

STANDARD HIGH SCHOOL ZZANA

S.5 GEOGRAPHY PAPER ONE NOTES

EVIDENCES OF CONTINENTAL DRIFT

Relevance of the theory

Jig saw and visual fit. There is a close fitting of the continental coastlines across the Atlantic Ocean like a jig saw puzzle. That is, the East coast of South America and west coast of Africa (Guinea) have good visual fits not only at the surface but also at a depth of 2000 meters below the sea-level. Thus these continents must have been together before drifting.

Geometric fit. That is, the west coast line of Africa and eastern coastline of South America fit almost exactly in each other if rotated through an angle of 57° with rotational points at 40° North and 30° West.

Matching Geology. There is Similarity in rock alignment and minerals between the west coast line of Africa and eastern coastline of South America. For example the gold deposits of Guyana in South America appear to be a continuation of the gold deposits of Ghana in Africa. The Cretaceous oil beds of Bahia in Eastern Brazil are similar to those in Angola; meaning that they were once joined together but separated due to continental drift. The coal bearing rocks of Eurasia and North America (Appalachian).

Existence of orogenic belts of Pre-Cambrian age and structure both in South America and Africa yet are sub-parallel to the coasts; proves that these continents were once joined together during their formation but separated due to continental drift. For example the cape ranges of South Africa appear to be a continuation of the fold mountain ranges of Falkland Island in South America.

Occurrence of carboniferous glacial deposits called Dwyka tillites in South Africa, South America, southern Australia and India proves that these continents emanated from the break up of Gondwanaland which had huge ice sheets due to its proximity to the South Pole.

Existence of Similar sedimentary basins along some parts of north eastern coast of Brazil, south eastern Nigeria and Cameroon means that these continents broke form Pangaea but separated due to continental drift.

Occurrence of Similar plant and animal species both in South America and Africa for example the tropical rain forests in Brazil, Congo and Gabon in Africa shows that these two continents were once together and experienced similar climatic conditions for a long period of time.

Palaeo magnetic evidence. When igneous rocks cool they are magnetized by the earth's magnetic field. In India, Australia and South America the magnetic properties in the magnetized rocks no longer point in the N-S direction as it should be. This suggests that during the course of drifting rocks were twisted and changed their true magnetic north direction.

Existence of laterites. Laterites only form under tropical climates. The occurrence of laterites in cold continental climatic regions like North America (Kentucky and Ohio), Ayrshire in Britain, Germany and Russia shows that these continents drifted from the tropics with laterites to their present positions.

Existence of coral reefs- in Green land, Britain and North America shows that these areas drifted from the tropics where conditions for coral reef formation exist for example warm temperatures of tropical climate, clear, salty and well oxygenated water.

The occurrence of salt evaporites in cold parts of southern states of Britain, U.S.A., Germany and Russia yet salt evaporites occur in tropics shows that these regions once existed in the tropics before attaining their current position.

Proximity of the continental blocks to the North Pole than the South Pole justifies the north ward drift of Gondwanaland and Lauresia.

Deposition of new rocks at the mid-ocean ridge, trenches in ocean floor, expansion of Atlantic Ocean and the widening of the rift valley floor at an average of 2cms per year proves that continental drift took place and is still taking place.

CONTINENTAL DRIFT AND LAND FORM DEVELOPMENT IN EAST AFRICA

QN. (a)What is meant by plate tectonic movements?

(b) Explain the influence of plate tectonic movements on the development of relief land forms in East Africa.

Approach

- ❖ Define plate tectonic movements, outline the assumptions of the theory including ;
- ❖ The cause, major plates and the major plate boundaries.
- ❖ In part (b) Show how plate tectonism generates tensional; compression forces and vertical movements which led to the occurrence of faulting, vulcanicity, warping and folding.
- ❖ Explain the formation of landforms produced by these tectonic processes.

Answer guide

(a) Plate tectonic movement refers to the movement of separate and rigid parts of the earth called tectonic plates on which continents and ocean basins rest.

