy which makes the flow possible, is produced by gravity, and the amount of energy that a river has is related to the gradient of its bed, to its volume and the nature of its flow and to the shape of its channel usually, the energy increases when the gradient and the volume increases.

Water in river flows in two ways

1. Laminar flow (in layers parallel to the bed)
2. Turbulent flow (in a circular – like mariner)



(a) Turbulent flow



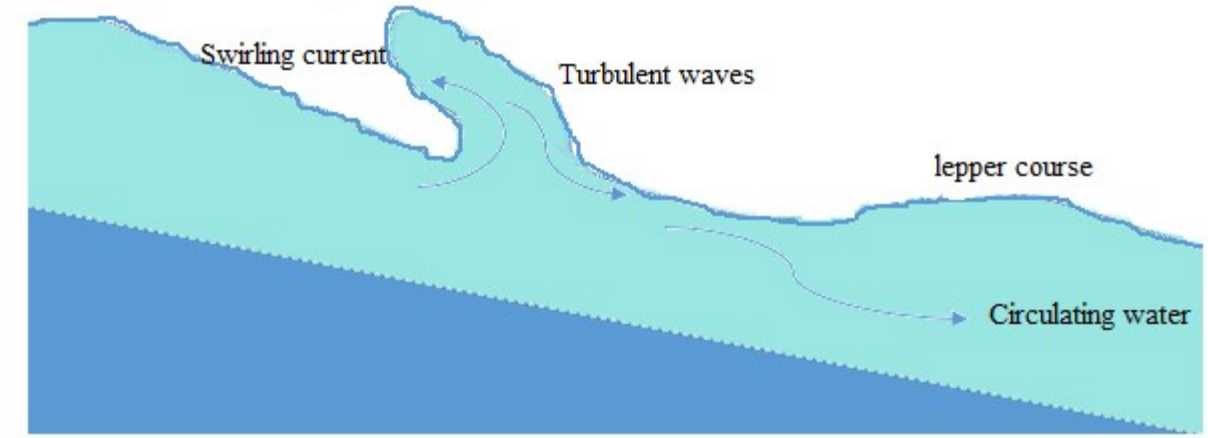
(b) Laminar flow

The energy of a river decreases when its flow is turbulent because energy has to be used to overcome the fuction within the water caused by turbulence.

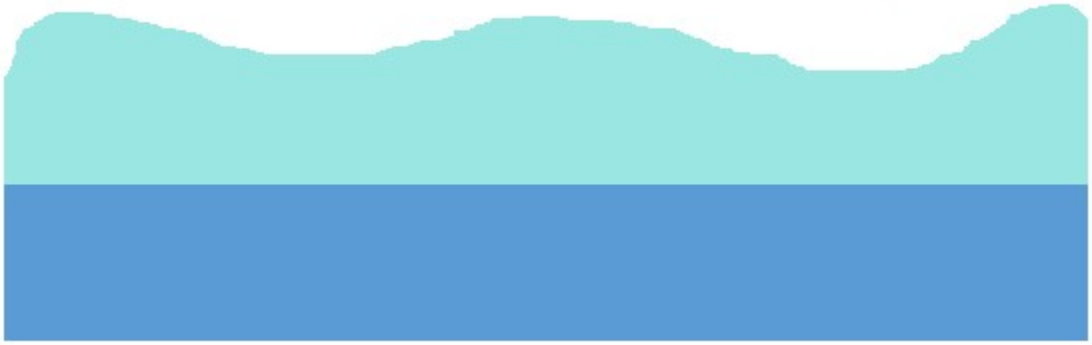
The shapes of a channel also affect the amount of energy a river has for erosion and transport. A river uses more energy to flow through a flat, mite channel than through a narrow, deep channel because the former has a large surface area, and frictional drag is therefore greater.

In the upper part of a river's carve the gradient of the channels is steeper but the volume of water is less. In the middle and lower part of a river's carve the average velocity of the river is at least

equal to and in some cases greater them, the velocity in the upper part. This is because of the turbulent upper part of the curve.



In the middle and lower course water flows more directly



River Erosion

Involve a matrix of interacting processes namely

- Hydraulic action
- Corrosion (abrasion or Rasping)
- Attrition
- Corrosion (solution)

a) Hydraulic action

Is the process where moving water sweeps away the loose materials like silt, gravel, pebbles.

b) Corrosion, abrasion or Rasping

Is the wearing away of the bed or the banks of the river by the load carried by the river water hence the amount of load determines the nature of erosive power and the rate erosion

c) Attrition

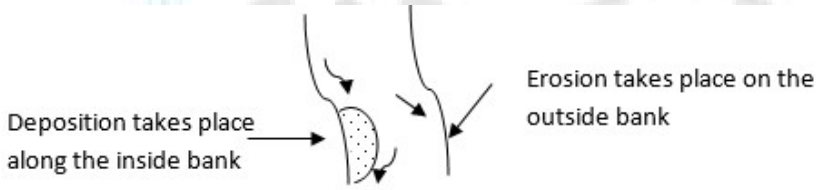
Is the process of wearing away or breaking down of the load itself as fragments collide with each other and against the river bed.

d) ***Corrosion (solution***)

Some minerals dissolve in water leading to the disappearance of the rocks

Hence: these four processes constitute river erosion which enables a river to cut a **channel into the land and it operates into 3 ways namely.**

1. Head ward erosion – Is cutting back of the river and its source.
2. Vertical erosion – Involves undercutting into a river bed which leads to the depending of the river valley.
3. Lateral erosion – is the wearing away of the riversides



RIVER TRANSPORT

All the material that a river transport is called its load: A river transport its load in four ways

1. By traction: (the dragging of large piece of materials such as pebbles along its bed)
2. By saltatoin (the bouncing of smaller pieces over its bed)
3. By suspension of light materials, such as silt and mud in the water.
4. By solution of certain minerals which dissolve in water.

NB: A river loses energy when its **gradient decreases** when its **channel widens,** when it **meanders** (twists and turns) and when its **volume decrease** after a flood.

During times of flood the volume of a river increase and its energy therefore increase, which results in more erosion, which is turn leads to an increase in the river's lead. But when the floods subside, the volume decreases and so does the energy. The river now has too great a load, its power to erode decrease and deposition takes place.

RIVER DEPOSIOTN

Deposition takes place when a river has insufficient energy to carry all its lead. The first part of the load that is dropped consists of boulders and pebbles. The last part that is dropped in fire sedimentary, called **silt.**

Deposition takes place at any point in a river's course. Material is constantly being deposited, picked up again and transport to another part of the bed where it is again deposited.

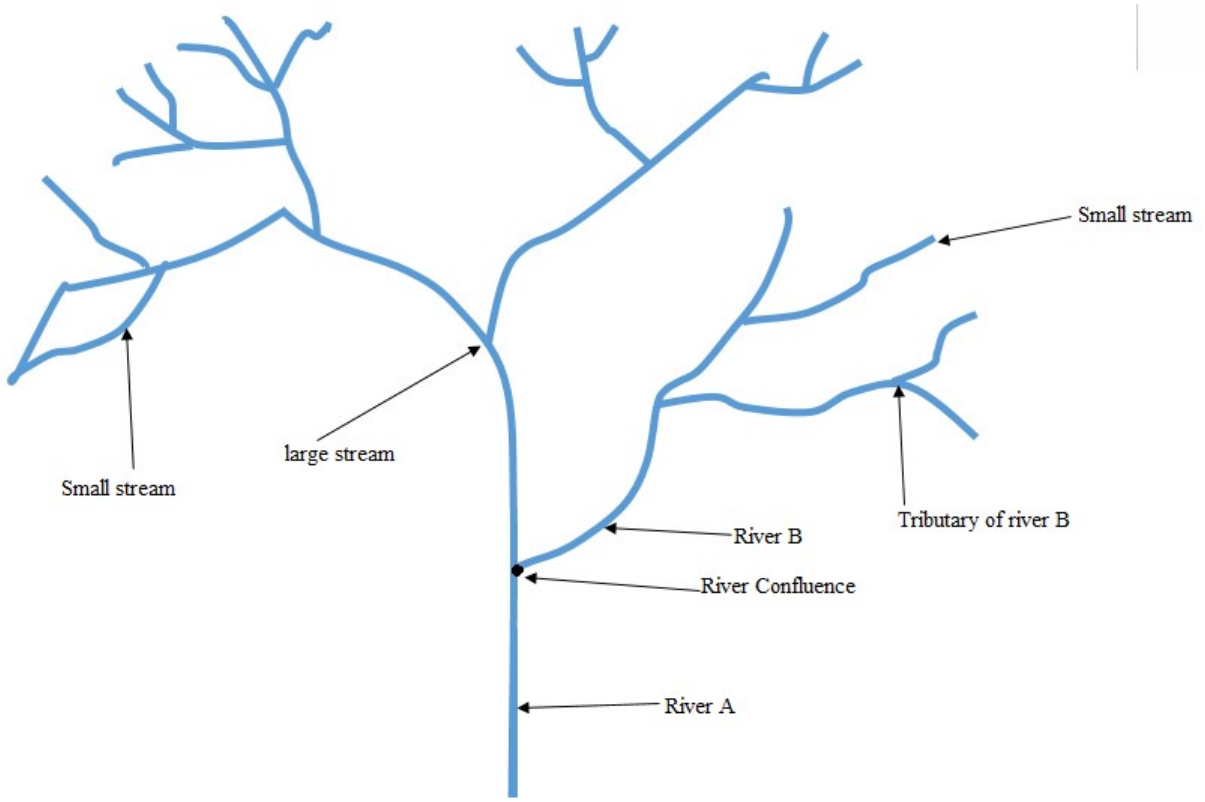
Factors which influence River deposition are as follows

1. Decrease of the volume of the river
2. Decrease in the velocity (speed) of river water
3. Presence of an obstacle
4. Stagnation of water when the river enters the sea or lake or the flat land.

THE DEVELOPMENT OF A RIVER VALLEY

When rainfalls, some of it soaks into the ground, some evaporates and some runs off the surface the letter sometimes gives rise to ***stream*** which liter join together to form rivers. Although a river can also develop from a spring or a lake or mass of ice most rivers start in upland regions where rainfall is usually high through ant the year.

The surface run – off forms small streams in the area where a river beings. The internal streams join together to give a river. The juretion of two streams or of a stream and a river or of two rivers is known as a confluence. When a smaller flow (earth a stream or a river) joins a large flow, it is called a tributary.



The erosion power of a river depend on its volume and its gradient and as we have already seen. This power changes whenever there is a change in the volume or the gradient.

A river erodes to its level, i.e. the lowest level to which a river can cut vertically. The base level may be the confluence with another river, the surface of a lake or the surface of the sea.

All base levels are temporary except the sea which is the ultimate base level.

If the draw a line following the course of a river from its source to its month, this line is called the long profile of the river. This line usually has a concave slope.

THE LONG PROFILE OF THE RIVER

The profile a river is always changing. For example, if a river does not have a fall load in one reach (a reach is the name gives to any part of a river's course) then the river will erode its bed. This results in addition of eroded material to the load. This erosion of the river's bed described as **degrading the bed.** Never, erosion decreases in the lover part of the reach because more energy is needed to transport the increased lead. Thus the gradient is less steep and there is a decrease in the river's velocity. Eventually to velocity of the river in that reach enables erosion to balance deposition. This means that the amount of material removed from the river's bed is abort equal to the amount deposited on it. On the other hand, position will take place if the river enters as reach whoso gradient is less steep than that of the reach it has just left. This will course the river's velocity to decrease and part of its land will be deposited. This deposition on the river's bed is described as **aggrading** the bed, and it results in the gradient being steepened causing the

velocity to increase again. This recurrent action of erosion and deposition on a river's bed can be summarized as follows.

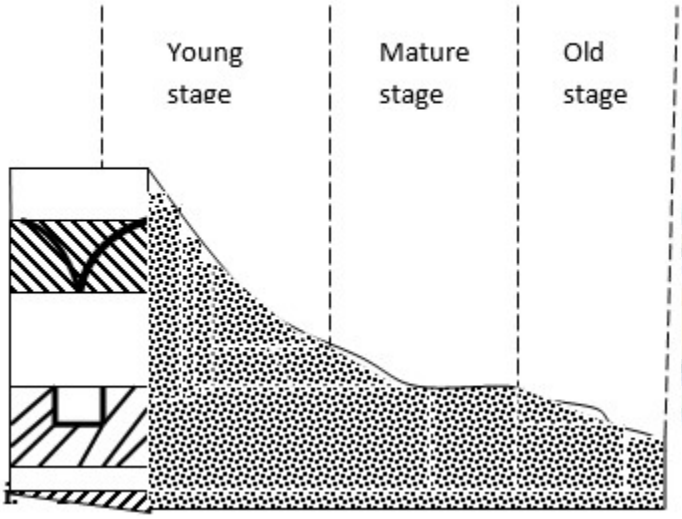
Gentler gradient →decrease in velocity → Beginning of erosion (degrading the bed) And increase of the load. → Increase in velocity → steeper gradient ← decrease in erosion and beginning Of deposition (aggrading the bed) ← decrease in velocity

The long profile is really made up of a series of part, each of which is balanced the factors **velocity, depth**, width and **discharge**. If one of these factors changes, then all of the remaining factors will be affected. It is sometimes possible to divide the long profile into stages/sections.

STAGES IN THE LONG RIVER PROFILE

When the river profile develops it leads to the emergence of stages if the river namely young or upper state, mature or middle stage and Old or lower stage.

Each section or stage has its characteristics where these features vary due to the variation in the rocks structure, topography and nature of erosive process.



1. **YOUNG STAGE/ UPPER SECTION**

It is called a youthful stage or torrential stage it is a stage where sources of the river can be traced, in this stages the river is very fast and erodes, vertically forming V – shaped valley. The river becomes very powerful due to its high speed.

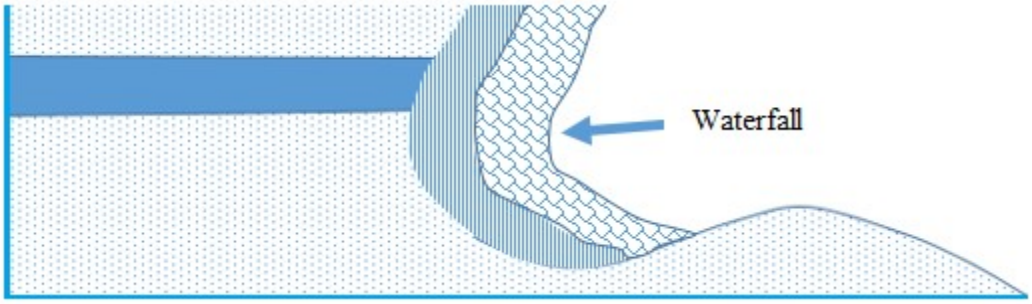
- Has steep slope

- River flows through later locking spums

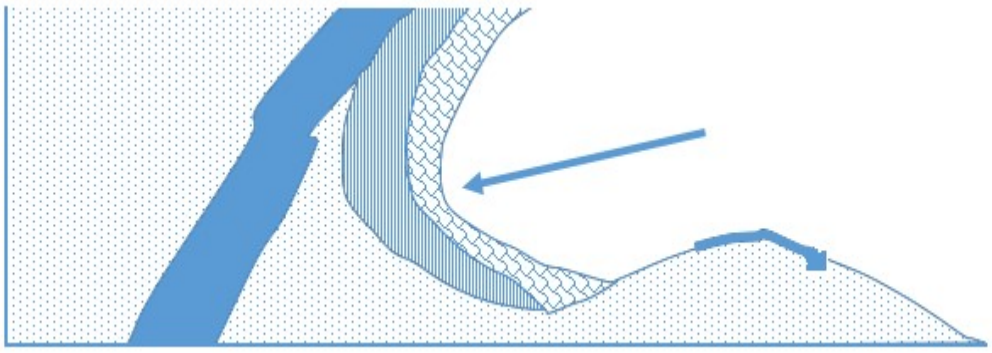
- Has rapids and water falls(waterfalls are sudden flows of water)

Condition leading to the formation of waterfalls

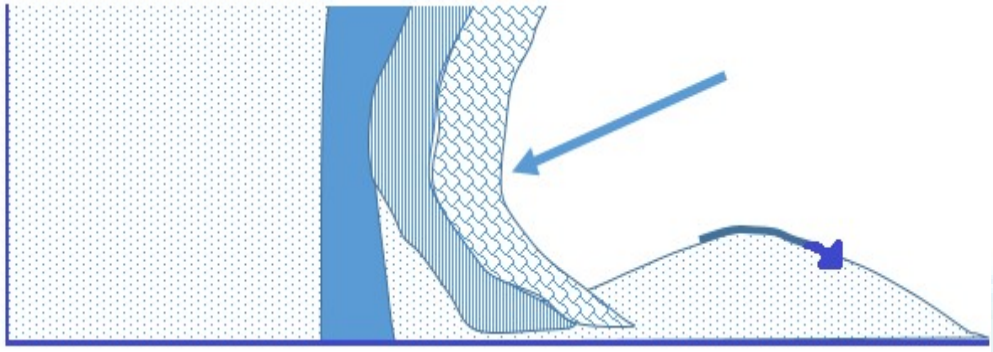
1. The water falls can be formed where the hard rock layer lies horizontally or the soft rock layer, the water erodes the soft rock layer



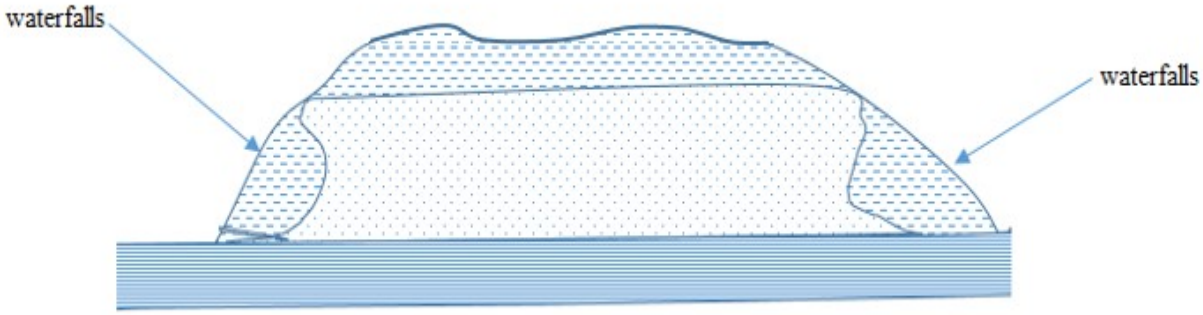
1. When the hard rock dips gently upstream



2. When hard rock stands vertically



3. Waterfalls can develop along the edge of steep sides of the plateau



1. **MATURE STAGE/ MIDDLE SECTION**

It's also know as valley stage, whose valley are widened by the process of lateral erosion, at this stage the speed of the river is slower, many tributaries are developed joining main river, which again increase the volume of water, meander's develops, cliffs are developed across the river or valley floor.

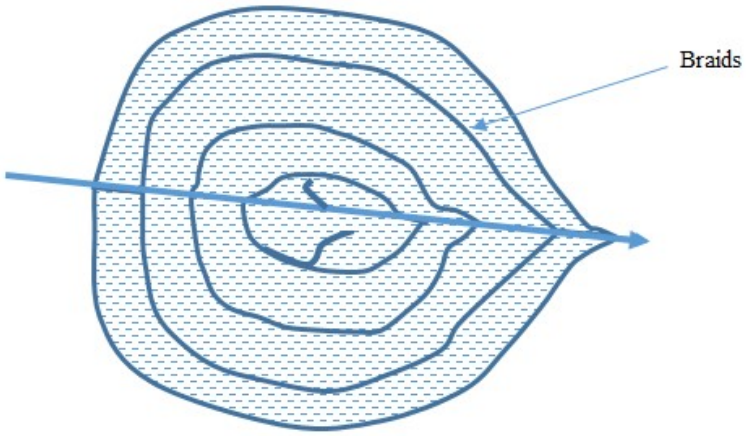
1. **OLD STAGE/ LOWER SECTION**

It is also referred to as the plain stage its main features are development of flood plain, braided stream, meanders, ox Bow Lake, and levees, deferred tributaries, lagoons and estuaries. When a river reaches old stage, the land is almost flat and its speed is very slow such that the main task is **Deposition** because the volume of the river is at its maximum due to addition of more attributes when course materials are deposited first and five materials are deposited at least in the rivers mouth.

The meanders are more pronounced than in the middle stage.

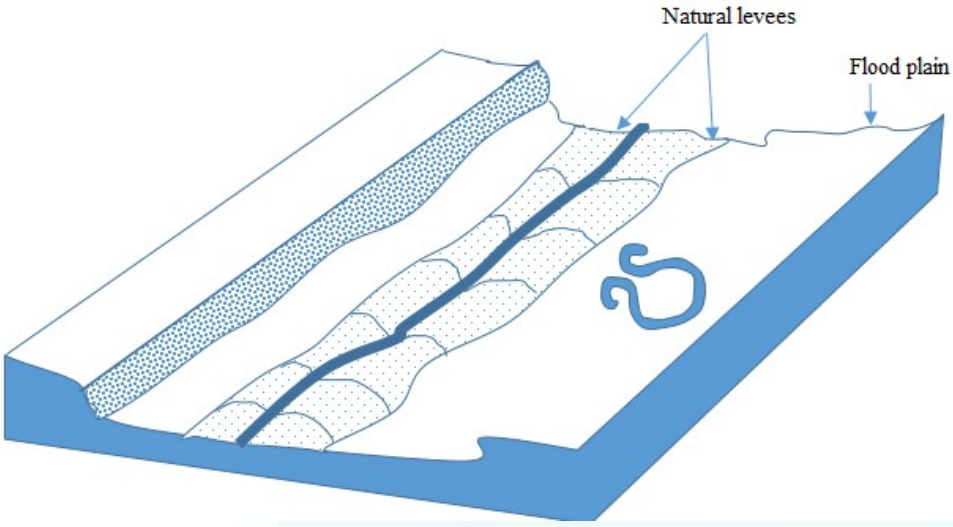
Characteristics of Old Stage are

1. Formation of the braded river resulted from silt deposits into small channels (braids)



1. Formation of flood plain due to the deposition of alluvium (silt and sand).
2. Natural levees

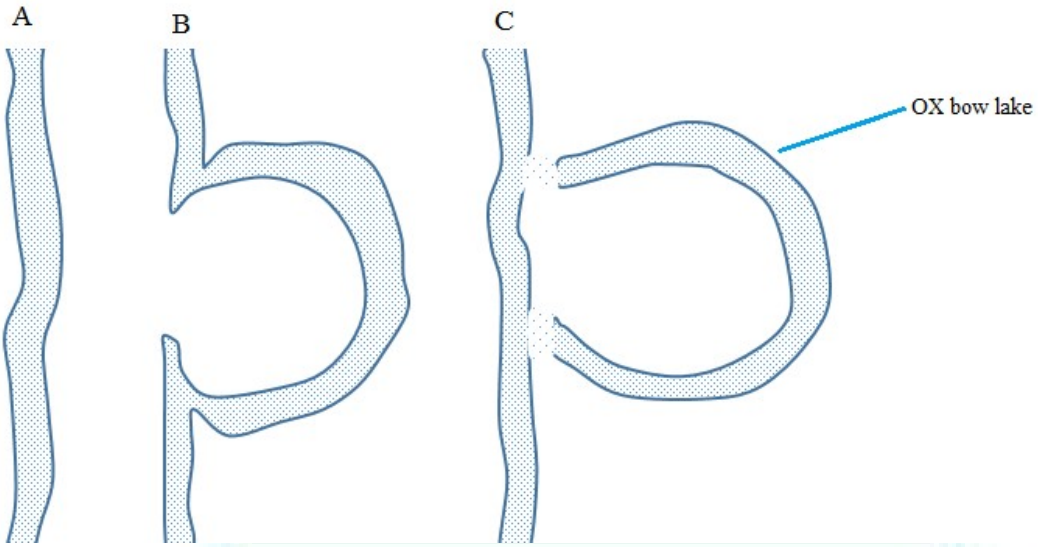
These are ridge like or embankments produced as a result of deposition of sediments along the banks of the river in the flood plain.



1. Ox bow lakes (cut – off)

Are cut off meanders formed as a river cuts through the necks

Ox bow formation



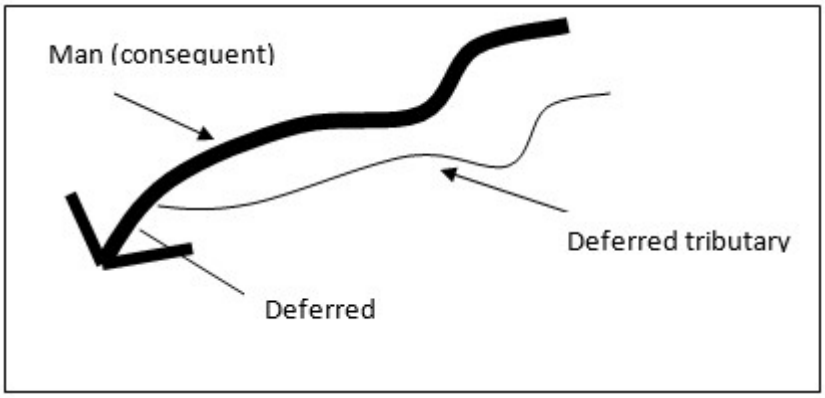
1) At A the river has just developed meanders

2) At B the meanders has become more pronounced forming a loop

3) At C a river has at through a neck isolating at a bend, which later former an Ox bow lake.

1. Deferred Tributary (Yazoo stream)

Is a tributary is a lower course forced to flow alongside the main valley or (consequent) valley. For long distance before joining the main stream.



1. ***DELTA***

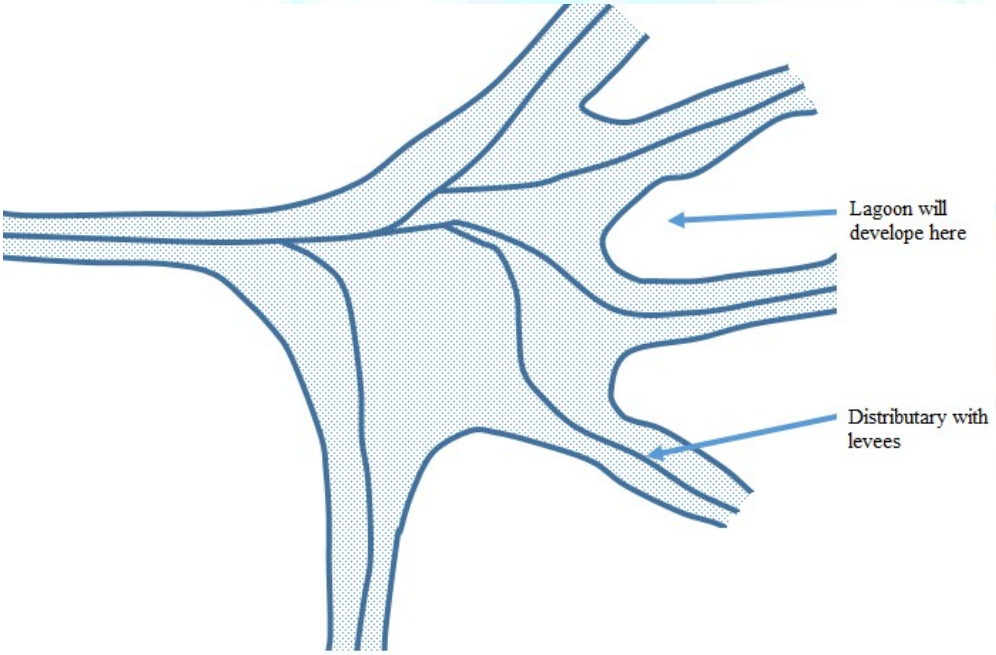
A delta is a low – lying swampy plain which gradually becomes colonized by various typed of plants. It formed when load carried by rivers is eventually deposited in the oceans, the seas and the lakes into which rivers drains. Sometimes the deposited load is carried for way from the mouth of a river before it sinks to the bottom, but sometimes the deposited load sinks to the bottom in the mouth of the river when this happens, layer upon layer of sediments may collect to form a gently sloping platform. In time, the platform may extend up to the surface and above, when it is called delta.

For the formation of a delta the following conditions are necessary

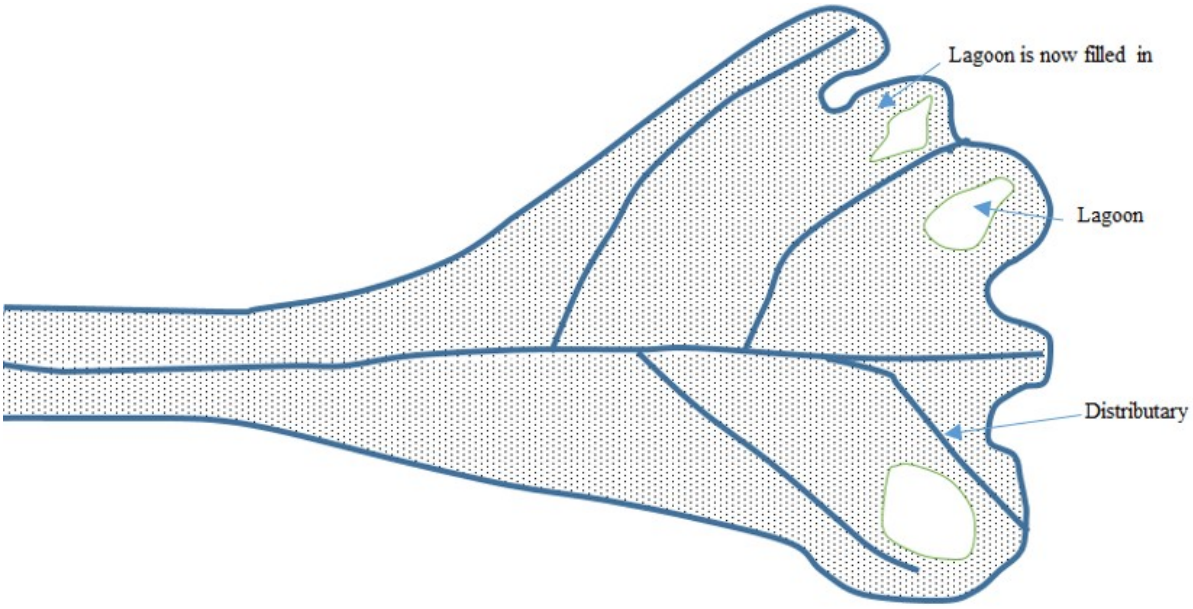
1. A river must have a large load
2. The velocity of a river must be sufficiently low to allow most of its load to be deposited in the river's mouth.
3. The river's load must be deposited faster they it can be removed by the action of tides and currents. The river Congo has a large load but high velocity near its mouth which enables most of its load to be carried for cat to sea thereby preventing the formation of a delta. The River Niger also has a large load, but its velocity near its mouth is low. Much of its load is deposited in its mouth where an extensive delta has formed.

There are stages in the formation of a delta in an ocean or sea.

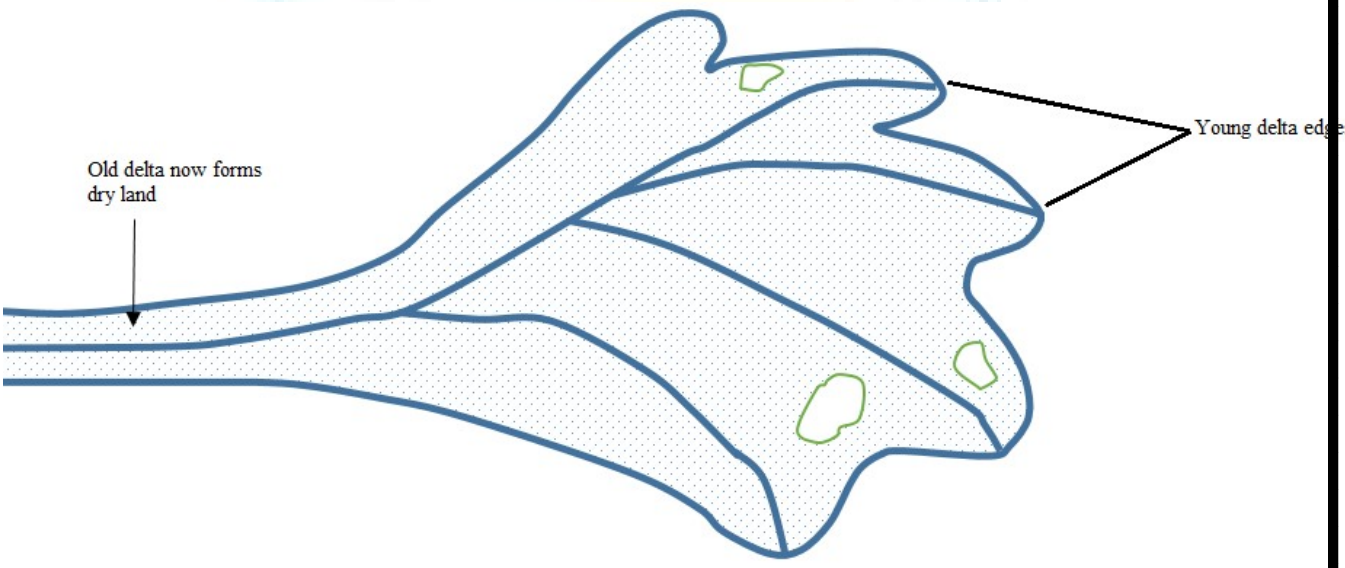
In stage 1: Depositions in the river's math cause the river to divide into several distributaries. The delta beings to form when the initial sediments collect on the continental shelf around the river's mouth. As the deposition continues, layer upon layer, a low platform develops. Reposition on the banks of the distributaries produces levees and the areas of water bounded by distributaries become the sites for feature lagoons.



