FOLDING

It refers to crustal distortion which forces the rocks to bend or crumble due to compressional forces. Folding occurs in fairly young sedimentary rocks. The compressional forces develop as a result of tectonic plates moving towards each other. The folding process occurs very slowly over a long period of time.

PARTS OF A FOLD

A fold occurs when a section of the crustal rocks bends upwards or downwards after being subjected to compressional forces.

The parts of a fold include;

Anticlines
these are parts of the earth's surface which bend upwards when folding occurs.

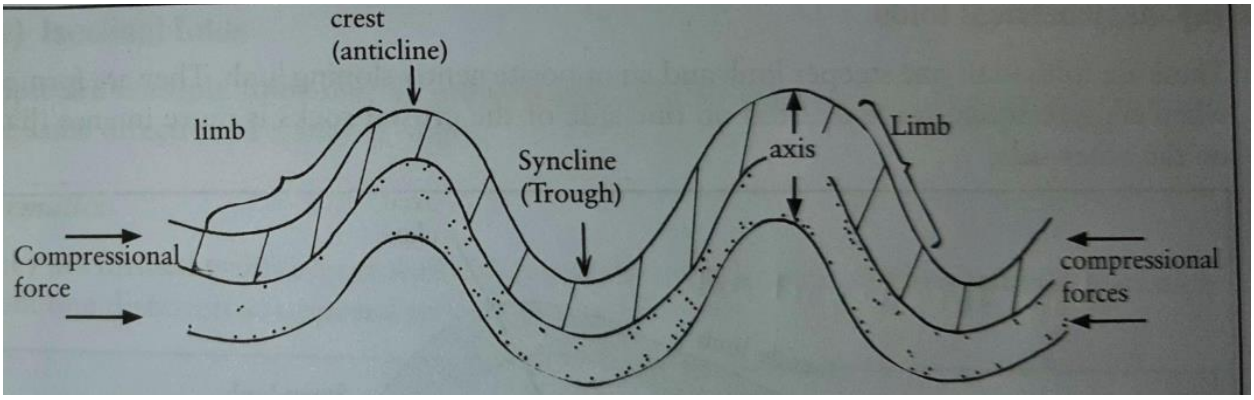
Synclines
these are parts of the earth's surface which bend downwards when folding occurs.

Crest
this is the top most part of an upfold/anticline.

Trough
it's the lowest part of the downfold/syncline.

Limb
these are rock layers sloping on either sides of a fold.

Axis
this is an imaginary line drawn vertically through the centre of the anticline or syncline marking the region where the rock layers slope away (as in the anticlines) or from which the rock layers rise in opposing directions (as in the syncline)



TYPES OF FOLDS

There are about six types of folds and these are;

i) Simple fold/symmetricalfold

This has limbs of either sides sloping at the same angle i.e . It has uniform limbs. They are formed by two compressional forces of equal magnitude.

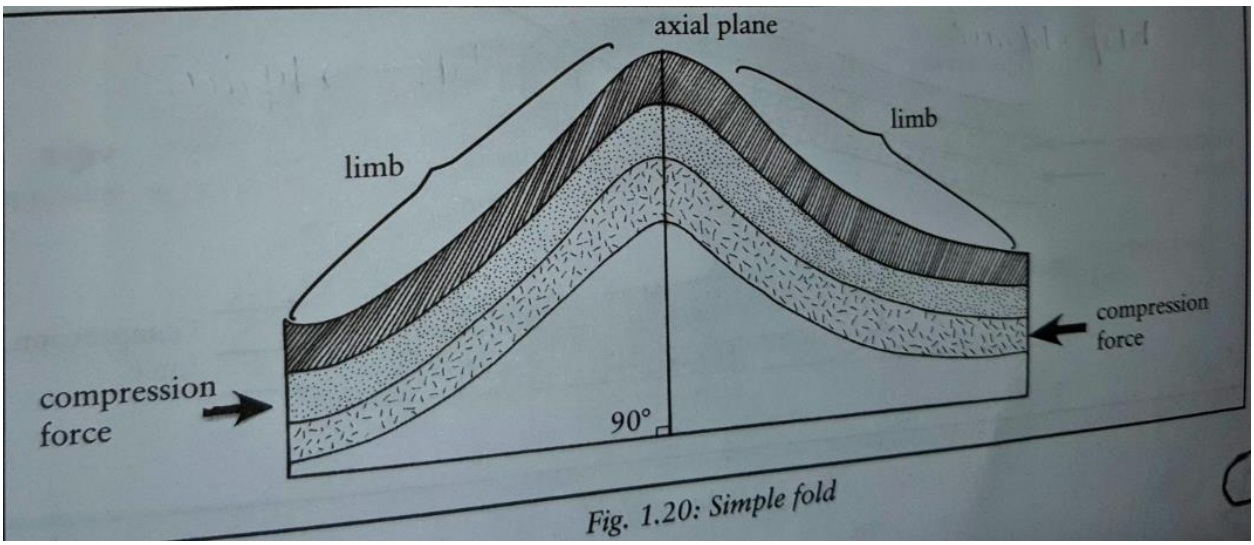
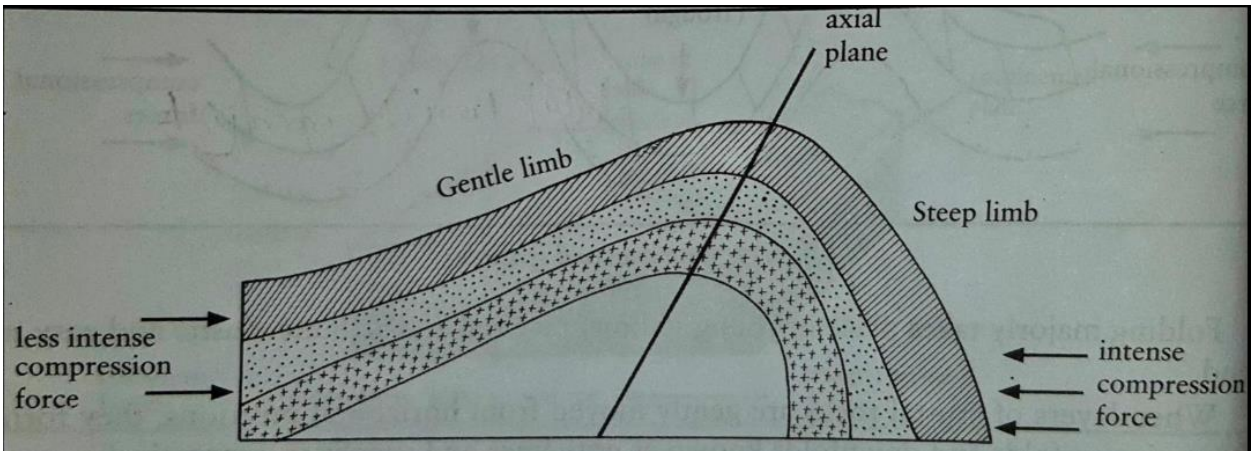


Fig. 1.20: Simple fold

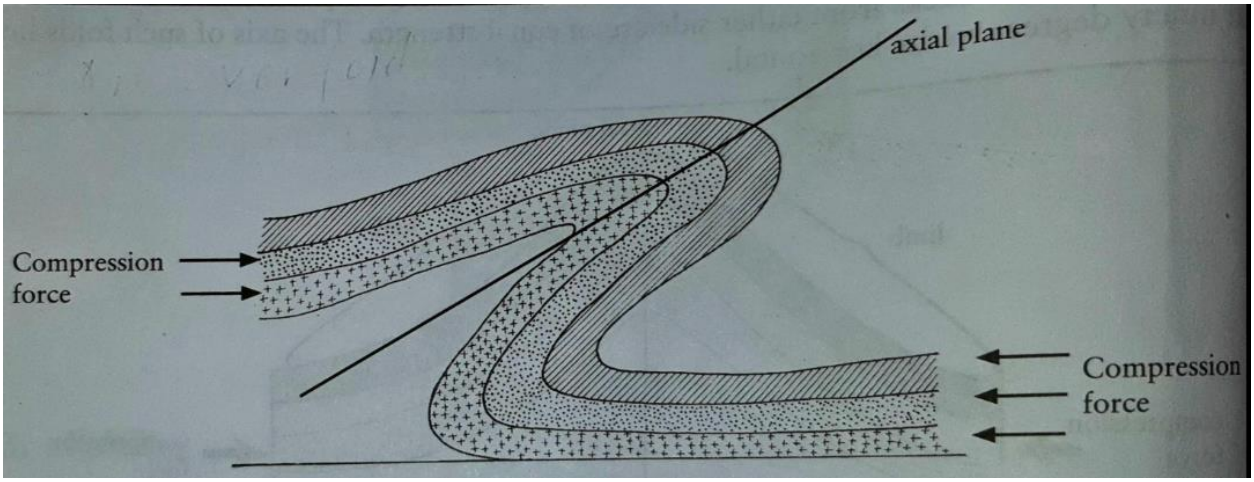
ii) Asymmetrical fold

This has one limb steeper than the other and with different angles. It is formed when one of the compressional force pushing in one direction is stronger than the other. For example asymmetrical folds seen in Kigezi, Arua, along Kampala – Mityana road etc.



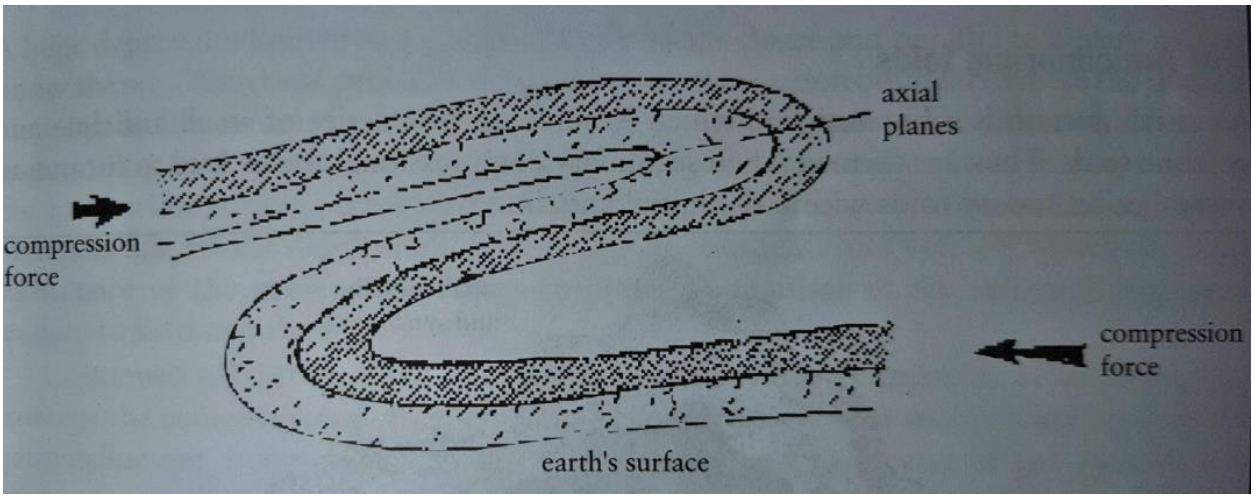
iii) Overfold

This is where one limb of the fold is pushed over the other limb. It is due to intense compressional forces pushing harder in one direction than the other.



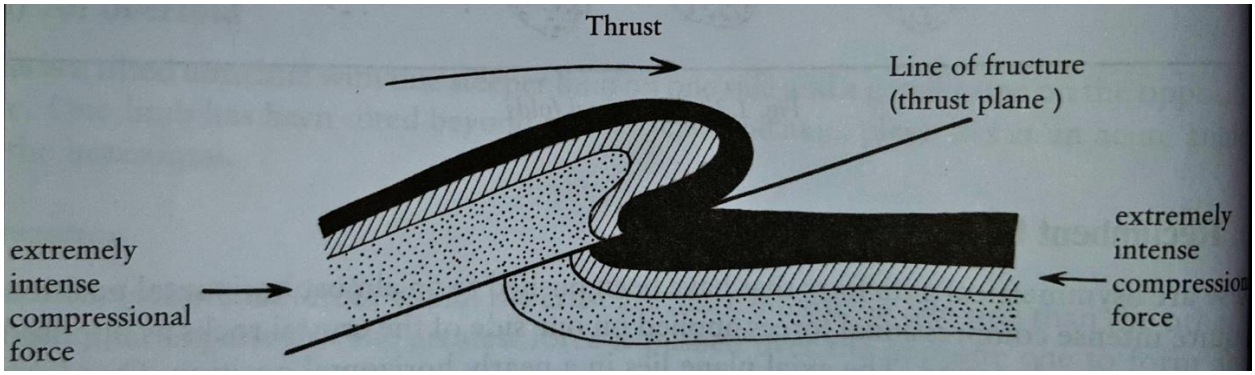
iv) Recumbent fold

This is where one limb lies horizontally over the other limb. It is formed by two compressional forces one of which is very strong, able to push one limb over the other.