The theory assumes that;

- the earth crust is divided into six major plates and 12 small plates.
- The major plates include African plate, American plate (North and South), Eurasian plate (Europe and Asia) Australian-Indian plate, Pacific plate, and Antarctic plate while the minor plates include Nazca (on the west edge of South America), Philippine plate, Caribbean plate e.t.c
- The theory assumes that a plate carries either an oceanic crust or continental crust and that plates are mobile floating on a layer of molten rock called the Asthenosphere like a tabular ice bergs on a frozen sea
- The theory also assumes that the Plates are driven by giant convective currents generated by intense heat produced by radio-activity and geo-chemical reactions within the core & mantle
- As plates move or drift, so do the continents which are carried on top as “passengers”
- Tectonic plates move along 3 major boundaries or margins caused by convective currents. Namely;

Constructive / divergent margin- plates move away from each other to form a mid-ocean ridge

Destructive boundary/convergent margin- the plates move towards each other hence collide and the dense oceanic plate sinks below at a subduction zone

Neutral / conservative or transform boundary- Plates move past each other without adding or destroying the ocean floor example North American plate against the Pacific plate forming the San Andes fault causing off setting of land to the west.

(b).These movements generate tensional force, compression force and vertical movements which led to the occurrence of tectonic processes of faulting, vulcanicity, warping and folding responsible for the formation of various relief landforms. For example;

Faulting-led to formation of;

The East African rift valley, Block Mountains, Escarpments, Grabens, Tilt block landscapes, Fault guided valleys

Vulcanicity-occurs at the margins of the faulted areas leading to;

(a) Extrusive vulcanicity responsible for the formation of volcanic cones such as;


Ash and cinder cones, Composite cones, Basaltic cones, lava plateaus, Cumulo domes, Calderas, explosion craters e.t.c

(b) Intrusive vulcanicity responsible for the formation of;

Batholiths, sills, dykes, e.t.c exposed by denudation forces to form Inselburgs, ridges, arenas/trenches e.t.c

Warping- occurred in form of up and down warping and formed depressions occupied by Lake Victoria and Kyoga. The shoulders of the rift valleys of western Kenya and Uganda uplifted before faulting leading to the formation of ridges / watersheds.

Folding- led to formation of synclines and anticlines.

 Remember to explain the formation of these landforms with clear diagrams and examples.

QN. Examine the relevance of sea-floor spreading and plate tectonic theories to landform development in East Africa.

Approach

❖ Define both theories and outline the assumptions,

- ❖ Show how both theories explain the origin of tension, compression forces and vertical movements which lead to tectonic processes of faulting, vulcanicity, warping and folding.
- ❖ Explain the resultant landforms clear diagrams and examples where applicable

Answer guide

Sea -floor spreading and plate tectonics are recent theories of continental drift- the movement and distribution of present day continents and ocean basins and the resultant landforms.

The theory of plate tectonics assumes that the earth's crust is divided into a series of rigid and light blocks called tectonic plates which float on partially molten material (Asthenosphere) in the upper mantle.

The major tectonic plates include; the African plate, American plate (North and South), Eurasian plate (Europe and Asia) Australian-Indian plate, Pacific plate, Antarctic plate while minor plates include Nazca (on the west edge of South America), Philippine plate, Caribbean plate e.t.c.

A plate carries either an oceanic crust or continental crust

Both theories assume that;

The interior of the Earth is in a molten state (semi-fluid) because of the intense heat produced by radio-activity and geo- chemical reactions within the interior of the Earth (core & mantle)

Molten rock (magma) is light hence rises in form of giant convective currents and flow horizontally/ laterally underneath the tectonic plates before sinking back into the mantle to complete the cycle.

The lateral flow of convective currents drags the tectonic plates to their direction of flow/ movement like a tabular ice bergs on a frozen sea

When this movement takes place underneath the oceanic plate, exerts tension and compression forces leading to fracturing of the oceanic crust in form of a rift through which magma from deep within the crust up-wells and turns into solid rock as it cools on contact with ocean water hence creating a new crust (young rock) at the mid ocean ridge; pushing the old crust (old rock) side ways from the ridge.

In the process the floor of the ocean spreads or widens pushing the tectonic plates away from each other hence continental drift.

