A-level Geography Paper 1 section C Revision questions

1. (a) Describe the characteristics of tropical Cyclones (13marks)

Candidates should clearly:

- Define tropical cyclones
- Locate /areas where they occur
- Mention different names of tropical cyclones
- Describe characteristics of the tropical cyclones

Guide

Definition

A tropical cyclone also known as typhoons(Asia), or hurricanes (America and West Indies), Willy-willies (Australia) or simply cyclones is an intense, low pressure wind system with a steep barometric gradient in which air circulates towards the center. They are the most dreaded and destructive winds all over- the world.

Location/areas where tropical occur

They develop or occur in the tropics between 5° and 20° North and South of the equator.

Characteristics of tropical cyclones

- They originate from within the tropical latitude usually between 5° and 20^0 North and south of Equator
- They cover a diameter of between 80-400 km
- They occur between July and October in the Northern hemisphere and January to April in the Southern Hemisphere.
- They usually originate from oceans and move towards land masses. They originate from the western sides of oceans and move towards the Eastern sides of continents.
- Tropical cyclones are associated with gusty winds. Winds blow at high speed ranging from 150km/h to 200km/hr.
- Cyclones result into thunderous and heavy rainfall full of lightening. At many times trees and animals are stroked to death by the lightening
- A combination of dense clouds, torrential rains and very fast winds reduce visibility to a few metres.
- Cyclones are associated with high temperatures of over 27^0C. These warm up the air resulting into heavy convective instability and formation of dense cumulonimbus clouds.
- Sudden appearance of calm, clear, and dry conditions with the advance of the eye and then violent conditions:

- The circulation of winds (air) is anti- clockwise direction in the Northern hemisphere and clock-wise in the southern hemisphere
- Direction of movement of cyclones is basically determined by wind direction.

(b) Explain the weather conditions associated with tropical cyclones. (12marks)

The weather conditions associated with tropical cyclones are winds, pressure, humidity, clouds and rain

- These weather conditions vary with vortices. Those in the advance vortex may be similar to those in rear vortex. But those in the eye of the storm, they are different
- Before the arrival of the storm; they are characterized by; high pressure, calm and still air, hot temperatures.

Weather conditions in the advance vortex

- There is decreasing atmospheric pressure
- Increasing wind speed and winds tend be violent i.e. surge upwards at high speed of an average of 150- 200km /hour
- Developments of dense clouds cover due to up surging of humid winds that they condense.
- Heavy rainfall, with lightning and thunder storms which may exceed 500mm in only 24 hours
- Reduced visibility due to low and dense cloud cover as well as stormy conditions
- Temperatures tend to be hot, a counting for the great evaporation and consequent humidity

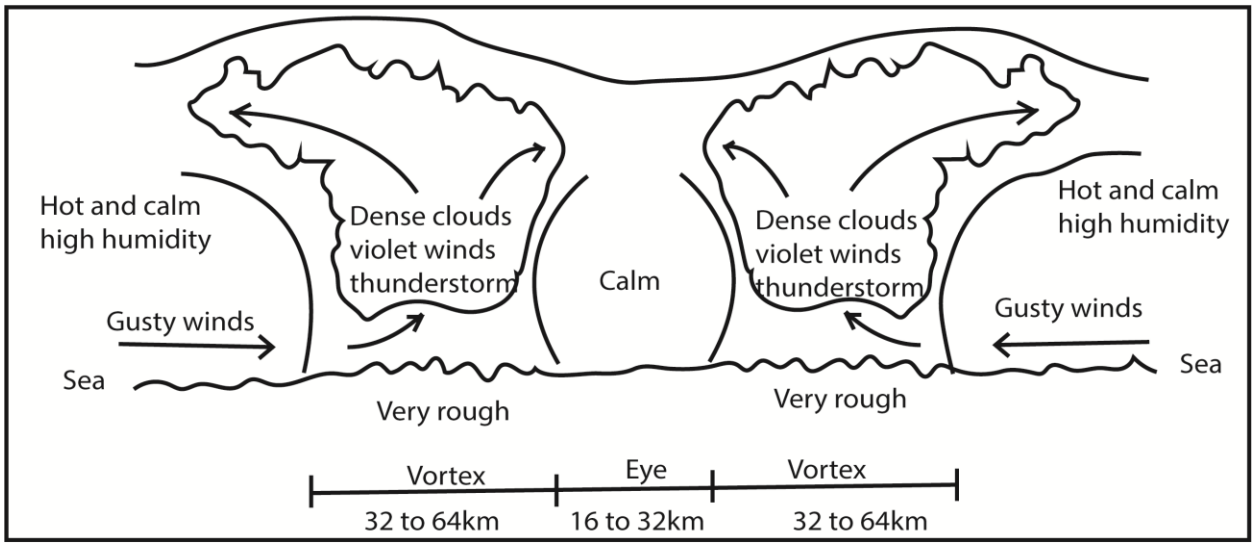
Weather conditions in the eye or the storm

- There are calm winds /light winds/stationary or still winds.
- Temperatures are generally hot
- There are bright and dry conditions
- The skies are clear with hardly any cloud

Weather conditions in the rear vortex

- These is low, but rising atmospheric pressure
- There are strong winds with high speed between 120-200.km/hr
- Winds are also marked by vertical instabilities i.e. rising air currents.
- It tends to be cloudy i.e. there are dense clouds
- There is high humidity
- There is heavy rainfall, accompanied by thunder storms

A cross sectional view of the tropical cyclone



2. Examine the influence of altitude on vegetation zonation in the highlands of East Africa. (25marks)
   - *Candidates are expected to define vegetation zonation, identify the highlands of East African then illustrate the vegetation zones on the highlands of East African.*
   - *Candidates should identify the vegetation types; describe their characteristics and explain the conditions for their existence at the given altitude*

Vegetation is a continuous plant cover.

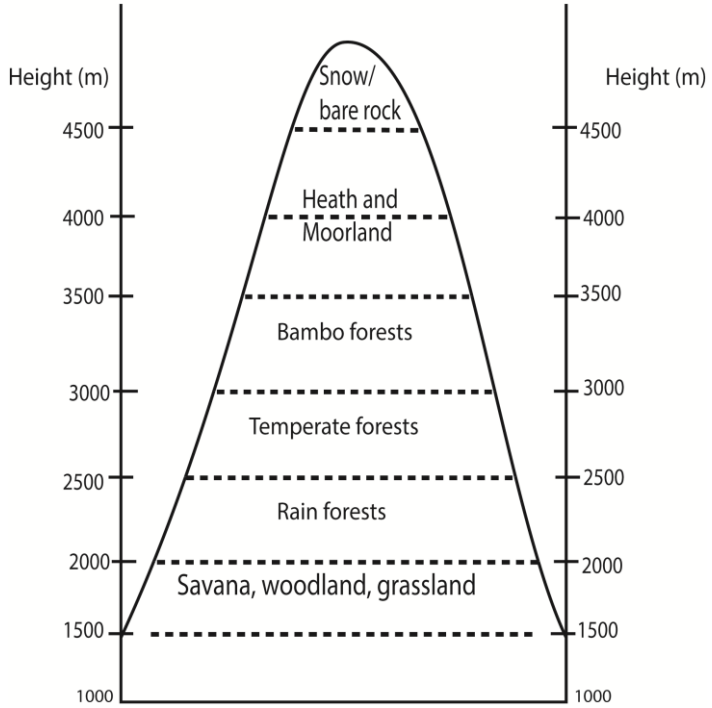
Vegetation changes from the bottom to the top of highlands in such a way that the types of vegetation can be identified.

Highlands of East Africa include Mt. Kenya, Mt. Rwenzori, Mt. Kilimanjaro, etc.

Role of altitude on vegetation zonation on highlands of East Africa

Vegetation zones on the above highlands can be illuslr8ted as follows.

Altitudes on vegetation in East Africa



Attitude influences the above vegetation zonation in the following ways:

- At the height of between 1000m-1800m above sea level, there is savanna vegetation i.e. grassland vegetation and woodland.

Savanna grassland is **characterized by:-**

- Tall grass e.g. elephant grass
- scattered trees
- grass dries during the dry season
- there is a lot of scrub, bush and thickets with stunted vegetation.

This is because at this altitude there is:

- low rain fall of less than 750mm
- low humidity of less than 40%
- hot temperatures of about 29°C
- Fairly fertile soils
- human interference like mining cultivation, settlement etc,

This is followed by savanna woodland characterized by :

- More trees which are umbrella shaped
- Trees are deciduous,
- Trees are drought resistant with swollen trunks , small leaves to control water loss etc.

This is due to the following conditions:

- moderate rain fall of about 1000mm
- Hot temperatures of about 27°- 29°C moderate humidity
- fairly fertile soils and well- drained soils

- At an altitude of between 2000m- 2500m above sea level, rain forests exist.

This is characterized by:

- tall trees of about 50m,
- evergreen trees with broad leaves
- buttress roots , climbing plants like lianas etc.

This is due to tfie following conditions:

- heavy rain fall of between 1500 -2000mm
- hot temperatures of about 27°C
- deep and fertile soils
- less human interference
- well drained soils .

- At an altitude of between 25000m-3000m above sea level; temperate forests exist although not common to all highlands of East Africa

  They are characterized by:

  - soft wood trees like pine, camphor trees
  - have small leaves
  - trees are evergreen
  - trees are conical in shape
  - needle shaped leaves etc.