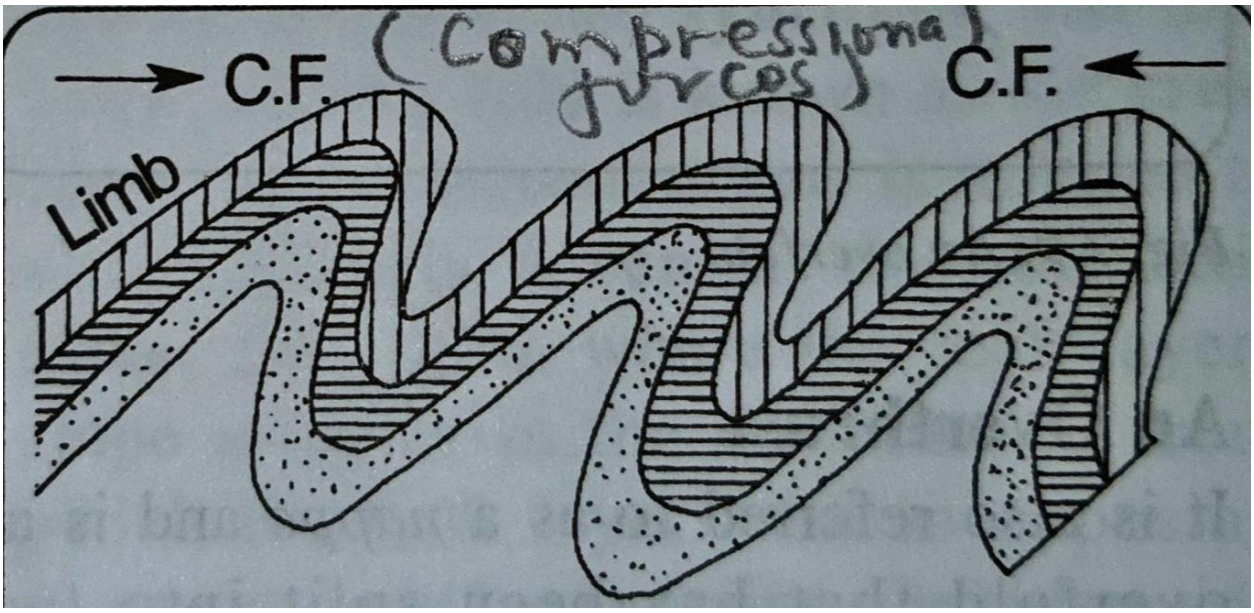
v) Overthrust fold/nappe

This occurs when compressional forces are very great causing a fracture in the fold over which one limb is pushed forward over the other limb.



vi) Isoclinal fold

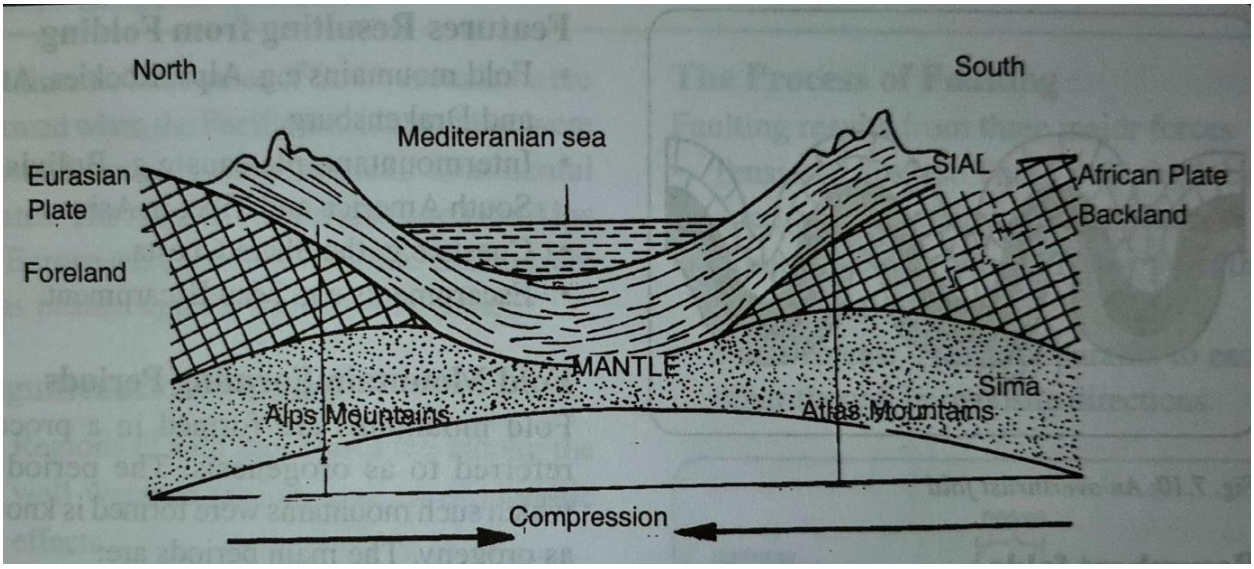
These are a series of closely packed parallel over folds with all limbs dipping at approximately the same angle and in the same direction.



THE RESULTANT FEATURES OF FOLDING

Folding has led to formation of various relief features and these include;-

1. **Fold mountains**
   These are uplands formed where two or more tectonic plates are pushed towards each other. At these colliding and compressing boundaries, rocks and debris are warped and up folded at some sections into mountain ranges. For example Atlas and Alps mountains formed due to collision of African plate with Eurasian plate.



2. **Escarpment**
   This is a relatively continuous line of steep slopes facing in the same direction.
   They are formed when compressional forces cause folding resulting into one steep limb of the anticline to form the escarpment. An example is Mau – escarpment in Kenya.

3. **Depressions/basins**
   These are low lying open valleys formed when compressional forces cause folding of crustal rocks forming synclines, which finally form the basins/depressions.

4. **Ridges and valleys**
   When folding occurs, anticlines form uplands/ridges while synclines form valleys.

5. **Rolling plains**
   Rhese are plains which appear to rise and roll. They are formed when crustal surfaces are acted upon by weak compressional forces forming gently sloping anticlines and very wide synclines.

6. **Intermontane plateau**

   This is a high fairly flat land surface lying between mountains. It is formed when younger rocks at the edges of a region are intensely folded into mountains while the middle parts made of old and rigid basement rocks resist folding resulting into mountains which enclose high fairly flat land surface. For example Bolivia in S. America, Tibet in Asia.

7. **Inter montane basin**

   This is formed when some parts of the inter montane plateau sink more into the crust due to down folding resulting from compressional forces.

   In East Africa , folding has occurred in areas of ;

   - Ankole – Karagwe rocks
   - Kigezi region , South Western Uganda
   - Buganda region , Central Uganda
   - West Nile region , North Western Uganda
   - Bukoba region, North Western Tanzania
   - Watian, North Eastern Kenya
   - Nyanza – Kavirondo region in Western Kenya

NB : Folding has had limited effect on the landscape of East Africa because the region is made of old hard basement rocks.

Importance of folding

Positive

- Fold mountains have a magnificent scenery that attracts tourists bringing in foreign exchange and revenue.
- Fold mountains are water catchment areas for many rivers which are sources of water for domestic, agricultural and industrial use.
- Fold mountains influence formation of orographic rainfall on the wind ward side which promotes agriculture, forestry and settlement.
- Folding brings valuable minerals to the surface easening the mining activity .

- Some fold mountains have valuable mineral deposits such as coal, petroleum , gold , copper etc

Negative

- The folded ranges are barriers to construction of transport and communication network especially roads and railways.
- Fold mountains discourage settlement due to cold temperatures at higher altitudes and the rugged terrain.
- Some fold mountains act as climatic barriers. Areas on the lee-ward side receive low or no rainfall discouraging settlement , agriculture.

VULCANICITY

(IGNEOUS ACTIVITY)

Vulcanicity is the process through which magma and gases from the upper mantle are forcefully intruded into the earth's crust or extruded onto the earth's surface. Magma is the morten rock originating from the upper plastic layer of the earth's mantle.

Vulcanicity is caused by intense heat generated by the pressure of overlying crustal material onto the underly rocks, friction between the moving tectonic plates, radioactivity and geochemical reactions that melts rocks in the mantle to form magma. Convective currents from the molten rock create cracks or vents/fissures through which magma rises towards the surface due to much lower pressure at the earth's surface.

NB: Vulcanicity is always associated with faulting because;

(i) Faulting generates heat from the moving plates that melts the rocks into a molten state.
(ii) Faulting creates cracks/faults through which magma rises to the surface.

When magma reaches the surface and loses its gases, it is termed as **lava**. It is the escaping gases, which, because they expand rapidly due to the lower pressure, cause many eruptions to be very **explosive**. Eruptions that occur quietly with no explosive activity are described as **effusive.**

Nature of extrusive materials

Materials from the earth's interior occur in **three** major forms;

1. **Liquid materials**
   These consist of magma (molten rock) which reaches the surface as lava. Lava varies in chemical composition particularly in silica content and the degree of mobility. There are basically **three** types of lava and these are;

(i) Acidic lava/andesitic lava

This has a high silica content of over 66%, high melting point and highly viscous (i.e thick and sticky). Acidic lava eruptions are less frequent and thus allow for more concentration of gases which lead to very violent eruptions. It cools and solidifies rapidly at a very high temperature of about 850^0c . It may solidify in the vent causing recurrent explosive eruptions. Acidic lava is highly immobile and normally piles around the vent forming high steep sided volcanic cones such as volcanic , plug , composite volcanoes, cumulo domes etc.

(ii) Basic lava/basaltic lava

This is poor in silica content about 45% to 52% but rich in magnesium and iron. Basic lava has very high temperatures of about 1200^0c and takes longer time to cool and solidity. Eruptions of basic lava are more frequent and normally effusive. Basic lava is less viscous , very fluid in nature and thus highly mobile , able to flow for longer distances before cooling and solidifying forming flatter /low volcanic cones of greater diameter such as lava plains, basalt domes . The material ejected is usually lava and steam.

(iii) Intermediate lava

This is a moderate lava lwith a moderate silica content of 52% - 66% . It is fairy viscous with moderate mobility and therefore unable to flow far before cooling and solidifying. It normally forms medium sized features.

2. **Gaseous materials**

   Magma consists of a variety of dissolved gaseous compounds which are emitted during eruption and these include steam, carbondioxide, sulphur , nitrogen, chlorine, hydrogen and argon. The gases inter-react generating great heat within the lava. This affects the rate of cooling , lava flow , the shape and type of volcanic land form formed.

3. **Solid materials**

   These are fragments of solidified lava and broken rock particles ejected during volcanic eruptions. These fire broken particles generally known as **pyroclasts** , are ejected very violently into the atmosphere during eruptions, then fall back onto the earth's surface and pile up around the vent. Pyroclasts consist of particles of varying sizes collectively known as **tephra** and these include;

   - Very fine dust and ash particles,
   - Lapilli, the small stones,
   - Blocks, the fragments of hardened lava,
   - Cinder, the rock fragments that appear burnt,
   - Volcanic bombs, very large rock materials,

NB: Gaseous and solid materials are ejected during violent eruptions producing different landforms such as ;

- Ash and cinder cones
- Composite volcanoes
- Calderas
- Explosion crater and mountain craters

Types of Vulcanicity

There are **two** types of vulcanicity and these are;

a) **Extrusive vulcanicity (volcanicity)**

   This is a process by which magma is ejected onto the earth's surface from the interior of the earth. Magma cools and solidifies onto the surface to form the extrusive/volcanic features.

b) Intrusive volcanicity

This is a process by which magma is injected into the earth's crust from the interior of the earth. Magma cools and solidifies within the crust forming intrusive features.

EXTRUSIVE FEATURES (VOLCANIC FEATURES)

These are formed when magma from the interior of the earth is ejected through vents or fissures onto the surface where it cools and solidifies.

Extrusive features may be solid , liquid or gaseous. The solid extrusive features are known as volcanic land forms and these include; lava plains , basalt domes, cumulo domes, craters, composite volcano, volcanic plugs/neck, caldera, tholoid, ash and cinder cones.

The liquid and gaseous features include; Hot springs, geysers and fumaroles.

The type, size and shape of volcanic landforms are influenced by the following factors;

(i) Type of lava ;

Acidic lava which is highly viscous and very immobile forms high and steep sided volcanic cones such as composite volcanoes, cumulo domes, volcanic plugs while **basic lava** which is less viscous and highly mobile forms lowlying and gently sloping volcanic features with a greater diameter such as lava plains and basalt domes.

(ii) Nature of eruption

Materials from highly explosive eruptions pile up around the vent to form high and steep sided cones such as cumulo domes while materials from effusive eruptions flow for long distances forming extensive and lowlying volcanic land forms with gentle slopes for example basalt domes and lava plains.

(iii) Nature of passage

Materials escaping through a central or single vent usually pile up around it forming steep – sided cones such as cumulo domes , ash and cinder cones. Materials escaping through numerous fissures tend to form lowlying cones with gentle slopes and a wide base for example lava plains and basalt domes.

(iv) Number of eruptions/emissions

Successive eruptions lead to formation of complex cones with numerous layers or alterating layers for example composite volcanoes, basalt domes, lava plains while single eruptions lead to formation of small simple cones for example the ash and cinder cones.