In Stage 2: Some lagoon has already begun to fill with sediments which cause further division of distributaries into small distributaries. The delta has a more solid appearance. Though it is still very swampy and is usually well covered with water loving shrubs and trees.

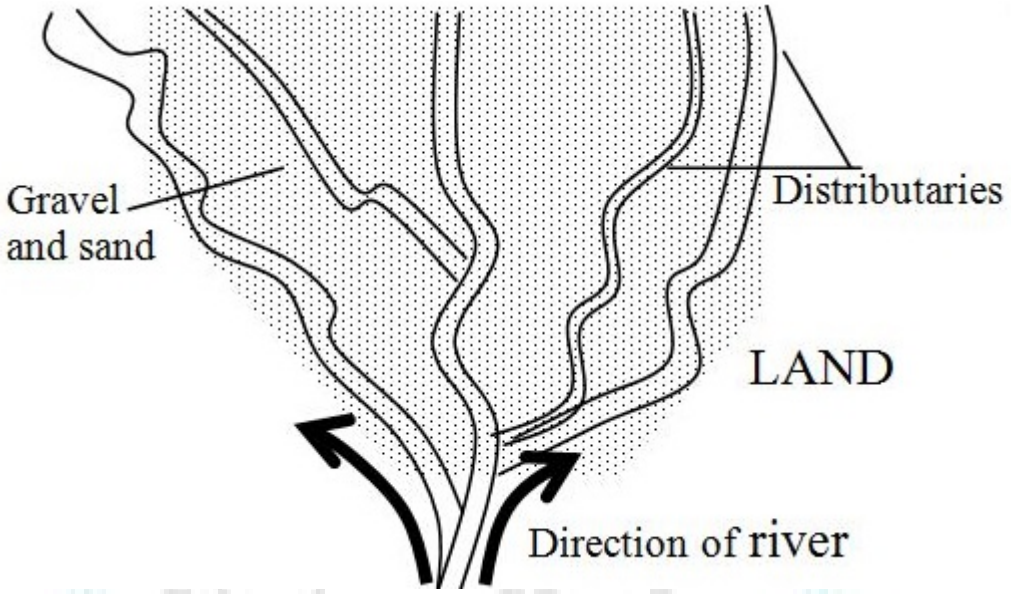


In stage 3: further in filling of lagoons plus the growth of a complete covering of vegetation results in the older parts of the delta coming to stand above water level and form dry land.



A delta's size and shape depended the type and amount of deposited sediments and also on the power of waved and currents. There are basic types of delta

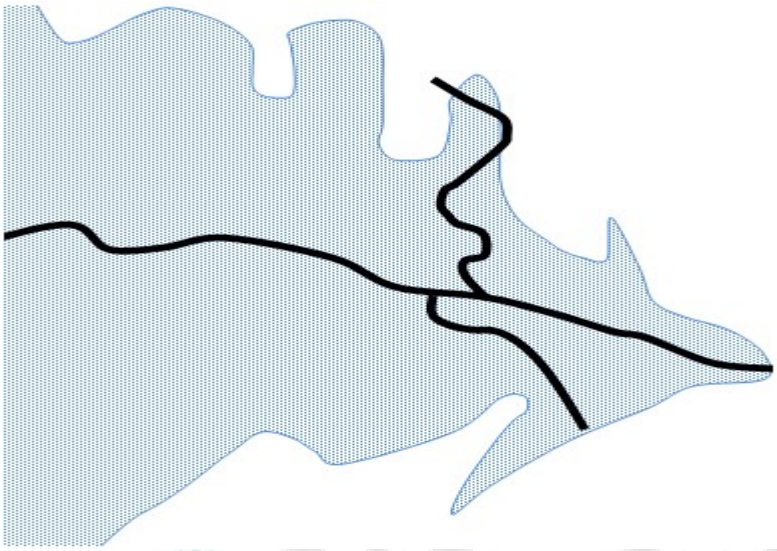
1. ***Arcuate;*** this delta consist of both course and fine sediments and its has the shape of an inverted cone. It is crossed by numerous distributaries. God examples of this type are the deltas of the Niger, the Nile the Ganges, the Indus and the Hwang – Ho



2 . ***Bird's foot***. This delta consists of very fine material, called silt and it has a few long distributaries bordered by levels that just out from the share. This type formed when power of the waves and currents is low. Example the Mississippi Delta.

3. ***Estuaries.*** This delta is formed from materials deposited in the submerged mouth of a river. It takes the shape of the estuary.

4 . ***Cuspate delta*** – This is a delta which looks a tooth-shaped feature. It is formed when a rive drops sediment onto a flat, straight shoreline with strong waves. Waves force the sediment to spread outwards in both directions from the river's mouth, making a pointed tooth-like shape with sides curved by regular opposing, gentle water movement. A cuspate delta extends to the sea as a V shape with long curving sides. Examples of such a deltas are Ebo in Spain and Tiber in Italy.



River Rejuvenation

Is the process where a river is renewed after being affected by fall in the sea level land uplift and subsidence and the increase in the river volume.

Hence: ***River rejuvenation is caused by***

a) Fall in the sea level (Eustatic change) which is done by earth movement trough diastrophic disturbances.

b) Land uplift and subsidence / isostatic change

c) The increase in the river volume, when the river volume increase power also increases due to heavy rainfall or snow melting.

TYPES OF RIVER REJUVENATION

Rejuvenation can be categorized as Dynamic or static rejuvenation

i) Dynamic rejuvenation

Rejuvenation – Is brought about by either sea level change or land level change. Hence can be again categories into.

1. ***Eustatic rejuvenation***

It is due to the change in sea level

1. ***Diastrophic rejuvenation***

Is due to by land uplift subsidence and flitting caused by faulting.

ii) Static Rejuvenation

Is the type of rejuvenation caused by the increase in the river volume due to either heavy Rainfall or melting of ice or river captures.

Effects of River Rejuvenation

River rejuvenation leads to the following features

1. ***Knick point (rejuvenation head)***

Is the break of slope in the long profile of the river valley.

2. ***Paired Terraces***

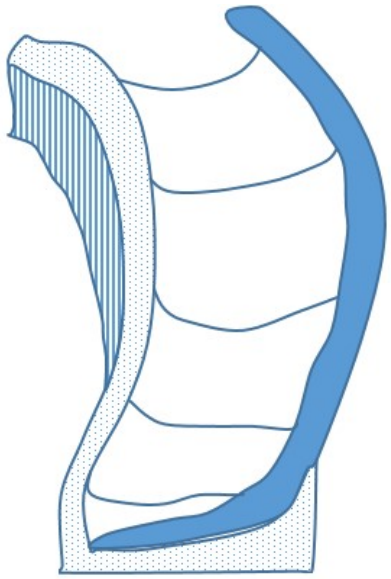
Are steps or benches on either side of the river valley formed as a result of undercutting of the river.

3. ***Incised meanders***

Are steep sided curved bends of the river valley produced as result of undercutting of the river bed. Incised meanders are of two types.

- ***Ingrown meanders***

Meanders are asymmetrical sides of a cross profile of the river



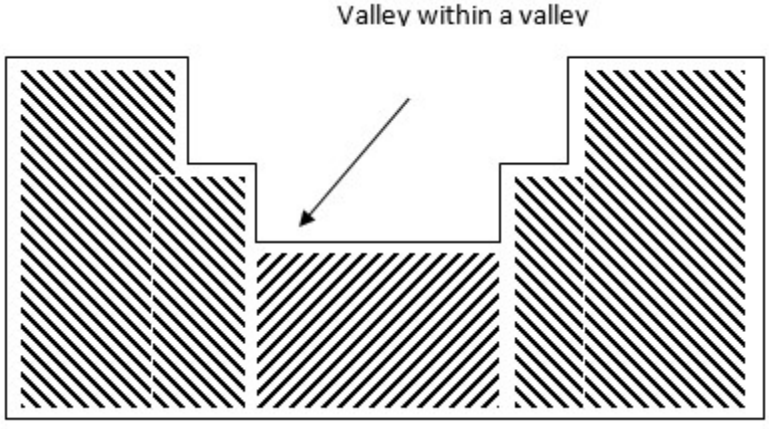
- ***Entrenched meanders***

Is a steep sided symmetrical meanders with sides stand vertically and parallel to each other it is produced by vertical erosion

4. Incised meanders Terraces

Involves services of terraces along the incised meanders produced by vertical under cutting in the river valley that has undergo rejuvenation. It produces features like

- A waterfall drops sharply from the knick point.
- Canyons and gorges
- Valley within a valley. Is a new valley formed within the former pre existingvalley.



RIVER CAPTURE

River capture (River piracy) – Is a process whereby one river diverts the course of the other neighboring river into its own course.

It's happen when there are two adjacent rivers and one is more powerful than other, then the more powerful river may capture its weaker neighbor. For this to happen, the more powerful river must flow at a lower level and it must erode its channel, both head ward and vertically, at a faster than its neighbor. This can take place when the more powerful river flows over rocks that are easy to erode or when it flows down a steeper slope than its neighbor. If either of these conditions occurs, then river capture takes place.

Conditions Necessary for River Capture to Occur

River capture occurs when is existence of the following condition

i. The capturing river should be stronger or must have greater energy for the vertical and head ward erosion than the other.

ii. The capturing river must be flowing at a lower and usually steeper gradient that its victims.

iii. The capturing river must be flowing over easily eroded, rocks that are weaker rocks.

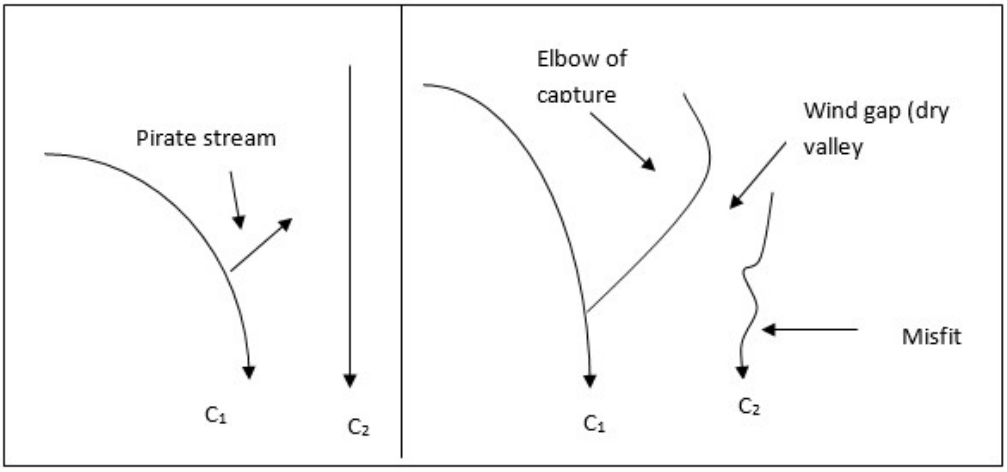
NB: river capture is common in the trellised pattern where there is faulting

Feature Due to River Capture

i. Elbow: This bend produced where the river has been diverted (changed). However not all right angled bends in rivers are due to river capture.

ii. Misfit (under fit stream): Beheaded stream heaving slot head water due to river capture and has been reduced in volume such that it becomes too small for its valley.

iii. Wind gap (Dry valley): The valleys of the beheaded stream below the point of capture or elbow and may be filled up with gravel or alluvium.



Examples of River Capture in Africa

i. Tiva River Capture in Kenya

ii. Cunene River Capture in Angola

iii. Nsaki River Capture in Ghana

iv. Imo River Capture in Nigeria

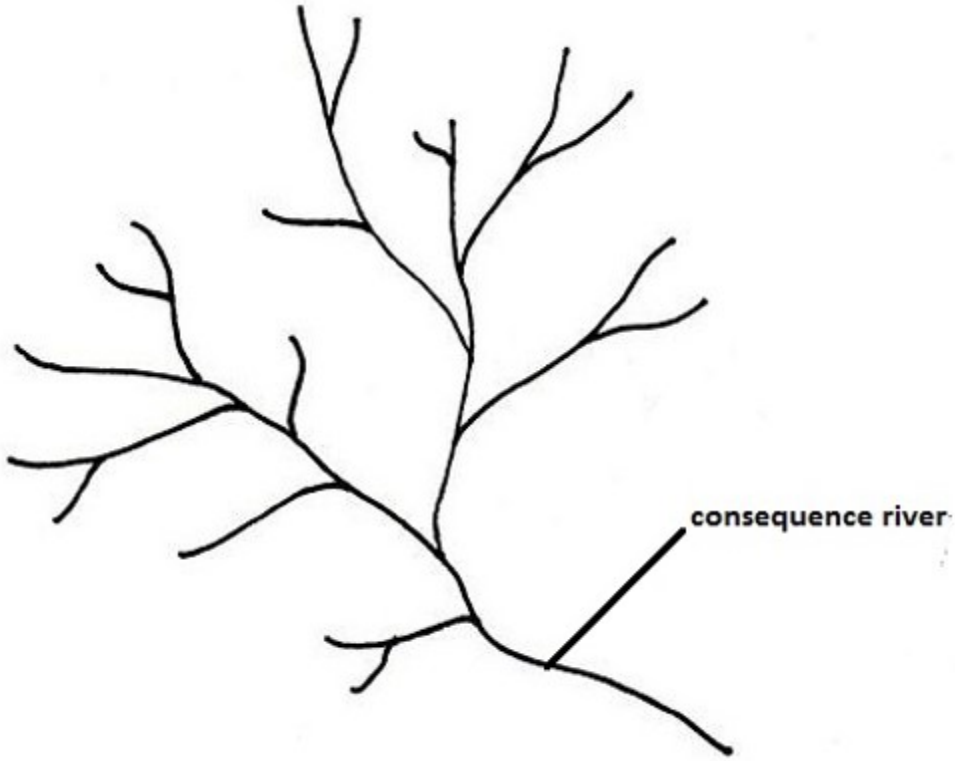
DRAINAGE PATTERNS

All the rivers are joined by smaller rivers or stream which are called tributaries .The area drained by rivers and the its tributaries is known as a rivers system or catchment area and its boundary is usually formed by the crest line of the surrounding highland called the watershed .

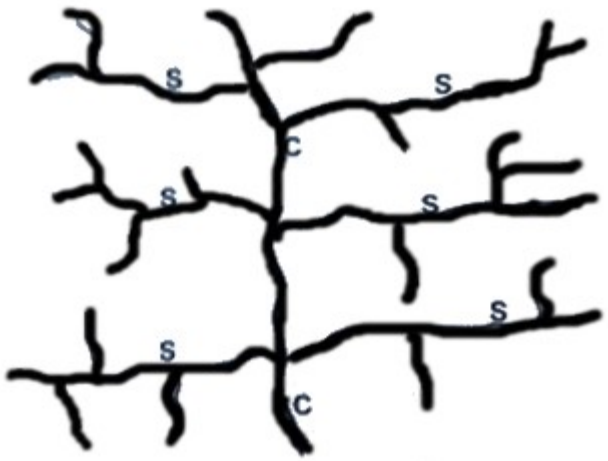
The watershed separates one basin from the next basin. The main river and all the its tributaries together form a river system.

A river system develop a pattern that is related to the general structure of its basin . There are these basin river system patterns.

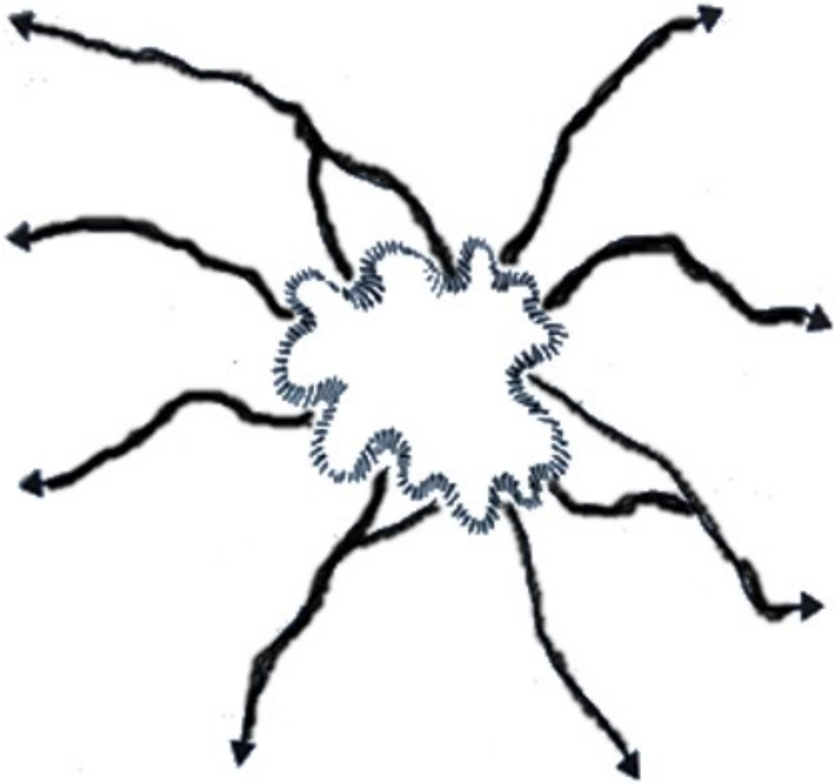
(i)Dendritic: This pattern has a shape like the trunk or branches of a tree with the tributaries joining the main stream is called a consequent stream or(river) because it develops as a consequence of the slope This drainage pattern develops on rocks of uniform structure and hardness



(ii)Trellis : A trellis pattern develops in a region which is made up of alternate belts of hard and soft rocks , which all dip in the same direction and which lie at right angles to the generally slope down which the consequent stream flows . The tributaries extend their valleys by head ward erosion into the weak rocks which are turned into wide valleys, whilst the hard rock stand up has escarpments . The tributaries which cut out the valleys and which do not flow down the main slope , are called subsequent rivers. This pattern develops in scarp land regions and regions of forded rocks.

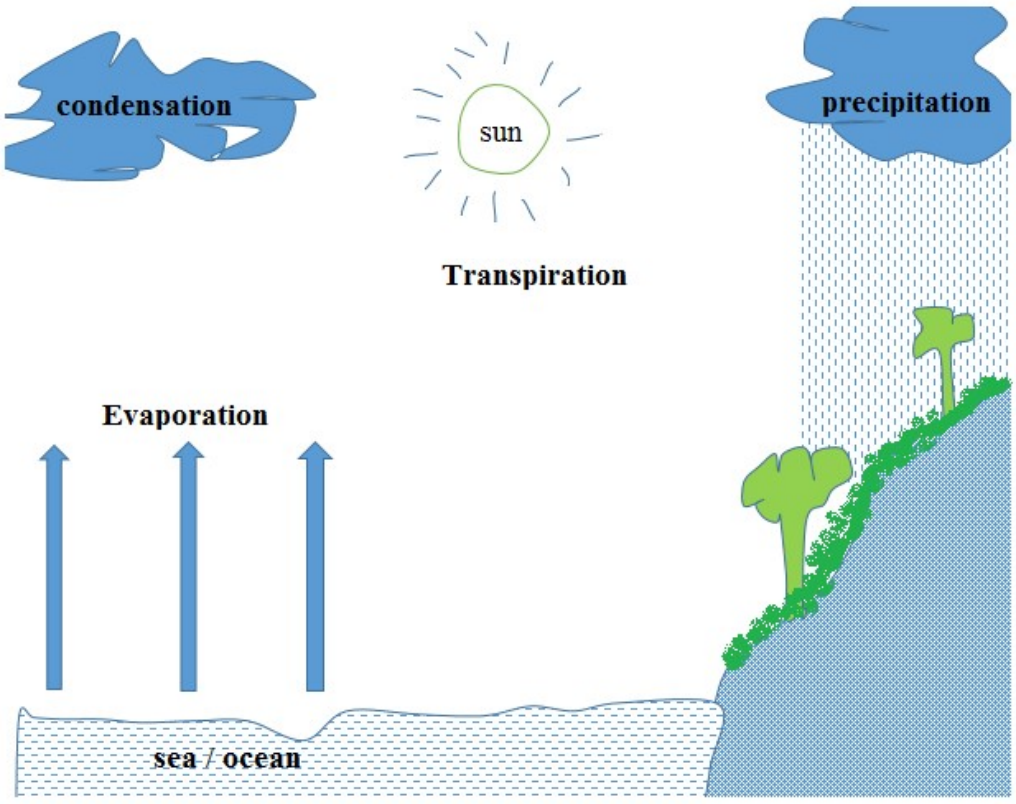


(iii) Radial , This pattern develops on a dome or cone shape upland , such as volcano. The rivers flow outwards forming a pattern like the spokes of a wheel.



HYDROLOGICAL CYCLE

Hydrological cycle in the endless or continuous interchange of water between the atmosphere, the earth (land) and water bodies. It is the circulation of water from ocean into the atmosphere through combined effects of evaporation , transpiration, condensation and precipitation



Evaporation: The process in which liquid water turn into water vapour and rises up.

Transpiration: The loss of water vapour from plants in the form of vapour to the atmosphere.

Condensation: The process in which water vapour turns into the liquid form following a drop in atmospheric temperature. The temperature at which condensation takes place is called dew point. The dew point is the temperature at which the water vapour in air at constant barometric pressure.

Precipitation: This refers to any product of condensation of atmospheric water vapour that fall under gravity. The main forms of precipitation include drizzle, rain, sleet, snow, hail and graupel. Precipitation occurs when a portion of the atmosphere becomes saturated with water vapour, so that the water condenses and "precipitates".

UNDERGROUND WATER

When rain falls, some water forms streams (surface run off) while some penetrates into the ground (percolation process). The water that seeps into the ground forms underground water. Water enters the rock in two ways:

1. Via the spaces, called pore spaces, separating the individual grains of rock; and
2. Via the joints or faults in a rock.

Percolation:

This refers to the process in which water on the ground surface seeps down into the ground.

Porous rock:

This is a rock which has pore spaces into which water can infiltrate, e.g. sand, gravel, sandstone, etc.

Pervious rock:

This is a rock which has joints or faults into which water can infiltrate, e.g. limestone, chalk, and granite.

Permeable rock:

This is a rock which allows water to penetrate through it, e.g. they have open texture and have poor cementation. They include limestone, sand, gravel, sandstone, etc.

This is a rock which does not allow water to pass and penetrate through it, e.g. clay.

Some rocks are both porous and permeable, e.g. sandstone, and some rocks are porous but impermeable e.g. clay. When the pore spaces of a rock are filled with water, the rock is said to be saturated.

Water table

The water table can be defined as the depth at which the ground becomes saturated with water. It can also be defined as the level below which the ground is completely saturated with water. The saturated zone beneath the water table is called an aquifer, and aquifers are huge storehouses of water.

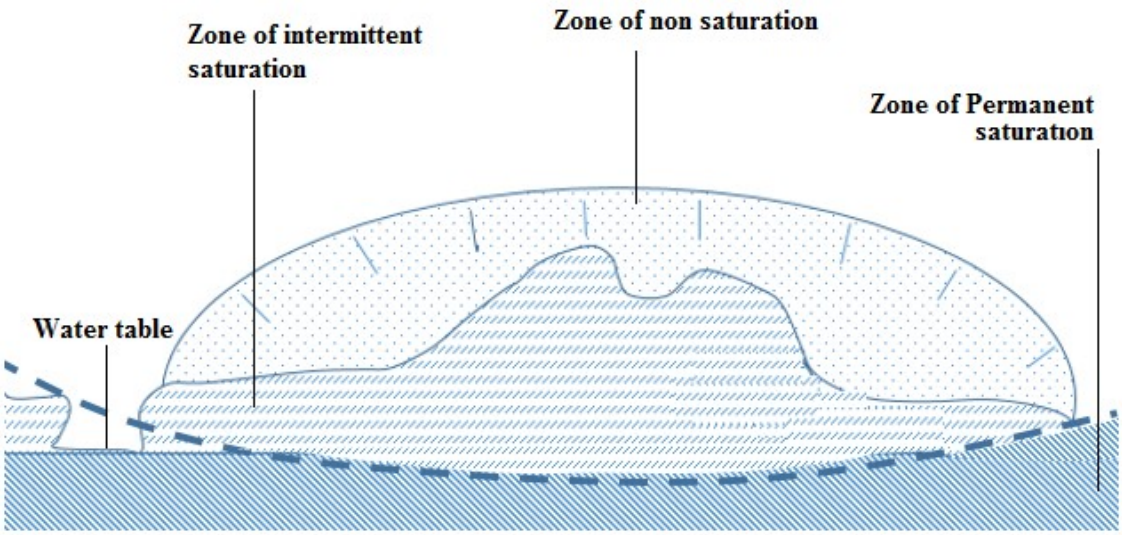
Water zone

The water entering surface rocks moves downward until it reaches a layer of impermeable rock when further downward movement ceases. There are three water zones as explained below:

Zone of non-saturation: This is the zone which is filled with water only during a precipitation. In this zone pores have open textures that allow water to pass through them. The zone is found immediately below the surface.

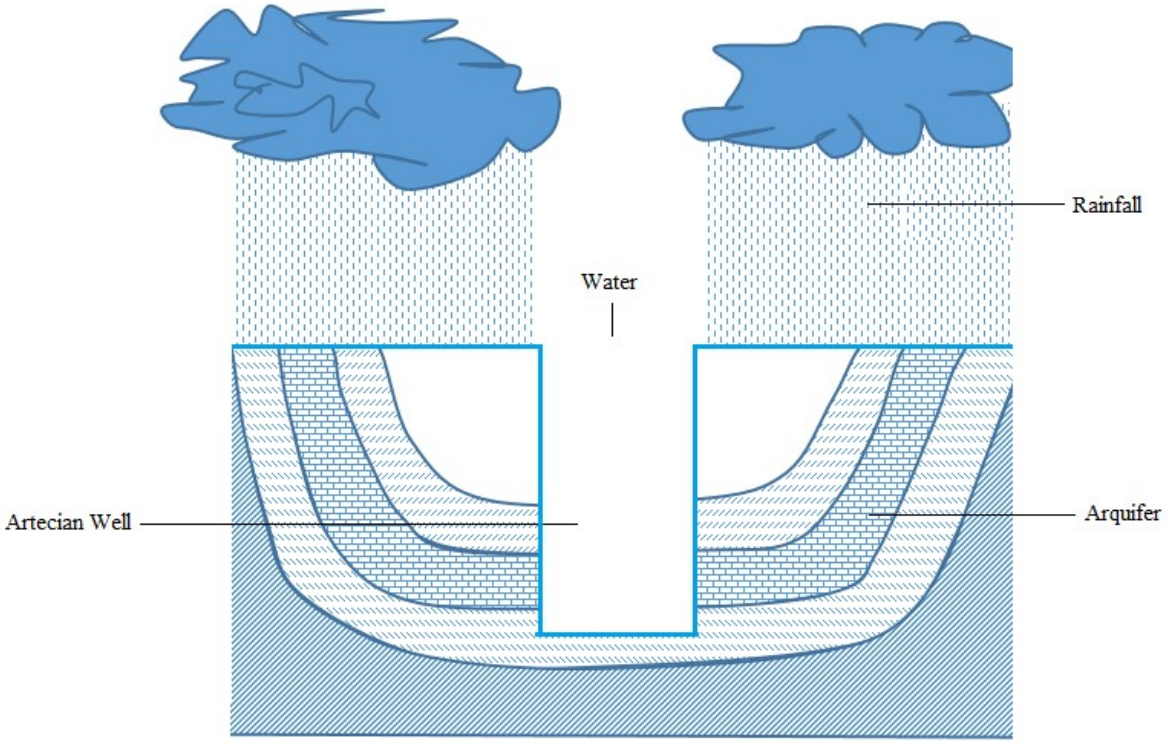
Zone of intermittent saturation: this is the zone which is filled with water and remains with water for a long time during heavy rain. the pores of this zone are filled with water during a heavy rainfall but after the rainfall ends it becomes dry.

Zone of permanent saturation: This is the zone which is always saturated with water. It does not become dry rather than extending far deep in the ground. It is suitable for sinking permanent wells. The last two zones, that is, zone of intermittent and non-saturation zone are sometimes called phreatic since they saturate only once.



Wells and artesian wells

A well: A well is the hole sunk below the water table. Always wells which are sunk below the water table (i.e up to zone of permanent saturation) have water throughout the year.

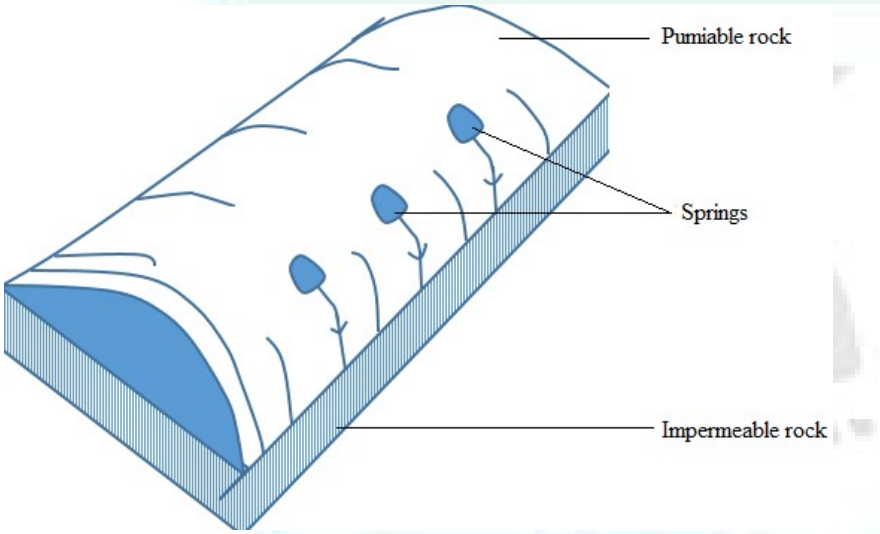


Artesian well: This is a well which sinks in the aquifer of an artesian basin. When a well is sunk into an artesian basin, the hydrostatic pressure in the ground forces the water to come out. The artesian well in which water does not reach the surface is called semi-artesian well.

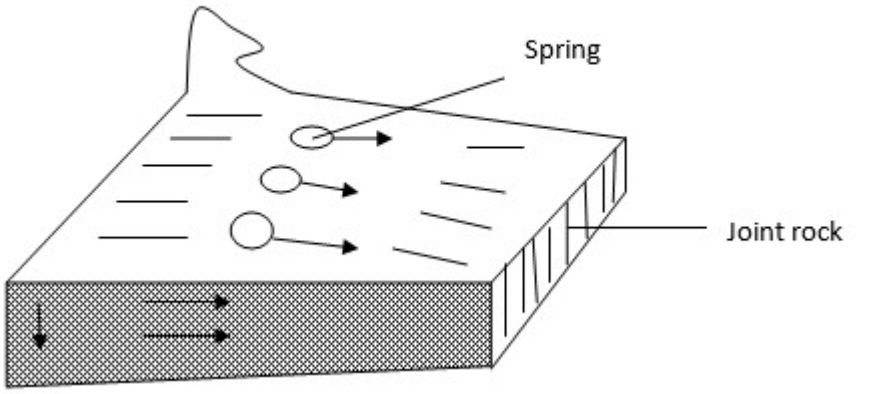
Spring: A spring is a natural of outflow of underground water to the surface. Some springs are permanent if the water table is permanent and they can be temporary if the water table is temporary also.

Formation of a spring

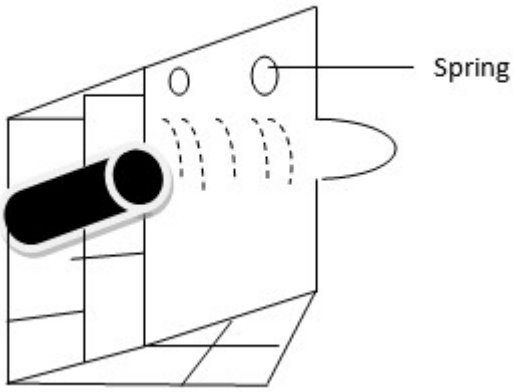
I. It may be formed when a impermeable rock underlie a permeable rock in a hill. In this feature the permeable rock lies on top of an impermeable rock causing water outflow.



II. A spring may also be formed when well-jointed rocks form a hill.



III. When a dyke acts as a dam. If it cuts across a layer of permeable rock then the water on the up-slope side of the dyke is impounded. This causes the water table to rise and a spring develops where the water table meets the surface.



IV. A spring may also be formed in a limestone region when chalk or limestone escarpments overlie impermeable rocks

V. When gently-sloping layers of a permeable rock alternate with a layer of impermeable rock.

Importance of underground water

i. It is very important in the weathering of rocks; hence it assists in soil formation.

ii. The springs and wells provide water for domestic and industrial uses such as drinking e.g. the Mzima spring in Kenya.

iii.It is very important for growth and survival of plants and some living organisms found in the surface soil

iv. In developed countries, hot springs have been harnessed for heating up houses during severe winters (e.g. in Iceland and Greenland) as well as for hydro-electric power generation.

v. It is very important in the growth of Karst (hanging stone) features which attract tourist, hence source of foreign exchange. For instance, stalactites, stalagmites, pillars and caves.