  This is due to:

  - reducing rain fall totals
  - cool temperatures
  - shallow/ thin soils
  - well drained soils.

- At an altitude of 3000m 3500m above sea level, bamboo forests exist.

  These are characterized by:

  - segmented stems that are hollow
  - small tough pointed leaves, evergreen trees
  - have prop roots
  - appear in single layers etc.

  This is due to the following conditions

  - cold temperatures /cool temperatures
  - reduced rainfall
  - thin soils
  - well drained soils

- Between 3500m -4500mabove sea level. Heath and moorland exists.

  These are characterized by short grass

  - Alpine shrubs /bushes
  - Everlasting green flowering plants.
  - Plants like groundsel, lobelia

- At an altitude above 4500m above sea level mosses, lichens exist

This is due to the following conditions

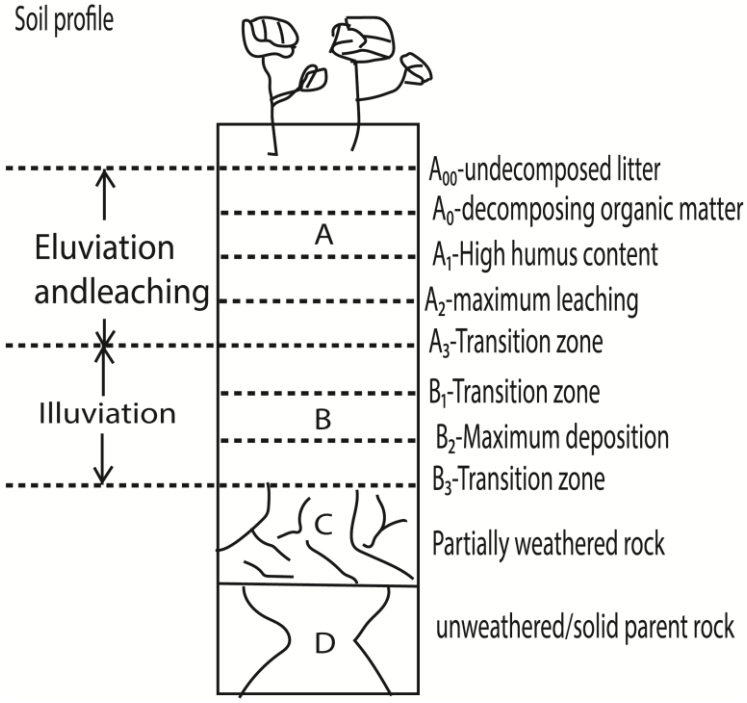
- cold/ cool temperature
- extremely low rain fall or no rain fail
- very thin soils
- Poorly drained soils due to melting of snow

3. (a) Describe the characteristics of a fully developed soil profile. (15marks)

Candidates are expected to define soil profile, draw its diagram and describe its horizons and the associated activities

Soil profile refers to the vertical arrangement /section through the soil from the surface up to the parent rock. It is composed of soil layers referred to as horizons which are differentiated in terms of color and texture.

Soil profiles differ from place to place however an ideal soil profile is composed of horizons A.B, C and D as shown below.



Horizon A.

- It's the topmost layer sometimes referred to as the top soil
- The top designated as A_{00} consists of un-decomposed litter of dead leaves and vegetation.
- It's followed by A_0 which is decomposing organic matter and A_1 which has high humus content and which gives *this* horizon its dark colour.
- It's followed by A_2 which is poor in nutrients because of the effect of leaching (removal to solution of nutrients) and eluviation (movement of material /clay particles in suspension) and which make it light coloured /bleached. It's followed by a transition zone.

Horizon B.

- It's the soil layer below horizon A and it's the zone where nutrients and materials removed from horizon A accumulate ina process known as illuviation (in washing of materials).
- It's therefore often richer in nutrients than the zone above it, and may be darker *in* colour.
- It's sometimes characterized by a hard pan caused by the accumulation of large quantities of clay and other nutrients.

Horizon C

Consists of recently/partially weathered parent material (regolith) resting on the bed rock.

Horizon D

It's the last layer of the profile and consists of solid parent rock or bedrock.

(b) Explain the factors which influence soil profile development in East Africa. (10marks)

Candidates are expected to explain me conditions for soil profile development

Nature of the parent Rock

- Hard rocks which are not easily weathered such as granite lead to formation of thin soils and poorly developed profiles while soft rocks which are easily weathered such as volcanic ash and limestone lead to the development of a deep soil profile.
- Rocks with joints and cracks are also easily broken down to produce deep/mature soil profiles as compared to those without
- Dark coloured rocks responsive to heat are also easily weathered to produce deep /well developed profiles as compared to light coloured rocks which are difficult to break up.
- Basic igneous rocks which are difficult to weather as well as some sedimentary rocks (composed of previously weathered materials are difficult to breakdown and produce shallow soils in immature/ poorly developed soil profiles.
- Permeable/ porous rocks are easily weathered by chemical processes to produce deep mature soil profile as compared to impermeable rocks which may produce shallow soil profiles etc.

Climate

- It determines the character and rate of weathering. In hot humid climates, chemical weathering occurs at a fast rate leading to the formation of deep soils and well developed/ mature soil profiles.
- In hot dry climates physical weathering predominates leading to the formation of thin/ skeletal soils/ azonal soils which do not have well developed profiles.

Vegetation.

- Thick vegetation cover decays and leads to the formation of humus which is added to horizon A of the soil profile
- Plant roots also lead to the disintegration of rocks and the formation of soil in a soil profile.
- Forested areas such as Mabira, kakamaga, Kissi in Kenya therefore tend to have deep soils in well-developed profiles while areas with thin vegetation cover have thin skeletal soils and poorly developed profiles.

Drainage

- Water logged conditions do not allow the easy development of a soil profile such *as* Lutembe wetlands, Katonga, Awoja wetlands, etc.
- Well drained areas lead to the formation of a well-developed mature soil profile such as areas around L. Victoria

Human activities

- Such as mining, quarrying, road construction etc. lead to the breakdown of rocks and the formation of deep soils characteristic of well-developed profiles e.g. mining in Tororo, cultivation around L. Victoria.

Living organisms

- In the soil such as ants, earthworms and mammals like rats and moles also break down rocks as the construct their passages underground leading to the formation of deep soils and well developed soil profiles

Time

- Ample time is required to the formation of mature, fertile and deep soils in a well-developed soil profile.

If time is short immature/ azonal soils will formed with poorly developed /shallow soil profiles.

Topography.

- Steep-s lopes are-more susceptible to soil erosion, and thin soil profile
- Gentle **slopes** - erosion is slower, there is a lot of deposition of soil eroded on steep slopes and min water percolates to assist in soil profile development leading to deep, mature soil profile.
- Valleys; lowlands; extensive deposition and percolation of water lead to deep mature soil profiles where there arc waterlogged conditions there is immature soil profile.

4. Account for the decline of savannah vegetation cover in East Africa. (25marks)

A candidate is expected to define the term savanna vegetation

Savanna vegetation lies between the tropical forest zone and desert areas.

A candidate should identify the three forms of savannah vegetation found in East Africa, their distribution and characteristics.

These are:

Tropical woodland/savannah wood land

It lies near tropical rain forests. Very common in parts of western and south western Tanzania (Miombo woodland), some parts of Northern Uganda, parts of Rift valley region like the lake George and Albert flats, parts of South and Eastern Kenya etc.

Characteristics

- Continuous cover of trees
- Trees are of moderate height (8-16m high)
- Trees are umbrella shaped
- There is dense growth of grass, bushes and shrubs (dense undergrowth).
- Trees are intermingled with xyrophytric thorny lianas, cacti and a few hardy shrubs.

Savannah grassland

This lies between woodland and dry thicket bushes. Very common in the Nyika plains of Kenya, rift valley floor of western Uganda, northern Uganda and also areas around Bukoba in Tanzania etc.

Characteristics

- The dominant vegetation are grasses that grow up to height of 1m high.
- The dominant grass species include elephant and spear grass.
- There are scattered short trees.
- The grass cover turns brown during dry seasons and green during wet seasons.

Dry bush and thicket/scrub dry savannah vegetation

Very common in Northern, Western, North-Eastern and North Western Kenya. (Turkana land), North-Eastern Uganda (Karamoja,) some parts of Ankole - Masaka corridor, parts of central Tanzania etc.

Characteristics

- Have thorny -bushy trees with scrub growing in between.
- Very short grasses more tufted with bare land between the scattered thorny bushes.
- Stunted trees with woody stem.
- Less than 8 meters in height

NB: *General characteristics that cut across all the forms of savannah vegetation include:-*

- Umbrella shaped trees
- Deciduous trees (shade off leaves during dry seasons.
- Dominant tree species include Acacia, baobabs, cacti etc.
- Trees have gnarled trunks (twisted) with thick barks.
- Trees have tinny leaves to restrict transportation.
- Trees tend to be drought resistant i.e. have thick barks, swollen trunks and long tap roots.
- Trees are fire resistant.
- Most trees develop branches close to the ground
- Trees have waxy barks and leaves

NB: A candidate should identify and describe the factors for the decline of savannah vegetation in E.A with illustrations.