(v) Quantity of material ejected

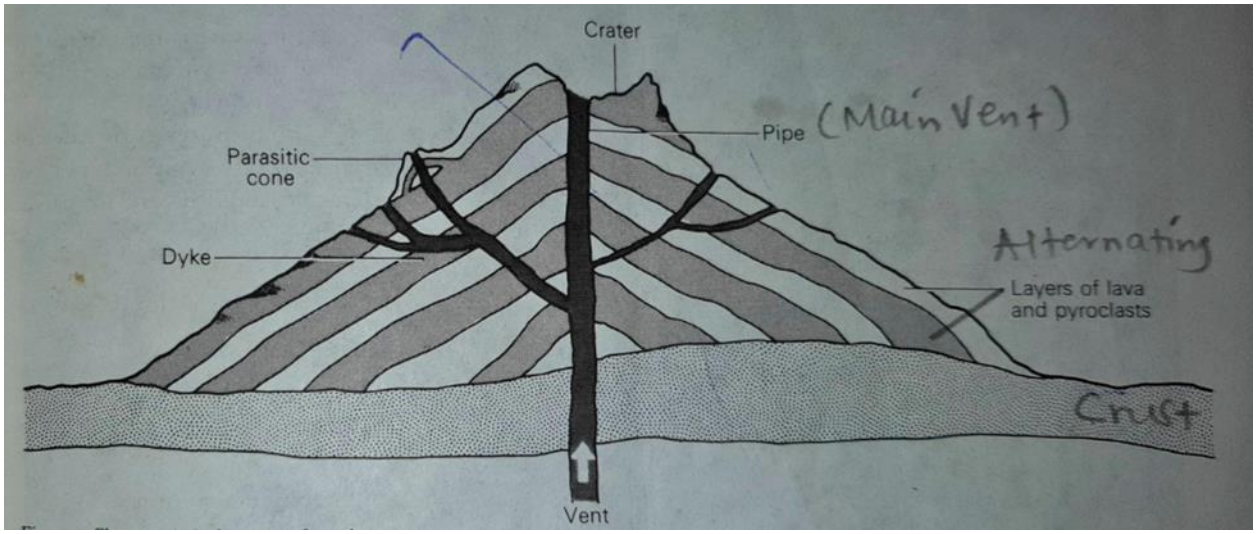
Large quantities of materials ejected lead to formation of large cones such as composite volcanoes and basalt domes while small quantity of materials lead to formation of small cones such as ash and cinder cones.

1. Composite volcano/strato volcano

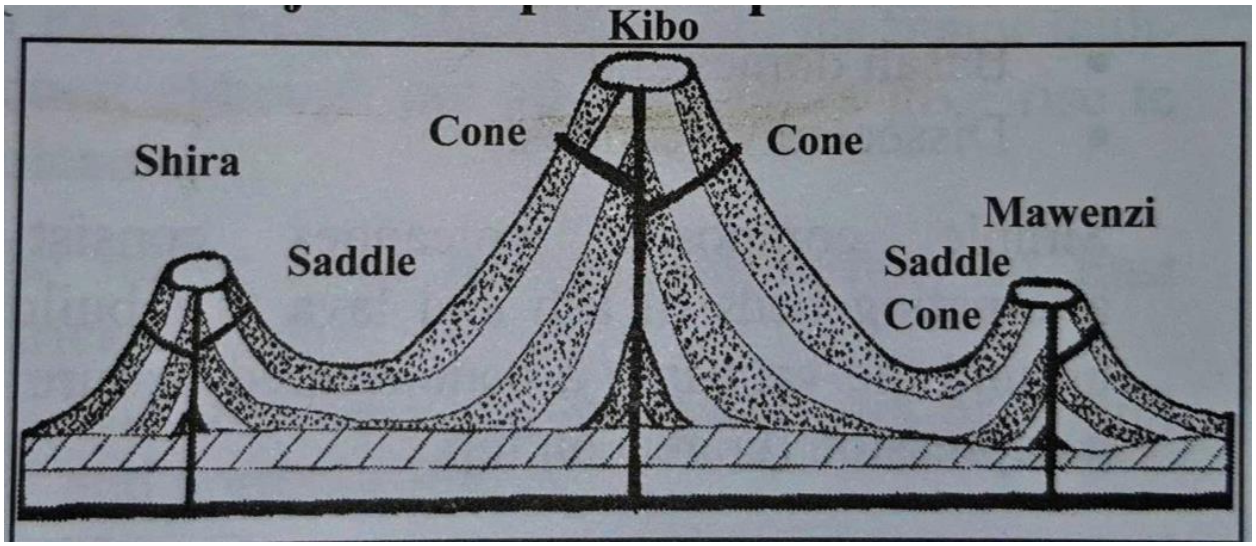
These are large , steep – sided volcanic cones made of alternating layers of ash and lava built over a long period of time through successive eruptions and pouring of large quantities of acidic or intermediate lava from the earth's interior. Later eruptions may blow off the volcano top to create a **crater**. If pressure becomes insufficient, magma may force its way to the sides through secondary pipes to build up **parasitic cones** on the sides of the mountain.

Composite volcanic cones may be simple or complex.

Simple composite volcano cones have only one main vent through which magma flows and have one peak. Examples include Mt. Muhavura . Mt. Longonot, Mt. Kenya , Mt. Oldonyo Lengai etc

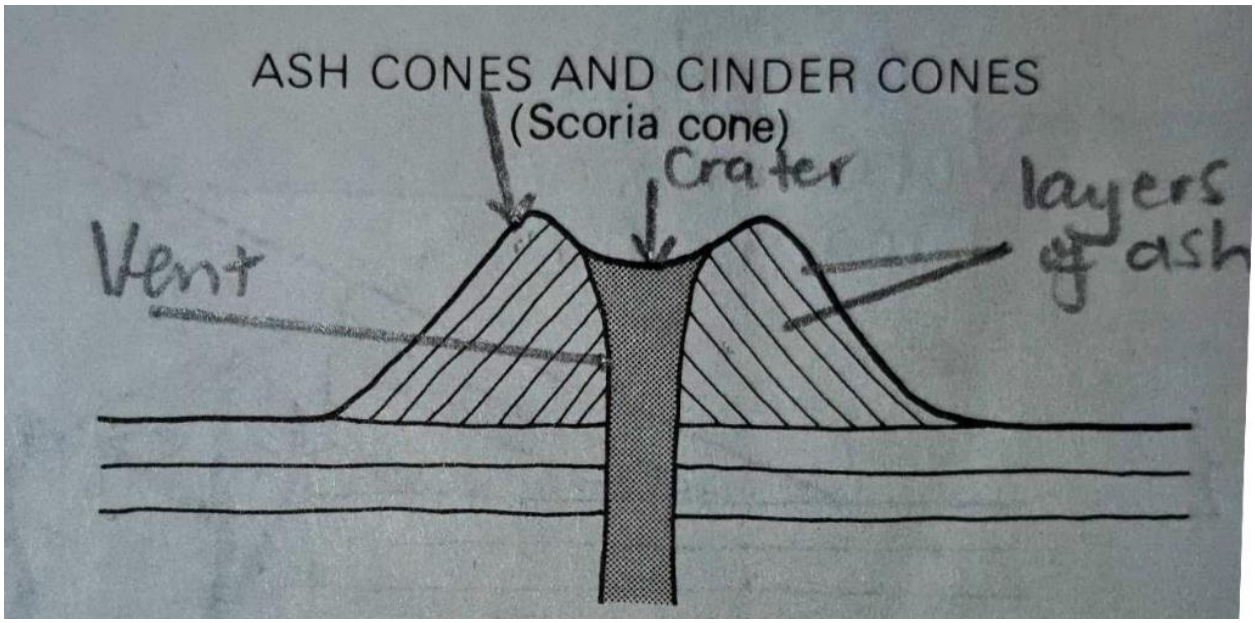


Complex composite volcano cones have more than one main vent through which magma flows and also have more than one peak for example Mt. Kilimanjaro with Shira, Kibo and Mawenzi peaks.



2. **Ash and cinder cone**

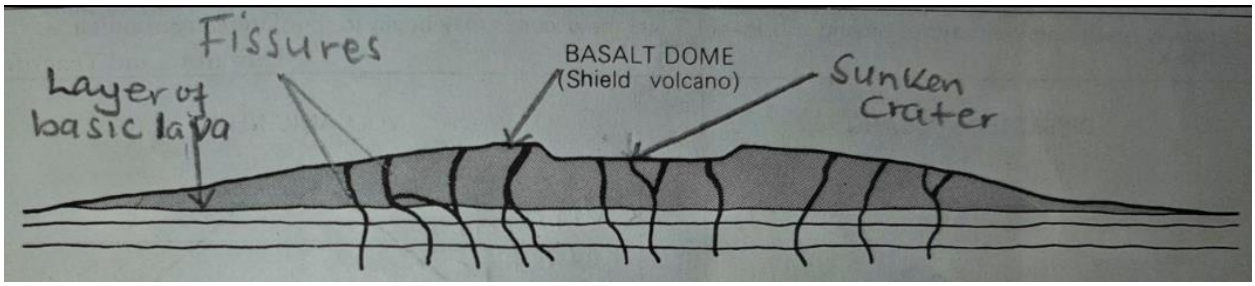
   This is a small symmetrical cone of pyroclasts with fairly steep sides and a large crater at the top. It is formed mainly through a single explosive eruption of acidic lava from the vent, blown violently into air which then solidifies and falls back to earth as ash and cinders , piling around the volcanic vent to form the ash and cinder cone. Examples include; Teleki, Likaiyu, Chiyulu, Nabuyatom (all in Kenya) , Sagitwe, Shozi in Kisoro, South Western Uganda.



3. **Basalt dome/shield volcano/lava dome**

   This is a broad based lowlying flat topped volcano of basic lava with gently sloping sides . It may have a large, shallow, steep- sided sunken crater at the top.

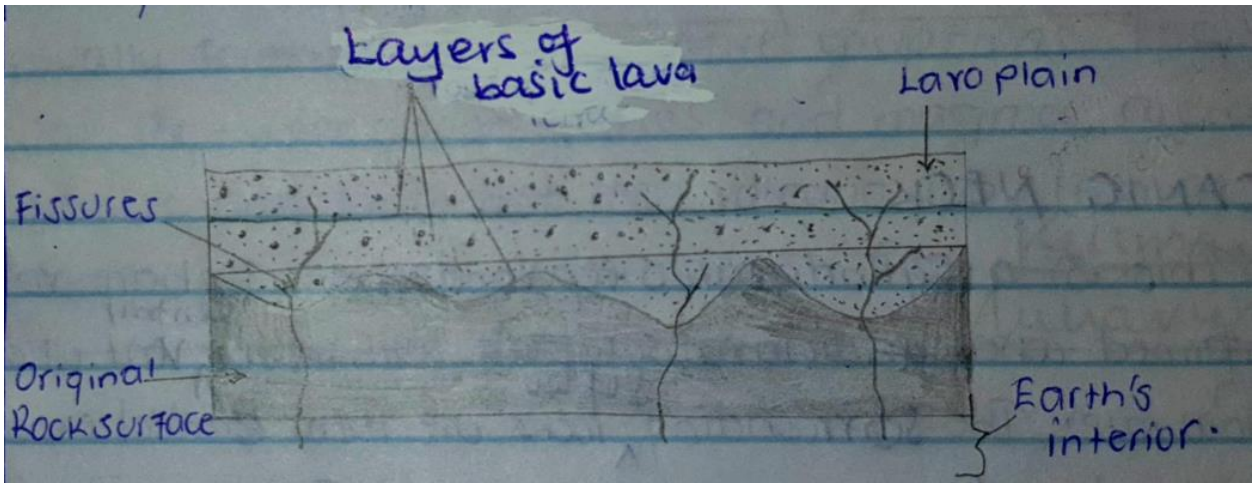
   A basalt dome is formed by effusive eruption of basic lava through numerous fissures, which flows for a long distance before cooling and solidifying to a wide volcanic cone. Examples include Tukuyu in the Rungwe ranges of Southern Tanzania, Marsabit in Northern Kenya, Nyamlagira on the democratic republic of Congo border.



4. Lava plain/lava plateau/basalt sheet

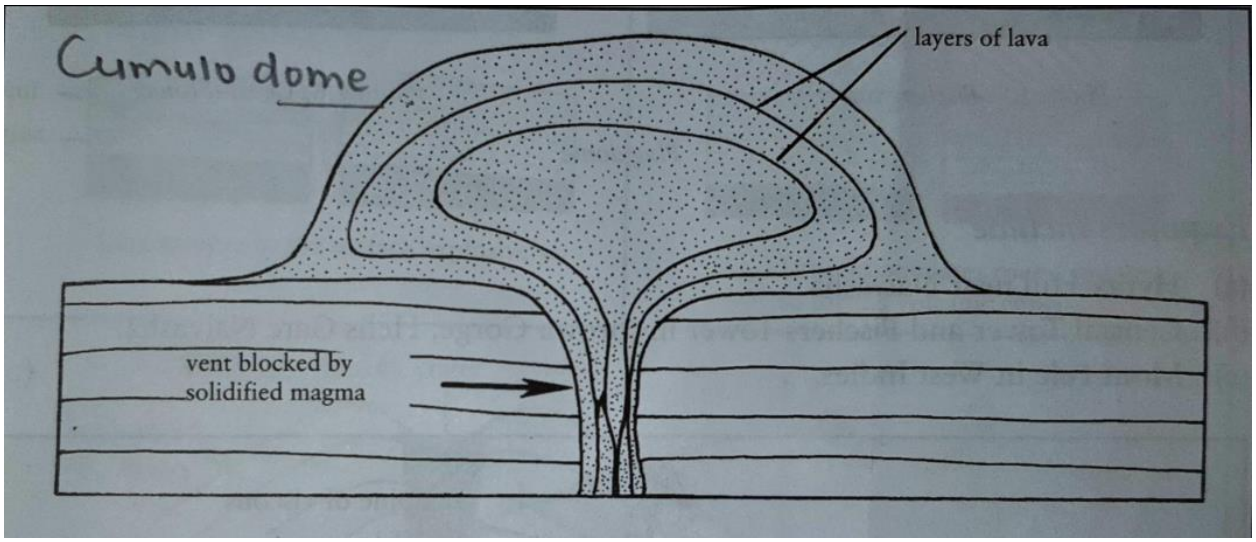
It is an extensive fairly raised volcanic landform with a generally levelled summit made of successive layers of basic lava.