KARST LANDSCAPE

Karst landscape is a landscape formed from the dissolution of soluble rocks such as limestone, dolomite and gypsum. It is characterized by underground drainage systems with sinkholes, dolines and caves.

Limestone consists chiefly of calcium carbonate ($CaCO_3$) which is insoluble in pure water but it is soluble in rain water containing a weak carbonic acid ($H_2 CO_3$). Limestone is a well –jointed rock. The rain water and river remove limestone in solution. The carbonic acid in rain water dissolves limestone into calcium hydrogencarbonate, which is soluble an can easily be washed away in solution.

$H_2CO_3+CaCO_3Ca (HCO_3)_2$

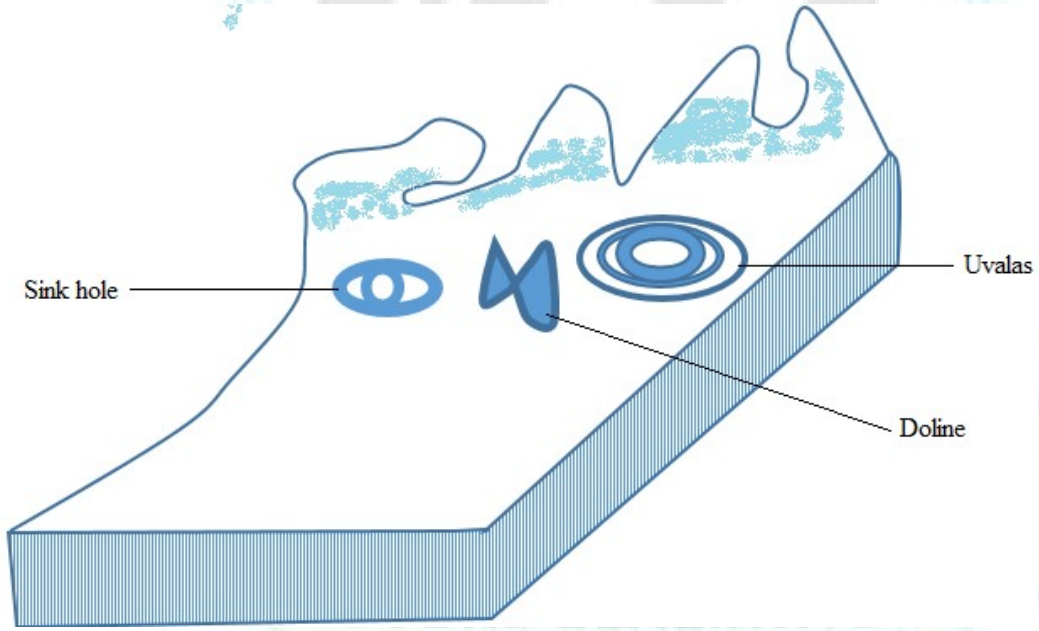
In this way, limestone regions may be removed or washed out to produce the following surface and underground features:

Sinkhole – a vertical depression or hole in the ground, sometimes called shallow hole, formed by river that sinks down when passing through a limestone region. It can be a source of an underground river.

Doline– a large depression formed when several shallow holes join together.

Uvala– a large depression formed when several dolines join together.

Polje – a very large depression that develops in association with faulting. It is a feature which is formed when several uvalas collapse, the collapsing associated with faulting. It usually covers several square kilometers (usually 5 to 400 km^2).

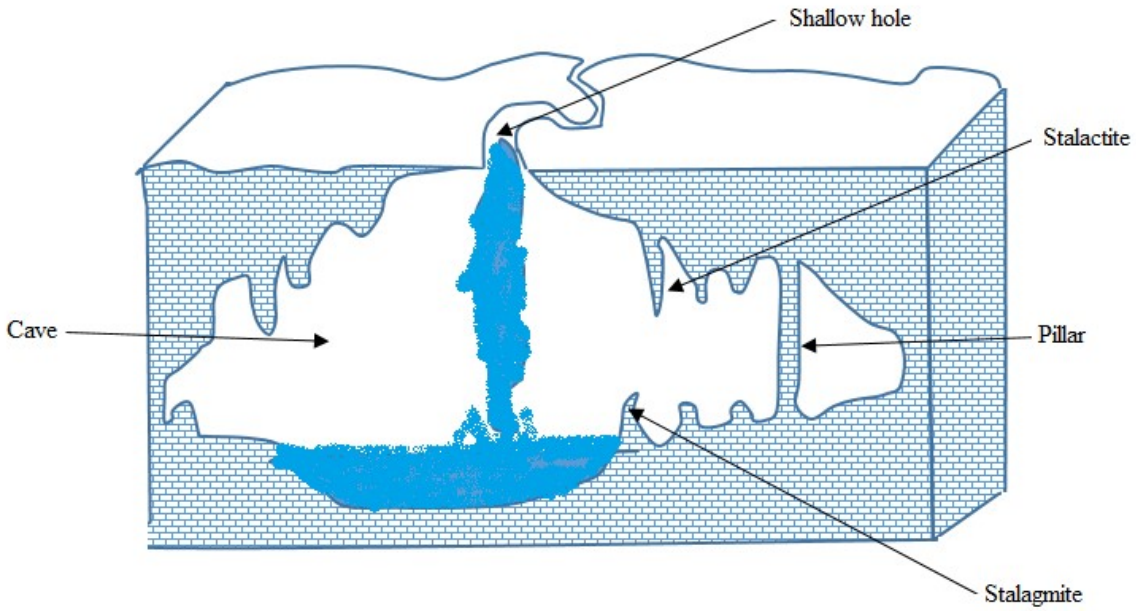


Stalactite – an outcrop rock in the cave growing from the roof of the carven towards the floor.

Stalagmite – an outcrop rock in the cave growing from the bed of the carven towards the roof.

Pillar – a feature formed in a limestone cave when a stalactite and a stalagmite join together. It is sometimes called **natural pillar.**

Cave or cavern: A cave or cavern is an underground hole formed due to solution of limestone rock. First, the tunnels are formed, followed by enlargement of a hole. Caves form naturally by the weathering of rock and often extend deep underground.



An example of a limestone landscape is the Matupi cave in Hoyomountain in DRC.

Features formed by rain action

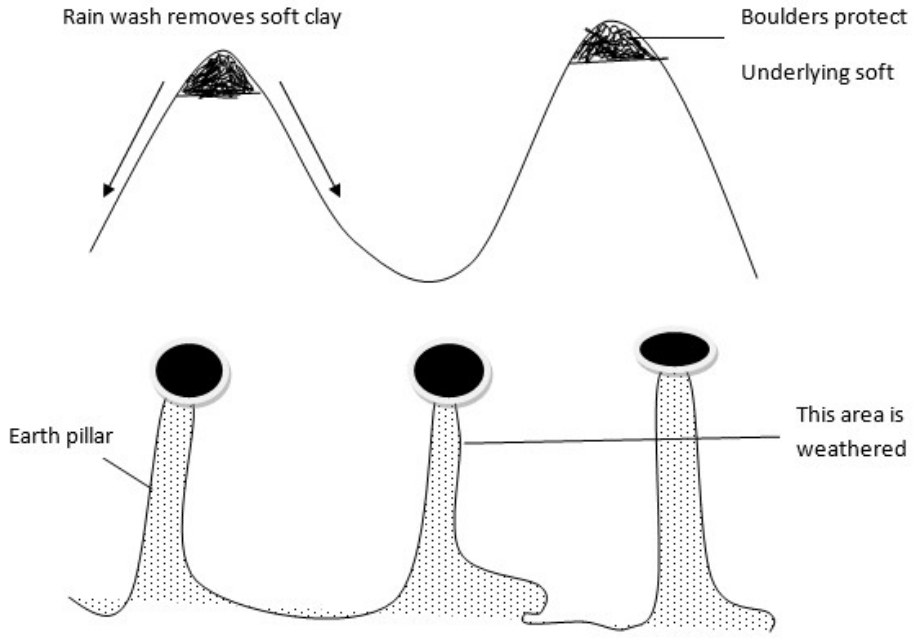
Rain action produces several types of features of which the most common are gullies and earth pillars

1. Gully

This is a deep formed by the action of running water on gently sloping land that has little or no vegetation. Gullies are sometimes referred to as badlands. They develop largely in semi –arid areas.

2. Earth pillar

This is the up-standing ridge capedwith boulders. It is formed when rain falls on the mountain slopes consisting of boulders and clay is removed rapidly except where boulders protect it.



WIND ACTION AND THE FEATURES IT PRODUCES

Wind refers to the air in motion from high pressure to low pressure belt. Wind action is very powerful in arid and semi-arid regions. Examples of deserts include the Sahara, in Africa, Namib, Kalahari and Gabi deserts.

Types of desert surfaces

Sandy Desert (Erg): This is a undulating plain of and whose surface is blown into sand dunes and nipples. The Sand Sea of Egypt and Libya is a good example of an erg.

***Stony Desert (Reg*)**: This consists of extensive areas with boulders and stones produced by daily temperature changes. Most of story deserts are formed in Algeria, Libya and Egypt

Rocky Desert (Hamada): This consists of extensive areas of bare rock from which all fine materials have been removing by deflation. Abrasion by the fine materials polishes and smooths the rock surface. One of the largest Hamada is Hamada el Hamra, in the Sahara of Libya.

Badlands: This is a land broken by extensive gullies, separated by steep-sided ridged. This type of desert is quite different from the three deserts explained above, in that it develops in sem-arid regions which experience sudden violent rainstorms.

WATER ACTION IN THE DESERT

Running water in the desert result the formation of fluvial features.

Fluvial features

Are the features which resulted due to the influence of water action.

The fluvial features can either fluvial depositional features or fluvial erosional features.

DESERT FLUVIAL EROSIONAL FEATURES

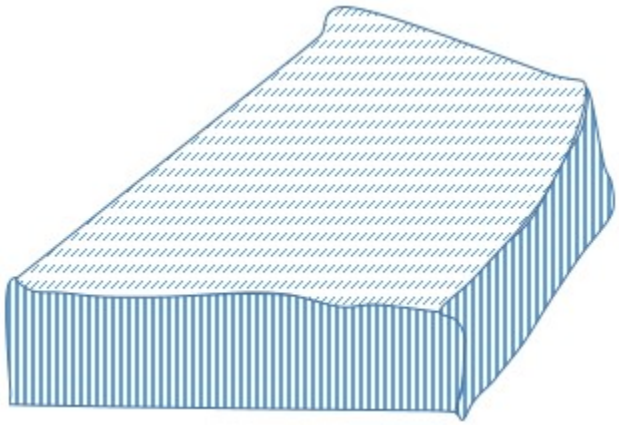
Desert fluvial erosional features are also known As Desert water erosional features.

These are the erosional features which caused water action in the desert.

Desert fluivial erosional features include the following.

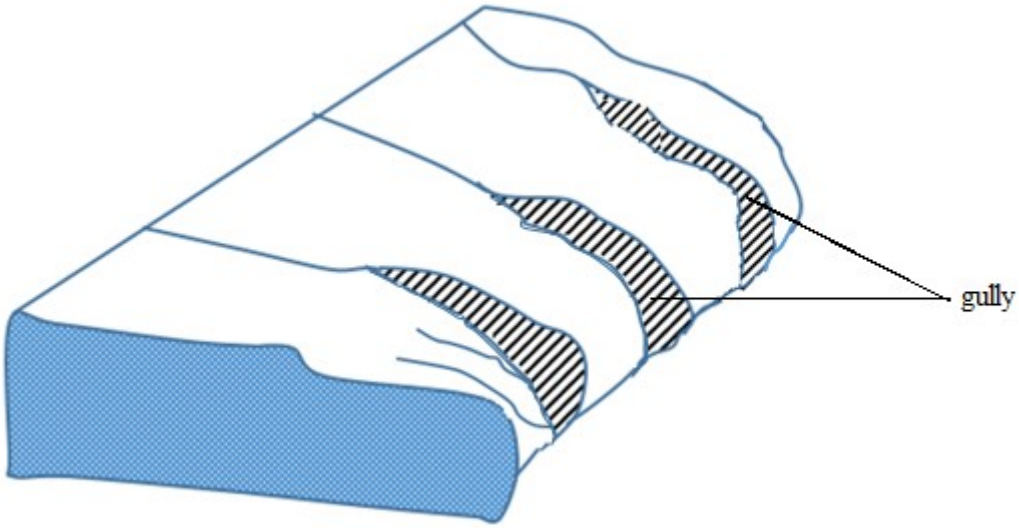
i. Rills: -

Are the small shallow grooves formed due to rill erosion effected by surface run off



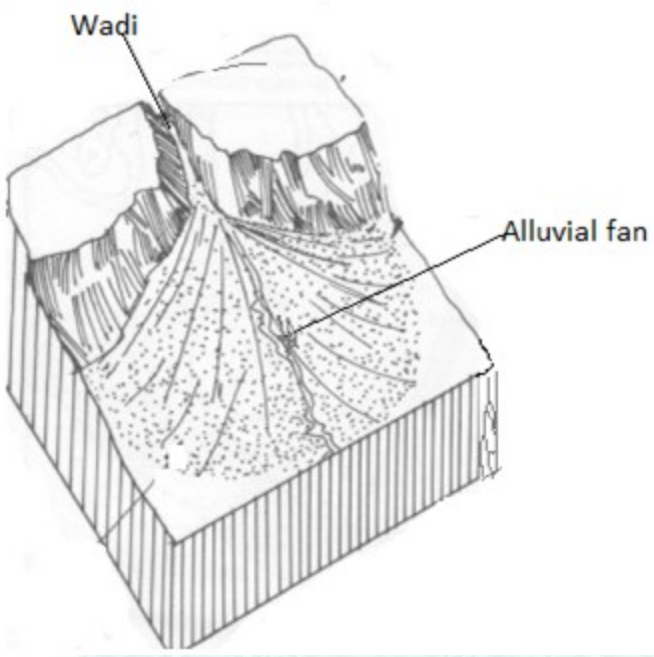
ii. Gullies: -

Are deep steep sided trough produced when erosion in the rills become more concentrated into the ground



iii. Wadis: -

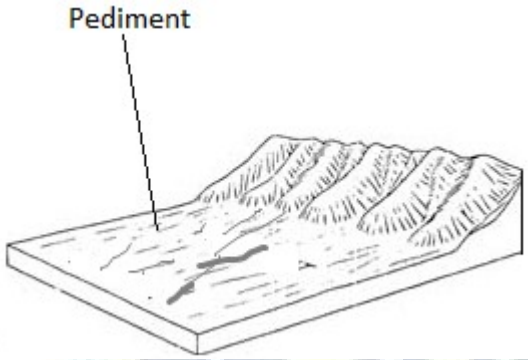
Are the steep sided deep and often flat floored valleys formed due to severe erosion by water in the desert.



iv. Pediment.

Is a gently sloping platform formed when edges of the desert and semi desert high lands get pushed back by erosion and weathering.

The process whereby pediments is called pedimentation.



v. Pedi plans / Pad planes

- Are the multiconcave features resulted by several adjacent of large scale pediments.

- They are formed as a result of wide spread surface water erosion on the surface in desert areas.

WATER DEPOSITIONAL FEATURES IN THE DESERT

Are the depositional features formed when the materials carried by running water accumulated and deposited in some parts of the desert surface.

The desert water depositional features include the following.

- Alluvial cones.

Are the features which look like alluvial fans in shape but consist of coarser materials

- They are formed when large coarser materials deposited at the foot of steep slope. Thus, they are formed in the same way to alluvial fans.

- Bajads or Bahadas.

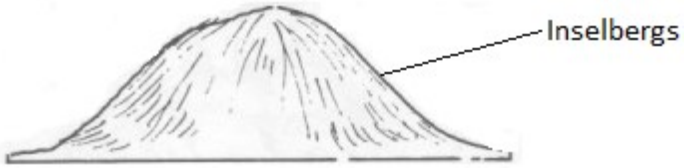
Are the continous gentle sloping features with undulating surface formed when either alluvial fan or alluvial cones coalesce during deposition of more sediment at the foot a steep slope.

- They consist of angular scree, gravels and coarse sands around the margin of the basin.

vi. Inselbergs: -

Are the residual hills or rock masses formed by water erosion in the desert

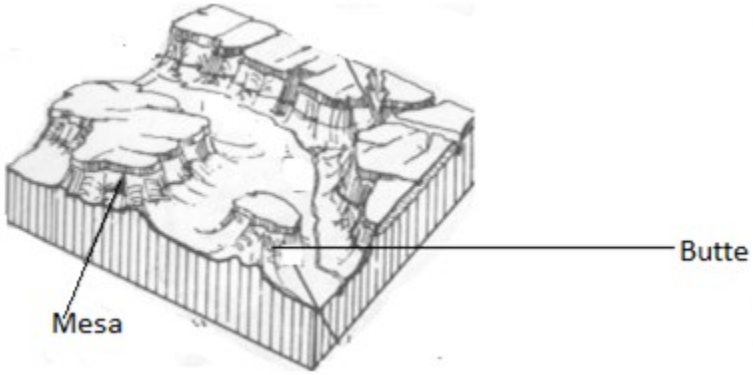
- They are always rounded and smooth



vii. Mesas and buttes

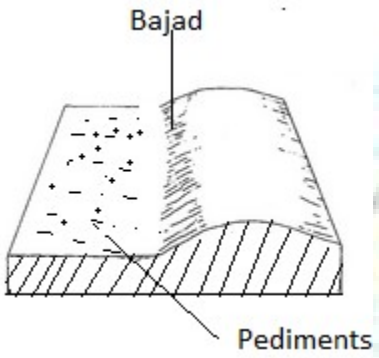
Mesas are extensive flat topped residual table lands which are generally capped with resistant rock stratum.

Buttes are the small but prominent residual flat topped hills usually capped with resistant rock stratum which remain a mesa and are similar to mesas except that they are small.



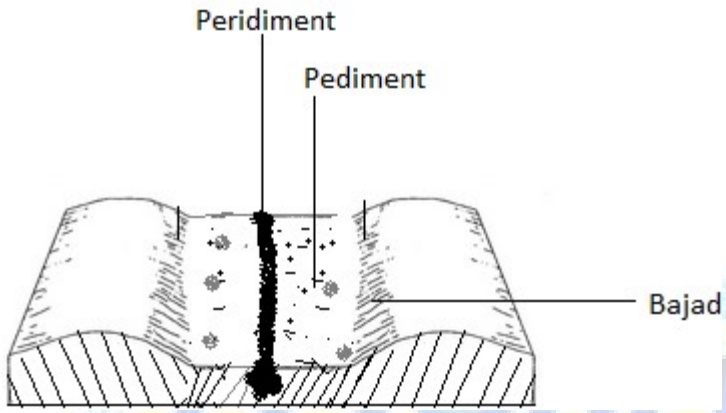
viii. Dry river valleys.

Are the river valleys which remain dry after the streams of water dry during dry season in the desert landscape or along the base of the mountain range in the semi desert area



ix.Peripediment.

Is a feature with a gentle slope formed when alluvial deposits overlie the edge of the pediment.



x. Plays and Salinas

Are the temporary salt lakes. Sometimes these playas dry up produce salt beds or salt flats called Salinas or Salas.

WIND ACTION IN THE DESERT.

Wind action is also known as Aeolian. It causes erosion transportation and deposition of materials in the desert.

WIND EROSION

Refers to the remove of particles on the desert surface.

Wind erosion consists of three main processes. These are

- Deflation

Is the process by which small the wind blows away loose rock waste and in doing so lowers desert surfaces producing deflation.

- Abrasion

Is the process by which small particles of rock are hurled by wind against the rock surfaces helping to produce features like rock pedestals, Zeugen and Yardangs.

During abrasion, the wind exerts the blessing action and uses its load as the tool for polishing and undercutting the surface.

- Attrition.

Is the process by which the rock particles rule or collide against each other as they carried along with wind. The particles get progressively reduced in size through this way until they become

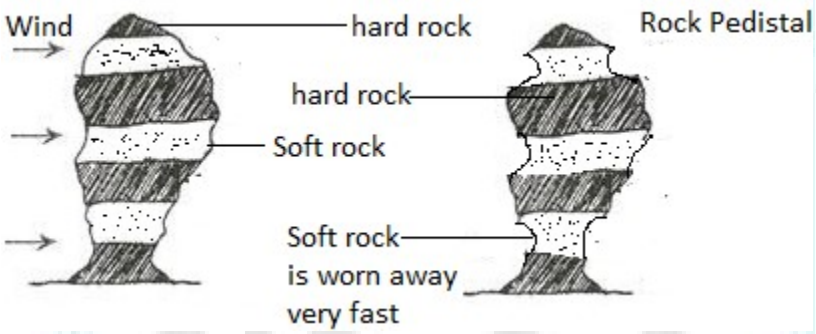
finer and finer.

WIND EROSIONAL FEATURES

The desert wind erosional features include the following

1. Rock pedestals

Are the tower like structures composed of alterate bands of soft and hard rock produced due to wind abrasion in the desert. As abrasion goes on attacking the weaker rock, the pedestal may break at the base and collapse.



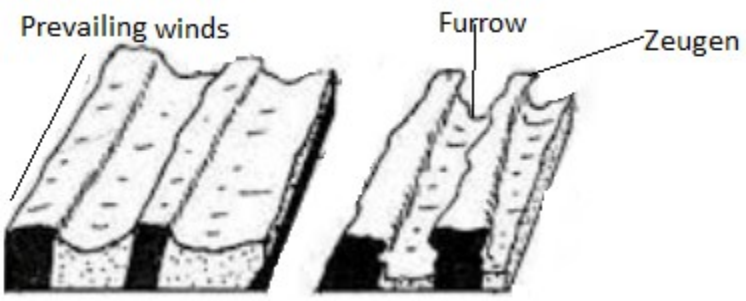
There are rock pedestals in Saudi Arabia, Tibest Mountains in central Sahara and in Niger.

ii. Zeugen

Are the ridge consisted of alternate layers of hard and soft rock overlying vertically downward.

- They are formed in areas where the rock layers lie horizontally and are characterized by joints.

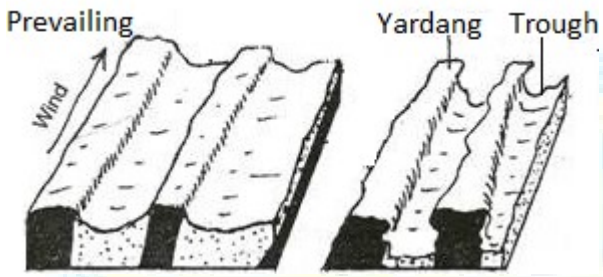
- The weathering process first opens up the joints and then wind abrasion continues the work of weathering leading to the formation of furrows and Zeugen



iii. Yardangs

Are the ridges consisted of hard and resistant rock bands standing either vertically or at an angle and can vary in height from 5m to 15m but having lengths of up to 1000m.

The yardangs are parallel to the direction of the prevailing wind. Example: - Yardangs can found near Salah (central Algeria and near KomOmbo in Egypt.



iv. Blowouts

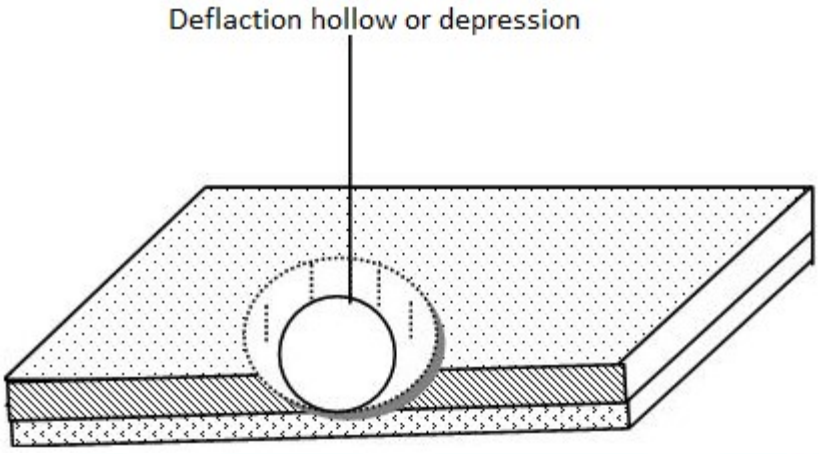
- Blowouts are also known as Deflation hollows or pans.

These are the hollows or depressions produced by wind deflation.

- The small hollows are known as pans and are common in Kalahari Desert.

- Larger hollows like Qattara Depression in Egypt were formed by wind deflation.

- When these hollows are filled with water oases are formed.

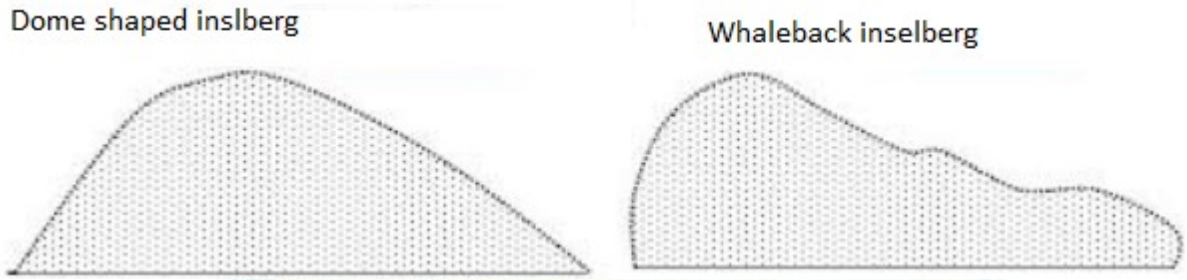


v. Inselbergs

- Are the residual hills consisted of hard and resistant rock left standing on the surface after the rest part of the earth has been eroded

- When inselbergs are smooth and round in shape are called bornardts

- When the inselbergs are characterized by a lot of joints with rectangular rock blocks pilled together to produce a castellated form are called Kopjes

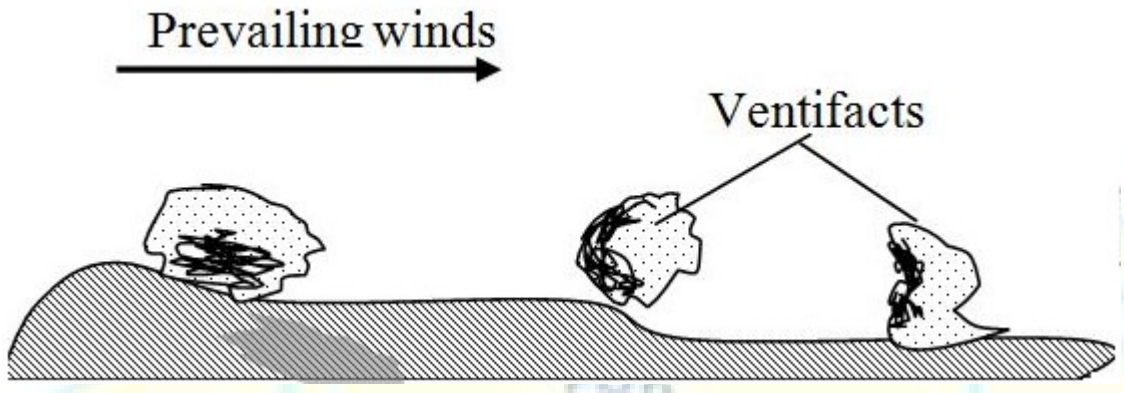


Note: - Inselbergs investigated that, many of them in the desert are formed due to the water action rather than wind action.

vi. Ventifacts

Are heavier rock blocks or pebbles left behind after the wind has sorted and carried away all material.

- They are sharpened and flattened as they lie by the action at the sandblast passing over them



WIND ACTION DEPOSITIONAL FEATURES

The material transported by wind from different features after deposition. The features formed include the following

- Sand Dunes

Are the hills of sand which have been deposited by winds in the desert

The formation of sand dunes is influenced by the extent of vegetation cover, the size of particles amount of the material and velocity of the wind.

There are two main types of sand dunes.

These are

i. Barchans

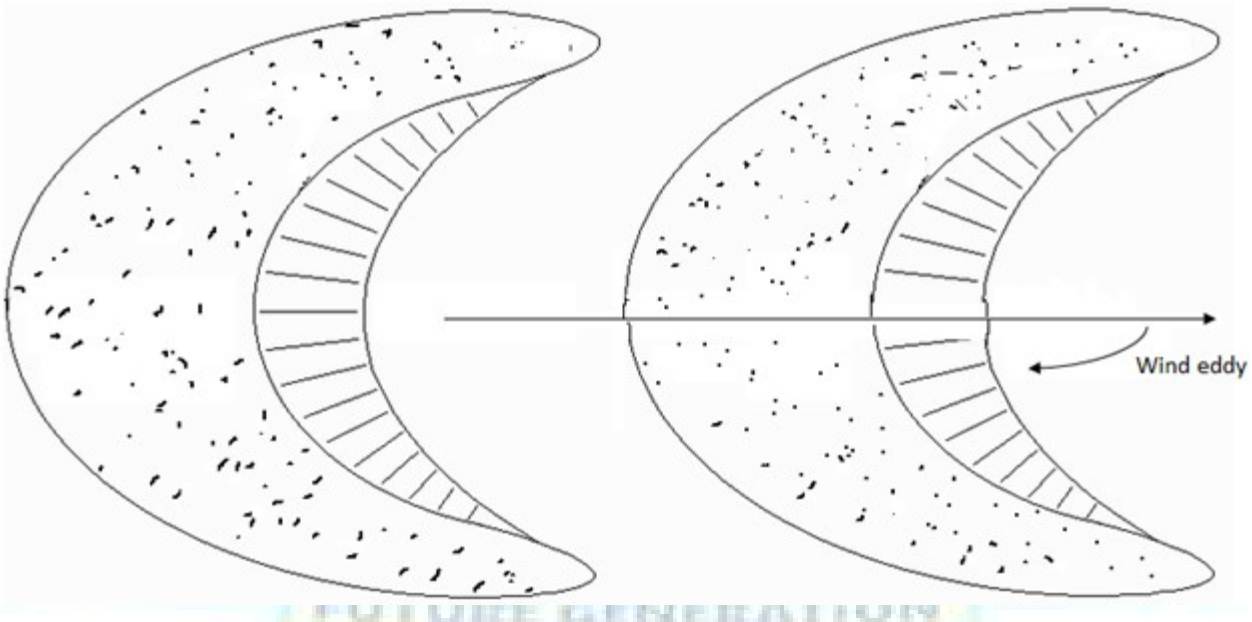
ii. Seifs

BARCHANS / BARKHANS

Are the crescents – shaped sand dunes which occur individually or in groups.

- Development of barchans is usually influenced by the obstruction which may be a tree or large stone.

- The windward side of the barchans is steep and slightly concave.

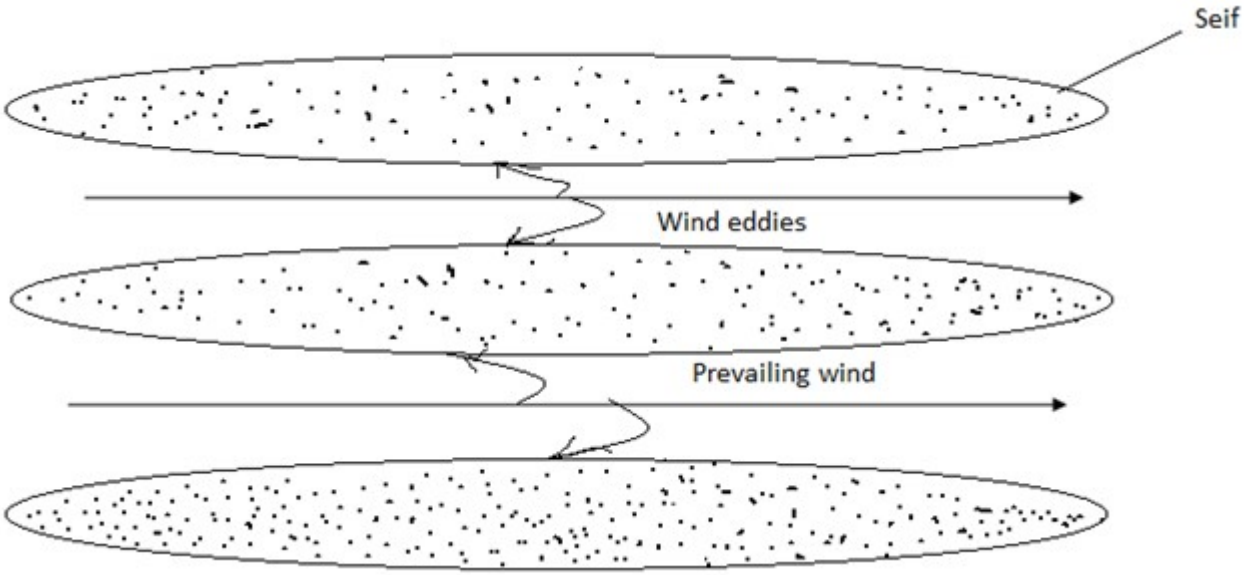


SEIF DUNES

- Seif dunes are also known as longitudinal dunes.

- They are long narrow ridge of sand which lies parallel to the direction of the wind.