Human activities which include:

- Over stocking which has led to over grazing, changing grassland to dry thicker
- Uncontrolled bush burning for fresh pasture has changed grassland to dry savannah.
- Tree cutting for building materials has destroyed woodland turning it into grassland.
- Clearing of woodland savannah vegetation to create land for cultivation and settlement has changed woodland into grassland. Very common in Kayunga district.
- Mining/quarrying activities have led to the destruction of wood land changing it into savannah grassland common in Busia, Mubende etc.
- Increased demand for fuel wood e.g. firewood and charcoal has led to wood land changing into grassland common in Nakasongola.
- Construction of transport routes like roads, railway lines has led to clearing of wood land savannah turning it into grassland.
- Industrialization in E.A has led to the destruction of savannah woodland due to a wide demand of land and firewood. E.g. Hima and Tororo cement factories have changed the woodland into grassland.

- Borehole drilling that lowers the water table bas transformed the grassland into dry savanna.

Other factors:

- Prolonged dry seasons that have led to desert conditions e.g. in Eastern Uganda, Eastern Kenya changing the grassland into dry bush and thicket
- Pests and diseases e.g. termites, caterpillars, harvester ants have destroyed savannah grassland vegetation changing into dry bush and thickets. Common in Nakasongola, Katakwi district etc.
- Natural fires during prolonged dry seasons have destroyed savannah grassland changing it into dry thickets. E.g. in Northern Kenya.
- Use of savannah grasslands as game parks has led to over grazing of grass and browsing of trees by wild animals e.g. elephants turning it into dry bush and thickets e.g. Murchison fall national park.
- Influence of the dry prevailing winds which further intensify the drying effect has led to the degeneration of grasslands to dry bush and thickets. E.g. North Eastern Kenya etc.

5. (a) Distinguish between terrestrial radiation and solar radiation (05marks)

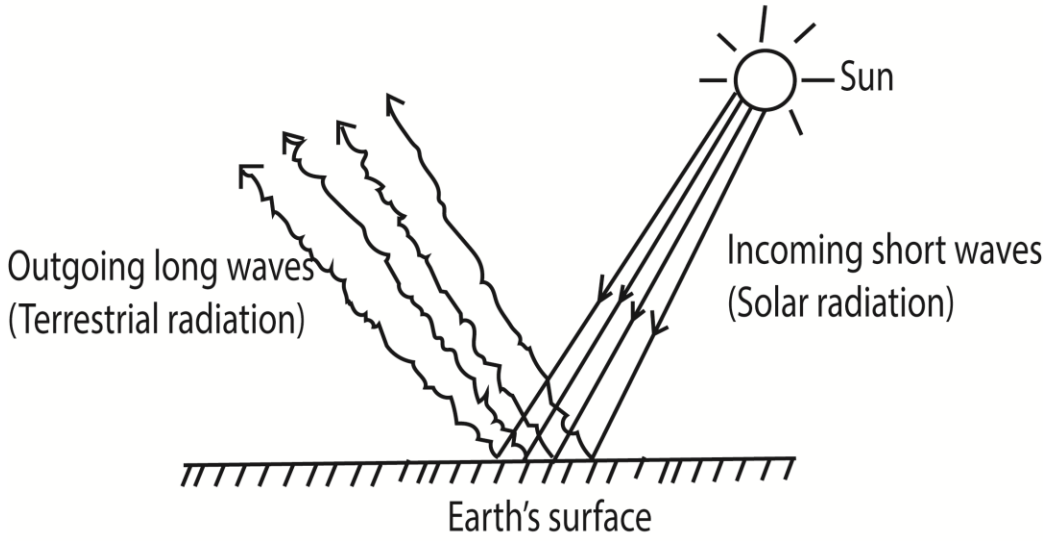
Terrestrial radiation (Thermal Radiation)

- This is the energy transmitted/transferred from the earth's surface to the atmosphere.
- Radioactive decay of isotopes at the earth's surface contributes to the terrestrial radiation.
- Terrestrial radiation is transferred in the form of long waves (electromagnetic radiation) and occurs all the time both during day and night.
- The amount of terrestrial radiation varies with the nature of the surface area and its size, e.g. water surfaces emit less radiation than land surfaces. Mountain tops also emit less than the low lands.
- The air, water vapor and clouds take up a great deal of this energy emitted by the earth thus resulting in the rising of temperature in the atmosphere which is measured and recorded at a weather stations.,
- Terrestrial radiation therefore results into a rise in the temperature of the atmosphere.

Solar radiation

- Solar radiation is the energy transmitted from the sun to the earth through the atmosphere.
- It passes in the atmosphere in form of a beam of short wave rays (solar short wave radiation).
- Solar radiation is received in a place during the day in form of light and converted into heat at the earth's surface.
- The amount of solar radiation received in a place also varies from time to time. The air, clouds and the ozone absorb some of this energy while dust particles and clouds themselves reflect and scatter the energy into space.
- The earth therefore absorbs only a fraction of the energy emitted by the sun. Albedo is used to express the ability of a surface to reflect insolation
- Is in form of visible light rays, UV rays, X-rays and gamma rays.

Diagram showing terrestrial and solar radiation



(b) Describe conditions that influence the in-coming solar radiation in an area. (20marks)

Latitude

The angular distance of a place from the equator partially determines the distance from the sun to the earth's surface. This further determines the angle of incidence at which the sun's rays fall upon the earth's surface.

Thus, there is always maximum insolation in low latitudes because the sun's rays strike the earth's surface at right angles and have a short distance to travel through the atmosphere. There is intensive heating since there is a smaller surface area per ray. The sun's rays are however less intensive towards the mid-latitudes and Polar Regions because of the long desistance they travel through the atmosphere and the oblique angle at which they strike the earth's surface.

Rotation of the earth

The rotation of the earth on its axis causes changes in solar radiation received in a place. Within the tropics the sun is overhead and higher amounts of solar radiation are received. Absence of the overhead sun at the poles, artic and sub-arctic regions reduces radiation rates.

Revolution of the earth:

This cause seasonal variation in the amount of radiation received in the different places of the global earth. More solar radiation in experienced during summer season compared to winter season.

Cloud cover:

Clouds in the atmosphere do absorb, reflect and refract radiation and this reduces the amount of solar radiation reaching the earth's surface. This implies that areas with a dense cloud cover receive less solar radiation as compared to areas with clear skies.

Aspect:

Areas in the direct path of the sun's rays and especially in the mid and high latitude areas receive more solar radiation as compared to those areas sheltered from the sun's rays e.g. in the mid-latitudes of the Northern hemisphere; the South facing slopes receive more solar radiation than North facing slopes. This is because the South facing slopes in northern hemisphers are in the direct path of the sun rays.

Humidity:

The amount of water vapor in the atmosphere may absorb or reflect solar radiation. It prevents some percentage of the solar radiation from reaching the earth's surface. Areas with less humidity e.g. arid and semi-arid regions receive more solar radiation on their surface because direct heat from the sun is received.

Impurities in the atmosphere:

Impurities in atmosphere such as smoke and dust particles tend to absorb part of the solar radiation reaching the earth's surface. This means that areas with much atmospheric impurities will receive less solar radiation as compared to clear atmospheric conditions.

Amount of the greenhouse gases (GHE)

The increase in the amount of Greenhouse gases such as CFCs in the atmosphere may affect the ozone layer. The depletion of ozone layer will trigger the occurrence of global warming- a condition that increases the amount of solar radiation. On the other hand, areas with less/ limited atmospheric Greenhouse gases have the ozone layer still intact and therefore experience less solar radiation reaching the earth's surface.

6. Discuss the causes and effects of soil erosion in East Africa (25marks)

Candidates are expected to define soil erosion as the removal/washing away of the top thin layer of soil by agents like wind, running water, glaciers etc. transported and deposited in some other place.

Candidates should identify areas in East Africa where soil erosion occurs e.g. highland areas like Kabale, Elgon, Kenya highlands. Other areas like Kondoa region in Tanzania, dry areas like Ankole - Masaka corridor, Kotido, Machakos in Kenya etc.

***Candidates are expected** to **bring 0ut** types/processes of soil erosion which include:*

- Splash erosion caused by the impact of rain drops which dislodge rock partic1es and scatter them in several directions.
- Sheet erosion which involves uniform removal of a thin layer of soil mainly on gentle slopes.
- Rill erosion which is the uneven removal of surface soil by running water in small channels/furrows as rills.
- Gulley erosion is where wide channels/grooves are created by running water. Common in areas with steep slopes and areas which receive heavy rainfall.
- Deflation by wind which removes soil material from one part of the earth's surface to another. Common in arid areas.

Candidates are expected to bring out the causes of soil erosion in which are both physical and human factors.

Physical factors include the following;

- Climate through heavy short torrential rainfall results into run off and loss of soil through surface flow.
- Prolonged but gentle rainfall leads to minimal erosion.
- Presence of strong winds especially in areas of very-low rainfall lead to wind erosion.
- Relief/topography: Steep gradients especially in highland areas accelerate the rate of soil erosion causing massive gullies.
- Gentle slopes encourage sheet erosion.
- Scanty or limited vegetation cover may also lead to soil erosion e.g. areas of limited vegetation cover experience high rates of erosion like wind erosion yet areas of thick vegetation cover, the rate of soil erosion is reduced e.g. areas of Mabira forest.
- Nature of soils also influences soil erosion. The poor porous and unconsolidated soils offer less resistance to forces of wind and running water e.g. volcanic soils, sandy soils leading to soil erosion.
- Biotic factors like harvester ants common in pastoral and semi-arid areas eat all the grasses leaving the land bare such that wind or runoff water easily carry away the soils leading to soil erosion.