Lava plains are formed when large quantities of basic lava are quietly ejected through several fissures and flows over long distances, spreading out evenly on either sides of the fissures, covering a large area before cooling and solidifying. Successive lava flows from repeated eruptions result into accumulation of lava to higher levels forming a lava plain. Examples include Laikipia plateau, Yatta plateau in Kenya, Kisoro lava plains in Uganda.

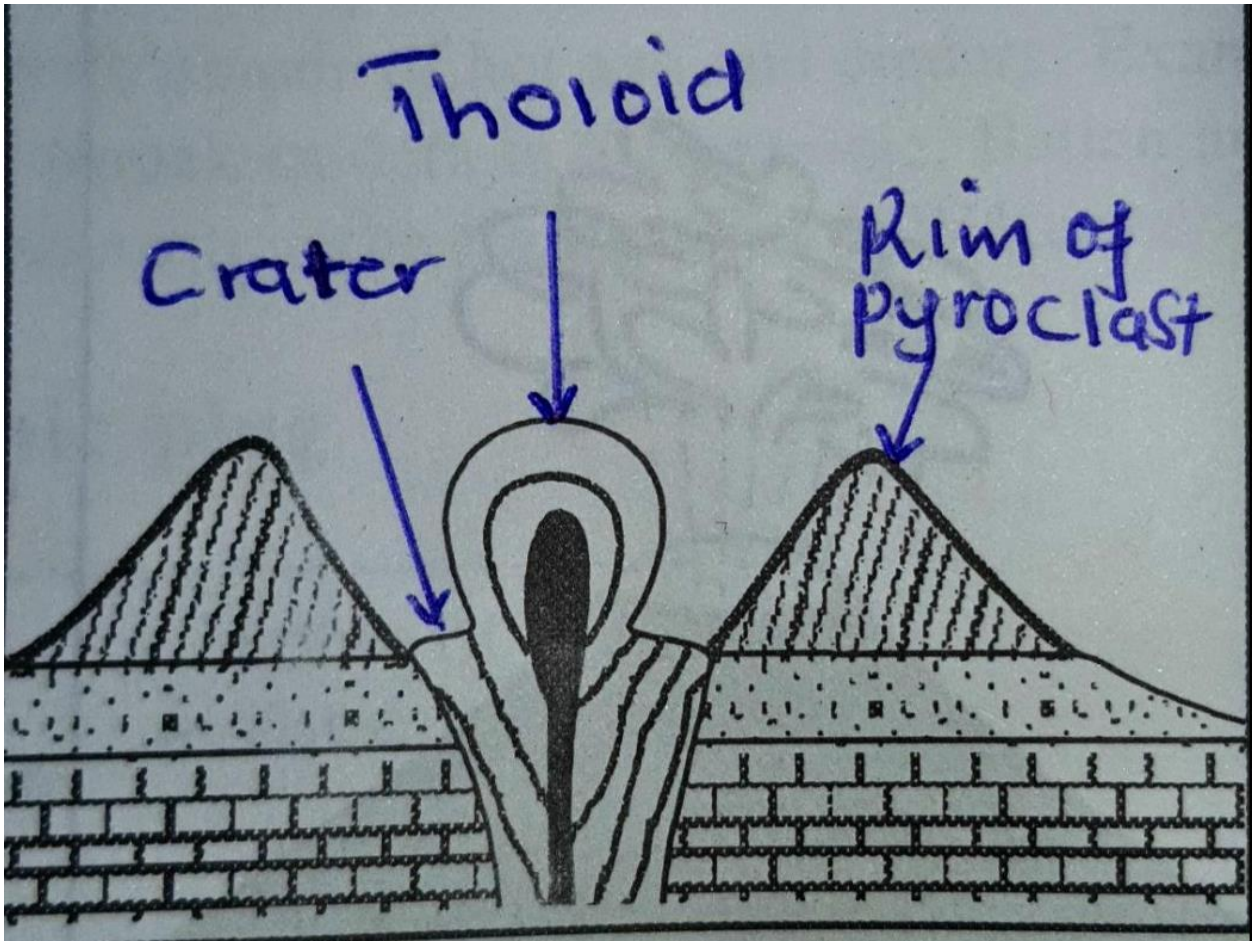


5. Cumulo dome

This is a steep – sided convex dome of acidic or intermediate lava. This viscous lava does not flow far, as it cools and solidifies , it piles up around the vent . It hardens quickly blocking away the remaining lava. Later extrusions, unable to reach the surface force the initial layers upwards and outwards to form a cumulo dome with a rounded top. An example is Ntumbi cumulo dome 30 km east of Mbeya town in Tanzania.

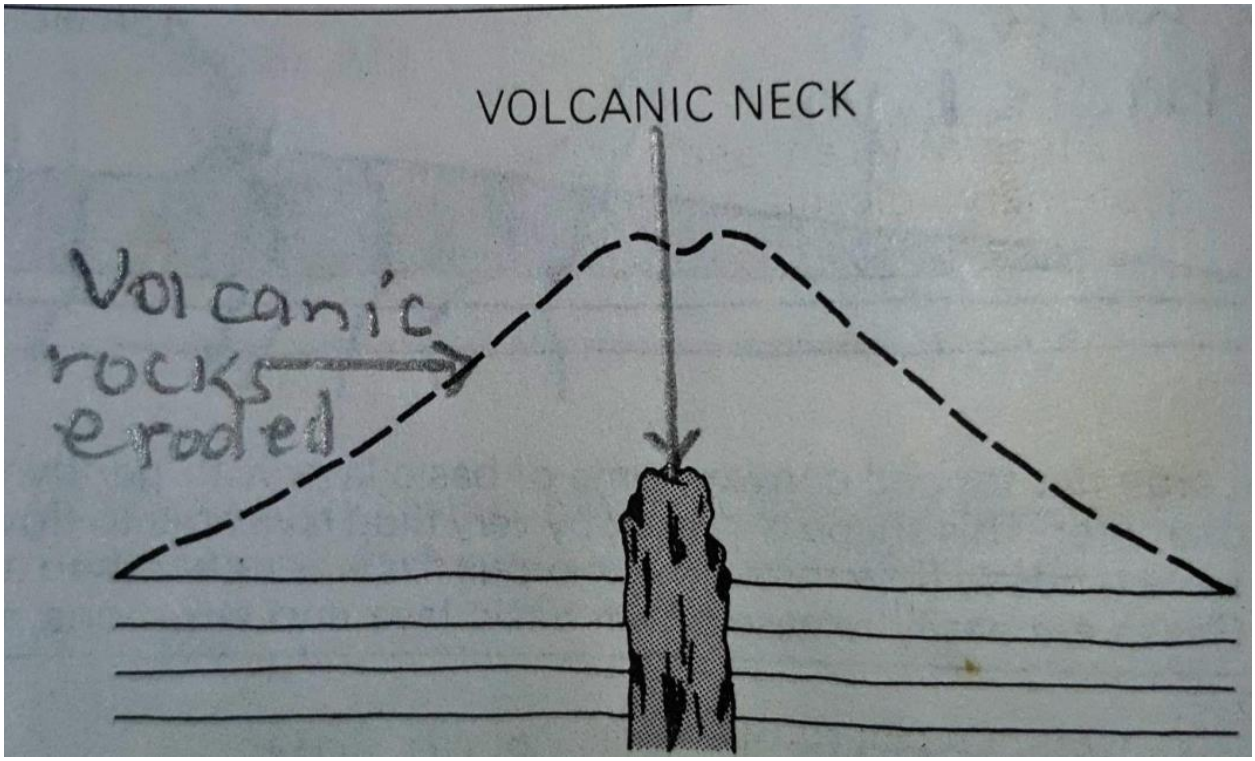


Cumulo domes may form inside a crater or a caldera of a larger volcano. These types of cumulo domes are referred to as **tholoids** and an example can be seen in the caldera of Mt. Rungwe in Tanzania.



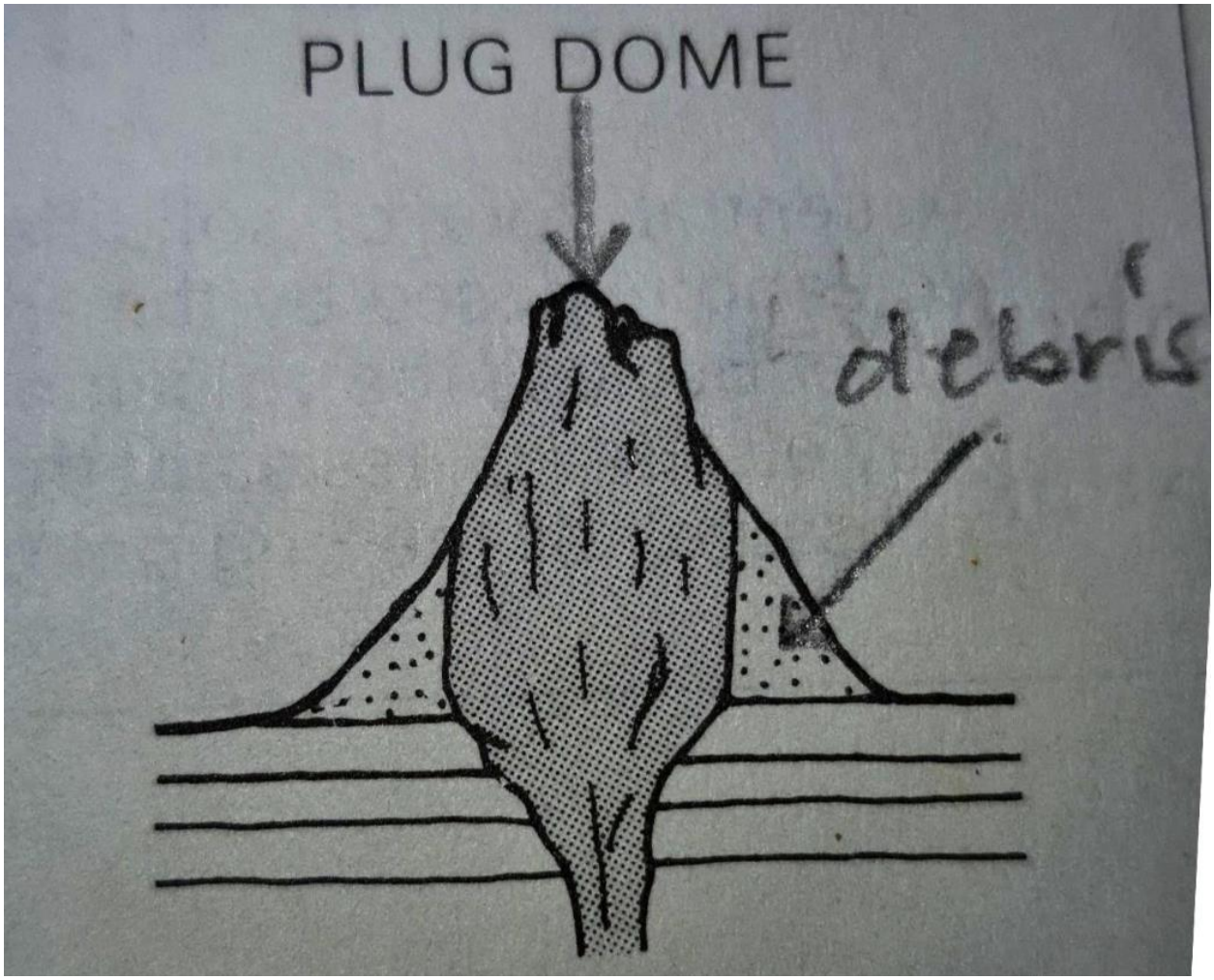
6. Volcanic neck/volcanic plug

This is a steep cylindrical volcanic landform of bare rocks formed when acidic lava is ejected and solidifies within the central vent of a volcano at a slow rate. The surrounding outer softer rocks of the volcano are then eroded exposing the resistant and hardened up lava of the central vent as a volcanic neck. Examples include Tororo rock in eastern Uganda, Mawenzi on Mt. Kilimanjaro, volcanic necks on Mt. Kenya.



7. Plug dome

It's a cylindrical volcanic rock pillar with extremely steep, vertical sides that stands high above the ground surface. It is formed when extremely thick acidic lava is forced out of the vent by high pressure that causes violent eruptions. The lava is too thick and viscous, unable to flow far, hence solidifies immediately blocking the vent. It's base is usually surrounded by exploded debris. Examples can be seen at the Central Tower and Fischer's Tower both in the Hell's gate national park near Naivasha in Kenya.