The tectonic plates move along three major boundaries created by convective currents. That is;

Constructive / divergent margins-plates move away from each other to form a mid-ocean ridge

Destructive boundary/convergent margin- the plates move towards each other hence collide and the dense oceanic plate sinks below at a subduction zone

Neutral / conservative or transform boundary- Plates move past each other without adding or destroying the ocean floor example North American plate against the Pacific plate forming the San Andes fault causing off setting of land to the west.

▪The movement of plates along boundaries generates vertical (uplifting), tensional and compressional forces and tectonic processes of faulting, vulcanicity, warping and folding responsible for the formation of various relief landforms. For example;

Faulting-led to formation of;

The East African rift valley, Block Mountains, Escarpments, Grabens, Tilt block landscapes, Fault guided valleys

Vulcanicity-occurs at the margins of the faulted areas leading to;

(a) Extrusive vulcanicity responsible for the formation of volcanic cones such as;

Ash and cinder cones, Composite cones, Basaltic cones, lava plateaus, Cumulo domes, Calderas, explosion craters e.t.c

(b) Intrusive vulcanicity responsible for the formation of;

Batholiths, sills, dykes, e.t.c exposed by denudation forces to form Inselburgs, ridges, arenas/trenches e.t.c

Warping- occurred in form of up and down warping and formed depressions occupied by Lake Victoria and Kyoga. The shoulders of the rift valleys of western Kenya and Uganda uplifted before faulting leading to the formation of ridges / watersheds.

Folding- led to formation of synclines and anticlines.

📖 Remember to explain the formation of these landforms with clear diagrams and examples.

ROCKS IN EAST AFRICA

A rock is an aggregate of various minerals that make the solid part of the Earth crust.

Rocks in East Africa are categorized according to (a) Mode of formation/ origin (b) age.

When rocks are categorized according to Mode of formation, they fall under three types namely;

(a) Igneous

(b) Sedimentary

(c) Metamorphic

IGNEOUS ROCKS

Guiding questions

QN. Account for the formation of igneous rocks in East Africa

Approach

- ❖ Define igneous rocks
- ❖ Explain the process of formation
- ❖ Identify the major types of igneous rocks,
- ❖ State and give the Characteristics, examples of each sub-type and areas where they are found in East Africa.

Answer guide.

Igneous rocks are fire formed rocks. They are formed through vulcanicity- a process by which magma is injected/ pushed into and onto the earth crust from the interior of the earth by pressure to form intrusive and extrusive volcanic rocks.

Vulcanicity is brought about by radio activity and geo-chemical reactions in the interior generating intense/ great heat and pressure; melting mantle rock into molten magma.

Some times molten magma forms as a result of Friction between moving rocks during plate movement and faulting.

High pressure pushes out molten magma into and onto the surface of crust; through lines a vent and fault lines created by tectonic forces/ movements such as faulting.

The injected and ejected materials solidify at different levels depending on the chemical composition of out pouring magma to produce various igneous rocks.

Igneous rocks are crystalline in nature (atoms are arranged in a definite manner). The size of the crystals depends on the chemical composition of magma, depth of cooling and solidification and exposure to oxygen.

Igneous rocks don't contain fossils and non-stratified.

Igneous rocks are sub-divided into three types depending on the size of crystals and the depth of solidification of magma namely; **extrusive volcanic rocks, hyperbyssal and plutonic igneous rocks.**

Extrusive volcanic rocks-are formed due to solidification of both acidic and basic lava **on** the surface of the crust.

They have **small crystals** because the rate of cooling is fast and exposure oxygen

Major examples include **Basalt, Rhyorite, Trachyte, andesite, Obsidian and Pumice.**

Volcanic rocks are found in volcanic regions such as mountain Kenya, Kilimanjaro, mufumbira, Elgon e.t.c.

Hyperbyssal rocks-are formed due to solidification of intermediate magma **near** the surface.

They have medium-**size crystals** because the rate of cooling is moderate.

Major examples include **quartz, dolerite and porphyry.**

Plutonic igneous rocks-are formed due to solidification of acidic magma **deep in the crust.**

They have **large crystals** because the rate of cooling is slow and lack of oxygen.