The human factors include the following;

- **Deforestation** which is the clearing of forests by man reduces the protective cover of soil and encourages run off which leads to soil erosion in form of sheet, gulley etc.
- **Overgrazing/overstocking:** The large herds of animals lead to emergence of bare patches of land. Such land is easily eroded by agents of erosion especially in areas of nomadic pastoralism.
- **Bush burning** by pastoralists e.g. Bahima, Masai in Kenya, Tanzania and cultivators distort the soil binding factors. It exposes soil to agents of erosion like wind and running water thus sheet, rill and wind erosion.
- **Monoculture** which is the persistent growing of a single crop on a particular piece of land which leads to soil exhaustion. The soils are left loose and can easily be carried away by agents of erosion.
- **Up and-down slope cultivation** without using proper methods of cultivation along the slope encourages run off leading to gulley erosion on steep slopes.
- **Over cropping** which involves continuous cultivation and growing of crops on the same piece of

land for a long time without putting it to rest, leads to soil exhaustion. The soils become loose and are easily washed away by agents of erosion.

- **Mining/quarrying** accelerates the rate of soil erosion because the vegetation cover is removed and land is left bare prone to soil erosion.
- **Construction works e.g**. roads and railway construction lead to exposure of soil leaving it unprotected and exposed to harmful effects of rain drops and running water. In addition running water easily takes advantage of transport routes to create gullies paving way to soil loss.
- **Growing of poor cover crops** e.g. cotton, tobacco, leaves bare land in between the rows that easily encourage soil removal by running water.

Candidates are expected to bring out effects of soil erosion which are both positive and negative

The negative effects of soil erosion include

- Loss of soil fertility leading to unproductive soils which lead to low crop yields thus famine/hunger.
- Creates waste land/ Bad Lands with gullies that hinder transport and communication as well as mechanization.
- Wind erosion leads to water and air pollution due to sand dust.
- Flooding in broad river valleys due to siltation leading to destruction of property and lives.
- Results into limited vegetation cover because badly eroded soils are unable to support plant growth. This results into problems e.g. reduced transpiration, scarcity of pastures for animals.
- Dust, particles earned by wind are deposited on social infrastructure like roads, buildings etc. leading to increased costs of maintenance.
- The positive effects of soil erosion include:
- Alluvial soils are transported and deposited in low lands which soils are fertile and can be used for farming/ growing of crops.
- Soil erosion exposes Isenberg which attract tourists thus promote tourism industry.
- Soil erosion exposes minerals that can be mined like granites and limestone and when exported, revenue is earned.
- Removal of top soil exposes the parent rock to agents of weathering leading to formation of fresh/new soils.

NB: candidates should put a lot of emphasis on causes of soil erosion.

7. To what extent has altitude influenced the climate of East Africa? (25 marks)

'Candidates should define climate and describe the different climatic zones of East Africa

Climate is the average weather conditions of a place recorded for a long period of time i.e. 30 - 40 years.

The climatic zones of E. Africa include:-

- ***Equatorial climate***

East Africa lies astride the Equator and thus experiences the following:

- Temperatures are **generally** hot and uniform **departing** little from 27^0C.
- There is great uniformity of temperature throughout the year ranging between 25^0C-28°C.
- The diurnal range is much more marked than the seasonal one, it's small and sometimes attaining only 8^0C while the annual range barely exceeds 2°C.

- Convectional rainfall is usually received during the afternoon and evening and is often accompanied by thunderstorms and lightening for example around the L. Victoria basin at Jinja, Entebbe and Kampala in Uganda, Bukoba and Mwanza in Tanzania.
- Receives heavy and well distributed rainfall throughout the year of between 1000 - 2000mm per annum
- Characterized by two rainfall maxima with peaks in March and November (Bi-modal pattern) where the first is heavier than the other.
- There is no dear marked dry season since rainfall is received throughout the year.
- Constantly high humidity (80%) throughout the year due to high rate of evaporation.
- Characterized by a thick cloud cover throughout the year due to high rates of evaporation and condensation.
- Equatorial areas are affected by air masses that converge along the I.T.C.Z though there may be long periods of calms or light winds.
- Mainly experiences convectional type of rainfall

- **Savanna climate**

It's found between a transition zone between the equatorial belt and the hot desert.
It's experienced majorly in Central and Northern Uganda, South and Western Tanzania, coast.al areas of East Africa etc.

Characteristics of Savanna climate

- There is alternating dry and wet season as a result of the apparent movement of the sun.
- Maximum temperatures of up to 32°C are attained before the onset of the rains as a result of the dry air and cloudless skies.
- Receives moderate rainfall of over 750mm - 1000m. But the rains are unreliable from year to year.
- Temperatures range between 23°C and 27^0C.
- Because of limited cloud cover, there is a high marked diurnal temperature range (15^0C) The annual temperature range is relatively low at between 7°- 8°C.
- Receives convectional rainfall alternating with a dry winter which either the trades or stable air masses are dominant The rains are normally short-lived and torrential.
- Low humidity during the dry season and relatively high during the rainy season.

- **Montane climate**

This covers the Highland areas of East Africa: mountains - Kilimanjaro, Kenya, Mt. Abadares and Mau ranges, parts of Western Uganda (Rwenzori and Muhavura), Elgon in Eastern Uganda, Southern highlands of Tanzania, etc.

Characteristics montane climate

- High rain fall totals of over 1000mm- 1500mm per annum
- Receive orographic type of Rainfall
- Has cool temperatures of less than19°C

- **Semi- Arid and Arid climate**

Majorly found in the North-East and Nothern Kenya., North East Uganda, Central and Western Tanzania etc.

Characteristicsofsemi-AridantiArid climate

- Low/ limited rainfall totals of less than 700mm
- Unreliable rainfall throughout the year
- High temperatures of about 30°C
- Large diurnal temperature range of above 5^0C
- High evaporation rates due to hot temperatures
- Low/limited cloud cover.
- Low humidity level of less than 30%

Candidates should bring out the influence altitude on climate clearly

NB Altitude is the height above Sea level.

- Areas of high altitude e.g. the highland and mountains like Kenya. Kilimanja.ro, southern highlands of Tanzania experience cool temperature because temperatures decrease with increasing altitude due to rarefied air; while low altitude areas like the coastal regions, Rift valley floor, mountain foothills experience hot temperatures due to a lot of dust particles, water molecules and carbon dioxide that absorb heat that's radiate in the lower altitude
- The highland areas e.g. mountain tops experience low pressure as pressure reduces with increasing altitude while in low altitude areas, pressure is high because of the big column of air pressing over the Earth s surface.
- The highland areas /mountainous areas like Rwenzori mountain, Kilimanjaro mountain receive heavy rainfall (1000mm -1500mm)
- Higher plateau areas (central plateau) receive moderate rainfall ranging between 700mm –1000mm
- The lower plateau of East Africa e.g. Nyika plateau are dry i.e. receive rainfall totals of less than 700mm
- Low altitude areas experience high humidity due to high evaporation - transpiration levels and hot temperatures while high altitude areas experience low humidity levels due to cool temperatures.
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Candidate should bring out other factors

- **Prevailing winds:** North East trade winds from Arabia desert are dry and bot leading to arid conditions in Northern Kenya and North-Eastern Uganda.

  The south East trade winds that are warm and moist bring rainfall to the Northern shores of Lake Victoria and the coastal areas of East Africa.

  The warm moist Westeries bring rainfall on the western slopes of mountain Rwenzori and aridity on the lee ward side of the mountain Rwenzori (Albert flats)

- **Latitude:** East Africa lies a stride the Equator. It's location explains the generally hot temperatures experienced though out the year. It also explains the double rainfall pattern maxima in the low latitudinal zone while one single rainfall peak in the southern Tanzania is being experienced and one rainfall peak in areas of Northern Uganda because in they are relatively away from the Equator.

- **Presence of water bodies:** Large lakes e.g. Lake Victoria, Kyoga and proximity to the Indian ocean experience heavy rainfall, high humidity as opposed to those areas that are far from these big water bodies.
- **Presence of vegetation cover:** Forests maintain heavy rainfall, high humidity, and moderate temperatures throughout the yearunlike areas with scanty vegetation.
- **Human activities** have modified the East African climate through deforestation, industrial pollution, agricultural activities, over grazing etc.

8. Examine the causes and effects of tropical cyclones. (25 marks)

Candidates are expected to define the term tropical cyclones, describe the characteristics of Tropical cyclones, state the regions where they occur. Describe how they are caused and state the effects in the areas across which they occur.

A Cyclone is a low pressure wind system that moves at an averagely high speed of 250km/hr, with a diameter between 80 and 400kms

A tropical cyclone is an intense violent tropical storm that occurs in the tropics particularly along the I.T.C.Z (Inter-Tropical Convergence Zone).

- They occur in tropical oceans, mainly on the Eastern side of the continents between 5° and 20° North and South of the Equator.
- They occur between July and October in the Northern Hemisphere and January to April in the Southern Hemisphere.
- Tropical cyclones have steep pressure gradients with violent winds circulating in wards Anti clock wise direction in the Northern Hemisphere and in a clock -wise direction in the southern Hemisphere.
- Thus Tropical cyclones usually develop/originate from oceans /seas and move towards land masses. They originate on the western sides of oceans and move towards the Eastern sides of continents.