- They usually occur on the small scale in sandy areas such as along the coasts and in the extensive sides of the river valley but such sand dunes are in small size because of the limited supply of sand.



LOESS

Is the accumulation of the fine particles of sand that have been carried beyond the limit of deserts.

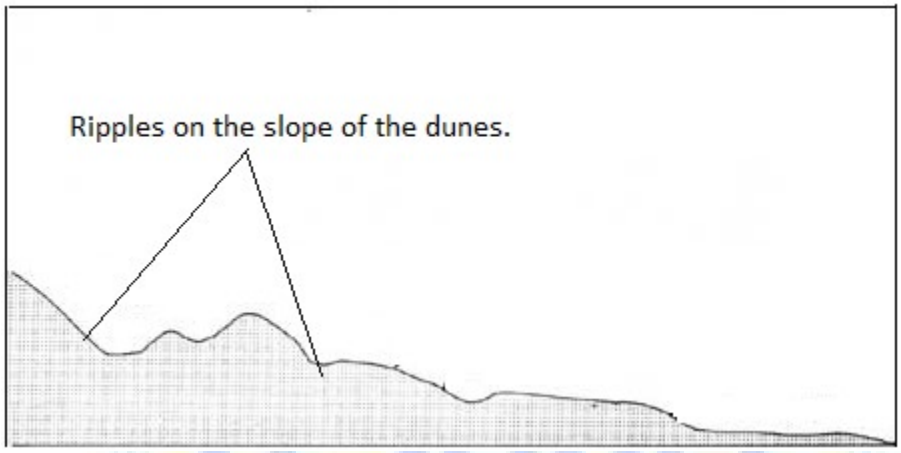
- They are mostly found in loess plateaus of the China.

- The loess leads to the formation of fertile soil

RIPPLES

- Are the smallest wavy structures, sometimes less that a centimeter high.

- They are commonly between the dunes



GLACIATION

Glaciation refers to the process whereby a certain area on the earth's surface is affected by glaciers (moving ice). Glaciations also refer to the process that takes place due to the influence of moving ice.

Glacial erosion

Glacial erosion, which predominates in the highlands, consists of the following mechanism or processes.

Sapping: This refers to the breaking up of rocks by alternate freezing and thawing of water at the bottom of cracks between a mass of ice and the side and floor a valley, or the side of a mountain.

Plucking: This is the tearing away of the blocks of rock which have been frozen into the sides or bottom of a glacier.

Abrasion: This is the wearing a way of rocks beneath a glacier by the scouring (scrapping) action of the rocks embedded in the glacier.

Feature produced by glacial erosion

Cirque (corrie): A semi-circular, steep-sided basin cut into the side of a mountain, or at the head of a valley. It is formed by the process of plucking, which steepens the basin, and abrasion, which deepens the valley. Some corries contain glacier, but in others the glaciers have melted and they now contain lakes (sometimes called tarns). Examples of tarns are Lake Tana in Ethiopia and Teleki tarn on Mount Kenya.

Arete: A steep-sides, knife-edged separating two cirques. It is formed by the cutting back of the walls of cirques by plucking. Examples of found on Mount Kenya.

Pyramidal peak: A jugged peak with a steep sided, angular horn. It is formed by the steepening of the back walls several cirques which lie on the sides of a mountain. Examples of pyramidal peaks are found in Mountain Elgon.

U-shaped valley: A steep-sided, flat- bottomed, wide valley contains features formed by both glacial erosion and deposition on the foot of the glaciated highland. It is formed by vertical and lateral erosion of moving ice. Most U-shaped valleys were originally river valleys.

Hanging valley: Are tributary valley of a U-shaped valley which ends abruptly, high above the floor of the U-shaped valley and separated from it by an almost vertical slope. It is formed due to unequal down cutting on the tributary valley.

Rock basin: An irregular depression in the floor of a U-shaped valley formed by unequal glacial erosion of the bedrock. It develops when the thickness and weight of a glacier increase, e.g. at the junction of two glaciers. Sometimes a rock basin becomes a lake when the glacier melts.

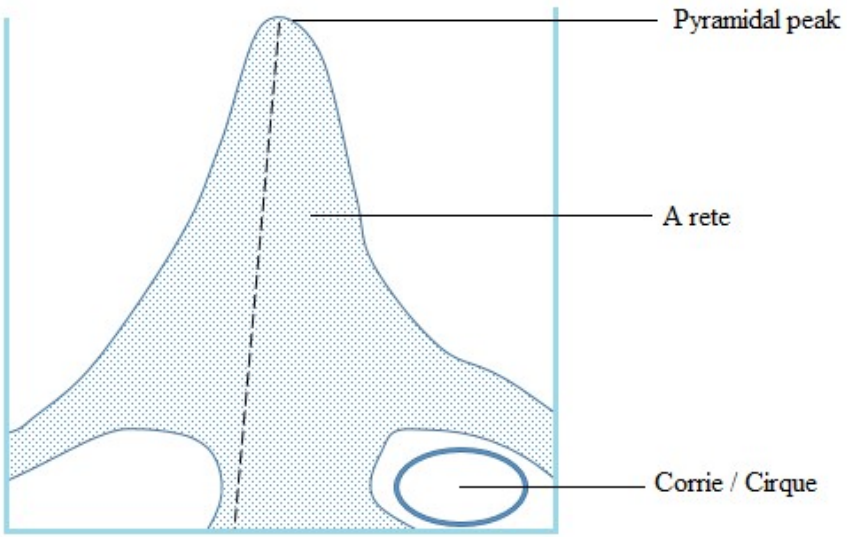
Ice-eroded plain: An extensive area once covered by an ice sheet which smoothed off the original landforms to give rounded topography, with large area of bare rock scratched boulders embedded in the base of the ice and rock basins in areas of weak rock, and the whole swept almost clean of the original weathered rock.

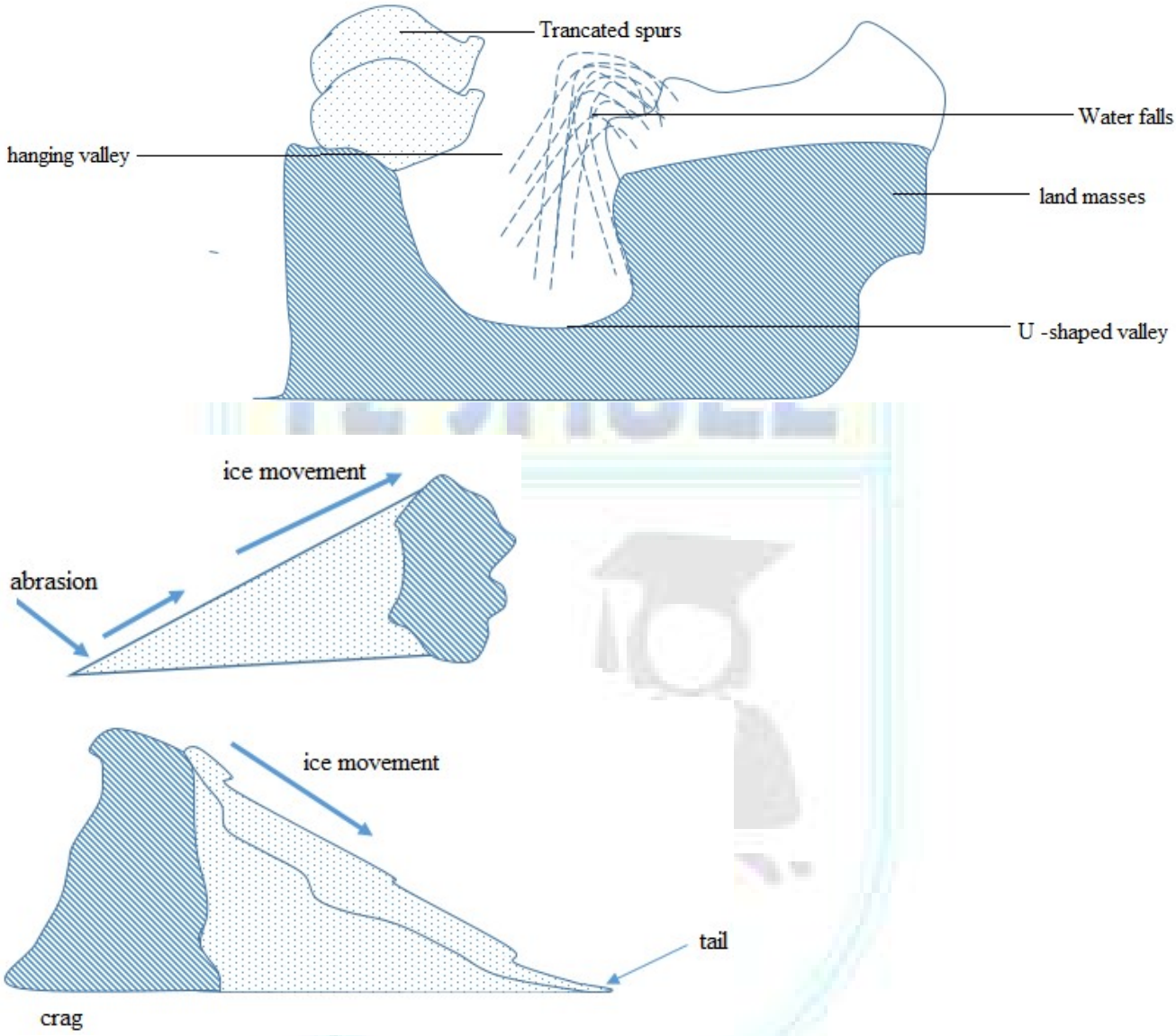
Roche Mountonnee: An outcrop of resistant rock smoothed by a glacier on the upstream side into a gentle slope. On the downstream side, the glacier eroded by plucking to give steep and jugged slope. It is formed where resistant rocks rise above the surrounding land surface. The upstream side of the rock is plucked to a steep slope.

Crag and tail: A head of resistant rock which protected a weaker rock from ice erosion on the downstream side.

Truncated spurs: These are blunt-ended rock ridges which descend from the steep sides of a U-shaped valley or glacial through. They are often separated by hanging valley.

Before glaciations, relatively immature rivers display a pattern of interlocking spurs. A valley glacier cannot avoid the interlocking spurs as a river can. As the valley glacier moves, abrasion and plucking eroded the protruding tips of the spurs, leaving steep cliff-like truncated spurs.



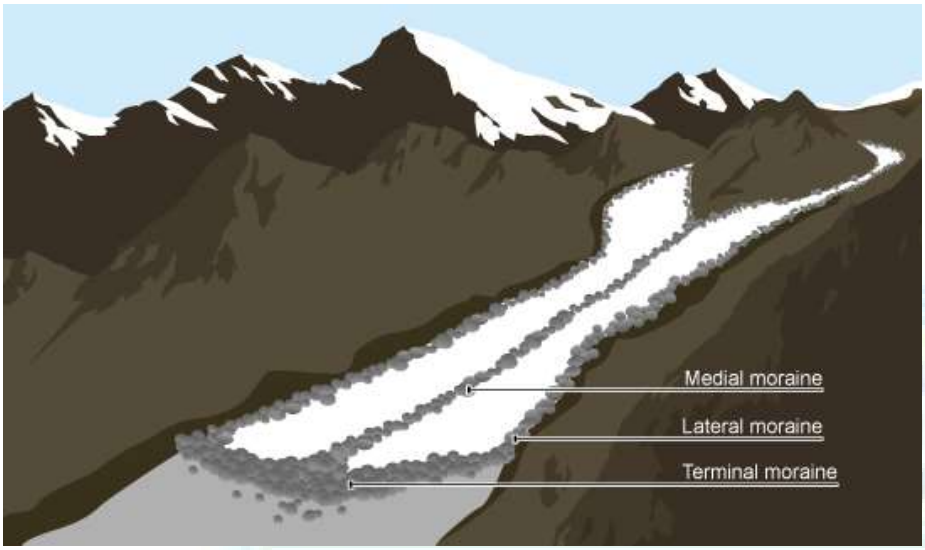


Depositional features of glaciations

Moraine: These are unsorted rock fragment of all sizes, from sand to boulders, formed partly by frost action and partly by glacial abrasion, transported by a glacier and dumped in ridges or sheets.

Types of moraines

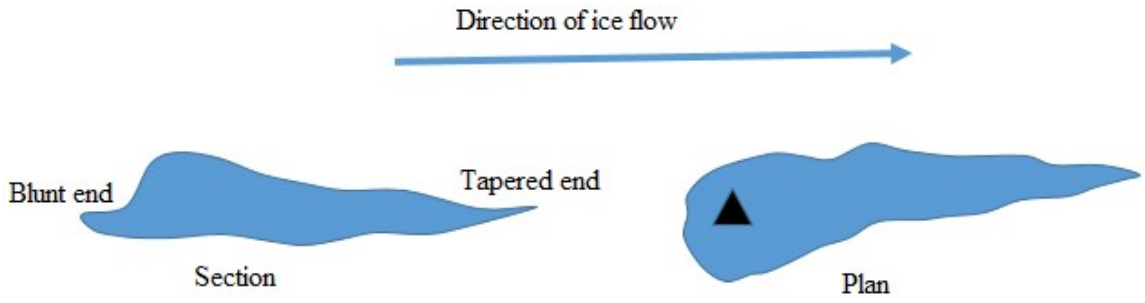
A moraine that forms along the sides of a glacier is called *lateral moraine;* that along the front of the glacier is called *terminal moraine*; and the at the bottom of the glacier is called *ground moraine.* When two glaciers join, their inner lateral moraines join together and give a *medial moraine.*



Boulder clay plain: A plain made of clay and boulders, deposited by ice sheets and glaciers over a surface.

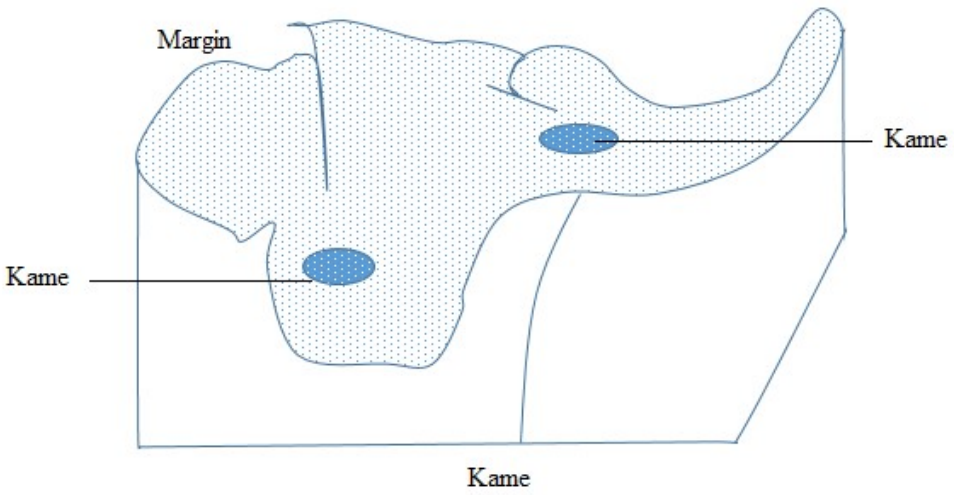
Drumlin: Elongated, oval-shaped hill made of boulder clay and about 1 km long and 25 to 100m wide.

Each drumlin is a small hill, tending towards an egg shape, with its steepest slopes and summit at the up-ice end. Drumlins rarely occur singly, however, and are found in groups or swarms, with the tapered end of each hill pointing in the direction of glacier flow.



Eskers: An esker is a long, narrow, winding ridge of stratified sand gravel. The materials that form an esker are deposited by sub-glacier streams which retreat their way in the channel under the ice. Eskers reach up to 40 meters high. They are mostly found in Scandinavian countries.

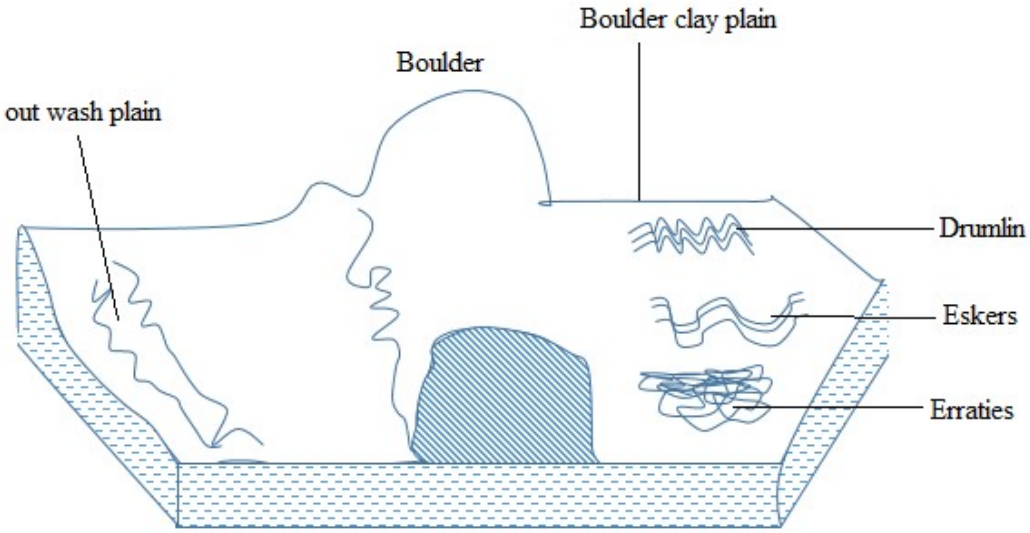
Kame: Is an irregular-shaped mass of stratified material formed as a delta on the surface of a stationary glacier or at its margin. It is a mound-like hill of poorly sorted material mostly sand and gravel, deposited at or near the terminus of a glacier. A kame may be produced either as a delta of a melt water stream or as an accumulation of debris let down onto the ground surface by the melting glacier.



Erratic: A glacial erratic is a piece of rock that differs from the size and type of rock native to the area in which it rests.

Norber Erratic

Most erratic can bound at Kimberlay (South Africa), North East USA and Wales in Britain



Terminal moraine

COASTAL LANDFORMS

A coast is a land or area near the ocean or sea. Coastal zone or line is a part of the coastal land bordering the sea or the part which can be reached by the strongest sea waves. The term is related to the study of the coast.

Definition of terms

Swash: This is the forward movement of waves from the coastline.

Backwash: This is the backward movement of waves from the coastline.

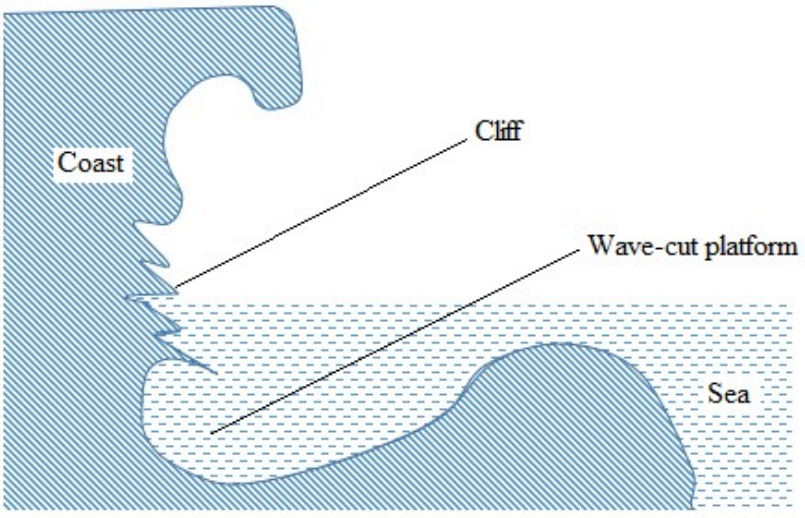
Wave: The upward and downward movement of water following the direction of wind.\

Crest: The highest apart of the wave.

Trough: The lowest part of the wave.

Wavelength: The distance from crest to crest or trough to trough.

Wave height (pitch): The distance between the crest the trough. The size of the wave or wave or wavelength depends on the strength of the wind, i.e. the stronger the wind the larger the waves and wavelength, and vice versa.



The coast has various physical features often termed as coastal landforms. These features have been formed due to various factors or changes (natural and manmade) which have affected the coastline or coastal zone. There are different factors for the changes or evolution in the coastline (the factors influencing the development of a coastline). The factors are divided into two groups:

a) Natural factors

This includes the work of ocean waves, currents and tides and agents of erosion, transportation and deposition. For example, the coastline may be affected by marine (wave erosional process forming such features such as cliffs, sea caves, wave-cut platforms, etc) and by marine (wave) deposition forming such features as beach, spit, sand bars etc.
The nature of the coastal rocks, i.e. Whether the coastal rocks are resistance to wave erosion or weathering or not. Where the coastal is resistant to marine erosion and weathering, coastal cliffs and headlands may be formed. Where the coastal rocks are not resistant to marine erosion and weathering, bays and caves will be formed.

The trend of the coastline – this refers to the direction and orientation of the coastline in relation to the marine erosional and depositional processes, e.g. steeply sloping coastline may favour the development of marine depositional features such as spits.

The effects of glacier and ice sheets reaching the sea or ocean. These may increase the sea or ocean level and hence lead to the submergence of the coastal areas forming landforms such as fiords (Fjords), and Rias.

Volcanic eruption and earthquakes along the coast. These may from various volcanic coastal features or may cause displacement or faulting of the coastal rocks.
Growth of reefs along the eastern coasts of Tropical Ocean water, e.g. fringing reef, barrier reef, atoll, etc.

b) Man-made factors

Through engineering activities such as construction of ports and dredging of estuaries.
Through land reclamations processes of agriculture, settlements or recreation
Through construction of dykes and lifeguard towers.
Through quarrying activities along the coast e.g. quarrying of sand and gravels.
Mining along the coast.
Fishing by using illegal means such as dynamites or explosives. Marine (wave) erosion refers to the coast by waves (current and tides). Processes involved in marine erosion (marine erosion process) are

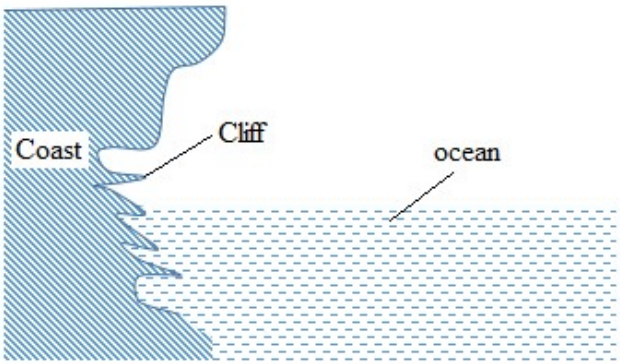
Abrasion (corrosion) : The erosion of the coastal by the material carried by waves
Chemical solution (corrosion): This occurs where the waves dissolve and erode soluble coastal rocks e.g. limestone.
Hydraulic action of waves: This is the erosion of the coastal rock by the power of water (i.e. water

waves)
Attrition: This is the erosion that occurs where the materials carried by waves collide and break into small particles which are the transported by waves.

NB: The above marine erosional processes may occur simultaneously although one process may be more dominant than the others. Marine (wave) erosion occurs where backwash is stronger than swash.

Marine (wave) erosional features (land forms)

Ocean cliff: This is rough, steep sided coastal rock facing the sea or ocean. It may be formed due to marine abrasion.



Caves, goes, arches and stocks: These are features produced by wave erosion during the development of cliffs.

Features produced by wave deposition

Beach: This refers to a deposit of mud, sand or pebble on the sea store. A beach has a gently sloping surface, usually formed between low water and high water levels.

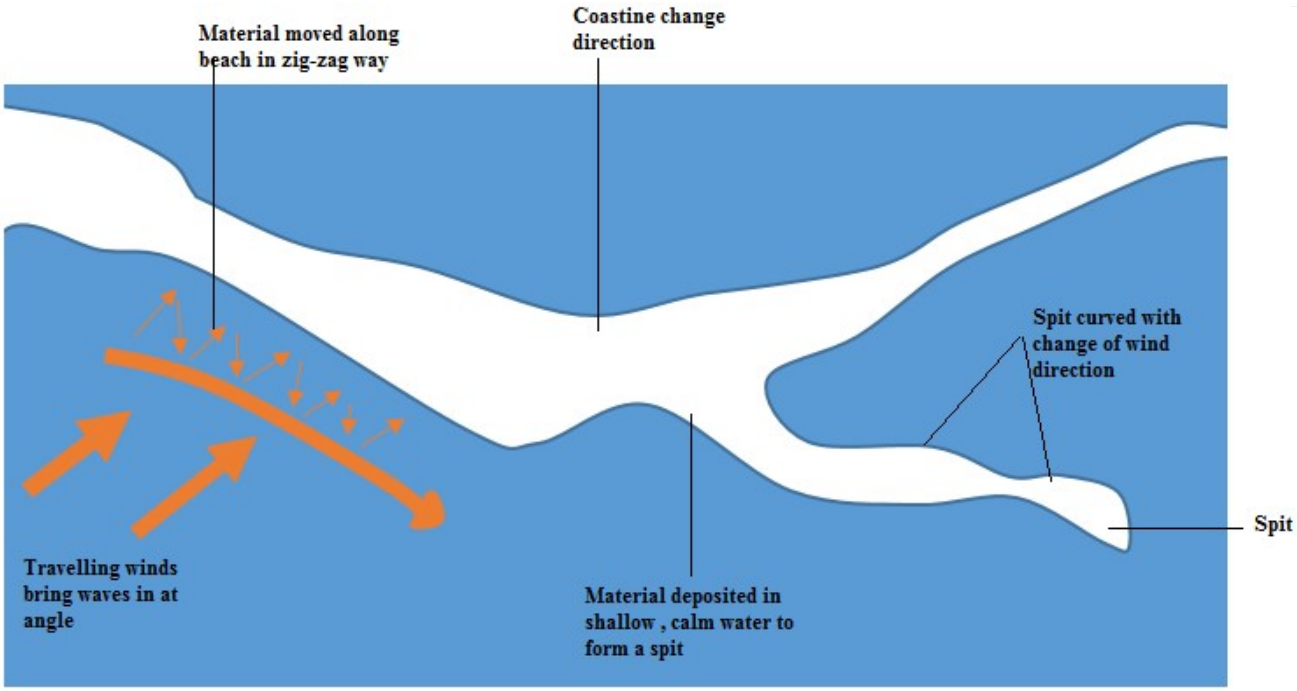
Beach

Types of beaches

Storm beach – beach formed by materials (pebbles, stones, mad, sand, etc) deposited by beyond the normal level reached by waves at high tide.
Bay beach – a beach formed by materials deposited at the bay.
Barrier beach – a beach development from an underwater offshore bar as the bar moves towards the land. It is a long ridge of sand, parallel to the coast and separated from it by a *lagoon.*

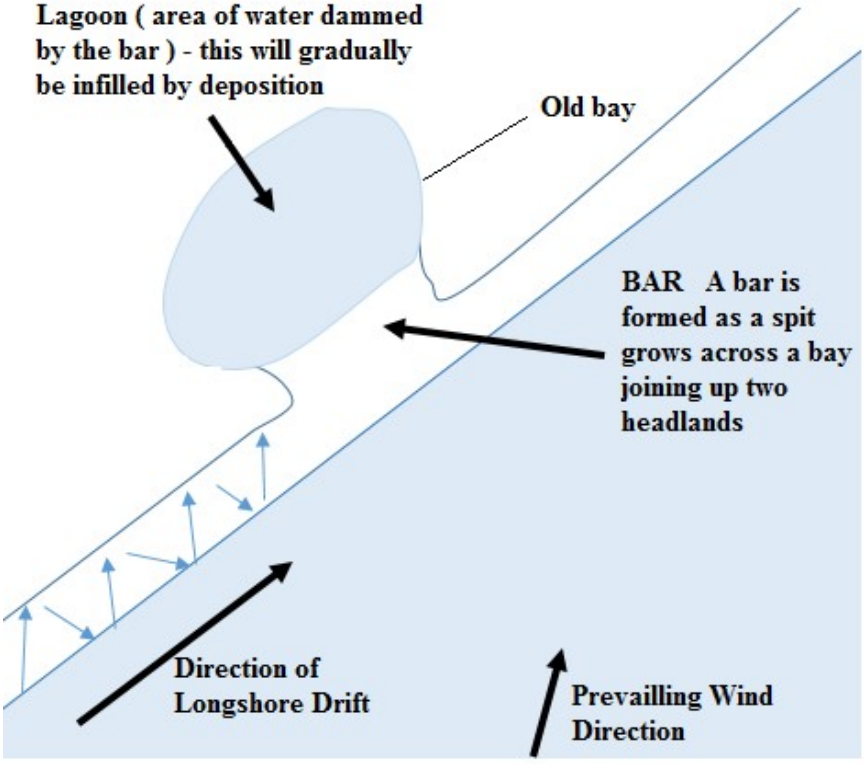
Spit: Spite is a low, narrow ridge of pebbles or sand joined to the land (mainland or island) at one end, with the other end terminating in sea. It is formed by deposition of material by long shore drift.

Formation of a spit



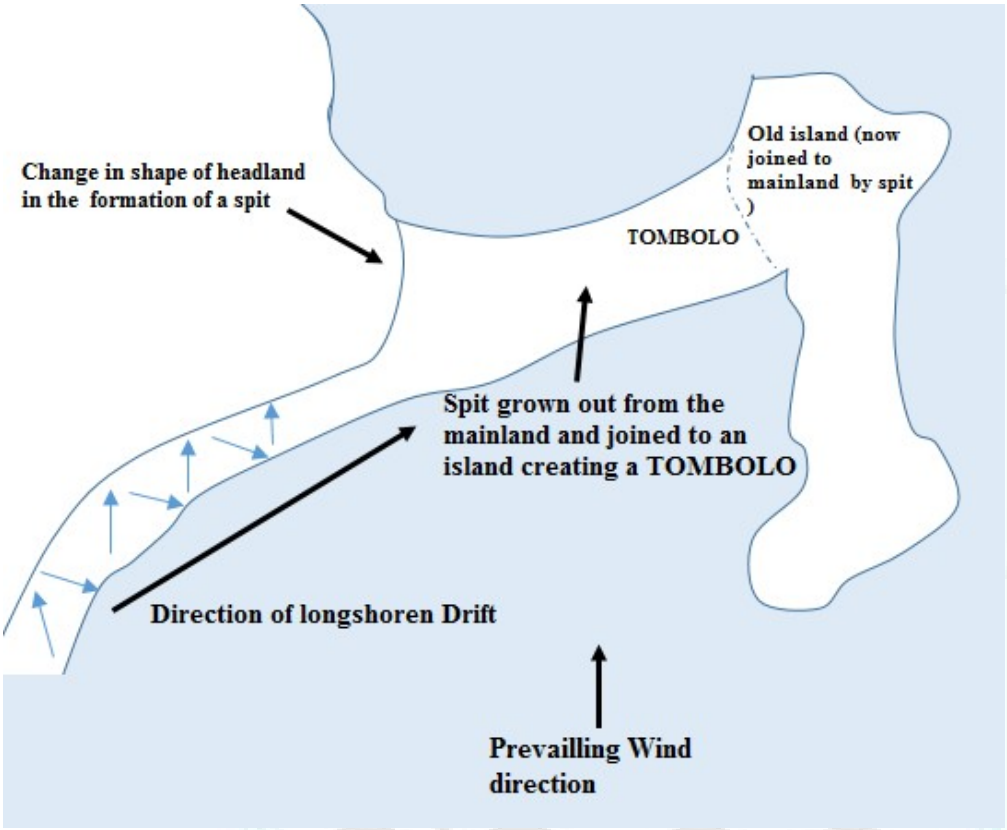
Bar: The words spit and bar are often confused and misused. A bar is a ridge of material, usually sand, which lies parallel, or almost parallel, to the coast. Unlike a spit, a bar is not attached to the land.

Formation of a bar



***Tombolo*:** This is a bar that joins an island to the mainland.

Formation of a tombolo



Offshore bar: This is an offshore bar that develops on the gently sloping sea bed, in an offshore zone where sand is thrown up by waves breaking some distance from the coast. The sea waves scoops up sand which is thrown forward where it accumulated as an offshore bar.

Mudflat: This refers to fine silt deposited along gently sloping coasts, especially in bays and estuaries. This deposition of silt, together perhaps with river alluvium, results in the building of a platform of mud called mudflat.

Mudflat.

SOIL

Is the thin upper layer of the earth's crust which has been weathered from the parents material and decomposed animals and plants .soil support plants growth and animal life.

FACTORS INFLUENCING SOIL FORMATION

Soil formation is sometimes called Tredogenesis.

The formation of soil is mainly initiated by weathering process. There are several factors which influence soil formation these are as follows:

a) PARENT ROCK MATERIAL

This is one of the chief factors of soil formation. It determines soil type, color, depth, rate of soil formation, structure, texture, porosity and soil fertility.