Major examples include **Granite, Diorite, Gabbro and Syenite.**

The rate of cooling is influenced by the chemical composition of the magma ejected from the mantle which in turn influences the process of crystallization. For example;

- Acidic igneous rocks contain high amounts of silica which make them viscous, immobile and cool rapidly near the vent for example Rhyorite
- Intermediate igneous rocks contain mixed mineral structures which make them fairly mobile example trachyte
- Basic igneous rocks contain less silica content but much mica and olivine which make them very mobile and flow for long distance before cooling hence found far away from the vent for example basalt.

Hyperbyssal and plutonic rocks form intrusive igneous landforms which may later be exposed by denudational forces for example the Mubende batholiths, Inselburgs in Eastern Uganda e.t.c.

Impression marking.....25 mks

QN. (a) Describe the formation of igneous rocks.....15mks

(b) Explain the importance of igneous rocks in East Africa.

Approach

- ❖ In part (a) refer to the question above.
- ❖ Explain the positive and negative effects in part (b).

ECONOMIC IMPORTANCE OF IGNEOUS ROCKS

Positive effects.....7mks

- Igneous rocks such as volcanic weather down into fertile volcanic soil that encourages crop cultivation for example Irish potatoes and vegetables in Kabale, Arabic coffee and bananas on the slopes of Mount Elgon and Kilimanjaro.
- Igneous rocks are tourist attraction by forming attractive scenery hence source of foreign exchange used for economic development for example, mount Elgon, Kenya, Kilimanjaro, crater lakes, hot springs e.t.c

- Source of valuable mineral ores for extraction for example Gold mining in Busiitema and Mubende, Iron and Copper in Mbeya and Kisoro, Diamonds in Mwandui near Shinyanga in Tanzania
- Provide building materials for example trachyte, Gabbro, dolerite are in setting foundation for heavy structures such as Dams, Bridges, storied buildings while Granite chippings are used in constructing non-skid surfacing roads.
- Volcanic rock outcrops are suitable sites for erecting communication equipments such as masts on Kololo hill, Kisoro, Mbale, Tororo and batholiths in Mubende.
- Igneous rocks such as granites form strong basement used for erecting heavy structures such as Dams, storied buildings and bridges hence facilitate urbanization.
- Igneous rocks provide opportunities for Education and research for example in the field of Geology, geo-thermal electricity development, mineral exploration etc.
- Some igneous rocks contain hot springs suitable for developing geo-thermal power for example Olkaria geo- thermal power station in Kenya while Kitagata and other hot springs are potential sites.
- Igneous Rock Mountains are catchments for rivers that provide water for irrigation, domestic and industrial use for example, River Tana and Athi on Mount Kenya, River Manafa, Suam, Malaba, Sironko and Nzoia on Mount Elgon.
- Igneous rocks are source of underground water basins / aquifers/artesian wells especially in areas where permeable rocks lay over impermeable rocks such as granites; used for domestic and industrial use.
- widened employment base through mining and construction hence source of income used by people to raise their standards of living
- Provide raw materials for construction industries

NEGATIVE EFFECTS.....3mks

- Extrusive and intrusive igneous rocks form rock outcrops that hinder construction of transport and communication networks for example Kigezi in southwestern Uganda.

- Igneous rocks limit areas for settlement because of the rugged terrain for example in Kabale, batholiths in Mubende and Tororo.
- Some igneous rocks such as granites weather down into coarse sand soil that discourages crop cultivation for example in Mubende.
- If volcanic rocks are impermeable; they cause impended drainage that reduces the water table below hence limiting crop productivity.
- Volcanic rock out crops are associated with landslide and soil erosion during the wet season which discourage settlement and agriculture for example in Mbale, Kigezi highlands, slopes of Mount Kenya, Meru and Kilimanjaro
- In case igneous rocks contain minerals, they may hinder mining since they are hard to break or increase the cost of mining.
- Some igneous rocks harbour pests such as snakes, rats and moles

SEDIMENTARY ROCKS

Guiding questions

QN. (a)Describe the processes which have led to the formation of sedimentary rocks in East Africa

(b)Explain the importance of sedimentary rocks to East Africa.