Tropical cyclones are /mown by different Names depending on where they occur

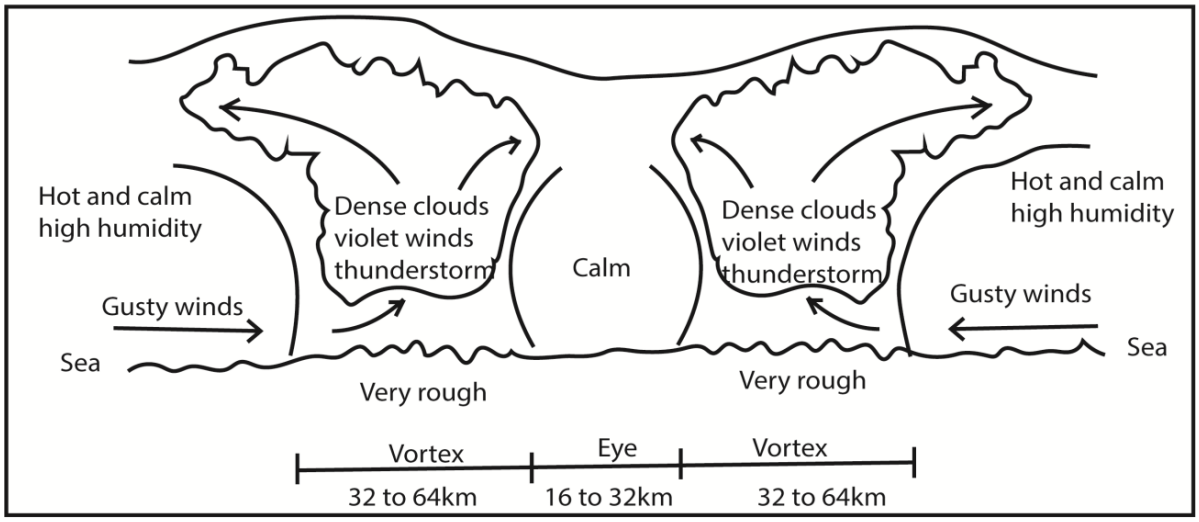
- Hurricanes in Mexico, Caribean. Seas and North Atlantic Ocean.
- Typhoons China, Japan, Philippines and Pacific Ocean.
- Willy- willies on the Eastern Australian coast.
- Tornadoes in USA
- Cyclones in the Indian ocean.·.
- Tropical cyclones occur in all tropical oceans/seas except southern Atlantic
-

Causes of Tropical cyclones

- Cyclones originate from a local heat source that is in the ocean /sea - surface.
- A wave disturbance is caused /occurs due to differences in the local temperatures and hence pressure differences over the ocean surface.
- A wind begins to cycle around the area of low pressure called the ''EYE", which is a zone of calm, dear skies and descending dry winds.
- This builds up momentum very strong and violent wind through the process of Cyclo -thesis (convective movement of violet wind) developing a towering Cumulonimbus clouds
- This is because there is a constant supply of moisture from the warm water body/ ocean (the local source of heating)
- It develops a steep barometric gradient in the "LOWS" (low latitudinal areas) giving rise to high speed winds (gusty winds)while the "EYE"' constantly develops calm weather conditions.
- Tropical cyclones therefore develop on the ocean surfaces due to maximum instability in the

atmosphere
- Tropical cyclonic movements are in the direction of the wind.

A cross sectional view of the tropical cyclone



Effects of tropical cyclones

Cyclones affect both weather and human activities.

Effects of tropical cyclone effects on weather are;

- -Cyclones are associated with gusty winds. Winds blow at high speed ranging from 116km/hr to 250km/hr. Tornadoes can reach speeds of500km/hr; such winds are very destructive.
- Cyclones result into thunderous and heavy rainfall full of lightening. At times trees and animals are stroked to death by the lightening
- A combination of dense clouds, torrential rains and very fast winds reduce visibility to a few metres.
- Cyclones are associated with high temperatures of over 27° C. These warm up the air resulting into heavy convective instability and formation of dense cumulonimbus clouds.
- Sudden appearance of calm, clear, and dry conditions with the advance of the eye and then violent conditions
- They are characterized by high humidity and temperatures.

Cyclones affect human activities and coastal areas in tile following ways;

- -In India & New Orleans & Bangladesh Violent winds blow up settlements, ships and most of the infrastructure. This leads to loss of shelter, total power blackout due to destruction of electricity lines and destruction of the transport infrastructure.
- Violent winds lead to loss of livestock, crops and humans are killed by flying debris or suffocated to death by the gusty winds. Breathing is very hard under such winds.
- Cyclones result into flooding of coastal islands and towns. In U.SA, New Orleans and Florida are usually flooded. In India coastal towns flood and slums are hit most.
- Cyclones are normally followed by an outbreak of water borne diseases liked diarrhea, cholera etc. this is a result of floods. Such diseases are common in India, Bangladesh and New Orleans in USA where the Katarina cyclone caused havoc in 2010
- Cyclones lead to food shortages which may result into famine. This is a result of the destruction of crops, animals and the entire social and economic infrastructure.
- Disturbance of shipping and aviation travel industry because of the gusty winds, torrential rains

and poor visibility.
- Land degradation due to massive erosion and mass wasting resulting from torrential rains especially near the coast.
- Salination of coastal lands because of the periodic sea incursions thus affecting crop cultivation.
- They destroy vegetation by uprooting trees and braking branches thus destroying leisure parks,along beaches

9. (a) Describe the characteristics of semi-desert vegetation. (10 marks)

Candidates are expected to describe the characteristics of semi-desert vegetation as follows ;

- The vegetation has bush thorny trees with scrubs growing in between.
- Many plant have deep /tap penetrating roots that enables them to draw water from underground
- Many plants have tiny thorny leaves that help them to reduce the rate of water loss e.g. cacti, acacia etc. and to deter animals which may wish to eat them
- Some trees have swollen trunks in which they store water for use during the long dry seasons e.g. Baobab.
- Some desert plants particularly those in the cactus family have stems that swell up with water only to contract later as moisture is slowly lost through transpiration.
- In some desert plants e.g. the cacti transpiration takes place through the stems but is reduced by the stomata closing during the day and opening it at night to control loss of water.
- Stems of some desert plants e.g. Australian eucalyptus have a thick, waxy cuticle / bark to control loss of water through transpiration.
- Plants such as creosote bush, desert holly, sage and saltbush have roots that spread out over wide areas near to the surface to take advantage of any rain or dew to support their growth due to limited rainfall.

- Some desert / semi-desert plants for example the cactus in the Sahara, Namib desert have very long roots that may exceed 15metres deep to tap underground water supplies.
- Desert plants such as cactus, desert holly and creosote are widely spaced to avoid congestion and competition for water.
- Some desert plants e.g. the cactus have bulbous roots for storing water for use during the long periods of drought which may be more than 10 metres.
- Seeds of deserts plants have a thick case that protects the inner centre. This enables them lie dormant for months or even several years until the next rainfall. The thick case provides protection against pests and animals.
- Some desert plants e.g. salt bush in the Sahara and Namib Desert are halophytic and can survive in salty depressions while others like date palm survive where water table is near enough to the surface to form Oases.
- Many of them can complete their life cycles in two or three weeks during periods of short lived rains. These are termed as ephemerals. An occasional downpour produces a short lived burst of plants grown where shrubs and herbaceous plants like sunflower primroses, poppies, lupines exotically for a brief season and a carpet of grass springs up, soon to be scorched by the heat.

(b) Explain the conditions that have influenced the distribution of semi - desert vegetation in East Africa. (15 marks)

Conditions favoring growth of semi-desert I/desert vegetation

- **Climate;** Hot temperature above 30°C with dry winds and high rates of evaporation favour growth of short grass and scattered trees.
  - Prevalence of rainfall ranging from 250mm- 625mm which is unreliable that cannot support luxuriant vegetation cover. Under such circumstances plants have a short cycle of germination, leafing, flowering and fruiting as well as seed dispersal.
  - Very low level of humidity due to absence of big water surfaces have led to the growth of drought resistant vegetation.

- **Soil/edaphic factors:** Desert vegetation grow in alkaline sandy soils with limited moisture and humus content for example in Chalbi desert of Kenya, parts of Eastern Somalia, Kalahari and Sahara desert. Infertile, sandy, skeletal soils with limited humus content discourage the growth of luxuriant vegetation thus the growth of semi desert vegetation in areas like Albert flats etc. Highly porous soils with a low moisture retention capacity in North Eastern Uganda and N. Western Kenya have encouraged growth or trees and grass clusters
- **Drainage:** In Oases areas, date palms and other relatively luxuriant plants such as creosote bush grow for example in the Quattara depression in Egypt. In areas of salty depressions halophytic plants such as Salt bushes grow. In areas f extreme limited surface drainage dwarf prickly, small brittle heath-like plants grow in scattered haphazard patterns.
- **Relief:** This is the general appearance of the landscape. Desert/ Semi-desert vegetation generally grow in areas of low-lying relief (with less than 1200m above sea level) with hot temperatures and limited rainfall such as much of the Sahara or in the leeward side of high mountains sue as the Atlas mountains in Algeria, Tunisia, growth of stunted short bushes.