Parent rock influence soil maturity, therefore hard rocks take a long time to mature while soft rocks take a short time to mature. Shallow and poorly productive

b) CLIMATE

The most variable elements under climate are temperature, precipitation (rainfall) and wind

- Temperature affects decomposition of organic matter hence it influences the development of soil profile
- Rainfall and wind encourage the formation of soil due to their role in the erosion process
- On the other hand rainfall adds moisture which encourages chemical and physical weathering

c) LIVING ORGANISM

Some plants have nodules with bacteria which add nitrogen into the soil hence improve aeration of soil. Micro organisms are active in the decomposition of the organic matter to form humus on the other hand barrowing of animals and plant roots facilitate the state of both physical and chemical weathering hence lead to the formation of soil easily.

d) RELIEF [TOPOGRAPHY]

The role of relief in soil formation is mostly in indirect way. Relief influences climate and vegetation. The most important aspect of topography in soil formation, steep slopes areas soils

are shallow due to erosion while on a gentle slopes and low land areas soils are deep due to deposition of materials.

e) TIME

This involves the duration that has been taken in the process of soil formation. Time determines the maturity of soil, when soil formation has taken a long time, soil tends to be mature i.e. they are deep and well developed.

IMPORTANCE OF SOIL

Soil is virtual life support to both flora and fauna organism , because all the organisms depend on the soil as their source of food . soil is therefore important to both plants and animals life in various ways including the following:-

(i) Animal life support ;

soil acts as plant habitat in which animals uses plants as food for their survival.

(ii) Building materials

soil is used directly in making of bricks ,tiles and white wash, The materials are the used in building of houses ,bridges and other structures.

iii) Source of minerals

some soils contains minerals which can be extracted for commercial purposes . For example Titanum is obtained from soil deposit of Kwale near Mombasa in Kenya Bauxite , which is mined in Guinea in West Africa

(iv) Cultural and medicinal values

Some soils are cultural value in some communities e.g red ochre and clay are used for body decorations by Maasai communities and clay mixed with herbals and being used for medicines

(v) Farming and settlement

fertile soil influence cultivation of crops .settlement distribution also depends on arable fertile soil where as people tend to dwell in areas with food availability.

(vi) Habitat for organisms

soil functions as a habitat for organisms such as burrowing rodent, earthworms and termite. These organisms perhaps are significant in the process of soil formation

SOIL CONSTITUENTS (COMPONENTS)/COMPOSITION

Soil is made up of the following components;

1 . Organic matter

This forms 5% of the total volume of soil and is made up of plant and animal remains. This forms humus as a result of decomposition of animals and plant remains.

IMPORTANCE OF HUMUS

i) Improving the structure of the soil and its water retaining capacity limits the leaching process and improves the soil acceleration

ii) Storing and supplying nutrients to the plant like nitrogen, phosphorus, potassium, calcium - high production.

iii)Humus regulates the temperature of the soil and soil pH

iv) The living micro-organisms help in decomposition.

2) **2. Inorganic matter**

This forms 45% of the total volume and is made up of minerals from the parent rock. Minerals constitute several nutrients which are needed by plants.

3) 3 . Soil water

Forms 25% of the total volume and it is one of the most important soil components. It is derived essentially from rainfall especially from infiltration and through flow.

IMPORTANCE OF WATER

a) It regulates temperature in the soil

b) It helps in the solution and transfer of nutrients in the soil

c) Too much water in the soil leads to the leaching of mineral nutrients in the soil

d) It controls chemical processes like weathering as well as mechanical weathering.

4) 4. **Soil air**

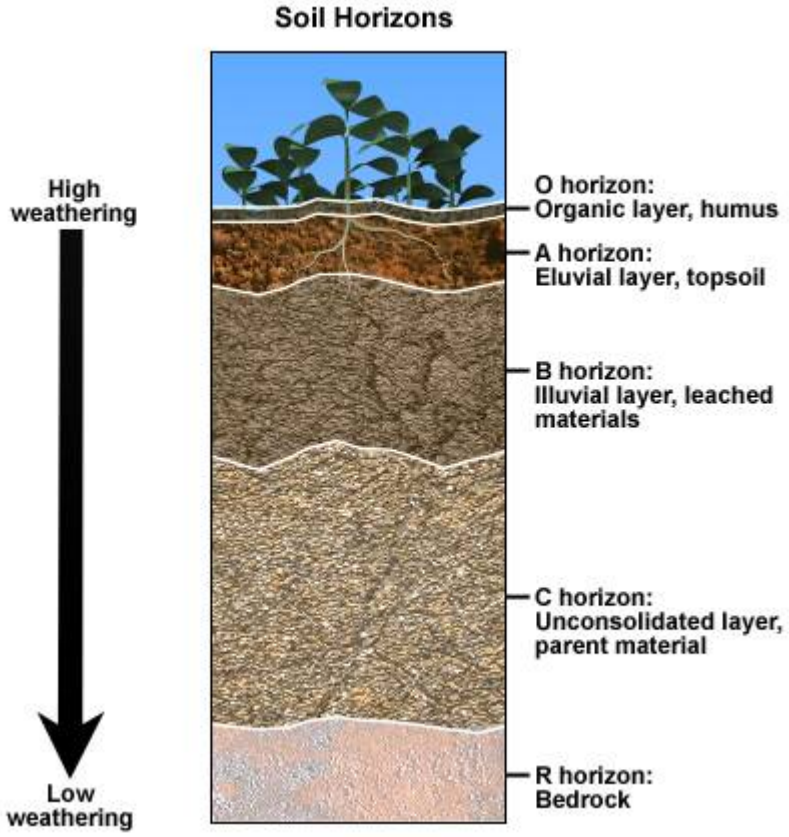
It forms 25% of the total volume. It consists of the soil atmosphere from which plants and soil organisms obtain oxygen for their metabolism and dispose of carbon dioxide and other gases.

SOIL PROPERTIES

A: PHYSICAL PROPERTIES

1. SOIL PROFILE

This is the vertical section from the surface to the parent rock characterized by distinct layers usually of different texture and colors.



A- horizon

Is the topmost layer and can include organic matter to form humus. Horizon 'A' varies in color from place to place for example dark, grey etc. this zone is also called the zone of Elleviation from which materials are washed down ward. It is in this place where leaching process takes place.

LEACHING

Is the washing down of nutrients in solution from the topmost layer to another layer

B- horizon

This zone is also known as the zone of accumulation. In this layer the materials washed from 'A' horizon are deposited or accumulated.

C- horizon

Is the partially weathered parent rock from which the soil develops, it is underlined the D horizon which is the fresh [unweathered] parent rock.

D-horizon(Bedrock)

It is the unweathered parent rock. it is the parent in sense that it is the source of the in organic content of the soil

2. SOIL DEPTH

Soil depth varies from place to place depending on maturity. Maturity is influenced by the nature of the rock as well as duration of the soil forming processes which have been operating.

Soil depth is important for agricultural activities. Thus deep soil is important for agricultural activities while shallow soil is not good for cultivation.

3. SOIL COLOUR

Soil color is determined by the materials and the mineralogical composition from which the soil is derived and organic matter content. It varies from one place to another. Soil color can be classified and described in terms of ;

a) Dark [black, grey, dark brown etc] and cinnamon

b) Bright [yellow, orange, red, reddish brown and yellow brown]

c) Light [white, whitish grey]

4. SOIL TEXTURE

This refers to the degree of coarseness of soil (especially soil mineral particles). It can also be referred to as variations in the particle size, caliber or mechanical composition

According to the soil texture, soil can be classified as;

a) Coarse sand (2 to 0.2mm)

b) Fine sand

c) Silt (0.02mm)

d) Clay (less than 0.002mm)

e) Loan soil is a mixture of sand, clay and silt.

NB; measuring of soil texture can be done through the use of finger testing

IMPORTANCE OF SOIL TEXTURE

1) It influences soil porosity, permeability, structure and retention capacity

2) It influences plant growth and root penetration

3) It influences the cultivation during agricultural activities

4) It influences soil resistance against erosion

5) It influences soil fertility

5. SOIL POROSITY

These are the total volume of the pores or empty spaces between particles of the soil materials especially in the soil. Soil porosity is mainly influenced by soil texture, organic matter, soil structure, individual undisturbed soil aggregate compounds referred to as peds.

IMPORTANCE OF SOIL STRUCTURE

i) It determines water retention capacity and aeration

ii) It is an indicator of soil fertility or suitability for agricultural activities, settlement locations and construction

iii) Good structure facilitates the activities of the micro organism

iv) It influences the cultivation process

v) It influences the plant growth by influencing the root penetration and water retention

-Therefore it is quite fundamental to note that the best soil is that which influences the water holding and aeration capacities of the soil.

6. SOIL STRUCTURE

This is the arrangement of soil particles into aggregate compounds particles. Individual undistributed soil aggregate referred to as peds.

7. **SOIL TEMPERATURE**

Soil has a certain degree of temperature and this tends to vary from one place to another due to the variation in the climatic condition.

IMPORTANCE OF SOIL TEMPERATURE

1) It controls biochemical and chemical processes especially the decomposition of organic matter and plant growth. Thus plant growth and decomposition tend to be fast in warm areas and slow in cold areas, this is due to the fact that growth cells and micro organisms tend to be very active in the warm areas unlike in the cold areas where they tend to be inactive or less active.

2) It also determines the existence of micro organisms in certain areas. In extremely hot areas and cold areas may not support the survival of animals and other micro organisms

3) It controls the amount of moisture in the soil where there is high evaporation soil moisture is less or the soils are dry

B : CHEMICAL PROPERTIES

These include soil properties like soil reaction (PH), reaction exchange and leaching.

1) Soil reaction (soil PH)

This is the term used to describe the degree of acidity and alkalinity in the soil and it is related mainly to climate. This degree of acidity and alkalinity is expressed in the PH value which is the measure in terms of hydrogen ions concentration held by the soil colloid. Soil PH scale range from 1 to 14 where ph 7 is neutral, the condition below 7 is acidic while the condition above 7 is alkalinity which means it has more alkalis.

IMPORTANCE OF SOIL PH

- It helps in determining the selection of crops and agricultural distribution
- It affects plant growth such that where there is too much acidity there will be poor plant growth. This is because the increase of acidity leads to the increase in leaching with affects soil structure

LEACHING

This is another chemical property of soil referring to the process in which nutrients are washed down in solution from the top – soil laver. During leaching process the base are washed down leading to concentration of hydrogen ions which in turn cause the increased acidity in the top soil.

Leaching is very effective in wet conditions

SIMPLE HYPOTHETICAL PROFILE FOR MATURE SOIL

The soil profile varies from one place to another depending on the variation in environment conditions.

For example under deciduous forest, soil with little organic matter can be produced (brown either or brown forest soil) while in mid latitude grasslands deep black earth soil (chernozem) is formed.

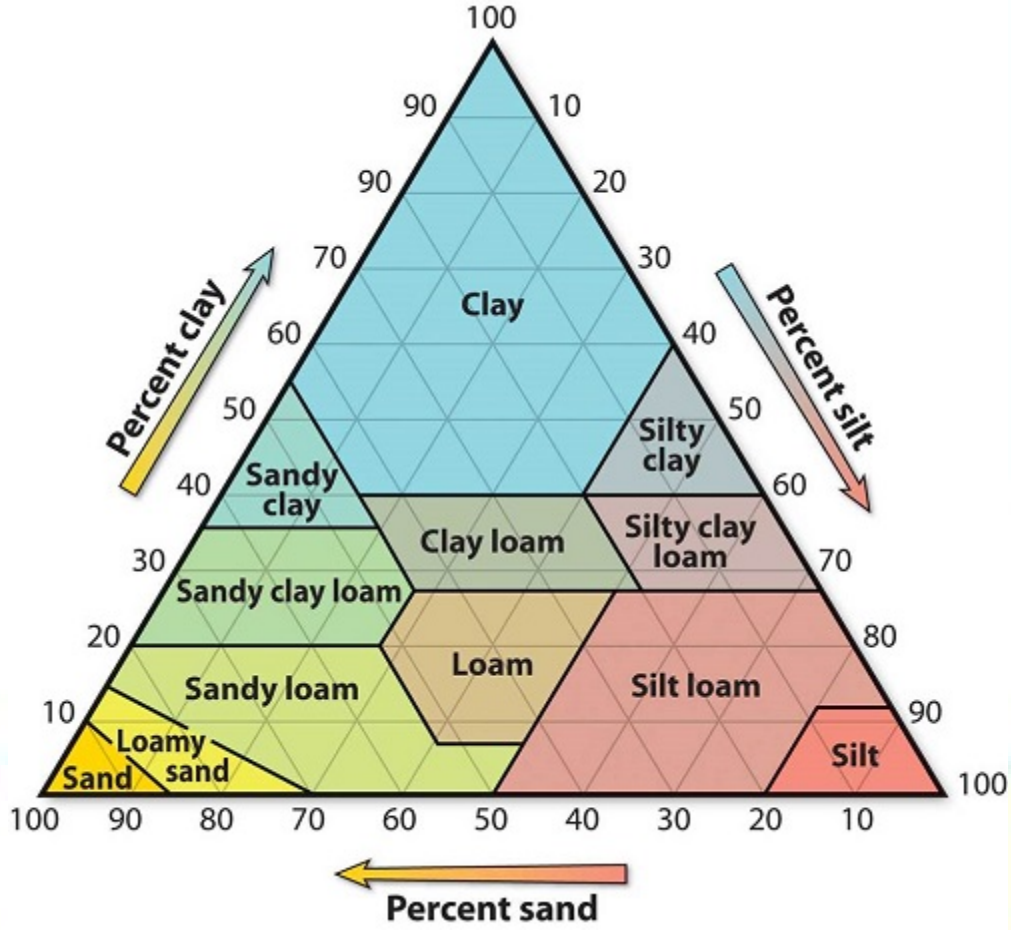
Chernozem has a lot of organic matter. In the desert area the soil profile usually lack the Ao horizon due to scarcity or absence of vegetation.

SIMPLE SOIL CALSSIFICATION

Soil classification refers to the grouping of soil according to specific characteristics, such as properties or factors like climate also soil can be classified according to the age, texture and color. One common classification is that based on texture.

According to the soil texture triangle, there are three main texture namely sand, silt and clay. This is based on the size of their particles as discussed earlier. There percentage content of each one of these determines the type of soil according to texture. Note that sandy soil have sand content of over 45% clay soil have above 27% while silt soil have silt content of above 40%.

SOIL TEXTURE TRIANGLE



SAND

This soil consists mainly of course and fine sand and contain very little among of clay such that it not sticky when wet and is lose when dry, percentage of sand is above 85, that of clay is up to 10 and silt is up to 10. When such soil is rubber, it does not leave any film on the figures.

LOAMY SAND: This consists most of sand but with sufficient clay such that it gives it a slight plastic quality when it is very moist. When it is rubbed between figures it leaves a slight film of fine material, sand particles account for 70% to 90% clay up to 15% and silt up to 30%.

SANDY LOAM: This soil has high percentage of sand between 43% and 85% with clay content of up to 20% and silt up to 50%. It moulds easily when it is sufficiently moist but does not stick easily to the figures.

LOAM

In this soil, sand and silt dominate an average of 40% each while clay account for about 20% on average. It moulds easily when it has sufficient moisture and does stick to the figures to some extent.

SILT LOAM

It has a high percentage of silt of between 50% and 87% sand between 13% and 50% and clay up to 27%. It is moderately plastic and not very sticky it has a smooth soapy feeling due to high content of silt.

SAND CLAY LOAM

This has over 45% sand, up to 28% silt and clay between 20% and 35%. It can be a bit sticky because of the clay content but quit porous because of the sand.

CLAY LOAM

Sand content between 20% and 54% silt between 15% and 53% clay between 27% and 40%. This one has sticky distinction when moist because of clay.

SILT CLAY LOAM

The amount of sand is between 27% and 60%, silt between 40% and 78% and clay between 27% and 40%. The high silt content makes it smooth and has a soapy feeling. It is less sticky than clay loam or silt clay.

SILT

This have over 80% silt particles, up to 20% sand and less than 12% clay. It is predominantly smooth and has a typical soapy feeling of silt.

SANDY CLAY

Sand between 45% and 65% silt up to 20% and clay between 35% and 55%. In the presence of sufficient moisture this soil is plastic and sticky clay and sand is dominated.

CLAY

The proportion of sand goes up to 45%, while that of silt is up to clay account for above 40%. The soil is sticky when moist has a plastic feel. It can be rolled into threads when moist and can be molded into different shapes. And can retain fingerprint.

SILT CLAY

Sand up to 20% silt between 40% and 60% and clay between 40% and 60%. This soil is composed of almost fine particles throughout. It is smooth and has to some extent the soapy feel of silt but has a degree of stickiness because of the high proportion of clay

SOIL EROSION

Soil erosion is the wearing away, detachment and removal of soil material from one place to another place through the agents like water, wind, ice etc

AGENTS OF SOIL EROSION

1) Water

This is the most important agent of soil erosion

Erosion by water involves:

- Splash erosion caused by rain drops
- Sheet erosion which involves the removal of the maximum cover of soil by surface water
- Sill erosion which leads to the formation of small channels called sills on the surface
- Gully erosion that leads to the formation of deep troughs called gullies due to severe under cutting
- River erosion that takes place in the specific channels called river valleys

2) Wind

This is another agent of soil erosion. It takes place in arid and semi arid areas or where the soil is loose

3) Ice

It is also another agent of soil erosion. It takes place in cold areas where there is the formation of ice

4) Gravity

This leads to the gradual movement of weathered material down the slope without involving transporting agents.

TYPES OF SOIL EROSION

1) Normal geological erosion

It is the wide spread type of erosion that occurs wherever there is a natural flow of energy and matter on the earth's surface without man's influence. It is normally very slow and so infectious to the soil cover of the world.

2) Accelerated soil erosion

Is the type of erosion associated with man's activities [man included] it is spectacular in nature therefore it has attracted man's attention.

FACTORS AFFECTING /ACCELERATING SOIL EROSION

1) Climate

Where there is heavy rainfall erosion tends to be severe while where there is low rainfall erosion is low

2) Topography

On steep slopes soil erosion can be fast while on gentle slopes the rate of erosion tends to be low

3) Nature of soil

This depends on the characteristics or features like texture, structure, permeability e.tc. Unstable soils with coarse textures are prone to severe erosion than fine textured stable soils

4) Vegetation cover

Where there is dense vegetation soil erosion is less or low rate unlike where there is scanty or no vegetation cover.

HUMAN FACTORS

5) Good management of the soil

Which involves the way human beings use soil wisely and skillfully and undertaking conservation measures to reduce or mitigate erosion through afforestation.

6) Poor management

That involves unwise use of soil through over cultivation, over grazing and deforestation.

7) The increase in pollution

This leads to the over exploitation of resources especially minerals, forests and over cultivation.

EFFECTS OF SOIL EROSION

Soil erosion is a serious challenge which has many effects on social and economic activities.Some of these effects are explained below:-

(i)loss of productive soil.

When the to productive soil is eroded it is lost forever only the unproductive stony soil is left behind the consequently is the lowering of agriculture productivity of land.

(ii)Depict of vegetation cover.

The eroded land cannot hold the plants including crops are washed away or are buried in the deposit soil way from their original location.

(iii)Destruction of structures.

when erosion takes place bridges can being taken away from their original areas . other structures like road ,railways, as well as buildings can collapse after erosion of soils.

(iv)pollution to environment.

Eroded soil that is carried into rivers lake s and oceans may contain chemical pollutants collected by water from farm and dumping grounds, hence resulting to loss of aquatic organisms.

(v)provides sand for building and construction activities.

sand which is eroded from steep slope is deposited on river bed from where it is scoped when the water flows in the river has diminished or even stopped.The sand is then used for construction purpose this is common in

Mpiji river at Bunju Dar es salaam and most parts of kisarawe II in coastal region.

POPULATION GROWTH AND SOIL EROSION

When the region is severely affected by soil erosion, where crop production impeded when useful soil are carried away, the region experience shortage of food.even the vegetable that used to grow wild become non-existence, This causes famine and malnutrition with inadequate nutrition ,child mortality rate goes up and population growth is impeded.

Soil erosion renders the land unsuitability for habitation when gullies develop the land is unsuitable for settlement and farming . The foundation of existing buildings and roads are eroded

Soil erosion leads to lowering of the water table in a region.this causes destruction of the vegetation in the water catchment areas and leads to shortage of water resources ,the wells may dry up this means that women and children have to travel long distance in search of water that means children may not go to school general health of both women and children becomes poor this may lead to early death and linear population

Also when land become more eroded it can lead land to be unfertilized therefore it accelerate rural-urban migration especially for men who migrate to urban areas.Then led to increase of the population in urban area than the rural areas where man power decrease due to rural urban migration.

SOIL EROSION CONTROL MEASURES

soil erosion is a geological process, However when it exceeds normal rate, That is when it becomes a problem. wecan not talk about stopping soil erosion .The following are some of the measures that can

be taken to control soil erosion

(i)Afforestation and reafforestation

Afforestation is the planting of trees where no forest has been known to exist . Reafforestation /Reforestation is the process of planting trees on land that previously had a forest the trees help to hold

soil particles

together so that they can not easily blown away by the wind or carried way by running water.

(ii)Control of bush fires

When the grassland ,are burnt the soil is directly exposed to agents of erosion , IF the piece of land has to be cleared for cultivation the old grasses and bushes should be cut down and grasses put

aside in heap,this

will prevent soil from erosion

(iii) controlling overgrazing

There should be matching the number of livestock kept in a piece of land with the carrying capacity of land .The land can also be divided into paddocks i.e individual division of blocks of land

and there after animals are grazed in one paddock at a time ,they then transferred to another division in later days.

TECHNIQUES FOR SOIL CONSERVATION

When using the land it must at the same time be properly maintained by apply proper farming techniques to reduce erosion and then to improve it productive capacity. Therefore a number of ways of doing this for example

(a)Crop rotations

This practice offers protection to the land from soil erosion and good chance to cover its original fertility crop rotation makes it possible to have the land occupied with crops most of the year. In addition the loss of crop most of the year. In addition the loss of nutrient elements by leaching is minimized and losses from erosion are greatly reduced

Erosion hazard are n important factor in determining the kind and sequence of crops to be grown in a rotation of a particular piece of land n area where erosion can easily occur due to either slope or soil characteristic, permanent crops such as trees or pasture should be planted rotation will not provide erosion protection on steep slopes.

(b)Contour farming

Contour farming is ploughing, planting and cultivating across the slope following the contours, generally on gently sloping land each contour row can be viewed as a small dam that checks the speed of non-off water and reduce erosion on well drained soil. Contour farming is simple and easier of all the supplemental soil conservation

(c)strip cropping

This is a system in which crops are grown in strips that are arranged across the general slope or at right angle to the path of the prevailing wind .The strip don not necessary have to follow contours.

(d)terracing

A terraced is an embankment of earth or stone or other suitable materials or combination of these materials made across the slope for the purpose of controlling run-off.

Terrace decrease the length of the slope thus reducing erosion and run-off .There are two types of terraces

(i)level terrace

Is a ridge built generally on sandy soil with little or no grade it is designed to hold water in the field until absorbed it adopted in areas where rainfall and soil characteristics are such that there is only slight danger of water accumulating on the soil and breaking the soil surface.

(ii)channel terraces

Consist that are cut across the slope these channel carry the excess rain water fro the fields but at a low speed thus minimizing erosion .they are commonly constructed in regions that receive heavy rainfall.

(e) Planting of trees and grasses

Trees and grasses can act as wind breakers and can also control water erosion .In controlling erosion caused by wind trees or grasses may be planted in strips so that soil particles carried by wind may be deposited on or near the grass strip.

f) controlled grazing

Overgrazing can be dangerous as most or all the vegetation can be removed with resultant exposure of the land to erosion rotational grazing with the optimum number of animals in one area can help to maintain the vegetation cover.

(g)mulching.

Mulch act as a huge sponge which absorbs the water that fall on to it and release it slowly and harmlessly to the underlying soil if there is no protective cover over a wide area erosion may occur rapidly.

MAP READING AND INTERPRETATION

MAP

Map is a scaled representation of a part of the earth or whole of the earth's surface on a flat surface such as sheet of paper, wall, piece of wood or plastic etc. **or**

It is a drawing which represents physical features.
Map interpretation is the process of examining a given topographical map of an area represented for the purpose of identifying the geographical information of an area.
It has two basic process;

-Map reading
-Map analysis.

Map reading -is the process of examining the given topographical map,conventional symbols and signs.
Map analysis -is the process of relating the identified information on the map with other geographical information which are not direct shown on the map.

TYPES OF MAPS

According to functions;

1) **Topographical maps**

Are maps which show physical features which are natural features e.g. mountains, valleys, hills etc and man made features e.g. bridges, ponds, roads, settlements etc

2) **Statistical maps**

Are maps which show the distribution of things in quantitative manner e.g. distribution of rainfall, temperature, crops etc.. Examples of statistical maps are dot maps, choroploth maps, Isoline maps etc

According to Scale size;

1) **Large scale maps**

Are those maps drawn to large scale size e.g. 1:10000

These maps gives a larger representation of small area, they are also more detailed (shows a lot of information). They represent areas like cities, towns and villages.

2) **Medium scale maps**

Are those maps drawn to medium scale size e.g. 1:100000

They show a moderate amount of details. They represent areas like districts, regions and countries.

3) **Small scale maps**

Are those maps drawn to small scale size e.g. 1:1000000

They give a small presentation of a large area; they show little content (little information)

They represent areas like continents and the world.

IMPORTANCE OF MAP READING

i) They provide basis for description of geographical phenomenon

ii) They are useful for traveling purpose i.e. they guide people to reach their destination

iii) Maps are useful for storage of geographical information

iv) They are important for field studies

v) They are important for land use planning

vi) They are useful for military purposes e.g. during wars.

BASIC SKILLS OF MAP READING/ESSENTIAL ELEMENTS OF A MAP

The basic skills required in understanding how to read a map include;

1. Title
2. Scale
3. Key
4. Indication of the north direction
5. Margin/Boundary
6. Date of compilation

1.Tittle

Tittle gives the name of the country and the area where mapped. It helps the map reader to know what the map is all about. The heading is usually printed in bold capital used on the map

2.Scale

Scale is a ratio between the distance on the map and actual distance on the ground. It is used to find actual distance and areas on the ground. On topographical maps scales are given in form of ratio or lines

3.Key/ legend

Key is a feature which explains the signs and symbols which are used on the map. Not all symbols which are used in the key are applicable to the particular map but all signs and symbols applied on the map are shown on the key.

Definition of terms which should be added on others terms under the tittle "Basic skills of map reading/Essential elements of a map" are " margins/Bounder

4.Indication of north direction

It gives an idea about the orientation of the map especially in identifying where the north direction is.

5.Margin/Boundary

A frame which borders the map. This guide and limit the map user in reading and interpreting the map. The aim of the margin is to enclose the area covered by the map

6. Date of compilation

Gives the publisher name and when the map was published .This date is important because physical and human settlements features changes with time but the map drawn representing the land does not. For instance between 1960 and 2007 Dar es salaam has changed in many ways.

FROM MAP INTERPRETATION THE FOLLOWING GEOGRAPHICAL INFORMATION CAN BE DESCRIBED

A.DRAINAGE
B.ROCK TYPE/STRUCTURE
C.RELIEF
D. CLIMATE
E.HUMAN ACTIVITIES
F.POPULATION DISTRIBUTION AND SETTLEMENTS.

A. DRAINAGE

Drainage is the plan or layout of the river with its tributaries until it reaches its destination i.e. lake, main river, swamps or an ocean .therefore the concept drainage includes rivers , swamps, lakes, waterfalls ,flood areas

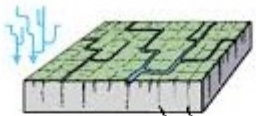
Note:-the common drainage shown on the map is rivers, swamps, lakes and ocean. But expect to see even waterfalls especially on coloured topographical map.

DRAINAGE PATTERNS

-Simply means the network displayed by a river and its tributaries

-Drainage of the river usually posses different network/system depending on the way how tributaries convey to the main river and the general appearance, hence drainage pattern

Dendritic



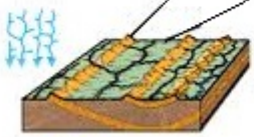
Rectangular

Fractures

Ridge

Valley

Radial

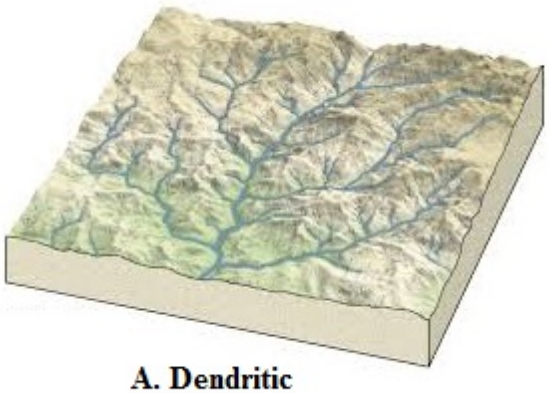


Trellis

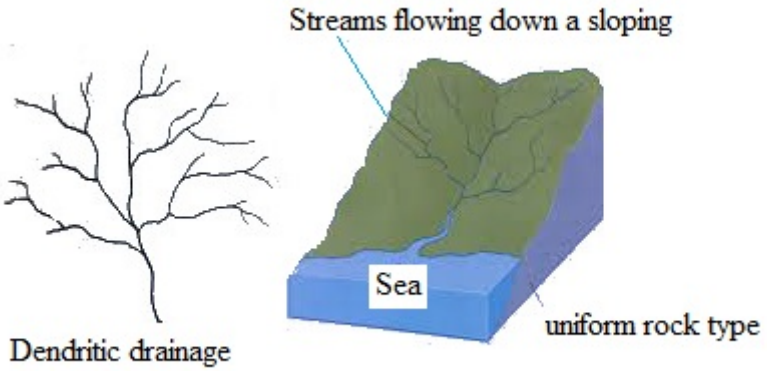
THE FOLLOWING PATTERNS ARE COMMONLY DISPLAYED IN TOPOGRAPHICAL MAPS

I. DENDRITIC PATTERN

-Is a pattern in which its tributaries convey (join) to the main river at an acute angle resembling to the shape of tree trunk and its branches



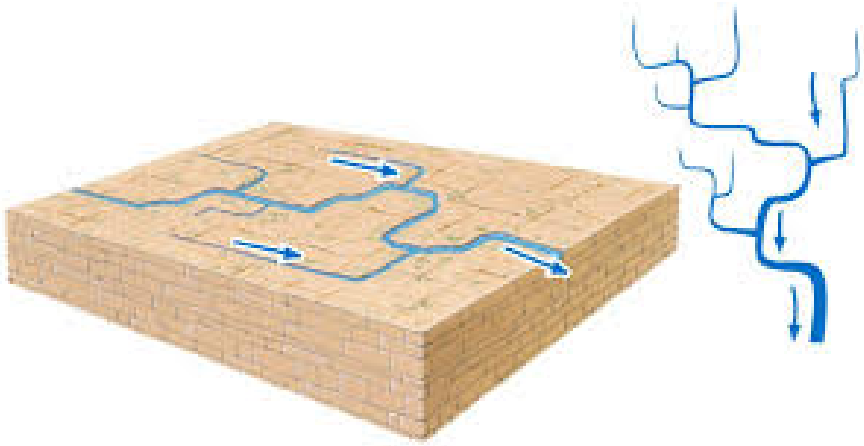
A. Dendritic



Note:- Dendritic pattern are common in areas of gentle slope and of uniform(homogeneous)rock hardness. Therefore it can be made from granitic or metamorphic rock

II.TRELLISED PATTERN

Is the pattern in which its tributaries convey or join to the main river at almost right angle.



Note:- This type is commonly found in areas with severe cracks or fractures mostly to the rocks with an alternate hard and soft rock. Therefore this is associated with sedimentary rocks.

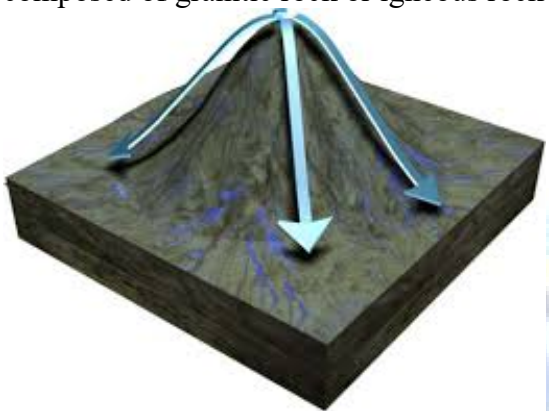
III. RADIAL PATTERN

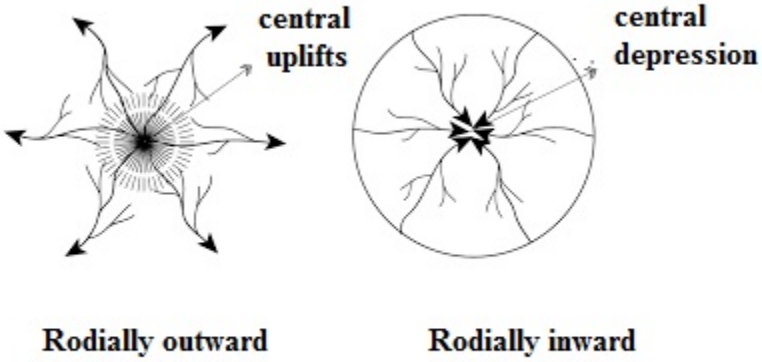
-Is the pattern or layout in which its tributaries flow outward from the center.(summit) or at the peaks of mountains

OR

-is a pattern that resemble a spoken ring of bicycles where stream flow out in every direction from the center.