Approach

- ❖ Define sedimentary rocks
- ❖ state the characteristics of sedimentary rocks
- ❖ Describe the processes / conditions of formation
- ❖ Identify and Explain the formation of the three types of sedimentary rocks
- ❖ Give examples of each type and where they are found
- ❖ In part (b) explain the positive and negative importance of sedimentary rocks

Answer guide

Sedimentary rocks are formed from deposition of sediments and other materials produced by weathering of igneous or metamorphic rocks.

The sediments are then transported by agents of erosion like running water, wind or ice and deposited in layers or strata on either dry land, valleys or under water for example sea bed, river bed e.t.c

The layers are separated by bedding planes which demarcate the end of one depositional cycle and the beginning of another; and can be horizontal, gently sloping or steeply dipping.

After million years, sediments are compressed, compacted, hardened and cemented together in various ways to form different sedimentary rocks.

STEPS OR PROCESSES INVOLVED IN THE FORMATION OF SEDIMENTARY ROCKS

Sedimentary rocks evolve through different stages after million years hence the processes have to be presented in the order. Sedimentary rocks are formed through the following processes

Weathering of the parent rocks to produce sediments through physical, chemical or organic processes.

Erosion and transportation of the sediments by running water, ice or wind

Deposition of the sediments on dry land, valleys and underwater in oceans, lakes or seas and rivers

Stratification of the deposited sediments by bedding planes to demarcate the end of old deposit and the beginning of a new deposit.

Compression of the stratified materials by the weight of the overlying new deposit

Consolidation/ compaction or hardening of the compressed materials

Lithification or cementation of the stratified materials by calcareous algae, siliceous and ferruginous materials

Transformation of cemented sediments into different types of sedimentary rocks

CHARACTERISTICS OF SEDIMENTARY ROCKS

Generally, sedimentary rocks consist of;

- Fossils of dead plants and animals
- Non-crystalline in nature

- Have layers or strata
- The strata or layers are separated by bedding planes of cementing materials
- The strata are either horizontal, gentle dip or steeply dipping.

TYPES OF SEDIMENTARY ROCKS

Sedimentary rocks are sub-divided further into three types according to the origin of sediments. That is **mechanically** formed sedimentary rocks, **organically** formed sedimentary rocks and **chemically** formed sedimentary rocks.

MECHANICALLY / PHYSICALLY FORMED SEDIMENTARY ROCKS

They are formed from deposition and consolidation of sediments produced by physical weathering and agents of erosion for example;

Wind deposition forms **loess** common in arid areas in East Africa.

River deposition forms **lacustrine / alluvial deposit** found in river valleys, glacial deposition forms **moraine or till** found in valleys of glaciated mountains.

Wave deposition forms **marine** deposits.

Major Examples of resulting rocks or mechanically formed rocks include;

Sand stones, mudstones, clay stones, shale gravel, boulder-clay, grit e.t.c

ORGANICALLY Formed SEDIMENTARY ROCKS

They are formed from fossils of dead animals and plants for example;

(a) Deposition of animal remains such as Coral polyps form limestone rock called coral reefs and chalk common along the East African coast.

(b) Deposition and decomposition of Plant remains during the carboniferous period led to formation of **coal** (lignite, peat, and brown coal) found in Ruhuhu valley in Tanzania.

CHEMICALLY FORMED SEDIMENTARY ROCKS

They are formed from the evaporation and precipitation of salt solutions to form **rock salts found** around Lake Katwe in south western Uganda and south of Nyanza province in Kenya, **Soda ash** around Lake Magadi and Natron and **Dolomite**,

Gypsum, Bauxite. Other examples include Laterites deposits found on hill tops in Central Uganda.