The lee ward *side* of mountain has led to growth of drought resistant trees in Turkana land, Kotido due to limited rain fall, humidity and hot temperatures.

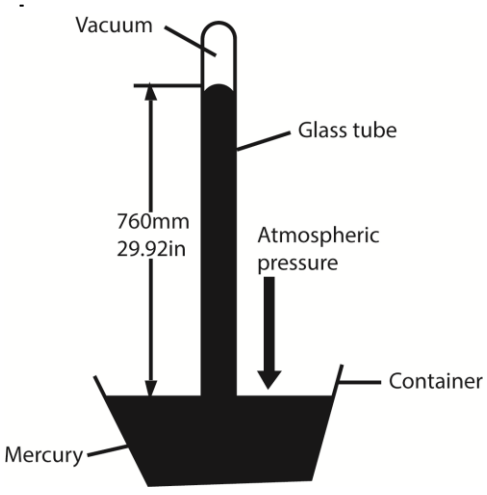
- **Altitude**: This is the height *of* land above sea level. Much of the hot desert vegetation grow in areas of low altitude not exceeding 1200m above sea level for example the Namib desert near all the Atlantic ocean, Sahara desert in Northern Africa near the Atlantic ocean and the Nod and Mediterranean seas (near sea level). Such areas are characterized by hot temperatures which lead to growth of drought resistant vegetation.
- **Biotic factor** such as the influence of wild animals, camels, pests such as locust, caterpillars affect growth of luxuriant desert vegetation. Locusts destroy much of the vegetation in the Sahara desert leaving only a few species such as the thorny cactus and dried-Like tree stumps surviving.
- **Human activities** have influenced growth of desert vegetation both positively and negatively. Positively conservation policies of desert vegetation in countries like Libya, Chad and Egypt have encouraged its growth. In contrast, activities such as settlement and cultivation along the Nile valley in Egypt, Quattara Oases, Okavarngo basin in Namib Desert have led to deterioration/ destruction of desert vegetation.

10. (a) Describe howatmospheric pressure is measured and recoded at a weather station (10marks)
Candidates should define atmospheric pressure

Atmospheric pressure is the force/weight of air exerted per unit over the earth's surface. This weight of air is the vertical column exerted from the upper limit of the atmosphere to the Earth's surface which is approximately l.034kg/cm^3 over the sea level.

Atmospheric pressure *is* measured by using a mercury barometer. OR an aneroid barometer

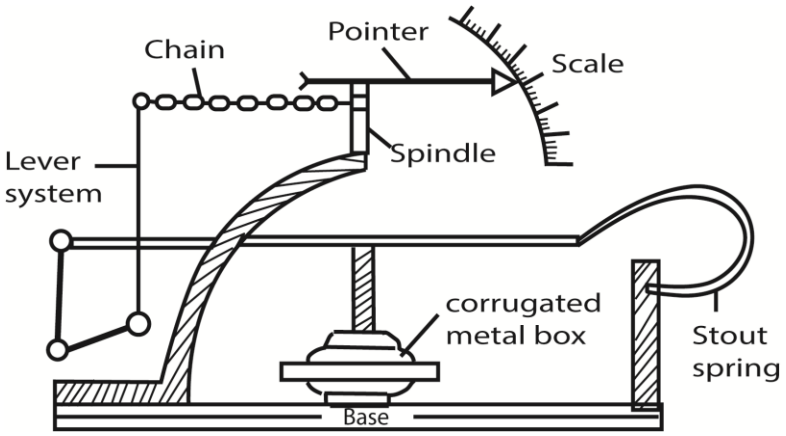
A mercury barometer
A mercury barometer consists of a *glass* tube which is inverted over a bowl of mercury.



- The glass tube is marked in mm and it's illustrated above

- Air has weight and therefore exerts pressure on the Earth's surface; it pushes the surface of mercury and cause mercury to rise up in a glass tube.
- When atmospheric pressure falls, the force on the mercury surface reduced and mercury is forced to flow out of the glass tube leading the height of mercury column to fall.
- The higher the length of mercury column in glass tube, the higher the atmospheric pressure.
- It is expressed in millibars where 750mm of mercury corresponds to 1000 millibars (mbs)

OR **Aneroid barometer**



- An aneroid barometer has a corrugated metal box that expands and contracts, depending on the atmospheric pressure around it.
- This is amplified by the lever system to give a reading on the scale that may be calibrated in bars, Pascal or atmospheres

(b) Explain the factors that influence the atmospheric pressure of a place.(15marks)

- **Temperature differences**: An increase in temperature leads to a fall in pressure & a decrease in temperature leads to rise in pressure. For example equatorial region which have hot temperatures due to the sun's effect have low pressure. This is because hot air expands leading to reduction of its mass per unit area.
- Altitude: This is the height of land above the sea level. Air pressure is created due to weight of air therefore sea level has highest air pressure. Moving above sea level air pressure decrease because the proportion of lighter gases (like nitrogen) leading to the decrease in air density decreases. For example air pressure at Mombasa (sea Level is greater than at higher altitude like Kampala or Kasese.
- **Moisture in Air (Humidity):** As humidity increases pressure decreases because water vapor is less dense than dry air at the same temperature; the addition of water vapor decreases the overall density of the air and lowers its pressure.
- **Gravitation of Earth:** Atmosphere glues around the Earth due to its gravitation. The intensity of gravitational pull decreases as we get away from core of Earth. Another fact is that as Earth rotates round its axis, average distance of Polar Regions and equatorial regions varies from the core of Earth. For example Polar Regions are nearer to core of the Earth as compared to Equatorial regions and hence have higher air pressure.

- **Rotation of Earth:** Rotation of Earth produces centrifugal force which has more effect in Equatorial region while lesser effect on Polar Regions. Centrifugal force pushes things away from its core. Same is the effect on air pressure which results into lesser pressure in Equatorial regions as compared to that in Polar Regions.
- **Latitudinal variation**: Along the equator there is much more heat and therefore low pressure, towards the pole temperature decreases & therefore there is high pressure.

Nature of the Earth's surface/ land & Sea breeze. During day the land heats up faster than water. Hot temperature over land leads to low pressure. During night the land lose its heart very rapidly while the sea is warmer. This creates hot temperature on the sea hence low pressure.

Time of day. At noon air pressure decreases due to an increase in temperature. During the evening and night temperature drop leading to an increase in atmospheric pressure.

Motion or stability of the air. At the same temperature and vapour concentration, an air mass moving on the surface will exert less pressure than an air mass with similar charateristics but which is simply rests on the surface..

Seasonal changes: During winter its cold and so pressure rise and summer temperature are hot and so pressure reduces.

11. (a) Describe the characteristics of tropical rain forests. (10marks)

Tropical rain forests are the natural forests within the tropics. They can be classified into Mangrove, Riverine, Montane and Tropical low land forests.

Characteristics of tropical rain forests

- Trees are tall up to a height of 60m and above due to competition for sun light.
- Trees have/ are of hard wood nature/ species e.g. mvule, musizi, Mahogany, Teak, Rose wood, Red heart, Iron wood etc. due to long gestation period.
- Trees are ever green, shading off leaves at different intervals throughout the year because of constant supply of rainfall hence continuous growth.
- Trees form a dense canopy which is usually in three layers /tiers i.e. the bottom layer, middle and top layers due to growth of trees at different intervals or age and sprawl to form canopies.
- Tropical rain forests have little or no under growth due to thick canopies which prevent sunlight from reaching the ground.
- Trees have broad leaves that allow evaporation to get rid of excess water.
- There are a variety of tree species i.e. trees grow in mixed stands, growing abundantly due to ample water supply e.g. palms, mvule, Mahogany etc.
- There are numerous climbing trees like Lianas, epiphytes etc. that get support from the tall and huge trees. Trees have along gestation period/take long to mature i.e. 60 years and above due to their great height and the size.
- Trees have straight and big trunks due to ample supply of water.
- Most trees have buttress roots that give support to the tall and huge trees etc.

(b) Expplain the conditionsa which favoured the growth of tropical rain forests in Africa

Candidates should identify areas in Africa where tropical rainforests are found e.g. DR Congo, Gabon, Cameroon, Nigeria, Ghana, Uganda, C.A.R, Kenya etc. Should not only discuss East Africa but the entire African continent

Candidates should then explain the conditions which have favored the growth of tropical rainforests in Africa.

- **Climate:** Tropical rain forests require heavy rainfall which is well distributed throughout the year of over 1500mm e.g. The Congo Basin forests, Mabira forests etc.

- They also require hot temperature ranging between 22°C- 28°C which increase humidity in air, hence rainfall for tree growth.
- Existence of high humidity level of about 80%. This promotes luxuriant tree growth
- Presence of adequate sunlight for plants/trees to manufacture to their food through photosynthesis which promotes plant growth.

- **Soils:** Tropical rain forests require deep fertile soils along mountain slopes, gently sloping areas, alluvial soils that exist along river valleys e.g. along river Niger in Nigeria, R Congo promotes riverine forests and along lake shore such as L. Victoria.

- **Relief**: Tropical rain forests are found along slopes of mountains e.g. Rwenzori forest on Mt Rwenzori and plateaus.

- Low lands e.g. along the East African coast where there are Mangrove forests and along river valleys favor riverine forests such as Katonga forest.