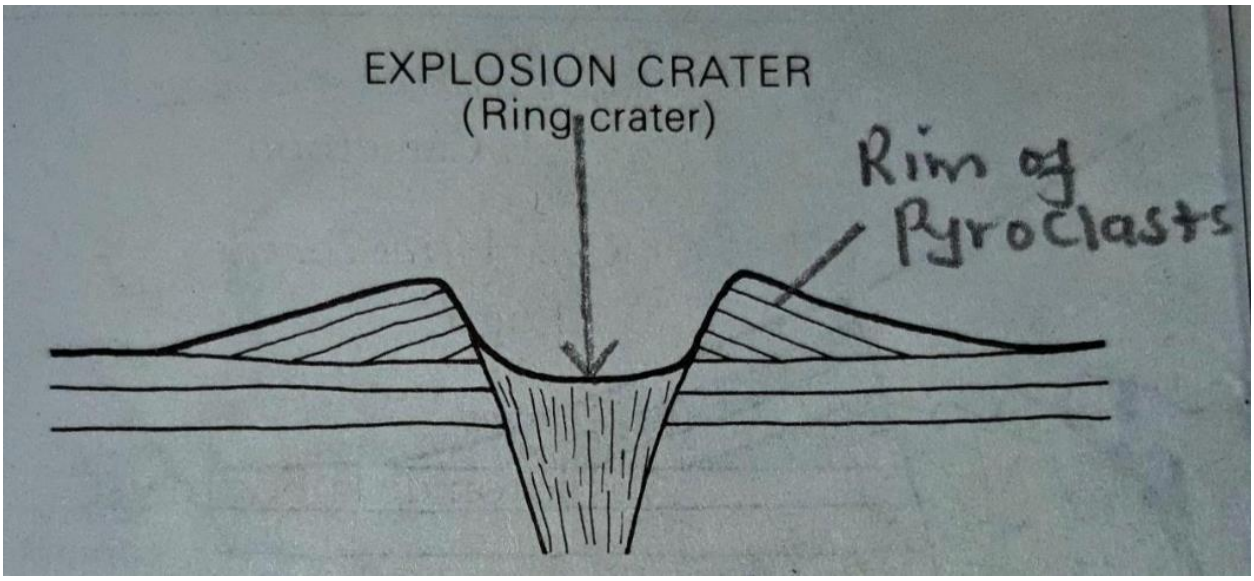
8. Explosion craters/ring craters/maars

These are small, shallow, flat floored circular depressions surrounded by a low rim of pyroclasts and local rocks, usually less than 50 metres deep and 500 metres wide, commonly found in low lying areas.

They are formed when the surface layers of the crust are blown off by a series of gaseous or violent eruptions, creating depressions known as craters. The local rocks and pyroclasts may fall back to the ground and pile around the rim of the depression, hence forming a ring crater.

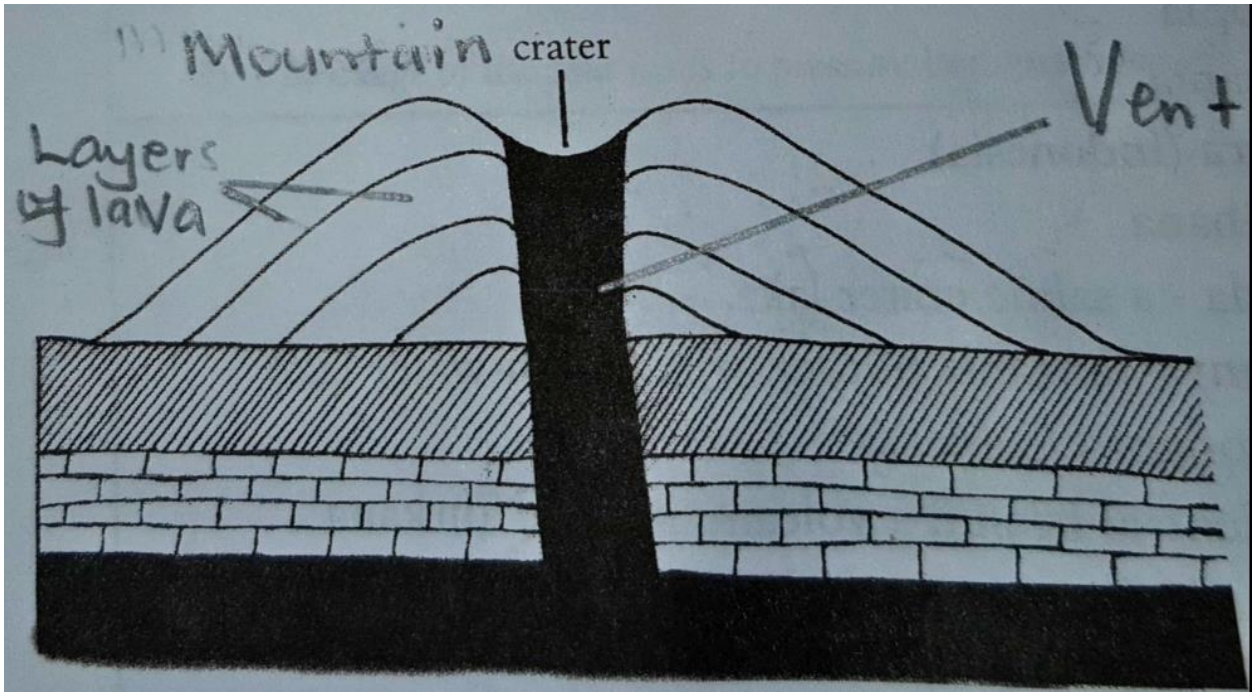
Examples include; Katwe, Nyungu,Nyamusingiri, Nyampaka, Bunyaruguru, Nyamunuka all found in western Uganda.

NB: The depressions may get filled up the water from springs , rain, rivers forming explosion crater lakes.



9. **Mountain crater**

   This is a small funnel –like depression on top of an extinct or dormant volcano that is less than 1 kilometre in diameter. It is formed when violent eruptions of magma and gases blow off the volcano top leaving behind a circular depression called a crater. Examples include Mt. Kilimanjaro crater, Muhavura crater, Shozi crater , Mt. Rungwe crater. The depression may get filled up with water from heavy precipitation forming a mountain crater lake eg Mt. Muhavura crater lake.

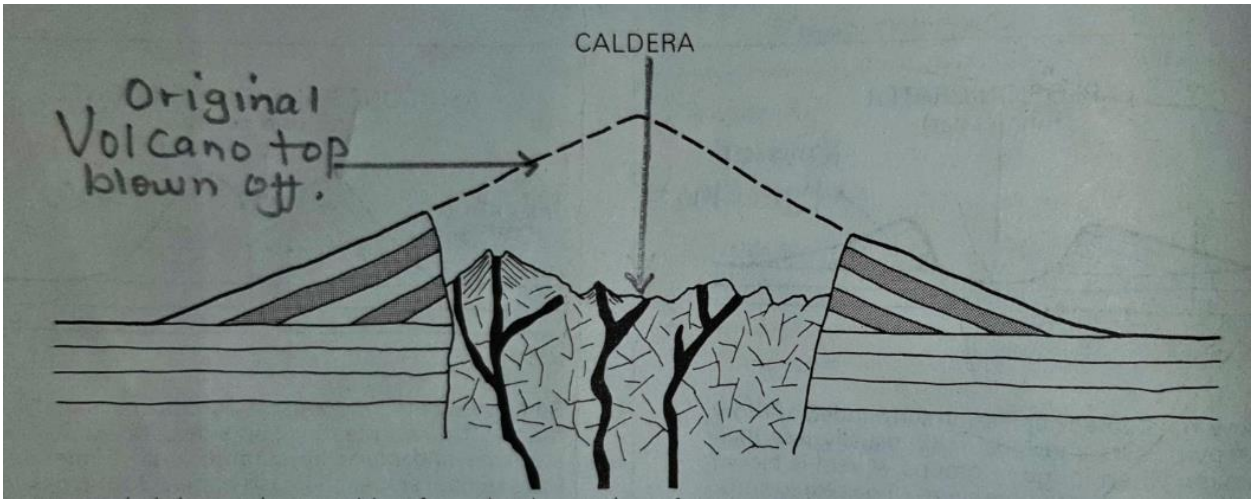


10.Caldera

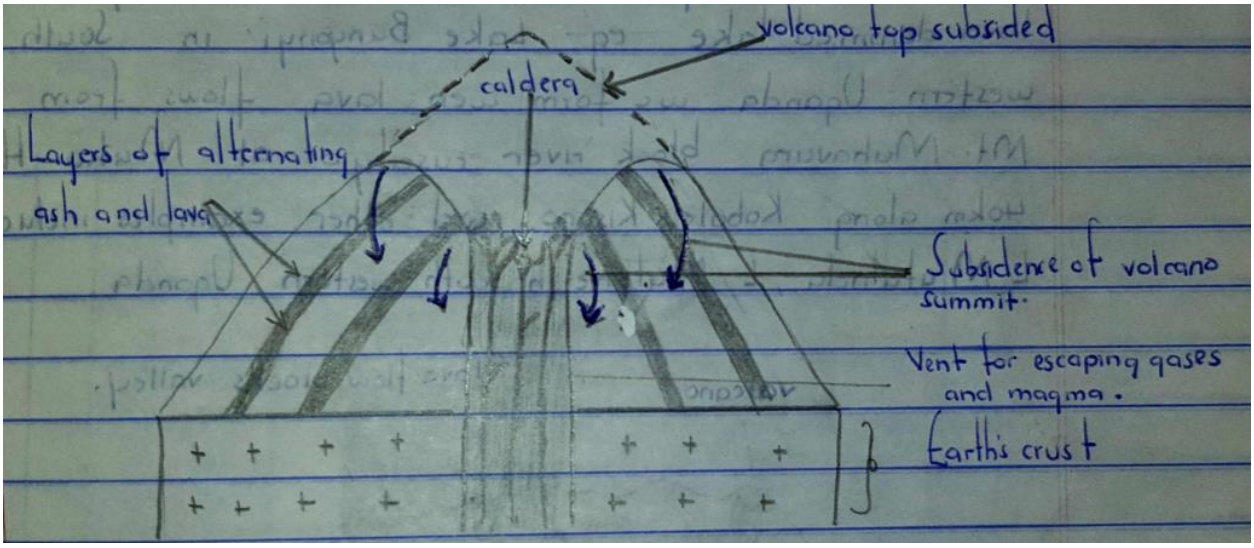
This is a large, deep and steep – sided circular depression of more than 1 kilometre wide resulting from the destruction of the upper part of a volcano in a violent eruption or cauldron subsidence.

A caldera is formed due to ;

(i) Escaping gases and magma building up high pressure causing violent eruptions that blow off the upper part of the volcano creating a wide and open circular depression called a caldera.



(ii) Cauldron subsidence where by the volcano top under its own weight collapses into the chasm left behind by the escaping gases and magma. As the volcano top subsides, it leaves behind a wide depression at the upper part of the volcano cone known as a caldera.



Examples of calderas include ; Ngozi, Ngorongoro in Tanzania, Napak in Uganda , Longonot, Menengai, Suswa in Kenya.

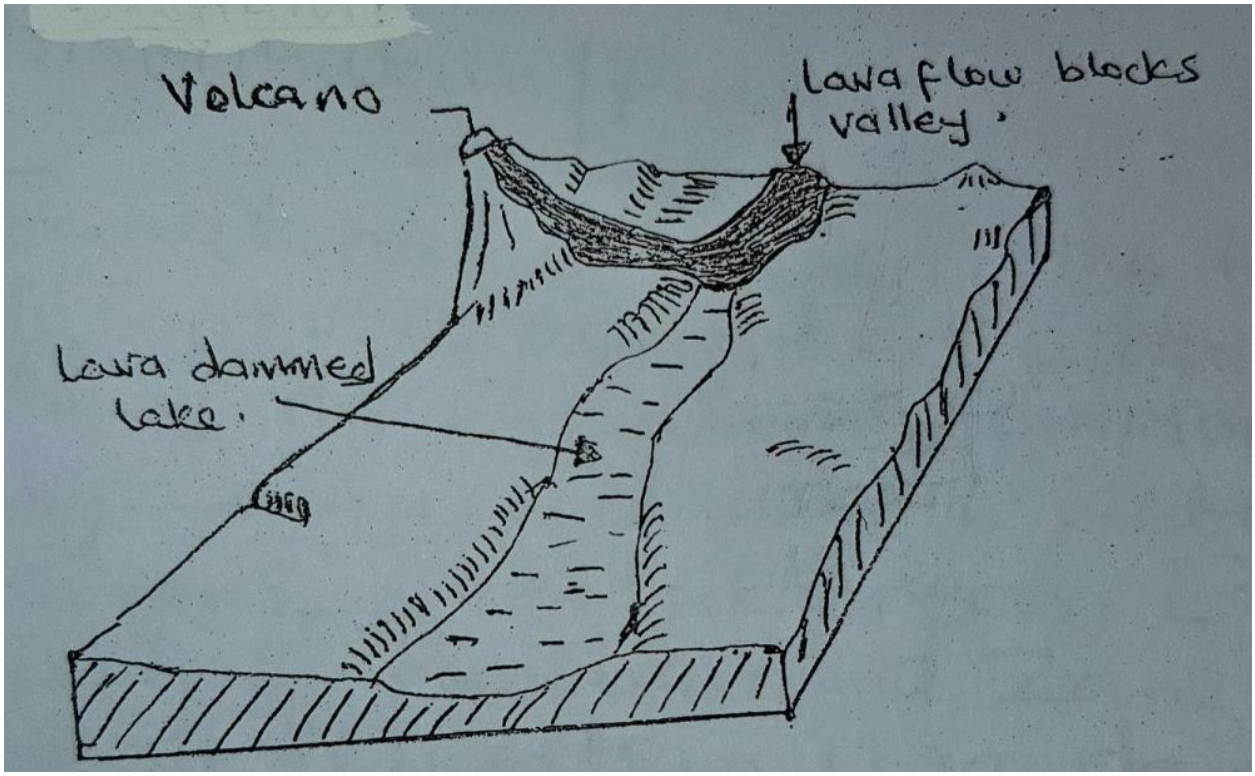
Calderas may get filled up with water to form caldera lakes for example L. Ngozi in Tanzania.