Impression marking.....15mks

IMPORTANCE OF SEDIMENTARY ROCKS

Positive effects of sedimentary rocks

- Weather down to form fertile soil on drainage basins hence supports crop cultivation for example alluvial soil in swamps, river valleys and lake shore supports yams, sugar cane, potatoes e.t.c.
- Coral limestone soils support agriculture for example coconuts, mangoes, citrus fruits, cashew nuts and cloves in Pemba, Mombasa and Zanzibar.
- Provide raw materials for the industrial and domestic use for example Rock salt, potash, phosphate, limestone used in making cement such as Bamburi
- Provide cheap building materials for example gravel and sand are used in mixing concrete, clay is used in making bricks, tiles, maxi pans e.t.c for example Lweza and Kajjansi clay industries.
- Limestone rocks are porous hence provide good source of underground water obtained through bore hole drilling for domestic use such as cooking, washing, drinking e.t.c
- Tourist attraction by forming attractive scenery hence source of foreign exchange used for economic development for example coral reefs and raised caves at the East African coast, stalactites and stalagmites in fort portal karst landscape e.t.c
- Source of mineral ores for extraction and mineral exports hence source of foreign exchange for example Diamonds in Mwandui, Gold, Tin, Coal, Cobalt, Tungsten e.t.c in western Uganda, Nyanza province in Kenya e.t.c
- some Sedimentary rocks are source of fuel for industrial and domestic use for example coal in the Ruhuhu valley in Tanzania, petroleum and natural gas in Kairo-Tonya in Bunyoro and Malindi-Lamu region in Kenya.
- Sedimentary rocks are associated with flat landscape due to deposition hence ideal for grazing of live stock and settlement for example the Great Plains and the coastal areas like Mombasa.

- Widened employment base in the mining, construction, Art and Craft, Agriculture hence source of income to a vast population in the region.
- Alluvial soils support mangrove and riverine vegetation hence promote forestry for example in the coastal and river valley areas such as Rufiji.
- Provide opportunities for education and research for example Geology, Oceanography, and mineral exploration
- Coral and delta lagoons encourage fish farming for example at the coast, swamps and river valleys in different areas.
- Riverine and swampy vegetation support craft industry for example palm leaves and papyrus are used to make hats, hand bags e.t.c
- Coral reefs provide good sheltered harbors for shipping and development of ports for example Mombasa and Dar-es –Salaam.
- Some sedimentary rocks such as clay are Source of medicine “**emumbwa**” used mainly in central Uganda to cure various diseases

NEGATIVE EFFECTS

- Limestone and sandstone weather down into immature and infertile soils which discourage crop productivity for example in the Coastal areas
- Lime stone rocks and sandstones are very porous hence have limited sources of surface water supplies
- Peat soils, silt and clay encourage flooding during the wet-season; leading to destruction of crops, settlements and other properties
- Coral reefs are barriers to marine transport and fishing at the coast because they are hard and protrude hence wreck ships, fishing boats and nets.
- Sandstone, limestone and chalk form wastelands which discourage settlement and agriculture for example sand dunes.
- Riverine vegetation and lagoons encourage breeding of disease causing vectors like mosquitoes which cause malaria e.t.c
- Some sedimentary rocks harbour pests such as snakes, rats and moles

METAMORPHIC ROCKS

Guiding question

QN. (a) Account for the formation of metamorphic rocks in East Africa

(b) Explain the importance of metamorphic rocks to the people of East Africa

Approach

- ❖ Define metamorphic rocks,
- ❖ Identify and Explain the formation of major types of metamorphic rocks,
- ❖ Give examples of each type and where they are found
- ❖ In part (b) explain the positive and negative importance of metamorphic rocks,

Answer guide

▪ Metamorphic rocks are changed rocks. They are rocks changed from originally igneous and sedimentary to new rocks with altered / changed structure and chemical composition (mineralogy, texture and internal structure)

▪ Metamorphism of the rocks is caused by heat (thermal), **pressure** (dynamic) or **both** (thermal dynamic); producing three types of metamorphic rocks. That is:

(a) Thermal (heat) metamorphism occurs when magma comes into contact with the adjacent rocks during vulcanity; consequently melts them and alter their mineralogy for example Batholiths. Thermal metamorphism changes;

▪ Lime stone to Marble ▪ Sandstones to Quartzite

(b) Dynamic metamorphism (pressure) occurs when Earth movements like faulting and folding exert pressure on the existing rocks and cause them to expand or contract. Dynamic metamorphism changes;

● Granites to Gneiss

(c) Thermal –dynamic metamorphism (heat and pressure) generated during mountain building, changes;

▪ Clay to Slate ▪ Coal to Graphite ▪ Shale to Schist

Metamorphic rocks cover wide areas of Nyanza, Western Rift valley, Eastern and North Eastern Provinces of Kenya, Western, Central, Eastern and Northern parts of Uganda and central parts of Tanzania.