- **Drainage.** Tropical rain forest require well drained areas especially along the gentle slopes of mountains e.g. Mt Kenya, Marsabit and low laying areas such as Buikwe where Mabira forest have grown.

- Water logged areas especially the East African Coast have favored the growth of mangrove ever green forests at Mombasa, and Dare es Salam and along the West African coast of Nigeria, Ghana.

- **Altitude**: Tropical rainforests are found at a low altitude of between 1000m - 2000m above sea level on slopes of mountain/ highlands e.g. Mt Kilimanjaro, M t Kenya and low laying areas where forests such as the Congo basin forests, Budongo have grown.
- **Government policy** of gazatting/ conservation of forest reserves has led to the growth of tropical rain forest e.g. Mt. Kei forest reserve in Uganda etc.

12. To what extent is the nature of parent rock responsible for soil formation in East Africa? (25marks0

    Candidates are expected to define soil i.e. thin loose surface layer of unconsolidated material on earth's surface which supports plant growth. It is made up of weathered rock materials, humus, water air and living organism.
    Candidates should bring out types of soil i.e. clay soil, alluvial soils, peat soils, lateritic soil etc.

The role of parent rock to the formation of soil

The parent rock forms the basis upon which soil formation process such as weathering, leaching, alleviations, illuviation etc. operate. Different parent rocks like igneous, sedimentary and metamorphic rocks give rise to different types of soil depending on rock characteristics like permeability/porosity, mineral composition, jointing, color, texture, etc.

- **Hard rocks** which are not easily weathered such as granite lead to formation of thin soils and poorly developed profiles while soft rocks which are easily weathered such as volcanic ash and limestone lead to the development of a deep soil profile.
- **Rocks with joints and cracks** are also easily broken down to produce deep/mature soil profiles as compared to those without
- **Dark coloured rocks** responsive to heat are also easily weathered to produce deep /well developed profiles as compared to light coloured rocks which are difficult to break up.
- **Basic igneous rocks** which are difficult to weather as well as some sedimentary rocks (composed of previously weathered materials are difficult to breakdown and produce shallow soils in immature/ poorly developed soil profiles.
- **Permeable/ porous rocks** are easily weathered by chemical processes to produce deep mature soil profile as compared to impermeable rocks which may produce shallow soil profiles etc.

However there are other factors that are responsible for soil formation In East Africa and these are;

- **CLIMATE:** Climate influences soil formation through the elements of rainfall and temperature that influence decomposition and breaking of rock to produce soils. This is under different climatic conditions.
  - In hot and wet/ humid areas the heavy rainfall and hot temperatures promote chemical weathering, leaching, eluviation etc. leading to deep mature soils e.g. around the L. Victoria basin including Jinja, Lugazi, Buikwe etc.
  - In Arid and Semi - arid areas such as Turkana in northern Kenya the hot temperatures lead to skeletal, immature soils because of limited decomposition.
  - Alternating wet and dry conditions in Savanna / Tropical climate favor physical and chemical weathering leading to fairly deep, Mature soils e.g. in central Kenya, Kyoga basin such as Lira, Nakasongola districts in Uganda.
- **RELIEF/TOPOGRAPHY:**
  - On steep slopes, erosion of weathered materials is dominant leading to shallow and immature soils e.g. along the steep slopes of Mt Kilimanjaro. However on steep slopes erosion exposes the rock to further weathering and soil formation.
  - On gentle slopes some deposition takes place, also war.er percolates leading to chemical weathering, Leaching, eluviation etc. that lead to development of deep, mature, well drained soils e.g. around Kericho highlands in Kenya and Kilimanjaro gentle slopes in Tanzania.
  - In valleys and lowlands extensive deposition takes place leading to deep mature soils e.g. in the low lands of Kigezi highlands/ Kabale, K.isoro.
  - However m lowlands with impeded drainage there is partial decomposition of organic matter **leading** to peat soils for example around Mpologoma swamps and Ssezibwa swamps..
    . .
- LIVING **ORGANISMS:**
  - In areas of thick vegetation cover the roots lead to disintegration of rock into soil particles. Also the thick vegetation cover lead to a thick humus layer. This leads to deep, mature and fertile soils e.g. around Kakamega forest in Kenya, Mabira and Budongo in Uganda.
  - Man through activities like ploughing, mining and construction lead to breaking of rock into soil particles leading to soil formation.
  - Bacteria, worms and other living organisms decompose organic matter to form humus which leads to deep, mature fertile soils.
  - Burrowing animals e.g. rats, moles, worms break the rock into soil particles leading to soil formation.
- **TIME:**
  - The longer, the duration of interaction of soil formation processes the more developed, deep and mature are the soils. The shor.er the period of interaction of soil formation processes the less developed and immature are the soils.

In conclusion, to a bigger extent the nature of the parent rock is responsible for the soil formation in East Africa though does not operate in isolation of other factors.

13. (a) Differentiate between annual range of temperature and diurnal range of temperature. *(05 marks)*

Candidates are expected to differentiate between annual range of temperature and diurnal range of temperature.

Annual range of temperature is the difference between the highest and the lowest mean monthly temperature in a year.

Or: It is the difference between the temperatures of the hottest month and the coolest month of the year.

Whereas,

Diurnal range of temperature is the difference between the highest and the lowest temperature for the day.

(b) Account for the variations in the temperature experienced in different areas of East Africa. *(20marks)*

Candidates are expected to define temperature, should give brief description of variations in the temperature experienced in different areas of East Africa with specific examples and then explain factors for the variations in temperature.

- **Temperature** is the amount of sensible heat or cold within the atmosphere. The main source of heat affecting the atmosphere and the earth's surface is the solar radiation. This culminates into differences into temperatures.

- **Different areas in East Africa experience different temperatures as shown below,**
  - Some areas experience extremely hot temperatures of over 30°C. These include, the Northern Kenya, North Eastern Uganda, Rift Valley areas of East Africa, Costal areas of East Africa etc.
  - Areas in East Africa with very low/ cool temperatures include, the highlands/ mountainous areas e.g. Kenya highlands, Kigezi highlands, Mt. Kilimanjaro, Mt. Rwenzori, Meru, Elgon etc.
  - Other areas of East Africa experience moderate temperatures of 15-20° C e.g. the central plateau of East Africa

- **Several factors contribute to variations in temperature of East Africa and these include,**
  - **Altitude:** It refers to height of land above sea level. Temperatures tend to drop as altitude increases by approx. 6°C for every l000m of ascent For this reason mountains like Kilimanjaro have low temperatures and are permanently snow capped at the top (the higher one goes the cooler it becomes).
  - **Latitude:** Distance from the equator; Temperatures reduce one moves away from the tropics towards the Polar Regions. Given that East Africa is a stride the equator, temperatures are more less similar so no big variations.
  - **Prevailing winds**: these have a modifying effect on temperatures over the lands within

which they blow depending on their origin and fetch. The North Eastern trade wind bring hot conditions in Turkana land and North Eastern Uganda since they originate from the Arabian Desert. However the South Eastern trade winds and westeries bring moderate temperatures around the central plateau of East Africa.

- **Continentality:** This is the distance from the sea. It is responsible for the variations of temperatures between places near the coast and those in the interior. The South Eastern Trade winds transfer warmer conditions to the coastal areas of East Africa. This explains why Mombasa is relatively warmer than the interior of East Africa.
- **Vegetation cover.** Thick vegetation cover has a modifying effect on the temperatures of the surrounding areas through evapo-transpiration. Forested areas have high humidity and relatively low temperatures e.g. areas around Mabira forests, Bundongo etc.
- **Ocean currents** also determine variations in temperatures in East Africa. Warm ocean currents e.g. warm Mozambique current raises the temperature of winds blowing over it. Therefore areas bordered by warm ocean currents e.g. Mombasa, Mtwara, Dar –es-salam experience hotter temperatures.
- **Cloud cover** also determines the temperature variations in East Africa. Thick clouds control the amount of solar insolation reaching the earth's surface and at the same time trap the escaping radiation from the earth. For this reason, regions with thick. cloud cover like Lake Victoria basin experience small diurnal temperature range than Turkana land with limited cloud cover.
- **Relief**. In highlands, the cold dense air drains down wards filling valleys with cold air at night displacing the warm air in the valleys causing temperature inversion. This is common in Kigezi highlands, Kisoro, etc.
- **Nature of surface/ Albedo**: water bodies like ocean, seas, lakes are bright and reflects much of thee heat back to the atmosphere leading to cool temperatures over water surfaces during day.
- **Human activities** e.g. deforestation, industrialization, bush burning etc. leading to destruction of the ozone layer leading to increase in temperatures. On the other hand afforestation reduces carbon concentration in the atmosphere since plants absorb carbon dioxide leading to moderate temperatu.res.

14. Examine the causes and effects of land and sea breezes in East Africa.(25marks)

Candidates are expected to:

- Define land and sea breezes.
- Identify the areas where they occur in East Africa.
- Factors of land and sea breezes.
- Causes and their effects ·
- Illustrate their answers.

Land and sea breezes are local winds which occur in areas where land is lying in close proximity to a water body e.g. around the shores of Lake Victoria and the coastal areas of East Africa. Land breeze blows from land to sea/lake and occurs during the night while sea breeze blows from the sea to the land and occurs during the day.