-Therefore radial drainage pattern is commonly associated with volcanic mountains /region composed of granitic rock or igneous rock



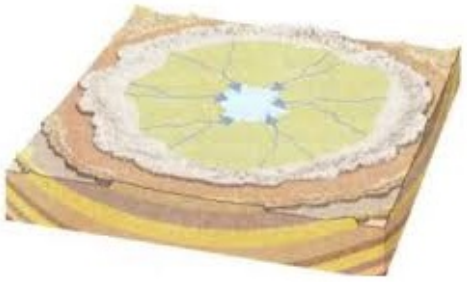


IV. CENTRIPETAL DRAINAGE PATTERN

-this is the pattern in which almost all streams are following from all direction converging to the center can be to the swamp, lake or depression.

OR

-Is opposite to radial as in this type the streams flow toward a common depression center



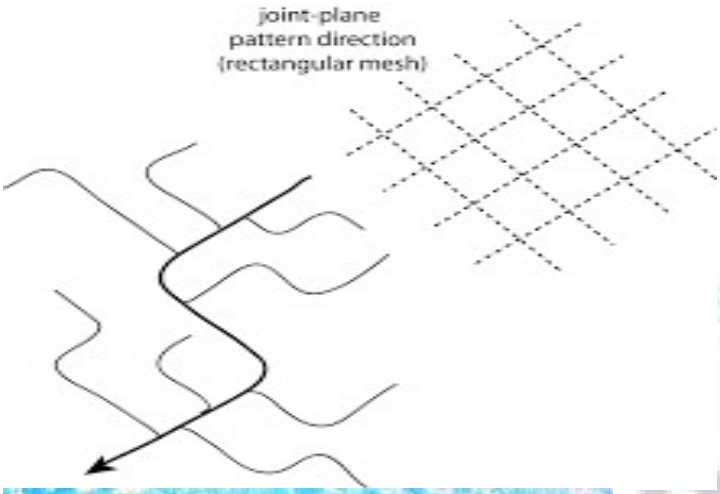
Centripetal: Channels converge on the lowest point in a closed basin from which water can not drain

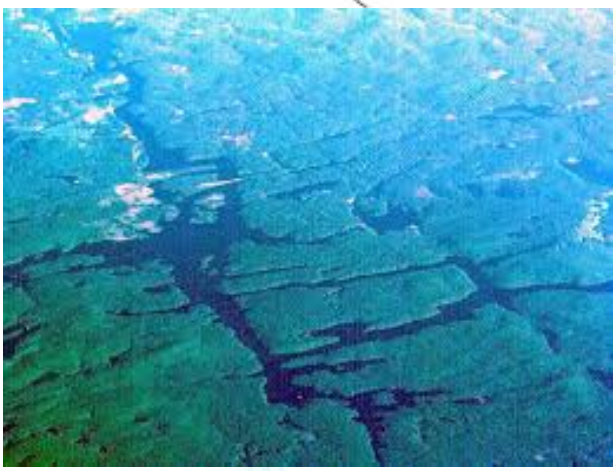
Note:-The determinant factor of stream flow is a slope .Therefore the drainage pattern can be associated with sedimentary rock.

V. RECTANGULAR PATTERN /DRAINAGE.

-Is a pattern which resemble trellised, but it has tributaries joining the main river at a right angle. The pattern is common in areas which are faulted.

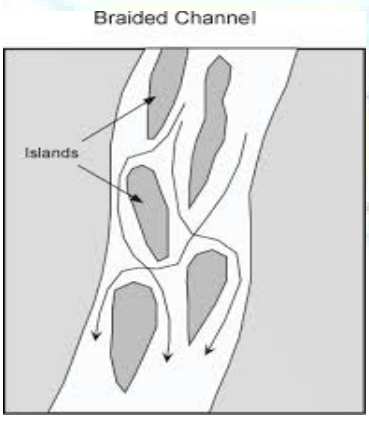
-Therefore can be found along sedimentary rocks/granitic rock or any faulted rock.





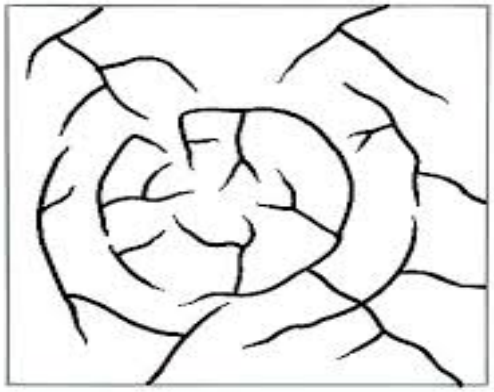
VI. BRAIDED PATTERN

-Is the pattern in which its distributaries tend to split into several channels which rejoin and split again .The Congo River has braided channels between Lisala and river Ubangi.



VII. ANNULAR PATTERN.

-Is the pattern with series of streams flowing on flanks or around the dissected dome, depression or crater. Where there are an alternate band of soft and hard rocks.



Note:-This type is not so common, but is found around Lake Bosumtwi in Ghana .Is commonly found in areas affected by back tilting.

B . ROCK TYPE/STRUCTURE

-surface rock on the topographical maps is not directly indicated .They some clues are needed in order to identify rock type and structure of the mapped area.

TYPES OF ROCK IN RELATION TO PHYSICAL FEATURES:-

- LAND FORMS
- VEGETATION
- NATURE OF THE ROCK

LAND FORMS

-Land forms shown on the topographical maps help on interpretation of rock type e.g. **The presence of volcanic land form** such a ;crater, caldera, name of the volcanic mountains suggest the presence of igneous rock.

-**The presence of erosion and depositional features** such as; depression, sand dunes, coral reef suggest the presence of sedimentary rock.

-Flood plain suggest sedimentary rock

-The presence of highland with steep slope indicated that rock are hard and resistance to the erosion .Hence such hard rock can be granite quartzite and gabbros

-presence of gentle slope, indicate soft rock e.g. sedimentary rock

-Flood plains suggest sedimentary rock

VEGETATION

-thick forest suggests the presence of igneous rock.

-poor vegetation cover suggests the presence of sedimentary rocks or metamorphic rock.

NATURE OF THE ROCK

-**Absence of streams** indicates that the rocks are permeable. Thus this depict that the rock is soft which can either be sedimentary, limestone or sandstone.

-**presence of many streams** on surface, indicate that the rock are impermeable such as igneous or granitic rock.

GENERAL INTERPRETATION

- Read the contour and the conventional symbols or signs on the map to identify types of relief. Can either be highland relief with lower arts or lowland relief.
- Describe the relief with associated land forms.
- Note:-When you determine types of relief first look on the units (V.I) whether the unit is in meters or feet. If units are in feet take the highest value the convent into meter finally determine type of relief (1m=3.3ft)

CLIMATE

-Climate is the average weather condition experience in a given area over a long period of time not les than 30 years.

-Topographical maps may be used to identify the climate of given mapped area.

-The following clue may be employed to identify or depict the type of climate on a given area

LATITUDE

- 0-5N/S of the equatorial imply wet-hot climate particularly **EQUATORIAL CLIMATE**
- 5-15N/S of the equator may suggest **TROPICAL CLIMATE** with seasonal rainfall.
- 15-30N.S of the equator imply **SEMI-DESERT**
- 30-40 N/S **IMPLIES DESERT CLIMATE** or **MEDITERRANEAN CLIMATE**

ALTITUDE

-Look on the contour height on mapped area. If the area experience high rainfall and implies. MOUNTANEOUS CLIMATE.

WATER BODIES

Presence of salt lake

-waterhole (wh)
-bore hole (bh)
-seasonal swamps

ALL these implies semi-arid climate
Presence of many streams in relation to the altitude indicates area that receives heavy rainfall.

VEGETATION

Is the total plant cover i.e. vegetation & crops

Vegetation and crops area also good guide on identifying type of climate.

- Vegetation can be Natural or artificial (planted tree)Therefore:-
- -presence of dense forest(tall trees)and bamboo suggest wet climate(equatorial climate or modified equatorial climate).
- -presence of scattered woodland vegetation suggest moderate rainfall (tropical climate)
- -presence of scrub/shrubs(thorn forest)and thicket(closely set tree)indicate semi-desert or desert

CROPS

- Crops also help to depict the type of climate because crops are grown depending on the climatic condition that favours the growth of crop. Therefore
- The presence of coffee tea pyrethrum rubber and cocoa imply/suggest heavy rainfall i.e. WET-COOL CLIMATE (Tropical highland)
- Presence of sugar cane sisal cotton I n the absence of irrigation suggest semi-Arid or dry climate. Note (sometimes range from tropical to semi arid with consideration of other factors)
- The presence of palm tree indicate Wet-warm climate
- Presence of millet and sorghum imply semi-Desert

Note: On identifying the climate of a given area one is advised to relay on more than one evidence

E. ECONOMIC ACTIVITIES /HUMAN ACTIVITIES

-Topographical map may contain information o economic activities undertaking usually the following are shown on topo maps.

a)ECONOMIC ACTIVITIES

i) **Agriculture**: - look on the presence of;

- Rural settlement in absence of other activities
- scattered cultivation
- storage houses/center
- plantation or estate (indicate large scale agr)
- industry such as Ginneres, Hulleries and Decotecator

seldom symbols or signs are used e.g. S-sisal, CC-coffee, Su-sugarcane

ii) **Pastoralism**:-look on the presence of;

- cattle market-cattle dips
- veterinary installation (Vet. Office)/center
- Creamers (lace where milk, cream butter and cheese are processed
- Scattered vegetation or dominated by scrub/shrubs)
- Bore holes (Bore holes (BH) or water hole (wh)

iii)**mining**:-look on the presence of;

- symbols of PIC () and shovel (
- salt work
- quarrying
- Roasting
- Sign Tin-TN, Iron-Fe.

iv) **Fishing**:-look on the presence of;

- water bodies such as lakes, seasonal swamps, rivers, dams, ocean. These should be surrounded by settlement.

v) **Trade and transportation**;-look on the presence of ;

- Road, railway, towns and market

vi) **Lumbering**;-look on the presence of;

- forest with track-roads ending on their edges.
- Saw-mill
- Sao hill forest
- -Note: thicket, scrubs/shrubs and bamboo trees cannot be exploited as a timber.

Vii) **Tourism** :-look on the presence of;

- National parks
- Game reserve
- Recreational centre's e.g. museum, archives beaches etc
- Landscape e.g. crater depression etc.

SETTLEMENT

Is a layout of dwelling in the habitable area where people live and conduct their social and economic activities by interacting with the prevailing environment.
There are two types of settlements which commonly than on the topographic of a map and these includes, rural and urban settlement.

URBAN SETTLEMENT

Is commonly found I areas of the following nature

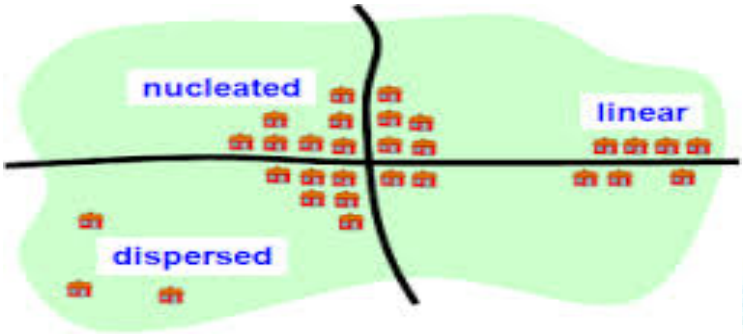
- District administrative centers
- Regional administrative centers
- Capital city of a country

RURAL SETTLEMENT

Is an area where the majority of people approximately to cover 80% engage in agriculture

SETTLEMENT PATTERNS.

The signs showing settlements on topographical maps are observed to have varied arrangement. The most common pattern include the following



i) Dispersed pattern

It is alternatively called scattered settlement pattern .The houses are widely spaced one to another

ii) Nucleated settlement pattern

Houses and other related form are compacted to another.

iii) Linear settlement pattern

Houses are concentrated along an elongated objected of economic significance like a road, river, railway lines and others

FACTORS ENCOURAGING SETTLEMENTS

1) A reliable source of water supply e.g. presence of permanent rivers, lakes.

2) Gentle sloe i.e. people prefer to establish settlement in less hazardous areas

3) Good soil for agriculture

4) Pleasant climate condition

5) Transport and communication.

Grid system numbers

Are numbers which show the position of physical features, most large scale topographical maps having vertical and horizontal lines drawn on them. Grid lines are drawn for the specific purpose of facilitating map reading especially fixing positions on the map. Vertical lines are called **Eastings;** they are numbered towards the east. Horizontal lines are called **Northings.** They are numbered towards the north.

- The original point of the grid is 0 marked
- There are 6 numbers / units
- 3 first digits are the eastings latitude from the west to east
- 3 last digits are northings longitude from north to south

WAYS OF SHOWING POSITION ON A MAP

A place can be located by its name where it is found. A more accurate way of locating a place is the use of latitudes and longitudes, this method is used by scalars at sea and aircraft in their flights. Generally position of any place can be located by using;

- place names
- Bearing
- Latitudes and longitudes
- Grid reference

METHODS OF SHOWING RELIEF ON TOPOGRAPHICAL MAP

In topographical maps relief is shown using trigonometrical Station which is shown by using triangles followed by a number of exact heights from the sea level.

2.SPOT HEIGHT

The spot height is another method used for showing relief, it is indicated by a dot with a number exact height 5890

e.g ● 5890

3.LAYER COLORING /TINTING

Is also done to show the relief features on the map, different coloring shades on the map to indicate different heights

4.FORM LINES

Are usually unnumbered lines drawn on a map joining of nearly the same height areas, Are broken lines

---------- They are drawn between two contour lines

5.HUNCHERES

Huaraches are lines drawn on a relief map showing direction and steepness of a slope

6.CONTOUR

Contour lines drawn on the map to join all places of the same height from the mean sea level.

This measurement of heights shown by contour lines starts from the mean sea level which is regarded as zero height.

Contour and associated landforms

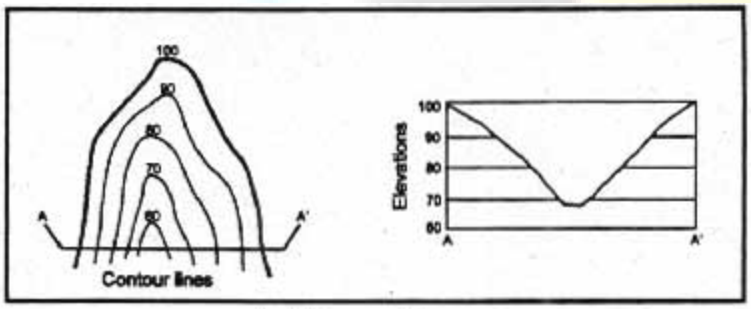
Contour also form different patterns which result in different landforms

Contour lines do not cross one another.

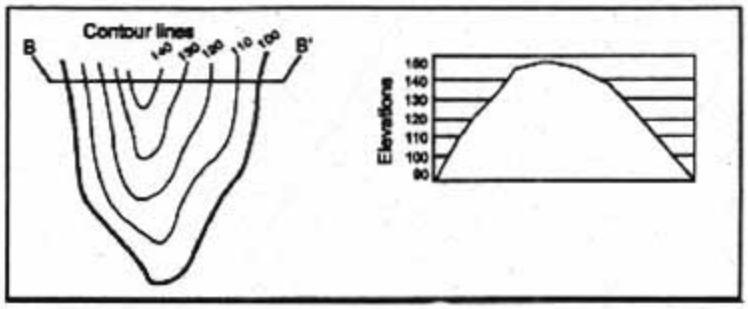
a) A ridge

Ridge is a narrow and long relief feature with steep slopes.

The contour lines of a ridge run parallel to each other.



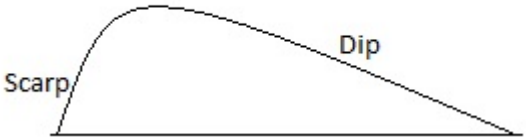
4a. A Depressed Area

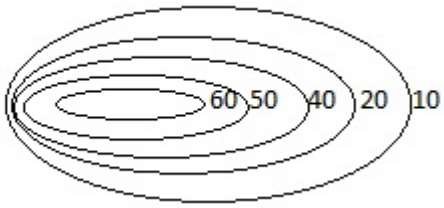


4b. A Ridge

b) An escarpment

An escarpment is an area of highland with very steep slopes on one side and a gentle slope on another side. The steep slope of an escarpment is called the scarp slope and the gentle slope is known as dip slope.





c) A plateau

A plateau is an extensive highland region with undulating surface. A plateau is easily identified on the map by the absence of contour lines on the higher land surface and with a series of contours close together on either sides.

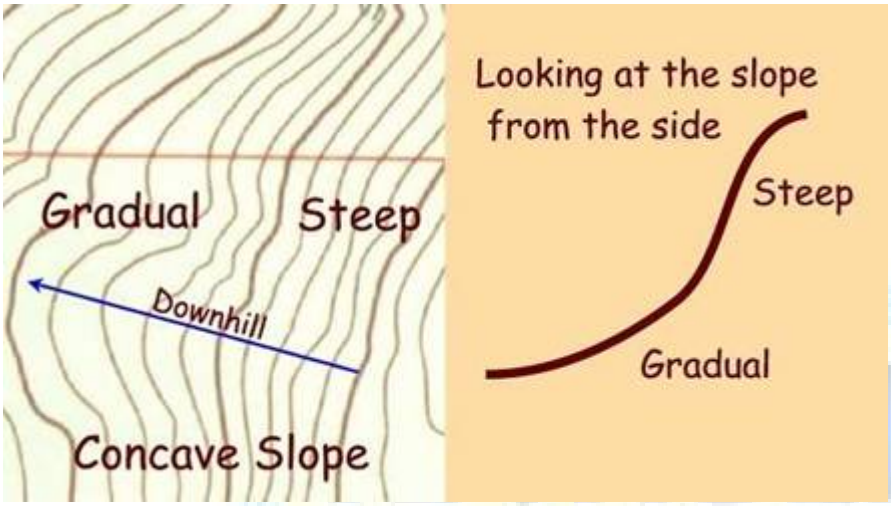
In some cases it is possible to find the contour on the plateau surface indicating presence of a hill or hills.

d) Slopes

Slopes are either steep or gentle

Such slopes which are constantly steep or gentle are usually referred to as even slopes.

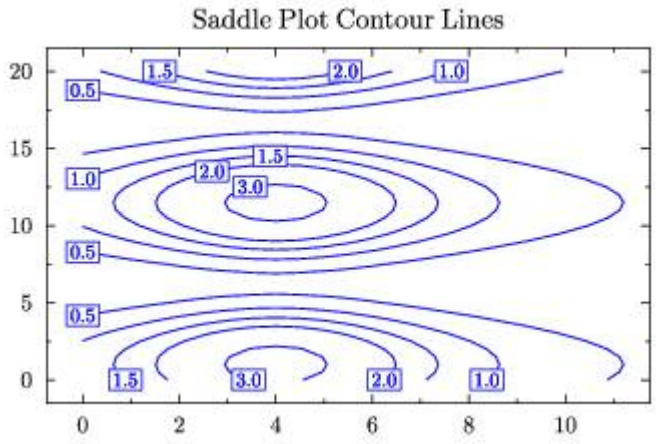
However some slopes bear both characteristics, a concave slope is gentle at the lower ground and gets steeper at the higher ground. Contours of a concave slope are widely spaced at the lower ground and closely spaced at the higher ground.



A convex slope on the other hand has a steep slope at the lower ground and a gentle slope at the higher ground. Contours of this slope are closely spaced at the lower ground and widely spaced at the higher ground.

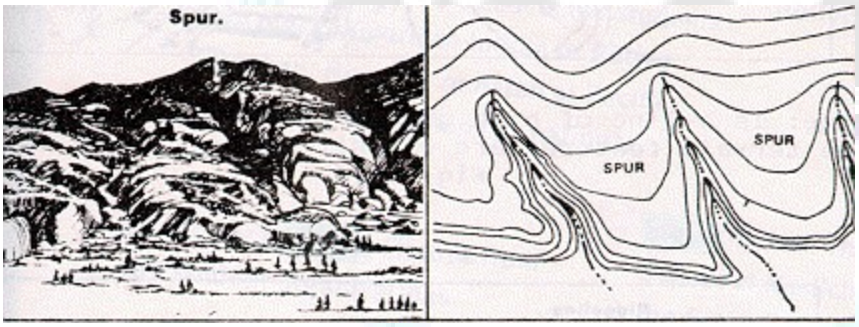
e) Saddle (pass) and col

This is the land between two peaks of a mountain or in the mountain ranges. A saddle is generally wider than a col. Saddles provide convenient passages across mountain ranges. Contours showing peaks are usually closed.



f) Valleys and spurs

Valley is the low lying part of the land which is bound over higher ground and steep slope. Valleys are indicated by contours forming 'V' shape pointing the higher ground and some valleys have rivers flowing in them. Spur (Salient) is a projection of the raised land from the side of a hill or mountain into lowland, contours showing a spur form a 'V' shape pointing to the lower ground.



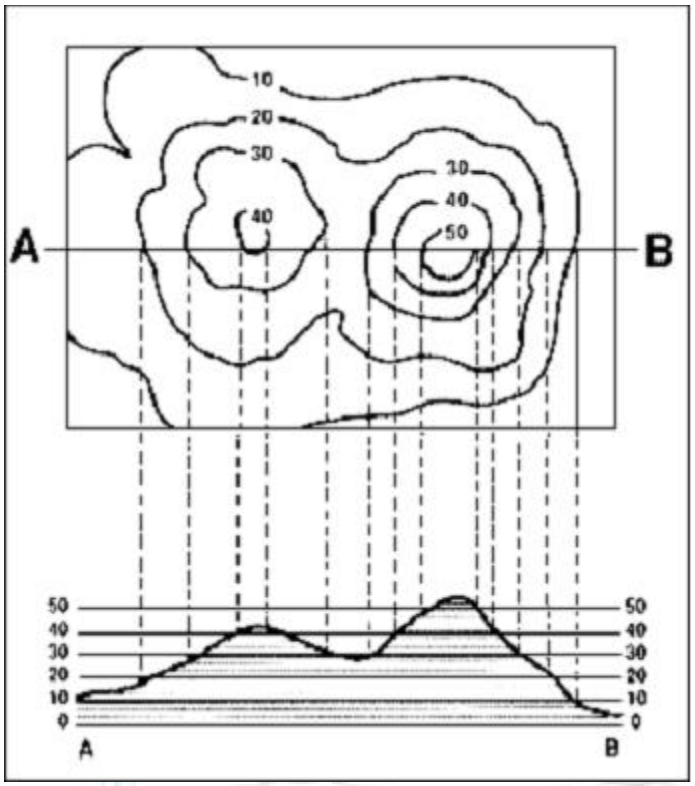
g) Hills/peaks

A hill is a rounded upland area not as high as a mountain. It is upland but less than a mountain. It is an upland that rises above the general relative low ground but less than a mountain. Hill height is usually about 350m-650m. Some hills are regular while others are irregular.

CROSS SECTION

A cross section is used to show relief variations across a region. In drawing cross section the following stages are followed

i) Two end points of the area in question are marked AB



ii) Join the two points with straight line by a pencil

iii) Take apiece of paper measure from point A to B

iv) A vertical scale is now required after marking the values of contours on the paper. The horizontal scale of the cross section is in the same scale as that of the map from which the line AB is taken

The highest contour line on the map is 400m

v) The horizontal base line represents sea-level; the marked paper is placed along the base line so that A on the paper falls on A on the scale. Then each contour along the horizontal line is marked with a pencil and ruler, vertical lines are lightly drawn up to the line which represents the contour height.

VERTICAL EXAGGERATION [V.E]

Vertical Exaggreration is a number of times by which the vertical scale is larger than the horizontal scale .

Mathematically expressed,

$$VE = \frac{\text{Horizontal scale (HS)}}{\text{Vertical scale (Vs)}}$$

- When drawing a cross section of a portion of a plateau it is important to choose a reasonable vertical scale in relation to the horizontal scale so that pictures drawn shouldn't appear too big or too small.

- Horizontal scale is the map scale/ ground scale

- When calculating VE both HS and VS should be the same units of measurements.

- For example if a map scale were 1cm to 100000cm and the vertical 1cm to 100m, the VE is first converted from 100m to cm

$$= \frac{100000cm}{10000cm}$$

VE=10cm

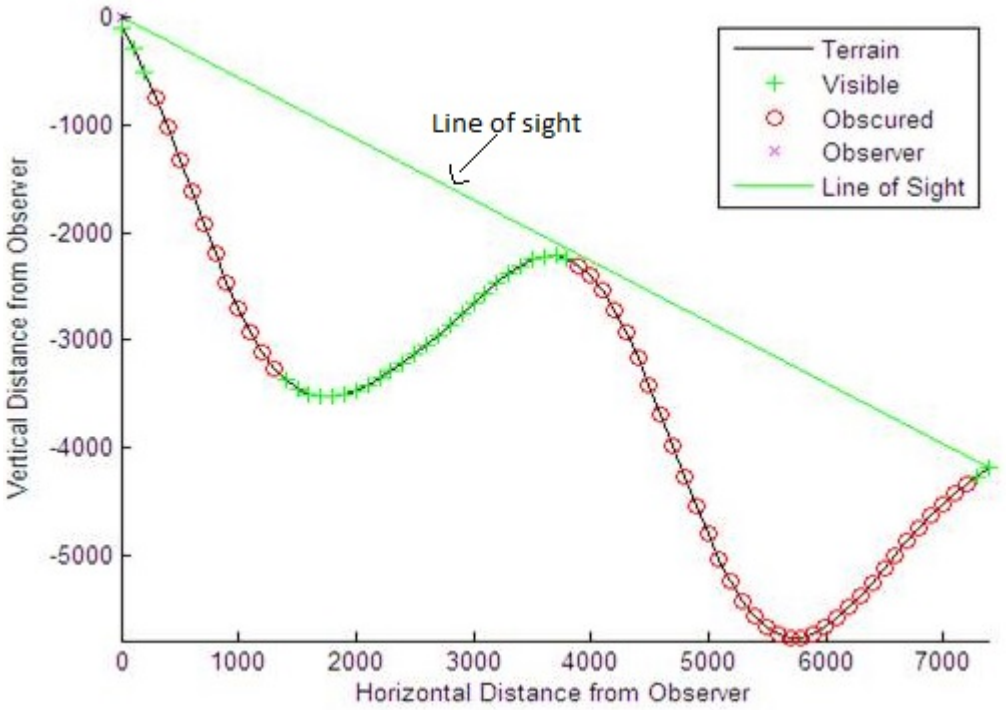
INTER VISIBILITY

- Map makers and readers are interested in knowing from a map whether one place is visible from another or not

- If two places A and B were to represent two observation points a cross section would make it possible to tell weather the two places are inter visible or not

- To explain inter visibility we look in the cross section if between the points(A to B) a mountain or hill develops we say the two points are not inter visible because the hill is an obstacle

- When the basin of depression develops we say the inter visibility, as a line of sight when drawn straight i.e. not obstructed



It is important to note that inter visibility can be affected by other factors such as buildings or vegetation and also higher land.

GRADIENT

Gradient is the measure of slope

Gradient/ slope are measured by comparing vertical distance to the horizontal distance. In map reading the calculation of gradient is done by comparing the vertical interval between two places and the horizontal distance between them.

The difference in height between the two places is called vertical interval, it can be obtained by subtracting the altitude of the lower point from the altitude of the higher point in other words the vertical interval is

V .I= highest contour - lowest contour

The horizontal distance is measured on the map then it is converted into ground distance by the use of the map scale

In calculating gradient both vertical and horizontal lengths must be brought to the same unit of length

The formula for gradient is

$$\text{Gradient} = \frac{\text{vertical interval}}{\text{Horizontal distance}}$$

CALCULATION OF GRADIENT

EXAMPLE 1

DATA

Given; highest contour 700, lowest contour 300

V.I=400m

Length from point A to B is 8.4 cm

Scale of map 1cm to 2km

Calculate the gradient

Solution

Step 1

Change 8.4cm into ground /map scale

1cm to 2km

8.4cm to x

=16.8km

Step2

Change the ground scale into meters

1km=1000m

16.8km=?

=16800m

Step 3

Gradient = $\frac{V.I}{HD}$

G = $\frac{400m}{16800m}$

Gradient= 1/42

MAP MAKING AND ELEMENTARY SURVEYING

MEANING AND TYPES OF SURVEY

Meaning of survey
Survey is the scientific and systematic measure of distance, height (altitude) and angles between various points on the ground.

OR:-

Survey is the process of observing and measuring in order to determine distance, position, boundaries and elevation of physical features on the land.

Purpose of surveying.
Surveying means the whole process of conducting survey. It involves the whole practices that involves in taking ground measurements of distance, height and angles between various points on the ground.

The purpose of surveying includes the following:-

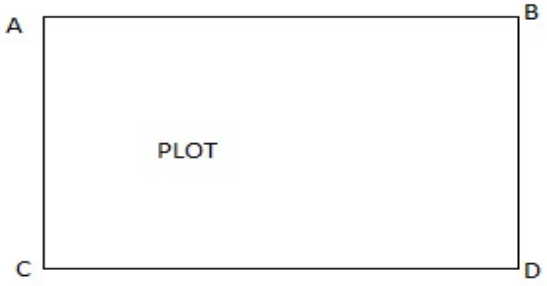
(i)To determine horizontal distance between points on the earth surface.

(ii)To determine vertical distance or height between the points on the earth's surface

(iii)To determine the area of the piece of land or plot

Plot is the enclosed piece of land usually occurs in rectangular or square shape

Example;



(iv) To determine the direction of various features on the earth's surface

(v) To determine the location of physical and non-physical features on the earth's surface

Stages of conducting survey/surveying methods/surveying process
The steps or stages or procedure or methods of conducting survey includes the following

(1)Reconnaissance / preliminary inspection/primary surveying
is the process of taking general view of the land to be surveyed .it is done In order to get real

picture of the work to be done .It is done by visual observation of the area. During the reconnaissance the surveyor does walking around the area to be surveyed and taking general views and noting down the dominant features area

- Boundaries of the area
- Corners of the boundaries of the area
- Other structures such as building, big trees, ponds, lakes, small hills e.t.c

Importance of reconnaissance

(i)It helps to get the full picture of the survey to be conducted
(ii)It helps for choosing the scale for map making
(iii)It makes survey for new coordinates and old coordinate easier
(iv)It shows the existing situation on a piece of paper

(2)Actual survey /secondary survey

This steps involved observing, measuring and recording direction, angles distance and elevation by using surveying equipments or tools.

(3)Presentation

this involves presentation of data or information collected or recorded,the information can be presented by writing or drawing form

BRANCHES /TYPES OF LAND SURVEYING

Main branches

There two major branches of survey these are:-

(i)Geodatic surveying

Geodating survey is the type of survey which takes into consideration or account the curvature of the earth's surface
The geodating survey is used for a large area for example at national level. Its purpose is to lay a foundation for other types of survey and research .hence it need high accuracy.

(ii)**Plane surveying**

Plane survey is the surveying which the area measured is considered as being flat or plane
The earth's surface is projected onto a horizontal plane
Plane survey is only used in small areas for example: - building sites like schools dispensary. Villages and wards
Plane survey does not take into consideration the curvature of the earth. But it is only gives the horizontal plane as if the earths surface is flat or plane.

OTHER BRANCHES OF SURVEYING

Are the branches of survey which classified according to the purpose or aim of surveying. These includes

(iii)Topographical surveying

This deals with the measuring and plotting of physical features in their horizontal and vertical positions.Nature and man-made features are measured and maps are prepared to show their relative position both horizontal and vertical.

(iv)Cadastral surveying

Is the survey that deals with defining special information for construction activities and all sorts of land development Example:- small construction site, a plane survey can be used and for a bigger site geodetic survey can be used.

(v)Engineering surveying

Is the surveying which deals with obtaining special information for construction activities and all sorts of land development. For small construction sites. A plane survey is used and for a bigger site geodetic survey can be used.

(vi) Mine surveying

Is the surveying which deals with finding minerals in the ground or rocks

(vii) Hydrographic surveying.

This surveying deals with searching or finding the amount of water present different parts or place on the earth's surface.

METHODS/TECHNIQUES OF LAND SURVEYING

Depending on how linear and angular measurements are combined there are four types of methods /elements/technique of land surveying.

1. Chain or tape survey
2. The prismatic compass survey
3. The plane table survey
4. The technique of levelling

NB: According to the revived syllabus of 2010 students should study only one method of conducting survey, which is chain or tape survey.

CHAIN/TAPE SURVEYING

Is the surveying method in which linear measurements of an area are taken or a tape.

Features of chain surveying

(i)It involves taking linear measurement of angular measurements.