IMPORTANCE OF METAMORPHIC ROCKS

Positive

- Source of mineral ores for extraction example kimberlite in Mwandui contains diamonds.
- Provide raw materials for the industrial use for example graphite is used to make pencil tips, kimberlite for drilling bits e.t.c
- Some metamorphic rocks like gneiss are used as grinding stones
- Some Metamorphic rocks such as quartzite are used for road surfacing, slates for roofing and stair steps e.t.c
- Source of thermal energy for domestic and industrial use fore example graphite coal from Ruhuhu valley in Tanzania.
- Marble is used for decoration and making ornaments fore example garnet extracted from gneiss and schist.
- Metamorphic rocks fore example slate are used for study purposes and research.
- Metamorphic rock out crops such as quartzite and gneiss are suitable for erecting of communication equipments such as masks, water tanks, and military defense hardware
- Metamorphic rocks form strong basement used for erecting heavy structures such as Dams, storied buildings e.t.c example Owen falls, Nalubaale and Bujjagali dams in Uganda, Kindaruma, Kamburu and Gitaru dams in Kenya.
- Slate and shale weather down into fertile soil that supports crop cultivation for example in Nyanza province in Kenya, western Uganda e.t.c.
- Tourist attraction by forming attractive scenery hence source of foreign exchange used for economic development for example granitic tors near Mwanza.
- Metamorphic rocks form underwater basins/ aquifer or artesian wells hence source of water for domestic use.

- Metamorphic rocks have widened employment base through mining and construction hence source of income used by people to raise their standards of living

- Provide raw materials for construction industry especially roads and houses

NEGATIVE EFFECTS

- Metamorphic rocks such as Gneiss weather down into poor coarse soils that discourages crop cultivation

- Some metamorphic rock out crops such as quartzite hinder construction of transport and communication networks

- Metamorphic rock out crops encourage landslides in form of rock fall, slumping and soil erosion during the wet season which discourage settlement and agriculture

- Some metamorphic rock out crops such as quartzite limit areas for settlement because of the rugged terrain for example in western Uganda and Kenya

- Some metamorphic rocks for example slate are impermeable; leading to impeded drainage that reduces the water table below hence limiting crop productivity for example Kigezi highlands, slopes of Mount Kenya, Meru and Kilimanjaro

- In case metamorphic rocks contain minerals, they may hinder mining since they are hard to break or increase the cost of mining.

- Some metamorphic rocks harbour pests such as snakes, rats and moles

QN. (a) Distinguish between igneous and metamorphic rocks

(b) Explain the importance of rocks to East Africa.

Approach

- ❖ Define igneous and metamorphic rocks
- ❖ Explain the processes of formation for each type,
- ❖ State the Major categories and examples of each rock type.
- ❖ In part (b) explain the positive and negative importance of rocks

Answer guide

- Igneous rocks are fire formed rocks.

- Main process of formation is vulcanicity- a process by which magma is injected/ pushed into and onto the earth crust from the interior of the earth by pressure to form intrusive and extrusive volcanic rocks.
- Vulcanicity is brought about by radio activity and geo-chemical reactions in the interior generating intense/ great heat and pressure; melting mantle rock into molten magma.
- Igneous rocks are formed according to the chemical composition of magma. That is; acidic, basic and intermediate for example granite, dolerite, Gabbro, diorite, olivine e.t.c
- Igneous rocks are also formed according to the physical structure that determines the rate of cooling and size of the rock crystals hence plutonic/ abyssal, hyperbyssal and volcanic rocks for example Syenite, quartz, obsidian, basalt, pumice e.t.c
- Generally Igneous rocks are crystalline in nature, contain no fossils, some are spongy and others are glassy

Impression marking08 marks

While

- Metamorphic rocks are changed rocks.
- Changes are brought about by heat (thermal), **pressure** (dynamic) or **both** (thermal dynamic) to produce new structures
- Metamorphic rocks are more compact/ harder/ resistant than those which they are derived
- Some metamorphic rocks are laminated in thin layers which easily split apart, and tend to be brittle
- Examples of metamorphic rocks include Marble, Quartzite, Gneiss, Slate, Graphite, Schist e.t.c