11. Lava dammed lakes

These are lakes occupying depressions or valleys that were blocked by a series of lava flows.

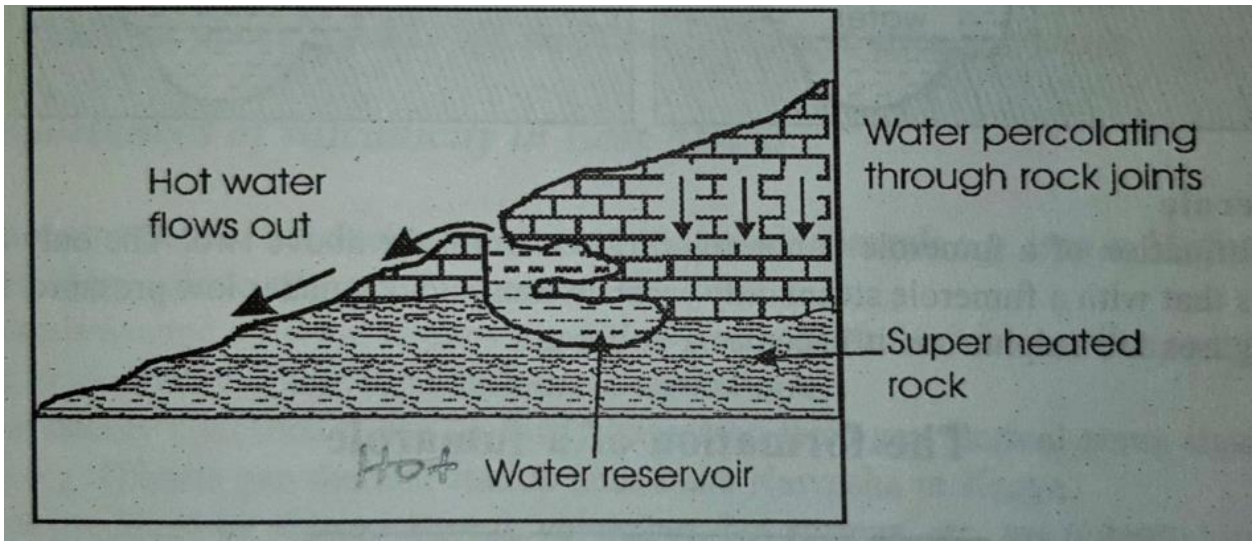
They are formed when basic lava from volcanic eruptions blocks the river valleys causing back ponding or damming of the rivers. Water collects and accumulates into the valley or depressions forming lava dammed lakes.

They are characterized by being deep for example L. Bunyonyi which was formed when lava flows from Mt. Muhavura blocked R. Rutshayo at Muko Heseisero 40 kilometers along Kabale – Kisoro road. Others are shallow for example L. Saaka and have fresh waters.
Other examples include L. Mutanda and L. Mulehe in South Western Uganda.



12.Hot springs

A hot spring is a continuous issuing out of hot water from underground onto the earth's surface through fissures.
They are formed when underground water comes into contact with extremely hot molten rocks or intrusive igneous rocks and gets heated up. Due to great pressure, the super - heated water is pushed out of the earth's interior through fissures onto the surface as Hot springs.
Examples include Kitagata hotsprings in Sheema district, Sempeya hotspring in Bundibugyo, Kibira hotspring near L. Albert all in Western Uganda, Maji ya moto near L. Nakuru, Olkaria in Naivasha in Kenya, Maji moto near L. Manyara in Tanzania.

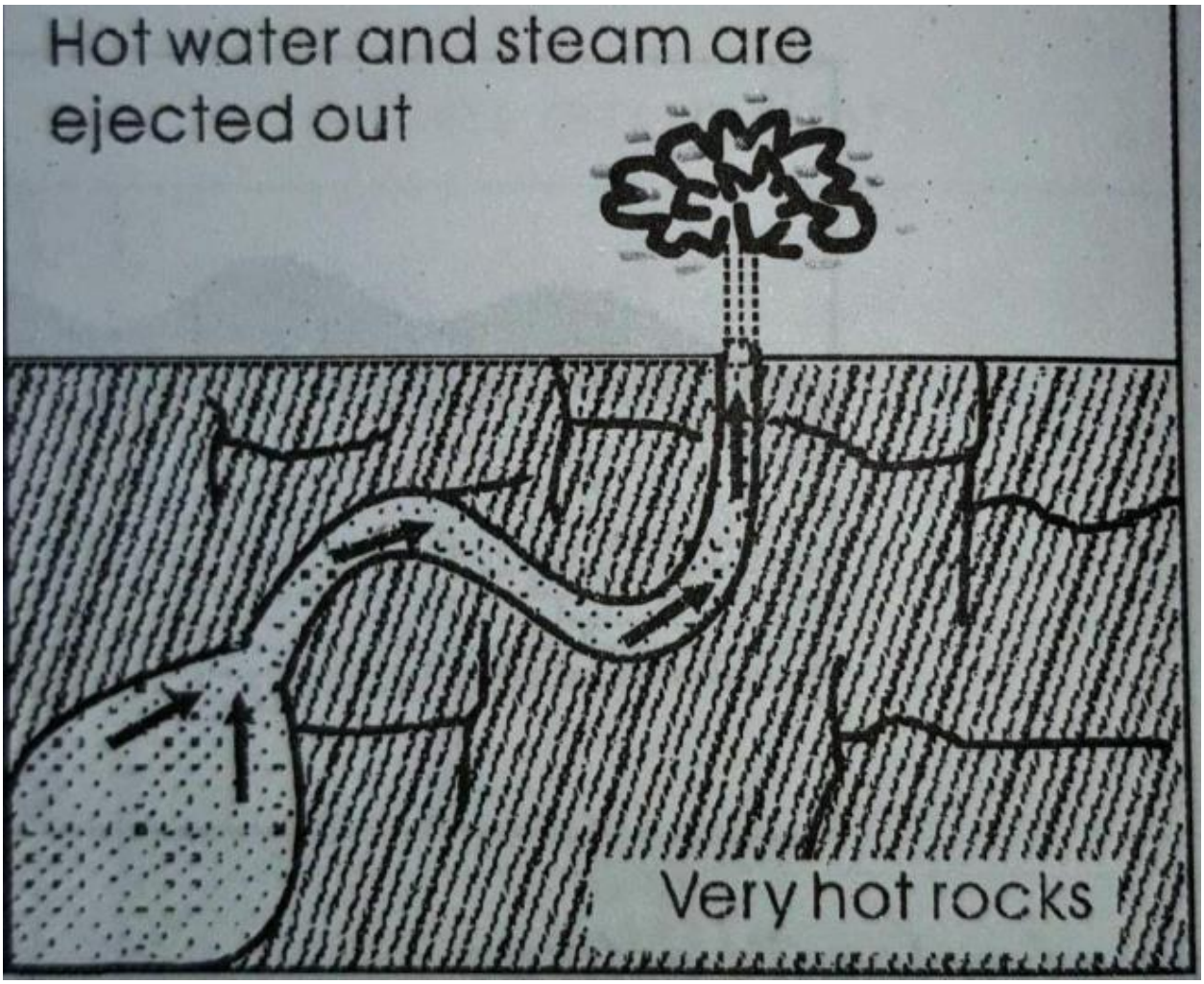


13.Geysers

These are jets of **hot water** and **steam regularly/periodically** ejected from underground through fissures onto the surface.

They are formed when underground water is intensively heated by hot molten rocks, due to high pressure, the hot water and steam are explosively forced out of the underground through fissures as geysers.

Examples include Bogoria geysers in Kenya.



14.Fumaroles

These are violent emissions of steam and gases such as carbondioxide , chlorine, sulphur dioxide, ammonium chloride from underground through fissures onto the surface. An example is at Eldama Ravine in Baringo, Kenya.

Questions

1. Account for the volcanic landforms in East Africa.
2. Examine the relationship between the nature of material ejected and the resultant land forms in East Africa.
3. To what extent does the nature of materials ejected influence the formation of land forms in East Africa ?
4. Examine the effect of volcanism on the drainage of East Africa.
5. (a) Distinguish between a caldera and an explosion crater.
   (b)Explain the importance of craters to the people living in East Africa.

INTRUSIVE FEATURES

These are as a result of injection and solidification of magma underneath the earth's surface. Magma is usually under low pressure .

Intrusive features only have an effect on the earth's landscape after being affected by prolonged denudational forces of weathering, erosion or mass wasting. They form features depending on the relative resistance of the rocks and forces of weathering and erosion. If they are more resistant to erosion than the surrounding rocks, they form uplands and when they are less resistant, they form lowlands.

The shape , size and type of intrusive landforms is determined by ;

i) The structure of the rock

Magma flows through cracks that are **across** the bedding planes or **along** bedding planes within crustal rocks. Magma cools and solidifies within these points of weakness to form a variety of intrusive landforms lying either **vertically across** the bedding planes such as **dykes** or **horizontally** along the bedding planes for example the **sills.**

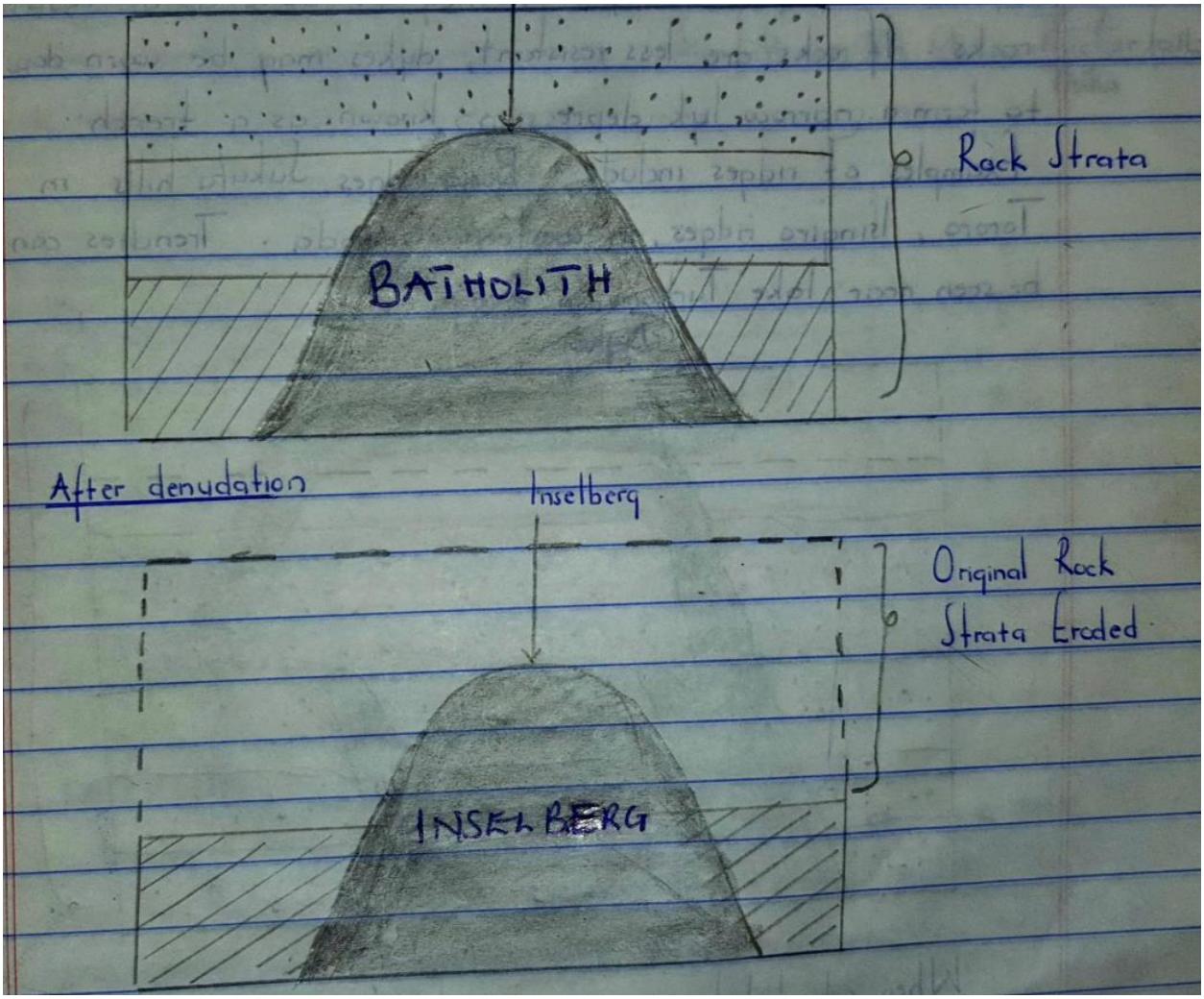
ii) Nature of magma

Highly viscous magma occupies large spaces within the crust and forms fairly large to very large masses of intrusive landforms. Viscious magma, unable to spread far, piles up within the crust to form massive land forms such as batholiths Laccoliths.