(ii)It is suitable for slam area .e.g. schools market etc

(iii)It is suitable in flat and open areas e.g. are with no forest or no high mountains

Equipments used in chain surveying

(a)A chain

This is made up of steel divided into tallies and links it is about 20m-30m long
It is used for measuring long distance on the ground

(b)Tape measure

It is made up of plastic or steel materials having the length of 10, 20 and 30 .
It is marked in meters, feet or centimeters.
It is used for measuring short distance
E.g 10m

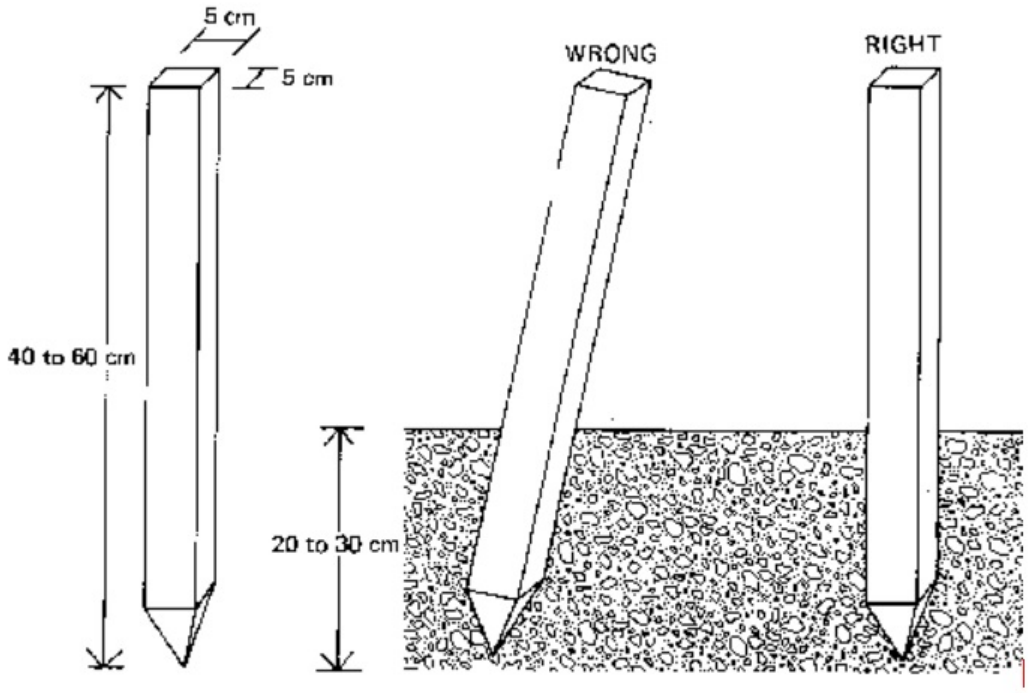
(c) Surveyor′s band

It is made up of steel materials fixed within a wooden or steel hand, it can have 30, 50, or 100

(c)Pegs.

Are made up of wood , they normally have 40cm to 50cm long and width of 4mm squares

They are used for marking permanent stations



(d)Ranging rod/ranging poles

Are made of wood, their length is about 6-10 feet .they are marked red and white or black so as to be seen easily

Used to mark permanent station in the survey line.

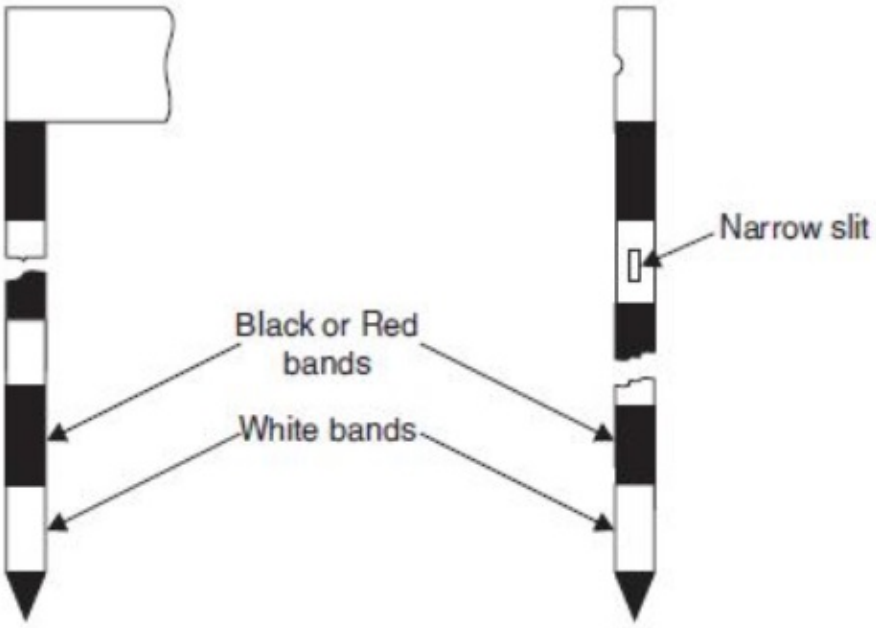


Fig. 12.7 Ranging rod

Fig. 12.8. Offset rod

(e) Cross staff

Is a wood rod with about 6 feet long

Is used to determine the right angle in survey line (to make off sets)other equipments used in chain survey includes an optical square, a ruler ,plumb bob ,field sheet and pencil.

other equipment/ tools used in chain survey, arrows, optical square ,Plumb bob(,book and pencil for keeping records of measurements)

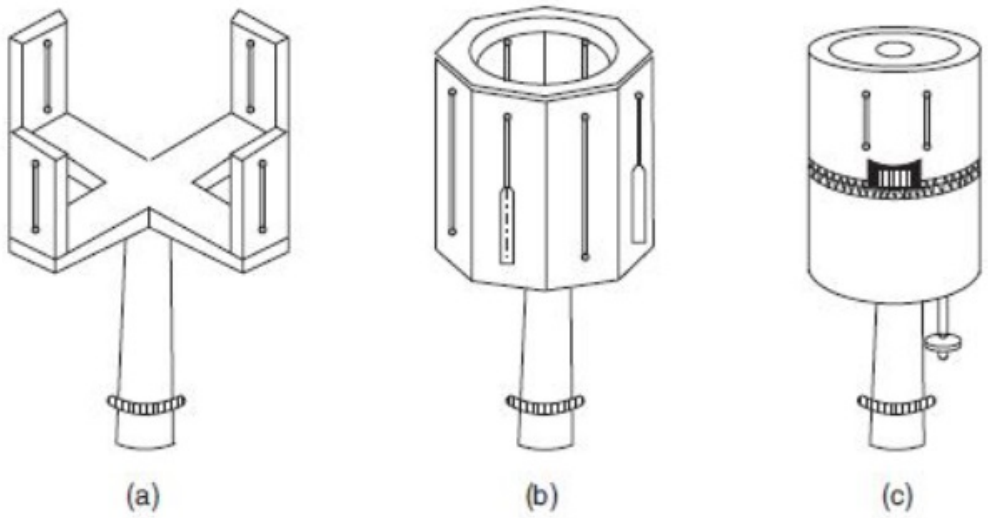


Fig. 12.14. Cross staff

The importance and usefulness of chain surveying

1. It is suitable for small areas of fairly open ground.
2. It is used to fill in details on a map whose large features have been surveyed by other methods.
3. It is used in mapping small areas of flat or near-flat ground and associated objects, for example paths, roads and railways.
4. It is used in adding detail to existing plans or large maps.

Advantages of chain surveying

1. It is the simplest method of surveying through the old method
2. It is suitable for surveying clear areas
3. It tends not to attract attention.

4. It is suitable for surveying flat surface on the Earth's surface, for example a school compound
5. It can be red easily and quickly
6. It can withstand wear and tear
7. It can be easily repaired or rectified in the field

Disadvantages of chain survey

1. It is a slow method of surveying
2. It is the oldest method of surveying
3. It is not suitable for surveying large areas
4. More difficult areas cannot be chain surveyed
5. Errors may be encountered due to the use of many chains and other reasons
6. It is time consuming
7. They are heavy and take too much time to open or fold
8. They become longer or shorter due to continuous use
9. When the measurement is taken in suspension, the chain sags excessively

THE ERRORS THAT OCCUR IN CHAIN SURVEYING

What is an error?

An error is a mistake or shortcoming that happens during the survey process leading to wrong measurements. It is sometimes called discrepancies. The following are the type of error or discrepancies in chain surveying.

Sources of Errors in Chain Survey and Their Correction

The errors can be divided into three groups

- Cumulative (systematic) errors
- Compensating (accidental) errors
- Gross Errors

Cumulative Errors

Cumulative errors are said to be systematic errors as they are one-directional hence keep on accumulating as the survey progresses. If not checked they have serious implications to the accuracy of the survey. Errors in this class included incorrect

length of the tape, page of the tape or the tape not being in line. Since the sources of these errors are known, they can be eliminated.

They can either be positive or negative errors. While positive errors shortens the measurement (e.g where the tape length is shorter that what it should be) while negative errors elongates the measurements (e.g. where the tape is longer what is should be). Checking the equipment can eliminate these errors.

Compensating Errors

Compensating errors are said to be accidental errors hence cancel out and does not pose serious problem to the accuracy of the survey. They arise as are result of not being perfect in the use of the equipment or in the whole survey process. For example, if the pull exerted on the tape in either more than or less than what should be the case, faulty results be gotten. The effect can either be positive or negative.

Gross Errors

These are mistakes that can be attributed to the inexperience of the leaders. These are very serious errors which although are random in accordance my lead to faulty plans and maps if not checked. They include discontinuing the chain length (e.g. where some arrows are cost or misplaced); misreading of the tape; reading tape upside down (e.g. taking 6 to be 9), etc. By taking the necessary precautions, these errors can be corrected.

Overcoming obstacles during chaining

TYPES OF OBSTACLES

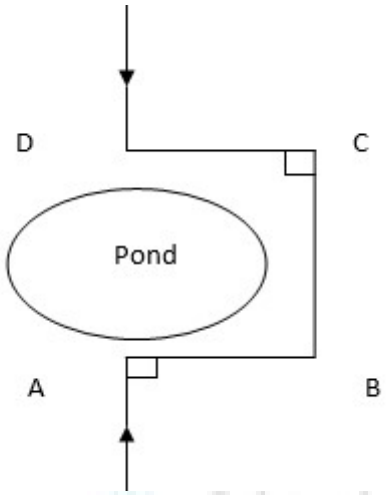
1. Visual obstacles: Is an obstacle that prevents an object but the chain remains free. An example of a visual obstacle is a forest.
2. Chain obstacles: This is the obstacle where by the chain is obstructed but visually it is free. Examples are rivers and ponds
3. Neither visual nor chain obstacles for example buildings

HOW TO OVERCOME THOSE OBTACLES

1. By rectangular method
2. By triangle method
3. By using similar triangle method

By constructing rectangles

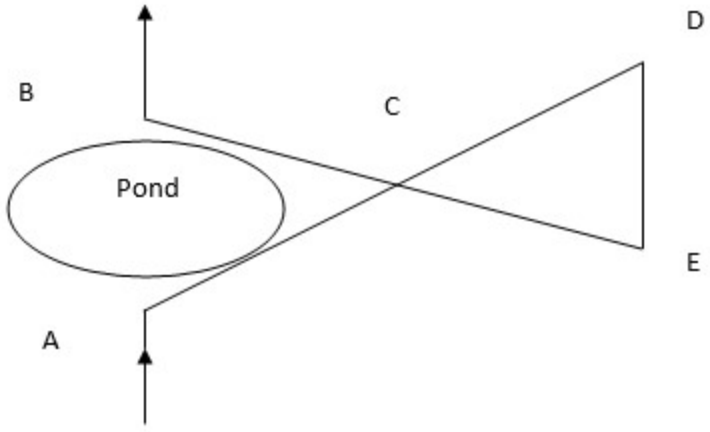
Chaining had reached A and encountered an obstacle. To get to B, mark A and B with any arrow. Set of perpendiculars AC and BD high enough to clear the obstacles. Join and measure DC which now equals AB. This allows chaining to continue from B.



By constructing similar triangles

To continue chaining for B, fix point C away from the obstacle. Range a pole at D to align with Ac hence AC =CD. In line with BC range another point E in line with BC. Hence BC = CE

Measure ED which equals AB hence chaining can continue from B.



Obstacles which obstruct both ranging and chaining

Chaining has reached B from A where an obstacle like a building has been reached. Erect equal perpendiculars AC and BD from A and B along the chain line.

Along CD, range E and F beyond the obstacle. Set off perpendiculars EG and FH from E and F equal to AC. AS G and H are in line with AB, then CE equals AG.

By constructing similar triangles

Chaining had reached A and there is the need to overcome the obstacles created by the stream to really B. Set out a perpendicular AC and mark the midpoint E. Set out another perpendicular CD so that D, E and B are in a straight line. The 2 triangles created are congruent CD = AB which is the required length hence chaining can now proceeds from B.

IMPORTANCE OF SURVEY

The following includes the general importance of survey

(i)It helps in determine distance between various points on the ground
(ii)It helps to determine heights on the ground
(iii)It helps to determine angles on the ground
(iv)It helps in determine areas of plots of land
(v)It helps to take ground measurements for construction of various structure E.g roads, buildings e.t.c
(vi)leveling survey helps to determine level of sloped ground
(vii)It helps to determine for sight intermediate and back sight of various points on the ground especial sloped land.
(viii)Survey is help in taking measurements to some areas where under ground structure to be constructed E.g. pipe line , underground canal e.t.c

LEVELLING SURVEY

1. **CONCEPT**

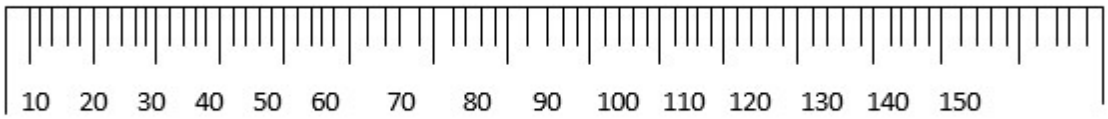
Leveling: Is the procedure by which the heights of the points on the Earth's surface are determined.

2. **EQUIPMENTS**

i) Leveling staff

ii) Surveying Telescope

i) ***Leveling staff***: Is a long ruler which can be made from steel material either white and black or black and rod. "Used to fix or heights on the earth's surface"



ii) ***Survey Telescope*** : Its used to determine the angle of position or height on the Earth's surface

iii) Also tape, chain and pegs are used in Leveling.

Used for measuring distance. Used for making station points

Method used in Leveling

1. Rise and fall method
2. Height of collination method

iv) Note book and pencils are also used in leveling process for recording or booking all necessary field work information

v) Spirit level or buble tube

This is about 50 mm to 225 mm in Length mounted on a telescope. Height readings to object can be made and the whole instrument can be using in a horizontal plan. The observer taken recording or graduated telescopic staff from hio own position whose height is known.

The producers of leveling

1. A staff is plat at station one or base station. Then the sighting instrument is put in the direction of travel when a back sight is recorded.
2. The distance from base station to the instrument is measured.
3. The staff man moves along the direction of travel ahead of the sighting instrument (telephone). This will be station two where a fore sight is recorded.
4. The sighting instrument is moved along the direction of travel ahead of the staff man. A back sight is takes and recorded. The procedure is repeated until all the leveling is done and recorded.

"**Use Fullness of Leveling"**

- Leveling helps to determine the relative heights on land that can be used in contour mapping.

- Leveling can be used to determine the heights or elevation of the land surface such as hills, valleys, plans, etc.

- Housing foundation, the location of industrial sites, the route of communication and sites of building can be located and determine with the help of leveling.

PHOTOGRAPH READING AND INTERPRETATION

Photograph

Is an image of an object which is recorded by a camera and then printed on paper

Or

Is a picture taken by means of chemical lights prepared on a special paper

Types of photographs

i) Horizontal photographs/Group photographs

ii) Oblique photographs

iii) Vertical photographs

1. HORIZONTAL PHOTOGRAPHS/GROUP PHOTOGRAPHS

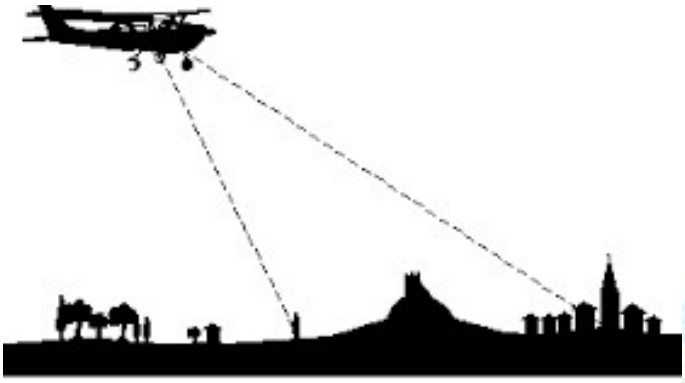
These are photographs that are taken from the ground when the camera is at the same level as the object being photographed.

- Objects are large and clearly shown in these photographs when they are close than those far from the camera
- The fore ground and the horizon is seen but the back /dead ground is not seen

- There is no fixed scale

2. OBLIQUE PHOTOGRAPHS

Are the photographs taken hen a camera is slanting at an angle less than 90°. They are taken when the photographer is standing on an elevated ground and hold the camera on an angle towards the lower ground .They normally cover the horizon.



3) VERTICAL PHOTOGRAPHS

These are photographs taken from the air with the camera directly above the object pointing vertically to the ground.

- Only the top view is seen

Instruments used to capture pictures are called air crafts or the satellites

These are various differences between 3 types of photographs as follows.

Ground photographs	Vertical photographs	Oblique photographs
Are taken when the camera is at the same level with the object	Are taken from the air vertically above objects being photographed	Are taken from the ground or from air with the camera tilted below 90^0
They show side of the object facing the camera.	It shows only the top side of the object	Shows the top and sides of the object
Size of object near the camera are large than those far away	Objects in the center are larger than those away from the center	Objects closer the camera are larger than those far away
Show relatively small area	Show relatively large area	Show relatively largest area possible

PARTS OF PHOTOGRAPH

In order to study and refer the position in the photograph properly ,It s necessary to divide photograph into appropriate parts .The photograph is devided into three parts both horizontally and vertically .

Horizontally ,It is divided into foreground, middle ground and back ground .The foreground is the area nearest to the camera,middle ground is the area between foreground and the back ground ,where as background is the furthest area from the camera. middle ground is the area between foreground and the background, where as background is the farthest area from the camera. For case of description of location onto features on the photograph it is appropriate to use these division.

Left	Centre	Right
left background	central background	right background
left middle ground	central middle ground	Right middle background
left foreground	central foreground	right foreground

The table gives appropriate description of both horizontal and vertical interpretation of photograph

READING AND INTERPRETATION OF PHOTOGRAPH

Is the process of reading, measuring, translating and explaining the meaning of objects identified on that photograph.

It is done so as to obtain reliable information about the natural or cultural features on their environments. It involves the following;

- Determining the title
- Estimating time and the season
- Estimating direction
- Identifying and interpreting physical features
- Identifying and interpreting human activities
- Estimating the size of phenomena
- Suggesting possible location of the scenery in the place

DETERMINING THE TITLE

Can be obtained by carefully studying the photograph, information determines the choice of the title. Photos show landscapes, activities on land, what is on the surface and the sky. The information contained in the foreground, middle ground and dead ground can help in determining a suitable title

ESTIMATING TIME AND SEASON

It is possible to estimate the time of day when the photo was taken if we know where the photograph was taken

1) If the photo was taken during the morning its evidence is through the shadow

During the morning

The shadow of the object lies in the western side because the sun rises from the east

2) **During the evening**

The shadow lies in the eastern side because the sun sets on the west

3) **During the after noon**

The shadow lies around the object because the sun is over head of the object

SEASONS

- A bright sky with dry vegetation may indicate a dry period or season.
- Thick vegetation young crops or flowering plants in the field and a sky full of rain clouds indicate a rainy season
- Clear sunny conditions with health vegetation and flowering plants or plants with fruits indicate summer season
- Plants with young leaves others bloom and field full of grass indicates spring season
- Hazy sky with leafless trees and some snow on the ground indicates winter season
- Also when people appear to be wearing heavy clothes with faces almost completely covered, hand gloves and heavy boots it indicates cold weather, likely winter in temperate regions
- People wear light clothes and some may even have broad-rimmed hats indicates hot weather
- When houses appear to have slanting roofs it indicates the region experiencing a lot of precipitation which facilitates the easy flow of water from the roof of the house
- If people appear to be planting then it is planting season the rains either are about to come or have just started
- If the people appear to be weeding it is growing season for the crops and there is reduced rainfall
- If people appear to be harvesting a crop it is harvesting season and probably dry season because harvesting normally takes place during dry weather.

ESTIMATING DIRECTION

- It is possible to estimate direction on the photo using shadows if time and place are known
- If a photograph shows trees whose shadow is on the right and is taken in the morning the photographers direction is south
- If the shadow is pointing towards you on the photo and the photo was taken in the afternoon (sun was in the west) then the camera was facing westwards.

IDENTIFICATION AND INTERPRETATION OF PHYSICAL FEATURES

Many varieties of physical features can be identified on photographs. These includes features of relief, drainage and vegetation

A) RELIEF

It is necessary to first identify feature of relief on the given photograph. These features appear the way they do in real nature .When describing relief on photograph one should start giving a general idea about the area shown in the photograph.

On the ground photograph, it is possible to identify flat land scapes ,hilly areas and mountainous relief. Other details can be fitted within this general outlook.

B) DRAINAGE

Drainage features such as rivers, lakes and other alike water bodies can be easily identified on all types of photographs. On ground/Horizontal and some obliques rivers may not be easy to study because of obstruction and intervening obstacles ,

Different aspect of rivers can be studied including the shape of either valleys and develop of different features. For example ;presence of rapid waterfalls is an indication of river flowing over steep land , River meanders indicates the mature stage of the it or even old stage .Drainage pattern. May indicate the highland areas and normally can be taken by aerial photograph while presence of big meanders, lake or ocean indicate lowland areas with high rate of deposition as the effect of erosion done at highland areas.

C) VEGETATION

Photograph shows all types of vegetation present in the photographed area. It is however difficult to distinguish certain types of vegetation foristance natural from derived vegetation. Planted vegetation may be easier to identify because of their unique character .Trees in clear straight row and the same height in photograph indicate the planted forest ,where as random arrangement and height indicate the natural vegetation .

Photograph interpretation with thick forest and greenish indicate the area with arable rainfall and rich in fertile ,photographs with less vegetation indicate the area with less or no rainfall which referred as semi- arid and arid areas in this areas photos may also show cactus plants acacia trees, jacaranda plants etc

CLIMATE

Climate is not shown in a photograph but can be used to give conclusion on the type of an areas. The characteristics of the sky can give a clue about the weather and season when the photo was taken ,

(a) Presence of thick cumulus or cumulonimbus clouds indicate a rainy season while a clear sky may imply a dry season

(b)The type of clothing people in the photograph are wearing gives a clue about the weather and possible climate i.e. light clothe indicates the hot climate condition and heavy clothes indicates the cold condition

(c) The type of vegetation shown, provides a clue about the season or climate of a place

For example ; presence of numerous cacti may indicate the semi arid or arid climate ,crops such as sisal grown in hot areas that may receive low rainfall while sugar cane thrives in warm to hot climate with high rainfall.

IDENTIFICATION AND INTERPRETATION OF HUMAN ACTIVITIES

FARMING/ AGRICULTURE

Crop cultivation and live stock keeping

Vertical aerial photographs may require close scrutiny to be able to identify. It is fairly easy to distinguish these two types of ground photographs

Type of farming	Evidence to look for.
1. Subsistence crop farming	• Some houses are permanent and others are temporary

	• Land is divided in small portions
2. Subsistence live stock farming.	• Mixed cropping • Simple farm tools such as pangas and hoes • Fields are separated by hedges • · Local and exotic animal breeds are kept • · Animal grazing on grassland/semi arid regions • Large herds of indigenous cows and goats
3. Commercial live stock farming	<u>RANCHING</u> • Large fields divided in paddocks • Presence of cattle heads near farm houses • Wind mills for water supply • Presence of water tanks, ponds and reservoirs in dry areas • Cattle dip on the farm. <u>DRY FARMING</u> • High grade exotic cows with large udders • Milk processing plant • · Indoor grazing unit
4. Commercial crop farming	• Presence of cash crops on extensive area • Modern farming methods (farm machinery) • Facilities for collecting produce (shades and stores)

	• Presence of feeder routes in the farm
5. Plantation farming	• ·A single crop on an extensive area • Processing factories • Presence of storage facilities • Many laborers on the field

SETTLEMENTS

Settlement comprises a group of buildings in area where people live and carry out social and economic activities

Settlements may be of two main groups:

i) Rural

ii) Urban

RURAL SETTLEMENTS

Can be indicated by;

- Simple semi permanent and permanent buildings such as grass roofed houses or iron roofed houses with mud or brick walls
- Farming, grazing or fishing
- Unplanned presence of villages

URBAN SETTLEMENTS

- Permanent buildings
- Regular street patterns
- Many large buildings and ware houses for industrial area
- High number of people if shown
- Many motor vehicles

- Port facilities [docks, cranes, ware houses, containers]

INDUSTRIAL AND MINING ACTIVITIES

Evidences

- Factory buildings with tall chimney for issuing smoke
- Large ware houses next to the building
- Large lorries carrying loads of rocks indicates open cast mining
- A vast area with derrick/oil rigs indicate oil fields

Also lumbering activities

- people cutting trees
- people loading trees /lumber on lorries
- logs floating down on rivers
- logs pilled near a sawmill
- large forest clearings
- Many road ways ending on the forest.

TRANSPORT AND COMMUNICATION

The following are some of the dues on transport

- motor vehicles and roads
- a railway line
- Presence of boats and ships and large water vessels
- Animal carrying loads on their backs

Facilities for communication are due to the presence of

- Telephone lines
- Telephone booths
- Satellite dishes
- Televisions

STATISTICS

Statistics is the branch of science of collecting, classifying and analyzing information using numbers.

Types of statistics

a) Descriptive statistics

Are techniques concerned with careful collection, organization, summarizing and analyzing from large set of data. It is obtained from field work and where the population is large. Examples are population census, harvest temperature.

b) Inferential statistics

These are techniques concerned with careful collection, organization, summarizing, analysis and drawing conclusion from samples.Samples are small data taken as representatives to give the probability of aspects of geography.

FORMS OF STATISTICS

Statistical data can be sub-divided into two major forms. Parametric data and non –parametric data
1.Parametric data- is also known as continuous data, it is data which is capable of having subdivision such values are 1.25, 2.65, 3.0, 2.5 and other can be obtained
2.Non- parametric data- known as Discrete data obtained by counting or ranking such values as 10,25, 35 etc.

These two types of data can expressed in different levels or scales such level or scale are:-

i.Nominal scale – They type of scale where classification and counting are made e.g A, B, F,. It is simply means the system of assigning number in order to label them

ii.Ordinal scale: is a scale which attempts to rank data in order.

iii.Interval scale: Scale used to adjust values into equal form

iv.Ratio scale: It have an absolute or true zero of measurement foristance the zero point on a centimeter scale indicate the complete obsceneof length or height.

VARIABLE

Is anything/characteristics that may have or an attribute which change in value, under given condition. Variable can be classified into two major forms:- 1.Independent variable- it is a variable factor which influence the changes of other variable e.g. Sex, year etc. It is expressed on the x axis
2.Dependent variable – an outcome or result which has been influenced by other variable e.g. The higher the attitude the lower the temperature and viceversa.

DATA PRESENTATION

Is the process of organizing data and presenting them into different ways or forms, This include linear graphs pie chart, bar proportional diagrams, polygons and others.

1. **LINE/LINEAR GRAPHS**

i) Get the data needed for the purpose
ii) Identity the depended and independent variable
iii) Decide on the vertical scale based on the graph space and values of the dependent variable available
iv) Decide on the horizontal spacing of the graph determined by graph space available
v) Draw and divide the vertical and the horizontal axes according to respective scale
vi) Plot the point
vii) Join the points to get the graph
viii) Write the title of the graph appropriately
ix) Indicate the scale appropriately
x) Show the key where necessary

TYPES OF LINE GRAPHS

a) Simple line graphs
b) Group (comperative) line
c) Compound line graph
d) Divergent line graphs

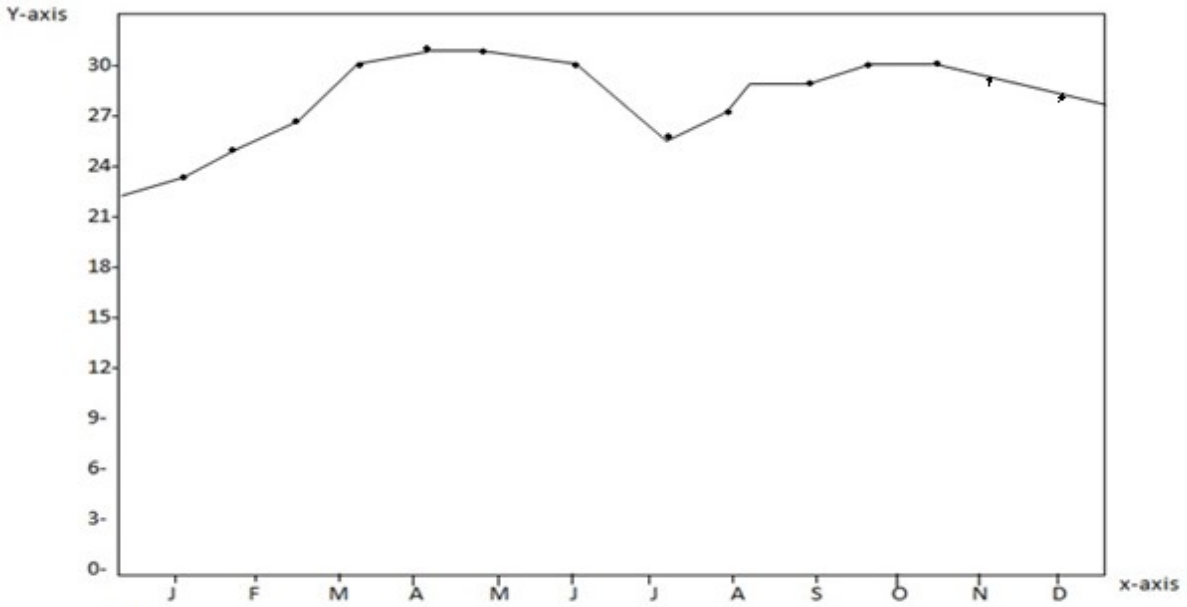
SIMPLE LINE GRAPH

This is a graph drawn to show the variation of distribution of a single item using line.
Procedure for construction refer to generally procedure for drawing line graph.

For Example:Temperature values for station x

Months	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Tempe(^{0}C)	23	24	26	28	29	28	26	26	26	27	26	25

A SIMPLE LINE GRAPH SHOWING MONTHLY TEMPERATURE FOR STATION X



Scale:

Vs : 1cm represent 3°c

Hs : 1cm represents month

Advantage of simple line graph

- They are simple to draw and interpret
- The continuous nature of a line or curve make technique suitable for showing data which in continuity e.g. Temperature
- Variations such as sudden rise or drop values are visually clear.
- It is easy to read the exact values against plotted point in straight line graph.

Disadvantage of simple line graph

- The record limit representation of only one item on graph
- They can give false impression on continuity of data even when there are periods when data is not available
- They do not give a clear visual impression of actual quantities.