Impression marking07 marks

IMPORTANCE OF ROCKS TO EAST AFRICA

Positive

- Some rocks weather down into productive fertile soils that encourage crop cultivation for example volcanic and alluvial soils are supporting cultivation of vegetables, bananas, fruits e.t.c in various parts of East Africa such as Kabale
- Provide raw materials for the industrial and domestic use for example Rock salt, potash, phosphate, limestone used in making cement such as Bamburi, graphite is used to make pencil tips, kimberlite for drilling bits e.t.c
- Provide cheap building materials for example gravel and sand are used in mixing concrete; clay is used in making bricks, tiles, maxi pans, trachyte, Gabbro, dolerite are in setting foundation for heavy structures such as Dams, Bridges, storied buildings while Granite chippings are used in constructing non-skid surfacing roads.
- rocks are reservoirs for underground for example aquifers/artesian wells, springs e.t.c for domestic and industrial use
- rocks are tourist attraction by forming attractive scenery hence source of foreign exchange used for economic development for example coral reefs, caves , stalactites and stalagmites in Fort Portal , granitic tors, inselburgs e.t.c
- Source of mineral ores for extraction and mineral exports hence source of foreign exchange for example Diamonds in Mwandui, Gold, Tin, Coal, Cobalt, Tungsten, graphitize e.t.c in western Uganda, Nyanza province in Kenya e.t.c
- some rocks are source of fuel for industrial and domestic use for example coal in the Ruhuhu valley in Tanzania, petroleum and natural gas in lake Albert, geo-thermal power such as Olkaria geo- thermal power station in Kenya
- Widened employment base in the mining, construction, Art and Craft, Agriculture hence source of income to a vast population in the region.
- rocks such as sedimentary contain Coral and delta lagoons which encourage fish farming for example at the coast, swamps and river valleys in different areas.
- Rocks such as clay are used for pottery, making tiles, bricks, cups, plates, flower vases e.t.c

-Some rocks such as clay are Source of medicine “**emumbwa**” used mainly in central Uganda to cure various diseases

- igneous and metamorphic rock out crops are suitable sites for erecting communication equipments such as masks on Kololo hill, Kisoro, Mbale, Tororo and batholiths in Mubende.

- rocks provide opportunities for Education and research for example in the field of Geology, geo-thermal electricity development, mineral exploration, and Oceanography

NEGATIVE EFFECTS

- Some rocks break down into coarse infertile soils that discourage crop cultivation for example granites produce sandy soils

- Rock out crops can be a hindrance to agriculture because of the rugged terrain and hardness

Hard and exposed rocks are barriers to transport and general construction works

- Areas with porous rocks have limited surface water supplies for example volcanic rocks in Kisoro, Bunyaruguru e.t.c

- Some rocks harbour pests such as snakes, rats e.t.c

- Igneous and metamorphic rocks are very hard hence may hinder mining or increase the cost incase they contain minerals

Factual marking.....positive.....07 mks

Negative.....03mks

QN. Account for the formation of different types of rocks in East Africa.

QN. Examine the processes responsible for the formation of various rock types in East Africa.

Approach

- ❖ Define a rock
- ❖ Identify the major rock types in East Africa i.e. igneous, sedimentary and metamorphic

- ❖ Describe how each rock type is formed
- ❖ State the characteristics of each type; give example areas where they are found.

 **Refer to the questions above.**

QN. Explain the influence of igneous rocks on landform development in East Africa.

34. Examine the influence of igneous rocks on landform development in East Africa.


Approach

- ❖ Define igneous rocks,
- ❖ Explain the process of formation,
- ❖ Identify the major categories of igneous rocks,
- ❖ Explain the landforms created by volcanic rocks, hyperbyssal and plutonic

That is extrusive volcanic rocks are associated with extrusive volcanic landforms such as composite cones, ash and cinder cones, Cumulo domes, lava plateaus, calderas, craters e.t.c

While

plutonic and hyperbyssal are associated with intrusive volcanic landforms such as batholiths, sills and dykes, ridges, arenas e.t.c after being exposed by denudation forces.

 Remember to explain the formation of these landforms.