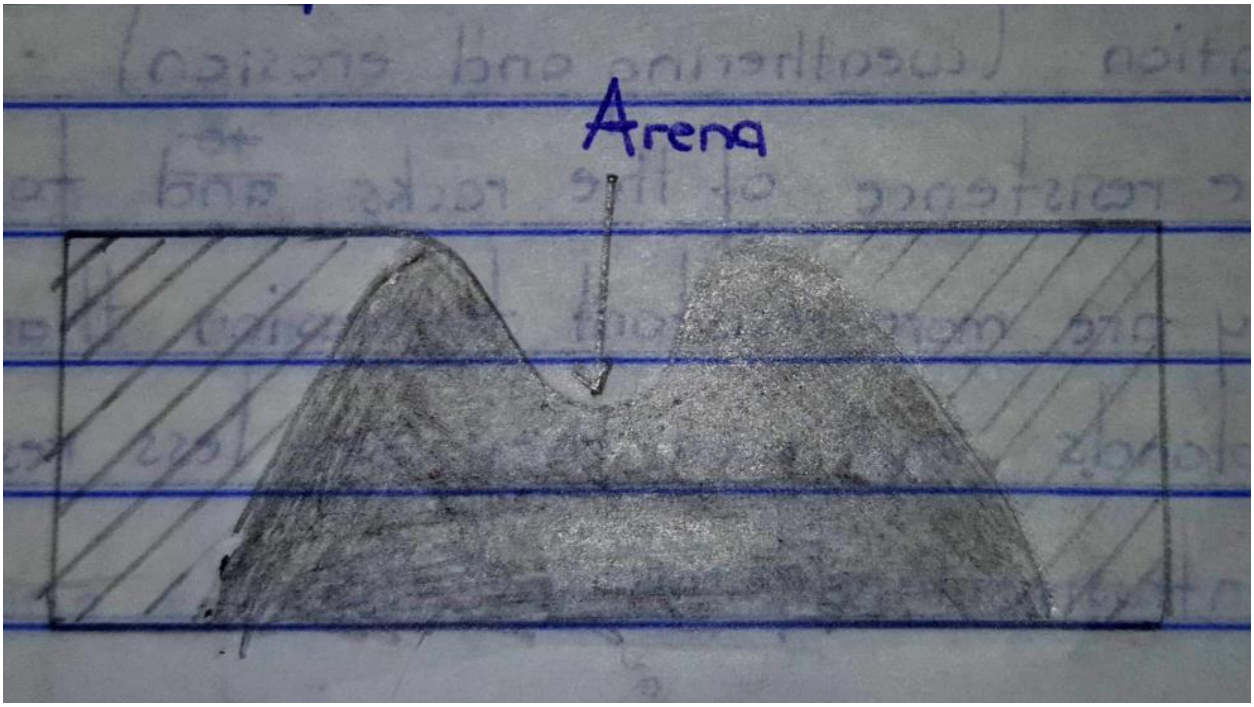
Intrusive vulcanic land forms include;

1. **Batholith**

   This is a large dome shaped mass of granite rocks formed at great depth by large scale intrusion of acidic magma that cools and solidifies slowly. When a batholith is subjected to denudational forces of weathering and erosion, it will be exposed on the earth's surface as an **inselberg /residual hill**, If the rocks are more resistant. Examples include Napak, Mubende, Nakasongola, Singo, Parabong inselbergs in Uganda, Sukuma inselberg in Tanzania.

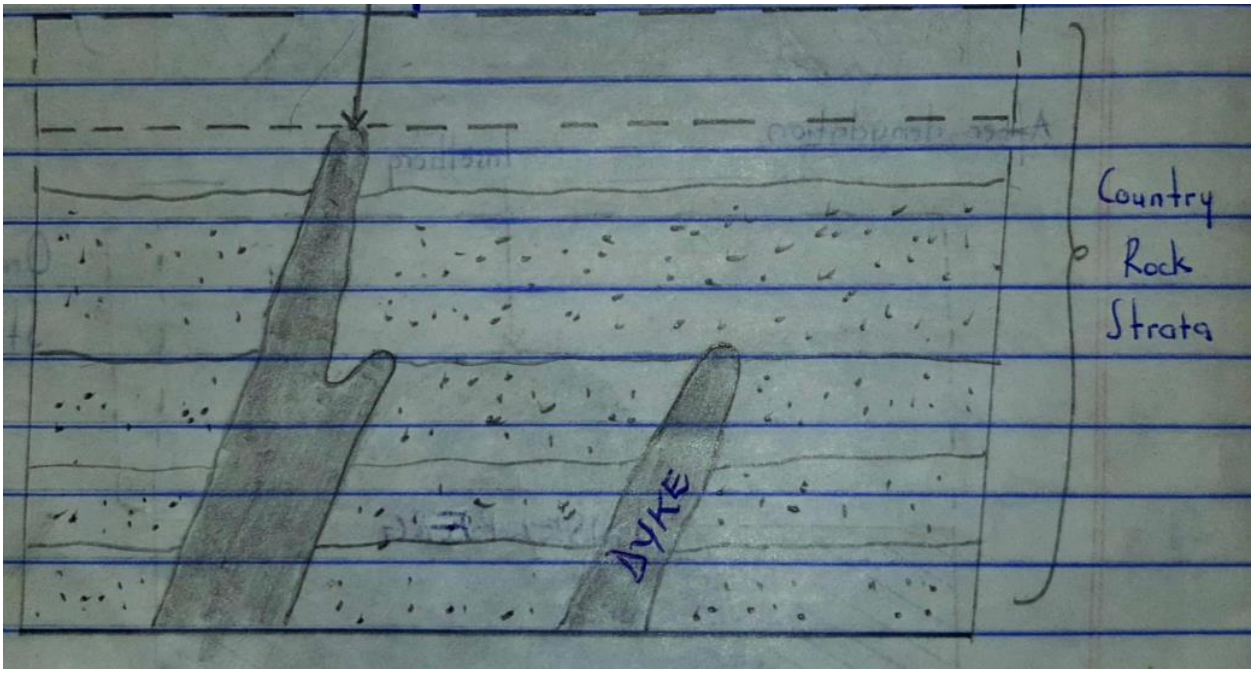


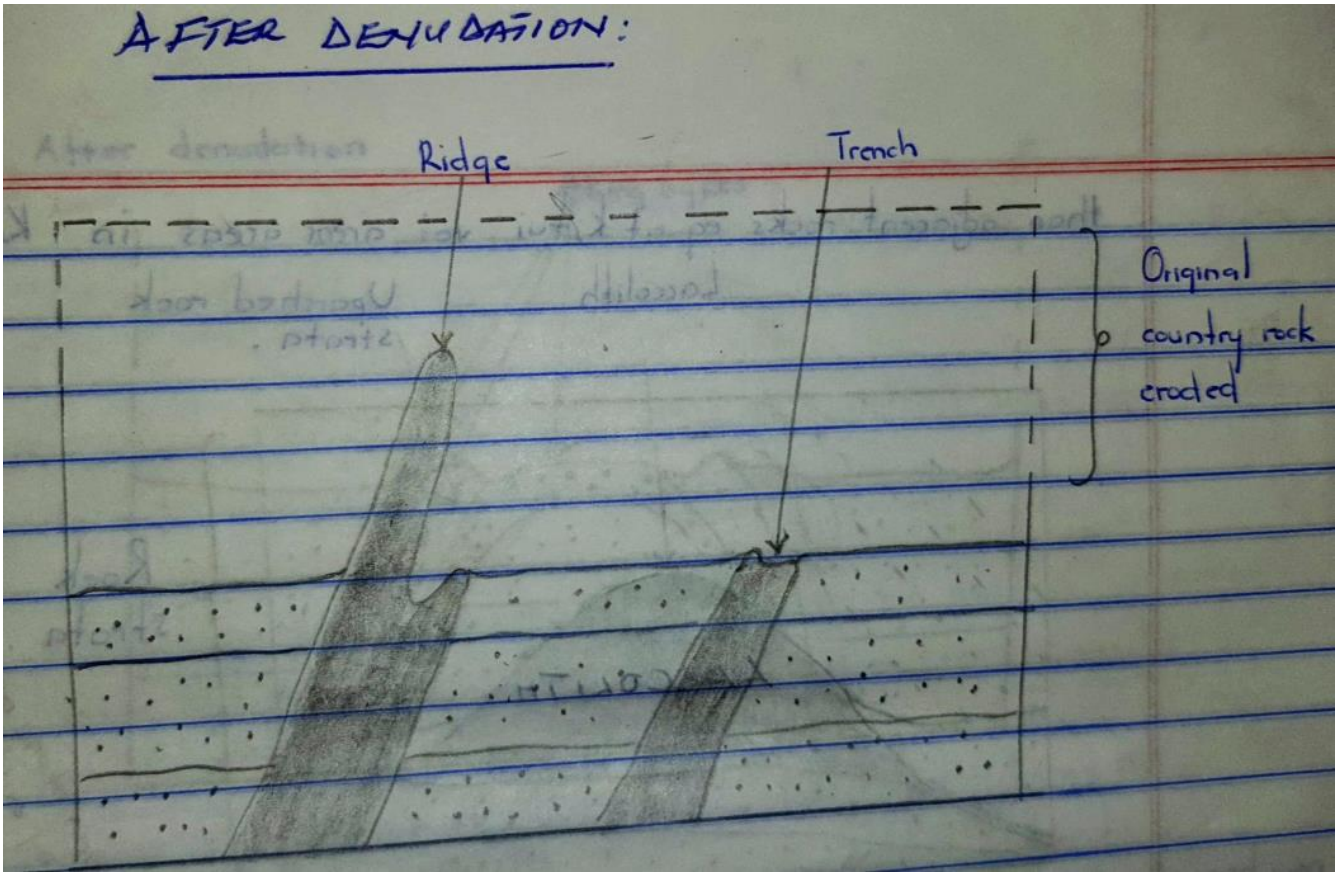
Where a batholith is less resistant, it is worn down to form a depression called an **arena** . Examples include Rubanda arena in western Uganda, Ankole – Karagwe arenas.



2. **Dykes**

   These are vertical (wall-like) or steeply inclined igneous rock structures **cutting across** the country rock strata. They are formed when magma is intruded and solidifies into igneous rock structure almost **vertically** along the **vertical fissures** or lines of weakness. When subjected to weathering and erosion , dykes stand up as **ridges** if they are made up of resistant rocks. If rocks are less resistant, dykes wear down to forma narrow – like depressions known as **trenches**. Examples of ridges include; Busia , Sukulu hills in Tororo, Isingiro ridges in Western Uganda. Trenches can be seen near L. Turkana in Kenya.


Country
Rock
Strata
DYKE


AFTER DENUDATION:
Ridge
Trench
Original
country rock
eroded

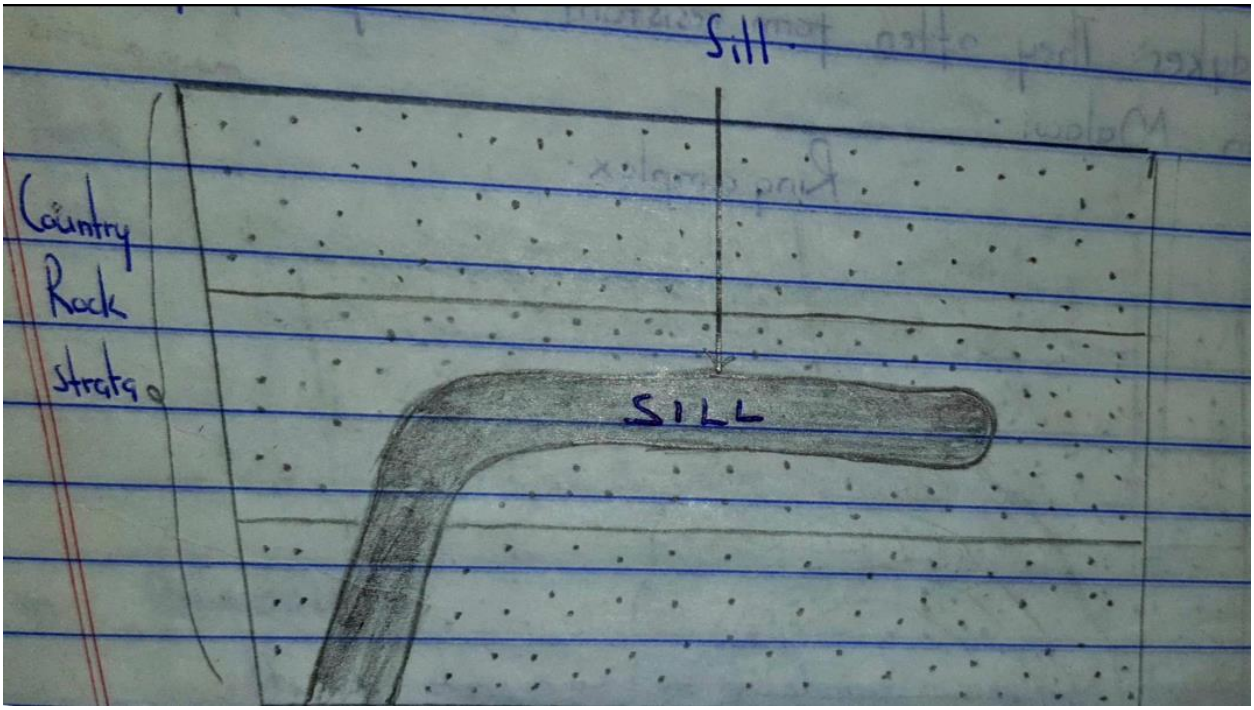
3. **Sill**

These are tabular sheets of igneous rocks lying **horizontally** between the bedding planes of the rock strata.