GROUP/COMPERATIVE LINE GRAPH

These are a series of line graphs that are drawn on the same charts. They show the relationship between sets of similar statistics for two or more items.
Note the following:

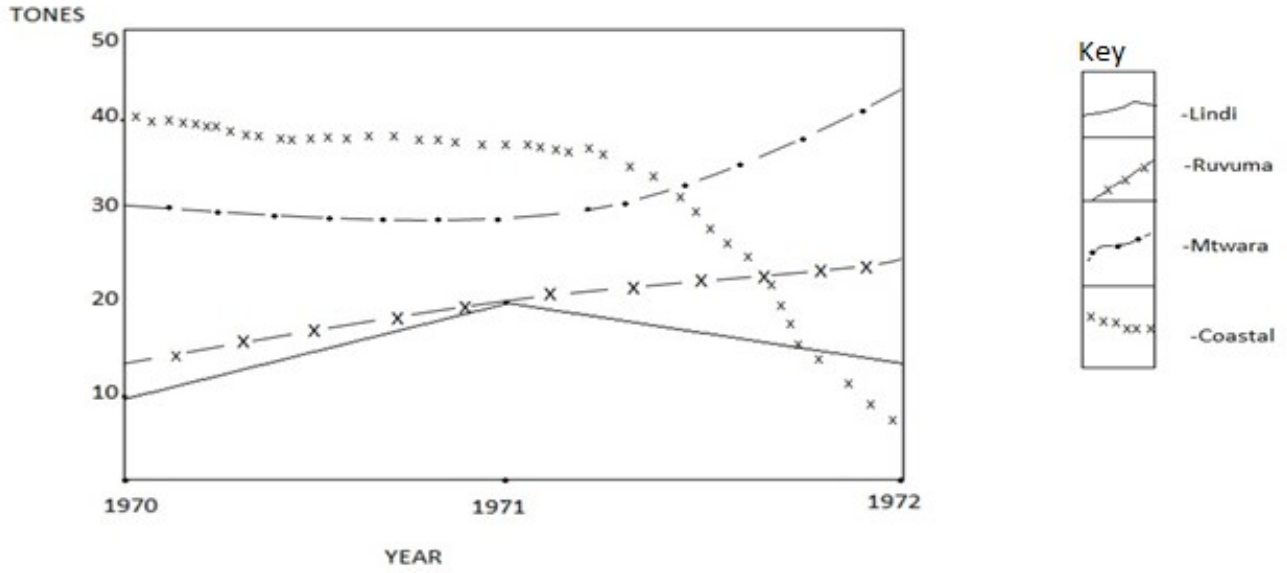
a) The line drawn should not be uniform
b) The number of line that a graphs should not exceed five (3)

Example: Drawn a group line graph to present cashew nut production in tonnes among four Regions of Tanzania

Region

year	Lindi	Mtwara	Ruvuma	Coastal
1970	10	30	15	40
1971	20	35	20	35
1972	15	45	20	05

GROUP LINE GRAPH TO REPRESENT CASHEW NUT PRODUCT IN LINDI, RUVUMA, MTWARA AND COASTAL REGIONS FROM 1970 TO 1972



Scale:-

Vertical scale : 2cm to 10 tones
Horizontal scale: 4cm to 1 year

Advantages of group comperative line graph

- Give comperative analysis of data
- Saves space and time since they are on one space
- Have good visual impression if well drawn

Disadvantage of comperative line graph

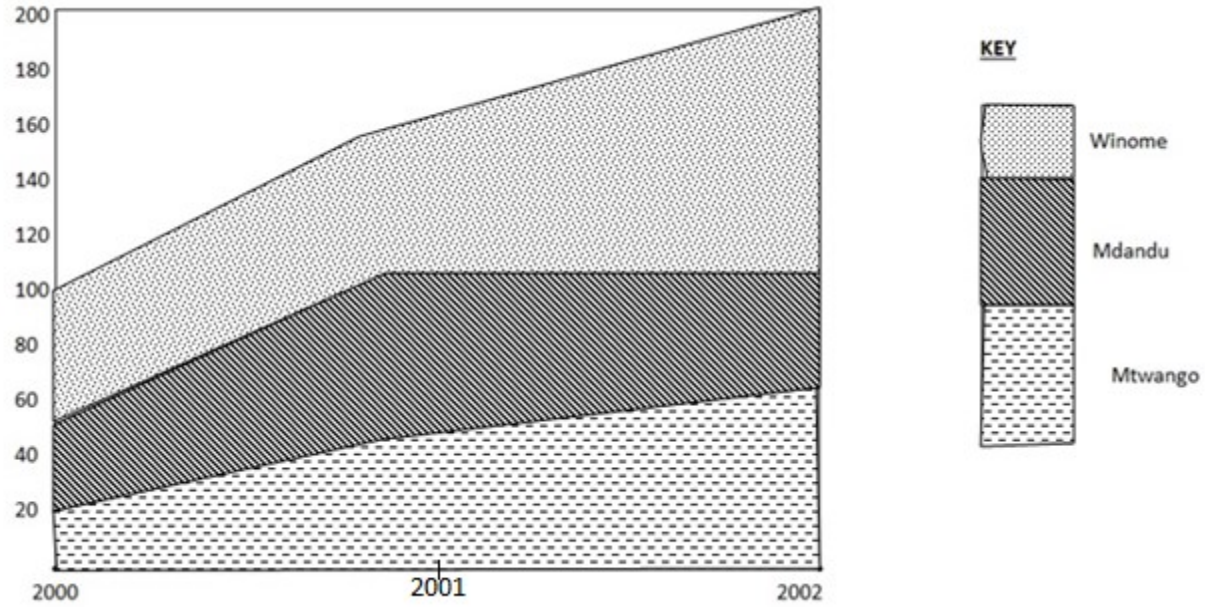
- Can be overcrowded if the set of data is many
- Easy to confuse with compound line graph

COMPOUND LINE GRAPH

Compound line graph is made of two or more lines which are drawn horizontally. Each line indicates are item different year/region.

An example of compound line graph to show the maize production in three villages from 2000 to2002 in 000 tones

Year	Winome	Mdandu	Mtwango
2000	20	35	40
2001	40	35	65
2002	50	70	80



KEY

Vs : 1Cm = 20 tonnes

H s : 5Cm = year

Advantage of compound line graph

- Total value are dearly shown for overall conclusion and suggestion
- It bring usual impression which encourage understanding for interpreter

- Combining several graphs in one save space

Disadvantage of compound line graph

-
- The calculation involved are difficult and time consuming
- Drawing is very difficult and time ensuring
- Interpretation may be difficult as well

DIVERGENCE LINE GRAPH

Are graphs which represents negative (minus value) and positive (plus value) around a mean. They are loss and gain graphs which show divergence or variation between export and import or profit and loss etc.The mean is represented by zero axis drawn horizontally across the graph paper.

For example; Present the following data into divergent line graph.

Year	Production (tonnes)
1960	2,000
1970	2,000
1980	1,500
1990	4,000

Construction Procedures:-

i)Calculate the sum of the dependent variable.

Eg. 2,000 +2,500 + 1,500 +4,000 =10,000 tonnes

ii) Calculate the Arithmetic mean of the value of the dependent variable.

$$\bar{X} = \frac{10{,}000 \text{ tonnes}}{4}$$

$$\bar{X} = 2{,}500 \text{ tonnes}$$

iii) Find the deviation from the mean of each value:

Year	X	(X –X)
1960	2,000	-500
1970	2,500	0
1980	1,500	+1000
1990	4,000	+1500

iv) Identify the for example dependent is deviations and independent variable is year of production.

v) Determine the vertical scale.Assuming the graph space available is 10Cm

$$\frac{\text{Maximum deviation from mean}}{\text{Graph space}}$$

$$\text{Vertical scale} = \frac{1{,}500 \text{ tonnes}}{10 \text{ cm}}$$

$$= 150 \text{ tonnes per centimeter}$$

$$\therefore 1\text{cm} = 150 \text{ tonnes}$$

vi) Write the tittle and scales of the graph

BAR GRAPHS

Are the graphs drawn to show variation of distribution of items by means of bars.

TYPES OF BAR GRAPHS

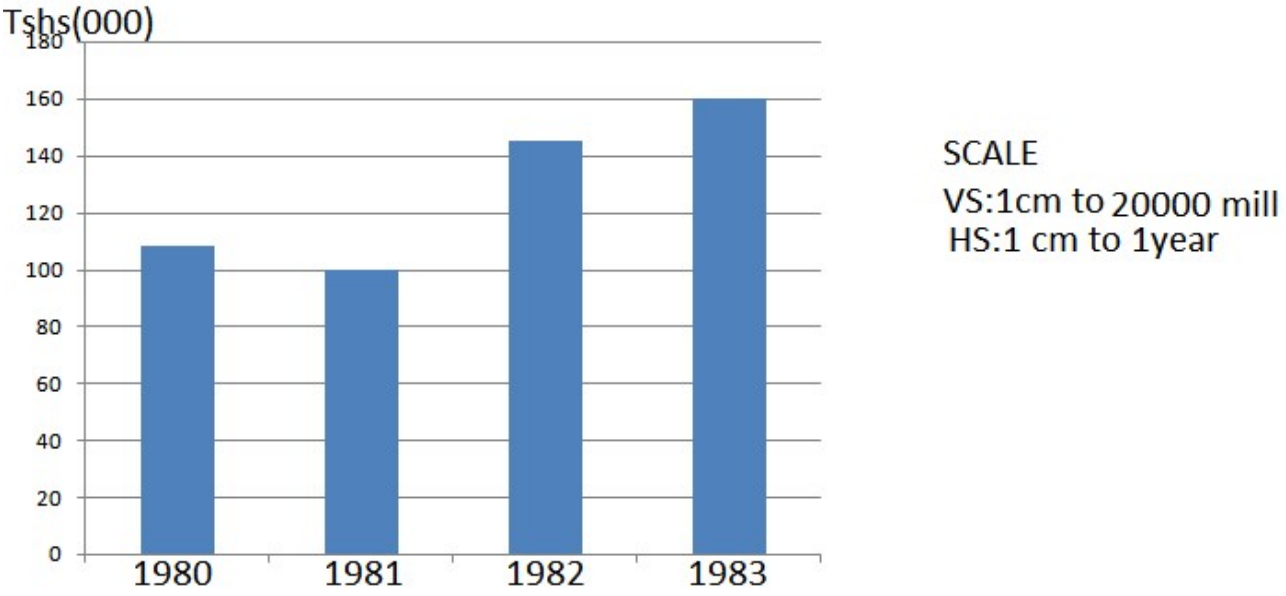
a) Simple bar graph
b) Group/comperative bar graphs
c) Compound bar graphs
d) Divergent bar graphs

A) SIMPLE BAR GRAPHS

This graphs express single item per bar and represent simple data.
Example: Draws a bar graph to represent Tanzania sisal export

Year	Export by value (Tshs 000)
1980	108,100
1981	100,400
1982	145,500
1983	160,000

A BAR GRAPH TO REPRESENT TANZANIA SISAL EXPORT 1980 TO 1983



Advantages of Simple bar graph

- They are relatively simple to draw
- Easy to read and interprate
- Bar represent tangible quantities better than line
- Have good visual impression

Disadvantages:-

- The method is limited, it is capable of representing only one item per graphs
- They are not suitable for cumulative data
- Consume space if data are many.

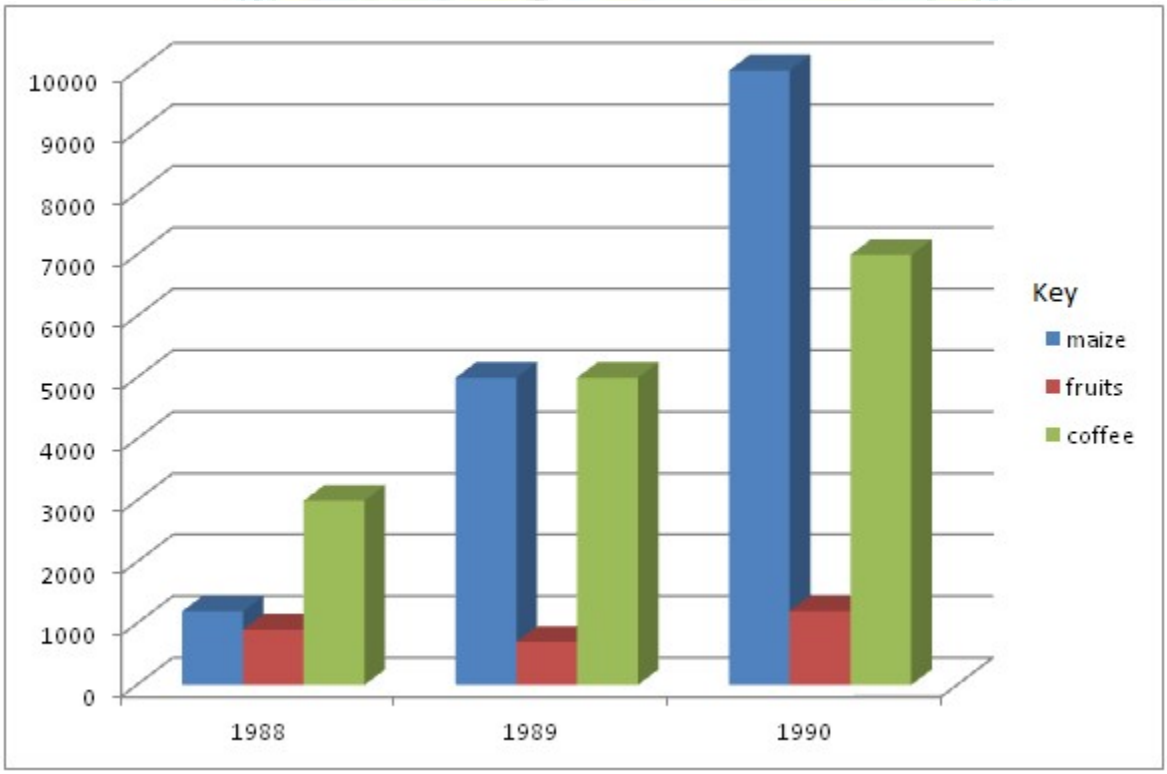
GROUP (COMPARATIVE) BAR GRAPH

For example.Present the data shown in a table into comperative bar graph to show agricultural products exports from 1988 to1990

	1988	1989	1990
Community			

Maize	1,200	5,000	10,000
Fruit	900	700	1200
Coffee	3000	5,000	7000

GROUP BAR GRAPH SHOWING EXPORT OF AGRICULTURAL PRODUCTS IN METRIC TONNES.



scale:
HS:3cm=1year
VS:1cm=100 tonnes

Advantage of group bar graph

a) Value in their totals are expressed well for illustration of points.
b) Construction is relatively simple hence easy
c) Interpretation is also relatively simple and easy.
d) The important of each item/component is clearly shown.

Disadvantages

a)The comparison of totals of items is difficult
b)Trends cannot be expressed easily e.g. Price and demand rise and falls.

COMPOUND/DIVIDED BAR GRAPH

This method of data presentation involve construction of bar which are divided to segments to show both individual and cummulative values of item. The length of each segment represent the contribution of an individual item while that of whole bar represents the contribution of the cummulative items in each group.

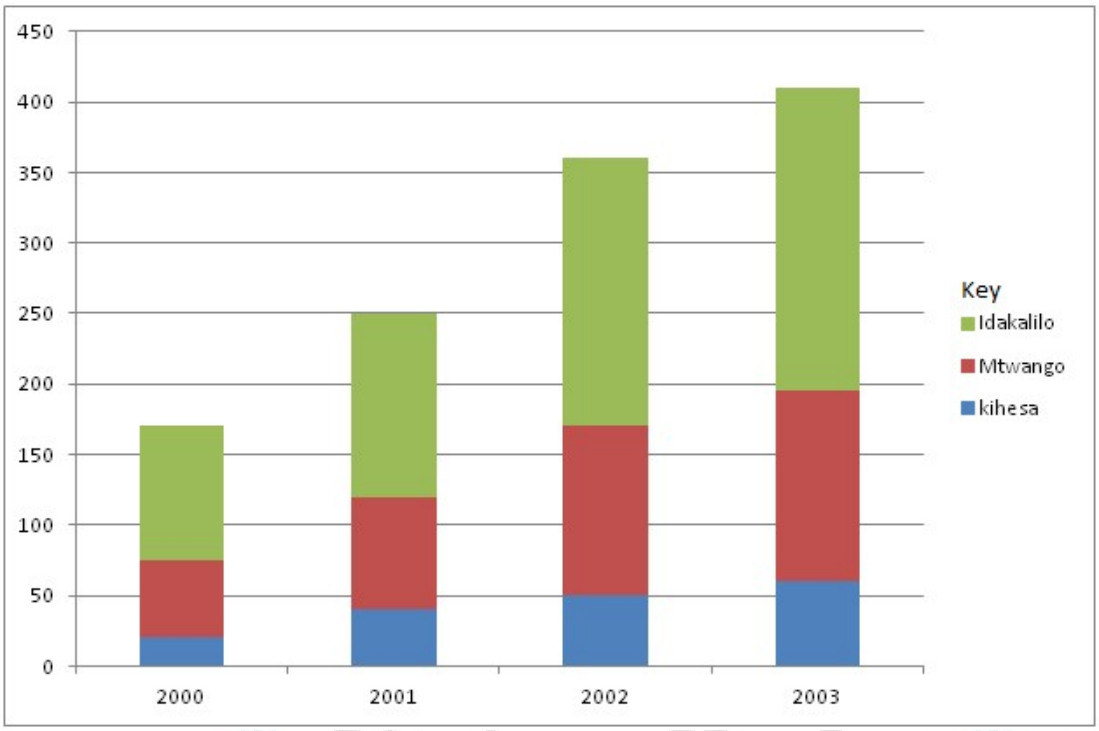
Example: Potatoes production in 000 Sacks

Year	Kihesa	Mtwango	Isakalilo
2000	20	35	40
2001	40	40	50
2002	50	70	70
2003	60	75	80

⇒Create a cumulative table

Year	Kihesa	Mtwango	Isakalilo
2000	20	55	95
2001	40	80	130
2002	50	120	190
2003	60	135	215

BAR GRAPH TO REPRESENT POTATO PRODUCTION IN 000 SACK



Scale

- Horizontal scale 1cm to 1 year
- Vertical scale 1 cm to 30,000 sacks

Advantages of compound bar graph

- It is easy to ready the highest and the lowest totals at a glance by comparing the size of the segments
- They give clear visual impression of the total value
- The increase and decrease the grand total values is easy to see

Disadvantages of compound bar graph

- They are relatively difficult to construct and interprate
- Difficult to represent large number of components due to long bars with many segments
- Time consuming.

Divergent bar graph

Instead of divergent line graphs, the data can be presented in divergent bar either horizontally or vertically.

For example:Present the data below by using divergent bar graph to show sisal production in different years

Year	Production (tonnes)
1960	2,000
1970	2,500

1980	1,500
1990	4,000

Procedures:-

i.Find the deviation from the mean of each value.

2,000 + 2,500 + 1,500 + 4,000 = 10,000 tonnes

$$\bar{X} = \frac{10{,}000 \text{ tonnes}}{4}$$

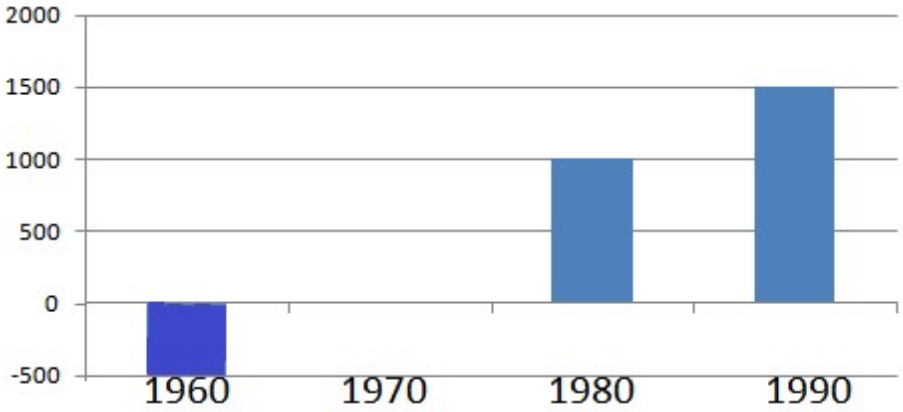
$$\bar{X} = 2{,}500 \text{ tonnes}$$

Year	X	X - X
1960	2,000	-500
1970	2,500	0
1980	1,500	+1000
1990	4,000	1500

ii.Insert tittle of the graph

iii.Insert the scale of the graph

DIVERGENT BAR GRAPH TO PRESENT SISAL PRODUCTION IN VILLAGE X FROM 1960,1970,1980 AND 1990.



scale;

vs:1cm=150 tonnes

Hs:2cm=1year

Advantage of Divergent line graph

a) It is simple to construct and interpret
b) A divergent shows fluctuations of items from the mean.
c) It show both the positive e.g. Profit and the negative e.g. Losses.

Disadvantage

a) It involves calculations which right to be both time consuming and difficult.
b) Interpretation needs special statistical skills of which one may lack.
c) Limited only to one item per graph.

DIVIDE CIRCLE/PIE CHART

Is a divided circle which drawn show the distribution of item or items in terms of degrees.
In drawing divide circle all items values must be converted into degree values.
Total degrees of a circle $=360^0$

$360^0 =$ 100%

Construction of Divide circle

Example:- carefully study the table below which show the use of soft drinks at chapamaji village in crates

Type of soft drink	Coca	Fanta	Pepsi	Mirinda	Novida
Number of crates	300	150	250	100	200

a) Draw pie chart to present data above
b) Give merits and demerits of the method you use (a in "a" above)

Solution

Procedures to draw a pie chart
i.To find total of items
Total = Sum of all items (soft drinks) consider the table below:

Soft Drink	Coca	Fanta	Pepsi	Mirinda	Novida	Total
Number of crate	300	150	250	100	200	1000

Total = 300+ 150 + 250 + 100 +200
=1000 crates.

ii. Step:- To change each type of soft drink into degree values.

$$\text{Degree} = \frac{\text{type of soft drink}}{\text{total}} \times 360^0$$

$$\text{Coca} = \frac{300}{1000} \times 360^0$$

$$= 108^0$$

$$\text{Fanta} = \frac{150}{1000} \times 360^0$$

$$= 54^0$$

$$\text{pepsi} = \frac{250}{1000} \times 360^0$$

$$= 90^0$$

$$\text{Mirinda} = \frac{100}{1000} \times 360^0$$

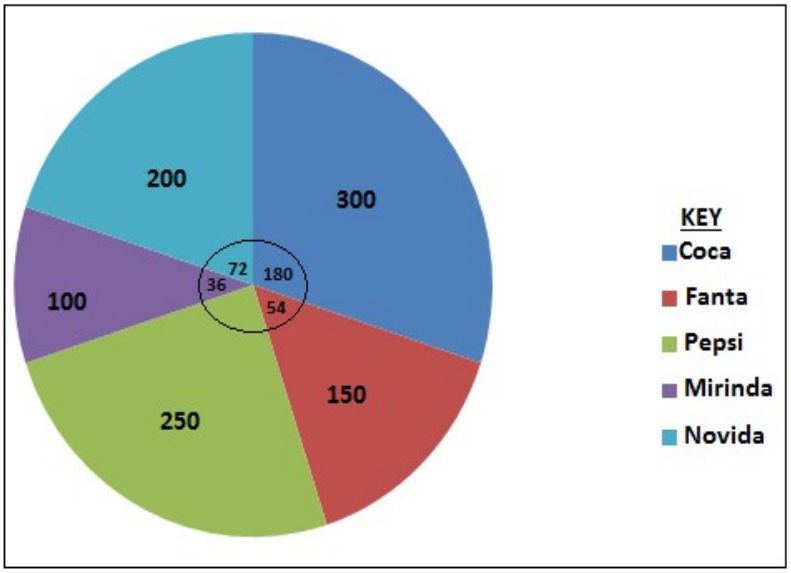
$$= 36^0$$

$$\text{Novida} = \frac{200}{1000} \times 360^0$$

$$= 72^0$$

iii. To draw pie chart. Drawing pie chart the obtained angles inserted in a circle by using protractor.

DIVIDE CIRCLE TO SHOW THE DISTRIBUTION OF SOFT DRINKS



1. **Merits of pie chart**

i. It is simple to construct.
ii. It is easy to interpret as they use both degree and percent
iii. It gives visual idea as the shades us
iv. It does not hide other feature when left unshaded
v. It has wide variety of uses in geographical field.
vi. It is useful to compare regions of high and low production.

Disadvantage of Pie Chart.(demerits)

i. It involve some mathematical calculation i.e difficult to construct.
ii. When drawn in percentage become difficult to interpret.
iii. It is time consuming
iv. It is difficult to select shade textures for many items
v. It is difficult to read exact values because reference can be made to a scale

Importance of statistics

- Helps in the comparison of different geographical phenomena for example climate, population, commodity and production.
- Used to summarize raw and bulk data for easy interpretative and visual explanation.
- It facilitates land use planning
- Helps resources allocation and provision of social services for example food, health, water, education.
- Makes it easy to compare data
- Its knowledge simplifies research activities

SUMMARIZATION OF MASSIVE DATA

Raw data collected from various sources does not tell users much unless they are organized in summary form. This process of summarizing data in an organized form makes sense out of the scored information.

This brings the necessity to geographer's of summarizing massive data which could be done in the following ways:-

1. **Frequency distribution**

Frequency distribution help to determine how many times a certain scores are arranged/occurs in that presentation. The technique consist of a table in which different scores are arranged in their rank order. It is advised ti start with the highest/largest value and back to the smallest That is in descending order

E.g: Use the data below which express a population survey in a certain region

- The raw information found that the family size of 20 families interviewed was 3,2,2,4, 3, 7, 8, 1, 3, 6, 2, 2, 4, 5, 6, 4, 3, 4, 5 and 2
- Arrange the scores in lending order from 8 to 1
- Distribute each score in the representation to get how many times each score occurs. This process of distribution is called tallying

Distribution of the score to get their frequency

Score	Tally	Frequency
8	/	1
7	/	1
6	//	2
5	//	2
4	////	4
3	////	4
2	~~////~~	5
1	/	1

The frequency which means the number of times a score or event appears or occurs is obtained. At time one is confronted with a large number of scores or event involving a whole region this is certainly difficult to handle if one deals with each score or event separated. The world is made simpler and easy by the use of grouped frequency. Be low are the steps involved in making grouped frequency.

Decide the size of the class interval. This is actually the number of scores or events in each class. But is important to know the characteristics class internal in order to be able to make classes.

a) A score appears only once. That means no score should be long to more than one class.
b) The size of the class intervals should be uniform
c) The class intervals should always and be continuous
d) The range of class intervals should be between 3 and 20. Thus, the intervals should not be below 3 and above 20.
e) Decide on the number of class intervals needed.
f) Ensure that the class intervals are the same size.
Ensure that no score falls in more than one class interval. Arrange the class intervals in order of ranks preferably in a descending order.

From the summarized data above one can identify two concept.

i) Apparent upper limit
ii) Apparent lower limit

These limits are the values which are seen in each class internal. The apparent lower limit opens the class interval while the apparent upper limit close the class interval.

Presentation of frequency

Class Interval	Tally	Tally Frequency	Cumulative Frequency
80-89	II	2	46
70-79	III	4	44
60-69	~~IIII~~	5	40
50-59	~~IIII~~ II	7	35
40-49	IIII	4	28
30-39	III	3	24
20-29	III	3	21
10-19	~~IIII~~ IIII	9	13

The table shows 80, 70, 60, 50, 40, 30, 20, and 10 as apparent lower limits and 89, 79, 69, 59, 49, 39 29, 19 and 9 as the apparent upper limits

A part from the two concepts above the table also has real limits which are not visible which are 0.5 below or above the apparent limits.
From the summary made above one can obtain other measures of statistics. Such measures include:-

I. Measure of central tendence

II. Measure of dispersion (variability)

III. Measure of relationship (correlation)

IV. Measure of relative position

SOURCES OF STATISTICAL DATA

a) Primary source

Data are collected from the field. These are original data for example through mail, questionnaire, interviews, observations, survey etc

b) Secondary source

Data are collected in official sources such as bureau of statistics, census and surveys, government publications, ministry bulletin, individual research work.

TYPES OF DATA

Individual data

Are exact value given to individual,
For example production of certain commodity, Population etc.

Discrete data

Are whole numbers assigned to certain item
E.g. 3 people

- 10 trees
- 1 shop

Continuous data

Are data with specific / exact value for example;

- Temperature
- Weight
- Distance

Grouped data

Are data without specific /exact figures groups of several value are used
E.g.

- 0 - 9
- 10 -19
- 20 - 29

PRESENTATION OF MASSIVE STSTISTICAL DATA

When statistics are collected in the field, they are usually in a haphazard form. For the statistics to be useful they need to be processed, arranged in logical manner and presented in such a way that they information can be easy to read and make conclusion.

For this purpose, statistics may be arranged in tables. From the tables the data may be presented in graphical form using graphs and charts.

This include the line and bar graphs as well as proportional circles and pie charts. Statistical data could also be presented in a forms of map i.e flow line maps, dot maps and choropleth maps.

SIMPLE STATISTICAL MEASURE AND INTERPRETATION

Measure of central tendency – Refers as indices of central locations in the distributions these are measures of average a typical performances of geographical aspect especially crop production crop sales, marketability, population sizes and others
These are three measure of central tendency, namely the mean, mode and median

a) The Arithmetic mean
The average is what we call Arithmetic mean. Arithmetic mean refers as the sum (total) of all scores or events divided by the number of occurrences. Mathematically arithmetic mean is represented as

$$\bar{X} = \frac{X_1 + X_2 + X_3 - - - - X_n}{n}$$

Where

$\bar{x}$ = Arthmmetic mean
x = Individual score
n = Number of occurence

Shortly

$$x = \frac{\sum x}{n}$$

$\sum x$ = Summation of x

For example

50, 90, 70, 60, 80, 75, 65, 60, 80, 70 compute the Arithmetic mean of the above geography marks

$$\bar{x} = \frac{\sum x}{n}$$

$$= \frac{70 + 50 + 90 + 70 + 60 + 80 + 75 + 65 + 60 + 80}{10}$$

$$= \frac{700}{10}$$

$$= 70\ \%$$

This is the normal or average pass mark of the students is 70 percent.

b) MODE

Mode is the most frequent score in a data distribution. It is the score or value which occurs more times than any other score or value in a distribution.

Example

2, 7, 8, 9, 2, 3, 1, 3, 2, the mode in the distribution is 2 which occurs 3 times. But sometimes the distribution is shown in a form of grouped data.

Mode becomes useful in statistics in many whys but one of the important whys is when mode is used to describe the content of the distribution of data.

Note: sometimes we may have two modes (bimodal) or more than two.

Median

Median can be defined as the score or value which is most central in the distribution of data or the mid point (middle value) in a distribution or set if score. The set of scores can be in odd or even form.

⇒Suppose the data distribution is odd and simple as shown below:

3, 4, 11, 12, 3, 1, 2, 6, 2.

Median is obtained through the following steps

a) Arrange the score in either descending or an ascending orderEg: 1, 2

b) Locate the central most score, where as: from the above data mid score is 3 so that the median is 3

⇒Suppose the data distribution is simple but even the median is obtained through the following procedures given the distribution below:

15, 13, 3, 7, 4, 6, 11, 9

a) Arrange the data in descending/ascending order 3, 4, 6, 7, 9, 11, 13, 15

b) Observe the mid point which is either for 9.

c) Get the median by calculating as follows.

$$\frac{N + x}{2}$$

Where N = Number of scores
x = Shows the position of scores

The median is therefore at position 4 in either way. From left of the scores, 4 the score is 7 while the right it is 9.

Thus median $= \frac{7+9}{2}$

$= \frac{16}{2}$

median = 8

The significance of median is to reveal the position where the data set is made to neutraize the weakness of Arthmetic mean as na average which is influenced by extreme score.
The three measures of central tendency can be combined in data interpretation. This is as follow.

a) When mean, mode and median are the same value, distribution is normal. The pheramena observed biasness.
b) If they are not of the same value, the distribution is normal hence there is biasness

Measures of central tendency can be calculated from grouped data.
Example.

SCORES	FREQUENCY
0 – 4	2
5 -9	6
10 -14	10
15 -19	8
20 -24	4

Assumed mean = 12

C1	F	X	Real limits	D =x -4	fol	cf
0 -4	2	2	0.5 – 4.5	-10	-20	2
5 - 9	6	7	4.5 -9.5	-5	-30	8
10 – 14	10	12	9.5 -14.5	0	0	18
15 – 19	8	17	14.5 – 19.5	5	40	26
20 - 24	4	22	19.5 – 24.5	10	40	30

Efd = 30

1. Mean$(\bar{X}) = A + \frac{\sum fd}{N}$

Where A=Assumed Mean

$\sum fd$ =Sum of the product of frequency and deviation

N=Total Frequency

2. Mode=L $+\left(\frac{t_1}{t_1 + t_2}\right)$i

Where by

L= the lower of the modal class

t_1 =The axess of modal frequency over the frequency of the next lower class.

t_2=The access of modal frequency over the frequency of the next higher class

i = The Modal class interval

Median = $l + \frac{\left(\frac{N}{2} + n_b\right)}{n_w}$ i

Where by

L = the lower boundary of the median class

N = the total number of frequency

n_b = the number of items in classes below the median class.

n_w = the number of items within the median class

i = the class interval

Measure of central tendence can be calculated from a grouped data
Example

Scores	Frequency
0-4	2
5-9	6
10-14	10

15-19	8
20-24	4

Assumed mean =12

Cl	f	x	Real limit	d=x-A	f d	c f
8-4	2	2	0.5-4.5	-10	-20	2
5-9	6	7	4.5-9.5	-5	-30	8
10-14	10	12	9.5-14.5	0	0	18
15-19	8	17	14.5-19.5	5	40	26
20-4	4	22	19.5-24.5	10	40	30

$\sum fd=30$

1. Mean$(\bar{X}) = A + \frac{\sum fd}{N}$

Where A=Assumed Mean

$\sum fd$ =Sum of the product of frequency and deviation

N=Total Frequency

2. Mode=L $+\left(\frac{t_1}{t_1 + t_2}\right)$i

Where by

L= the lower of the modal class

t_1 =The axess of modal frequency over the frequency of the next lower class.

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Median = $l + \frac{\left(\frac{N}{2} + n_b\right)}{n_w}$ i

Where by

L = the lower boundary of the median class

N = the total number of frequency

n_b = the number of items in classes below the median class.

n_w = the number of items within the median class

i = the class interval

1. Mean $(\bar{x}) = \frac{A}{N} + \sum fd$

Where: A = 12

$\sum fd$ = 30

N=30

Mean therefore = $\frac{12}{30}$ + 30 =13

Mean $(\bar{x})$ = 13

2. Mode=L $+\left(\frac{t_1}{t_1+t_2}\right)$i

Where

L = 9.5

$t_1 = 4$

$t_2 = 2$

i = 5

How to get t_1 and t_2

$t_1 = 10 - 6$

$t_2 = 10 - 8$

Mode $(\hat{x})$ $= 9.5 + \left(\frac{4}{4+2}\right)5$

$(\hat{x})$ $= 9.5 + \frac{2}{3}$ x 5

$\hat{x}$ $= 9.5 + 3.3 = 12.8$

Mode $(\hat{x})$ = 12.8

3.Median = $l + \frac{\left(\frac{N}{2} + n_b\right)}{n_w}$ i

Where : L= 9.5

N = 30

n_b =8

n_w = 10

i = 5

Median = $9.5 + \left(\frac{\frac{30}{2} - 8}{10}\right)5$

$= 9.5 + \frac{7}{10}$ x $5 = \frac{35}{10}$

Median = 9.5 + 3.5

Median therefore = 13