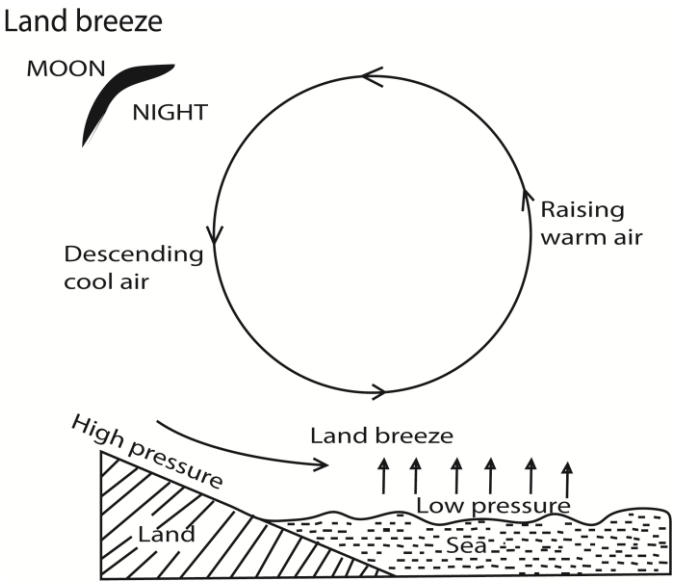
Factors of land and sea breezes

- Differences in specific heat capacity of land and sea.

- Mobility of water compared to solid land.
- Heat transmission through transparent water as opposed to opaque land.
- Differences in reflecting capacity of land and water.

Causes of land breeze (occurs during the night)

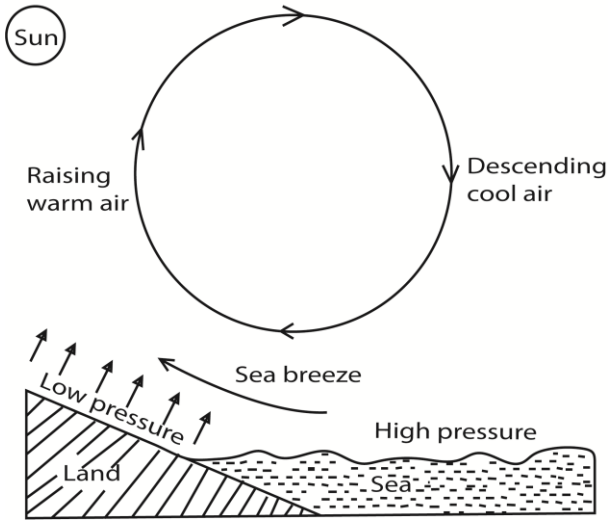
- Loss of terrestrial radiation at coastlands at night. Land cools faster than the seal water which retain much of its heat
- Water loses heat more slowly such that the air above it warms up.
- Low pressure is created over the warm sea and high pressure over the cold land.
- Cool air from the land under high pressure blows towards the sea to replace the rising air hence land breeze.



Causes of the sea breeze (occurs during du day).

- There is intense heating of land areas during the day.
- Land warms faster than the sea hence temperatures are high over the land and colder over the sea.
- Convective currents of warm air rise over the land and create low pressure at the surface.
- Cool and moist winds i.e. from sea replace the rising air i.e. from high pressure to low pressure on land.

Sea breeze



Effects of land breeze

- Lowering the temperature over the sea.
- This may lead to formation of foggy or misty conditions over the lake/sea which results in poor visibility.
- Dry condition on land because little or no rainfall is received
- It results into violent thunderstorm. Offshore/rainfall.
- It also results into high humidity in the sea/lake.
- There is also formation of cloud cover over the sea.

Effects of sea breeze.

- Lowering of temperature on land especially in the afternoons which results in poor visibility.
- On shore convectional rainfall is formed which is usually received in afternoons.
- It results into violent thunderstorm.
- It also results into high humidity on land.
- There is also formatio of cloud cover over land.

15. (a) Describe the characteristics of mangrove forest vegetation. (10marks)

The characteristics of Mangrove forests include:

- The trees are evergreen because of high rainfall received throughout the year.
- Trees have broad leaves to get rid of excess water.
- Trees have aeria1/silt roots to support the stout trunks and keep them grow above the water level for respiration.
- They are hard wood trees because they take long to mature.
- Trees have dense bushy stands because of hot- wet conditions and ample supplies of nutrients.
- Have belts of various species that grow parallel to the shore.
- Have grey leathery foliage that appears to float on the water.
- Trees have short stumpy trunks in low tidal waters.
- Trees have medium height due to ample supply of sunlight

(b) Explain the conditions that have influenced the distribution of mangrove forests in East Africa (15 marks)

Candidates are expected to identify areas in East Africa, with Mangrove forests/vegetation i.e. Areas along the coast of East Africa between 5^0N and 5^0S of equator, around Mombasa, Dar-es-Salaam, Tanga, Lamu . the lower valleys of Rufigi and Ruvuma etc.

The conditions include:

- **Climate.** Heavy rainfall of over l000mm, high humidity levels of over 80% and hot temperatures of 24°C- 30°C leads to the growth of luxuriant mangrove forest.
- **Soils.** They grow in impervious clay soils, peat soils. Mud flat alluvial soils, deep saline/coral soil facilitate, luxuriant growth of mangrove forests.
- **Altitude**. Found at low altitude of below 200m which is associated with high temperatures and heavy rain fall
- **Relief** Found in coastal lowlands and broad valleys/creeks which favours accumulation of silt, mud, alluvial soils that support mangrove forests.
- **Drainage**. Mangrove forests grow in poorly drained/soggy/water-logged and saline water conditions.
- **Presence of barrier reefs/coral reefs** along the coast that prevent the alluvial soils from being swept away by wave action.
- **Presence of low Tidal range of water** that creates marshy conditions which favour the growth of mangrove forests.
- **Government policy**. Governments have gazetted mangrove forests leading to their continuous existence (conservation).

However on the other hand, man is encroaching on the mangrove forests for extracting building materials/poles cultivation of water loving crops etc. hence reducing the area covered by these forests.

16. (a) Distinguish between Azonal and Intrazonal soil (05marks)

Azonal soils are young soils without a clear soil profile.

- They are soils that have not been exposed to soil forming processes for a long time therefore they are immature.
- They are skeletal soils with shallow profiles and show similar characteristics of the original parent rock.
- Azonal soils are divided into two groups i.e. Lithosols and Regosols - derived form unconsolidated materials such as aluminum, sand, volcanic ash etc.

Example of Azonal soils include:

- Scree soils/ mountain soils found on mountain slopes formed from accumulation of weathered angular rock fragments.
- Alluvial soils – river borne materials e.g. silt, mud etc.
- Marine soils - as a result of wave action e.g. mud, clay etc.
- Glacial soils - due to glacial action e.g. till soils, fluvio-glacial soils etc.
- Windblown soils (Aeolin) e.g. loess, dune *soils* etc.
- Volcanic soils - recent Lava and ash soils.

While

Intrazonal soils **are** soils that occur where special conditions of parent rock or drainage exert a stronger influence. E.g large amounts of salts, presence of much water etc.

Examples of Intrazonal soils Include

- Saline soils (Halomorphic soils) -- have high levels of soluble salts such as solonchaks and solonetz soils.
- Peat soils (Hydromorphic soils)- occur in water logged conditions e.g. meadow soils, gley soils etc.
- Calcareous soils (Calcimorphic soils)- formed from limestone parent rock e.g. Rendzina and Terra rossa.

(b) Account for the formation of Azonal soil in East Africa. (20marks)

- Climate.
  - Heavy rainfall leads to flooding and sea level changes causing formation of alluvial soils, marine soils etc.
  - Heavy rainfall also leads to severe soil erosion in high lands and deposition in lowlands forming soils such as silt, mud etc.
  - Temperature changes in high lands/mountains lead to processes such as frost shattering causing formation of mountain soils/ scree soil.
  - Differences in pressure in Deserts/semi-desert areas causes strong winds that facilitate wind erosion and formation of Loess soils.

- Rock structure/parent rock.
  - Loose/light soils are easily blown, transported and deposited to form wind-blown soils.
  - Soft rocks are easily eroded by agents such as rivers, glaciers etc. to form alluvial soils, till soils etc.
  - Highly jointed rocks in highlands are easily weathered to form soils such as scree soils.
  - Dark Coloured rocks a.-e easily weathered to form scree soils.
- Volcanic activity produces volcanic soil such as Lava; Ash/cindersetc.
- Erosion/transportation and deposition by agents such as:
  - Wind which leads to formation of Loess soils.
  - Wave action leading to formation of marine soils
  - Glacial action leading to formation of till soils etc.
  - River action leading to formation of silt, mud etc.

- Relief.
  - Areas of steep slopes in highland areas promote weathering/ mass wasting/erosion to form scree soils.
  - Valleys/lowlands encourage deposition of materials to form soils such as silt, mud etc.

- Time
  - Azorial soils are young soils that have been exposed to soil forming processes for a short time.

17. (a) What is ocean current? (10marks)
(b) Explain theinfluence of ocean currents on the climate of Africa. (15marks)

18. Describe the processes leading to the formation of the following:
    (a) Fog (08marks)
    (b) Hail (08marks)
    (c) orographic rainfall (09marks)
19. To what extent has altitude influenced vegetation distribution in East Africa? (25 marks)
20. With reference to specific examples, account for the formation of the different soil types in East Africa. (25 marks)