Sills are formed when intruded magma spreads horizontally and solidifies between the bedding planes of the rock strata near the surface.

Sills vary in thickness and may extend for several kilometres.

Where sills are resistant, they are exposed , forming **flat – topped hills**, **escarpments** or **cliffs** for example Kakinzi in Luwoero. Where sills occur across a river course, **water falls** may be formed for example Thika falls in Kenya , Sezibwa falls and Sipi falls in Uganda.



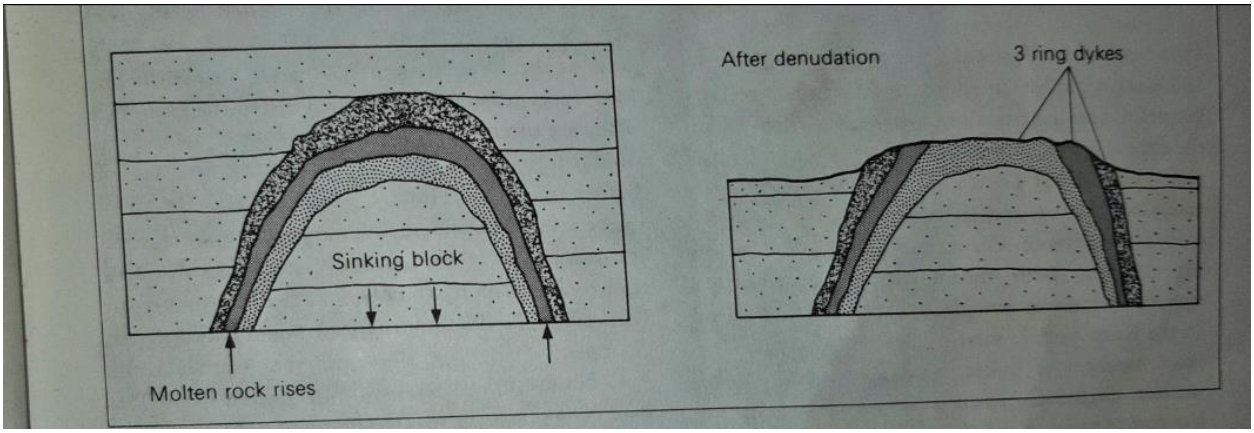
4. **Laccolith**

This is a dome shaped mass of igneous rocks with a flat bottom. It is formed by large scale intrusions of viscous acidic magma into the rock layers, which is unable to spread far and accumulates in a large mass, arching up the overlying rocks, hence a dome – shaped structure as it solidified.

Where laccoliths are more resistant to denudation than the adjacent rocks, they form **upland**s. For example Kitui , voi areas in Kenya.

5. **Ring dykes/ring complex**

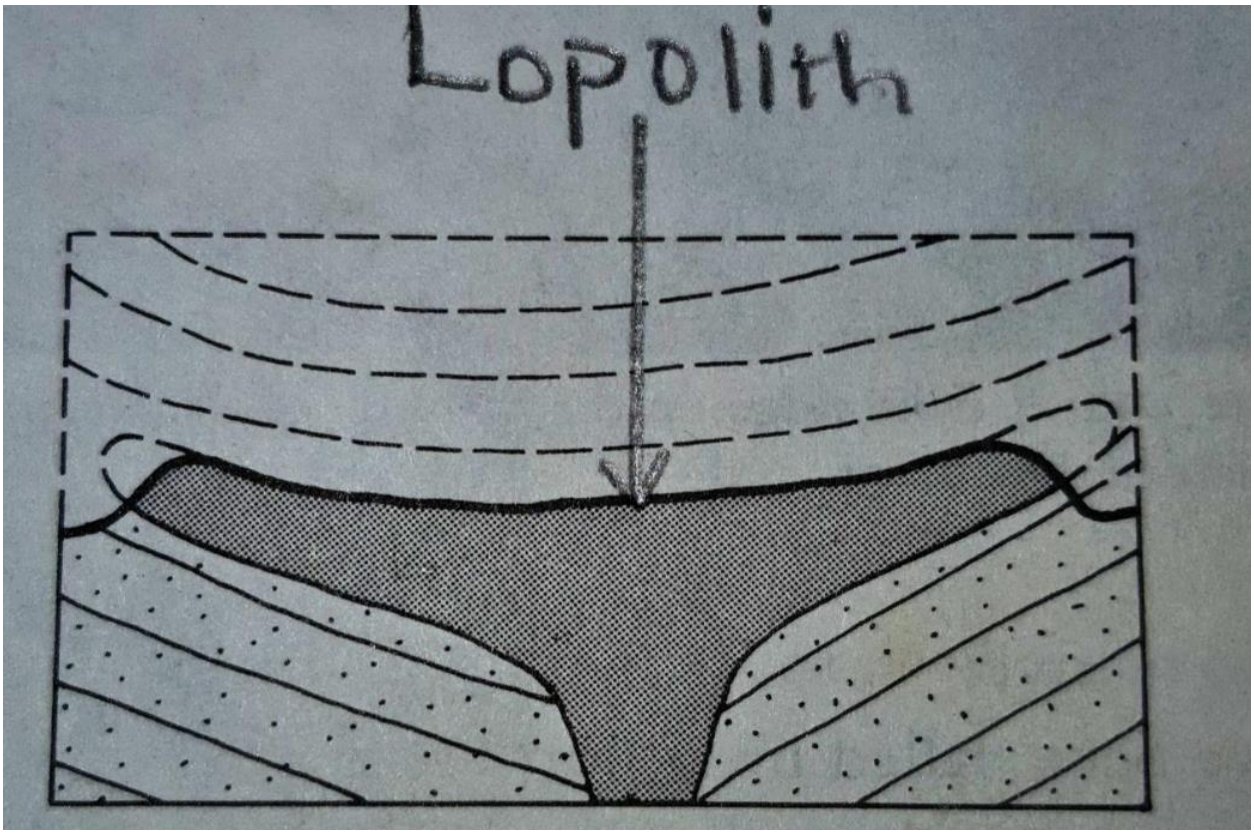
   This is a ring like intrusion of igneous rocks. It is formed when a circular block of the crustal rocks subsides into underlying magma , forcing it to rise along the vertical fractures around the block. The magma cools and solidifies to form dykes around the block, hence the name **ring dykes.** After denudation they often form a resistant hill mass. Example is Chambe hill in Malawi.



6. **Lopolith**

This is a large saucer shaped mass of igneous rocks intruded within the crustal rocks. The intruded less viscous magma that escapes through the central vent, spreads widely along the rock strata. The intruded magma exerts pressure onto the underlying rocks and eventually results into sagging/sinking, creating a depression at the top.

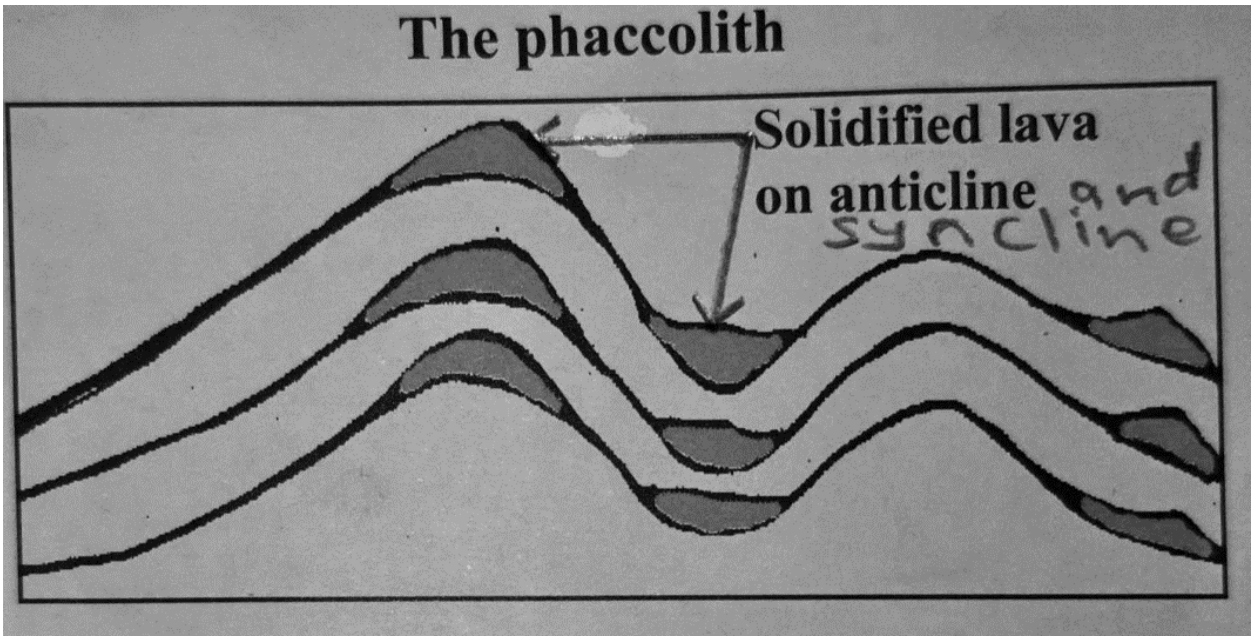
After denudation , a lopolith may be exposed to form a shallow depression with scarps on the exposed edges. Examples include Bushveld lopolith in South Africa, the Great lopolith of Zimbabwe .



7. **Phacolith**

This is an elongated dome – shaped intrusive igneous rock found on the crest of an anticline or the trough of a syncline.

Phacoliths are formed by intrusion of magma along the rock strata or bedding planes on the crest or trough of an up fold or down fold, respectively. Examples can be seen in South Africa.



Question

1. Examine the influence of intrusive vulcanicity on the development of relief landforms in East Africa.

Importance of Vulcanicity to Human activities.

Positive

- Volcanic eruptions emit lava which is weathered to form fertile volcanic soils suitable for cultivation of crops for example vegetables on the slopes of Kigezi highlands, Arabic coffee along Mt. Elgon, Pyrethrum on the slopes of Mt. Kenya.
- Volcanic features such as calderas, craters composite volcanoes, hot springs create beautiful scenery that attracts tourist hence promoting tourism industry that earns revenue and foreign exchange to the economies of respective countries.
- Hot springs , geysers and fumaroles are tapped for generation of geothermal energy used in domestic and industrial sectors for example at Olkaria power station in Kenya.
- Some lakes formed by volcanicity such as lava dammed lakes, caldera lakes, explosion crater lakes are used as fishing grounds, providing food to the community, as well as income and revenue to the fishermen and governments respectively. They are also sources of water for domestic and industrial use for example L. Bunyonyi supplying water and fish to Rubaya community in Kigezi.
- Volcanic mountains are catchment areas for many rivers that supply water for industrial, domestic and irrigation purposes . For example Mt. Elgon is a water catchment area for river Manafwa that supplies water for irrigation on Doho rice scheme in Eastern Uganda.
- Volcanic features are associated with mineral deposits such as rock salt from Katwe crater lake, lime stone from Tororo volcanic neck in Uganda, diamonds from the Mwadui volcanic rocks in Tanzania hence promoting the mining industry that earns revenue and foreign exchange to the region.

- Volcanic mountains lead to formation of orographic rainfall that supports agriculture and forestry on the windward sides for example on the slopes of Mt. Elgon in Uganda.
- Volcanic rocks such as the hard granite rocks are quarried and used as aggregates in the building and construction industry.
- Generation of hydro electric power from the fast flowing rivers originating from the volcanic highland. For example along R. Tana in Kenya, Hydro electric power is used for both domestic and industrial purposes.
- Volcanic uplands such as inselbergs are used for installing communication masks that improve communication in the region for example the Nakasongola inselbergs in Uganda.
- Gases emitted by volcanic activity are mined for industrial purposes for example carbondioxide at Esagen at Baringo in Kenya.
- Hot springs are used as health spas by the communities for example at Kitagata hot spring in Sheema , Western Uganda.
- The heavy rain fall and fertile volcanic soils attract heavy human settlement for example Kigezi highlands, Mt. Elgon etc.
- Volcanic features such as hot springs calderas facilitate research and study purposes.

Negative

- Volcanic land forms such as volcanic cones, craters and calderas form barriers which hinder the construction of transport and communication network for example in Kigezi highlands, South western Uganda , Mt. Elgon in Eastern Uganda.
- Landslides due to steep slopes and severe rainfall are experienced in volcanic upland areas and they destroy settlement crop fields transport routes. For example in Kigezi highlands South Western Uganda, Mt. Elgon in Eastern Uganda.
- Severe soil erosion is experienced mainly due to steep slopes of volcanic areas and heavy rainfall cause deep gulleys, infertile soils

that discourage transport , agriculture and human settlement for example along Mt. Elgon in Mbale.

- Volcanic eruptions destroy lives and property for example along the Mufumbira ranges, Nyiragongo in Congo in 2002 claimed more than 40 people due to heat and poisonous gases emitted.
- Volcanic regions are partly associated with young volcanic rocks which have not under gone sufficient weathering. Such soils are immature and infertile to support crop cultivation for example Rukungiri in Western Uganda.
- Dry conditions on the lee-ward side of the volcanic highlands hinder agriculture and settlement.
- Water shortage due to permeable volcanic rocks for example in Kisoro South Western Uganda, Muzina near Tsavo national park in Kenya.