Subject ..... Paper code ....(1)..... Personal Number 2000 - 2020

P250/1 PHYSICAL GEOGRAPHY

U.A.C.E 2020 MARKING GUIDE

This paper consists of section A, B and C.
Section A is factually marked.
Section B and C are marked by impression.
Read thoroughly through all the candidates' work and make comments before giving an award. Follow the guidelines below for impression marking.

0 - totally irrelevant.
1 - 8 - Rudimentary facts / a few scattered facts.
9 - 11 - O' level answer.
12 - 14 - Basic A' level answer.
15 - 17 - Good but not outstanding.
18 - 20 - Very good answer.
21 - 25 - Excellent answer.

NB 1. Avoid unnecessary crossing of the candidates' work.
2. When in doubt consult your Team Leader.

Scanned with CamScanner

Subject ..... Paper code ..... Personal Number

SECTION A (2)

1 a)(i) The natural feature found at grid reference 240564 is an Island / Habukara Is. 01

ii) GR of the Antiquity (Bukoora cave) S.E of Bukoora is 303573 ✓ 01 02MK

b) Cross section: Graph Paper → 09 09MK

c) Any two drainage patterns shown on the map may include:

- Radial pattern around shebeya hill, in the West, Rwaburigita hill in SW, Rwanyena hill in the south, Kitoora, Hamushanje etc

- Dendritic pattern displayed by river Razigizigi in the East, river Niombe in the ~~West~~ etc.

- Trellised pattern displayed by R. Katenga and its tributaries, river Niachati, river Kyiyora etc

- Annular pattern in the North East curving around mugabi hill.

- Centripetal pattern - rivers flowing into the basin of L. Bunyonyi from all directions / surrounding slopes

Identification only 1mk. Any 2 × 2 = 04MKS

Scanned with CamScanner

Subject ..... Paper code ..... Personal Number

3

ii) Formation of any one drainage pattern identified in c(i) above.

- Radial drainage pattern - Where rivers flow/radiate from a dome shaped/cone shaped upland/hill/mountain. It resembles the spokes of a bicycle wheel. occurs where there are:
  - homogeneous/crystalline rocks
  - steep slopes
  - heavy rainfall in the catchment area
  - Presence of a dome shaped upland/hill/mountain.

- Dendritic pattern - Tributaries join the main river at acute angles; resembles a shape of a tree trunk and its branches.
  - occurs on homogeneous rocks
  - Massive crystalline rocks
  - gentle slopes
  - heavy rainfall or large catchment area

- Trellis/Trellised pattern - Where tributaries/rivers join the main channel at approximately right angles occurs due to:
  - heterogeneous rocks/hard and soft rocks
  - Jointed rocks
  - gentle - to steep slopes

Scanned with CamScanner

Subject ..... Paper code ..... Personal Number

(4)

- heavy rainfall | large catchment area
- faulted landscape
- river capture

- Annular Pattern - where tributaries form concentric curves or semi circles around domes | uplands. Occurs due to:
  - heterogeneous rocks | alternate hard and soft
  - steep slopes
  - a dissected dome | upland | ridge
  - heavy rainfall | large catchment area

- Centripetal pattern - where rivers converge to the same basin | depression or lake. Occurs due to:
  - Homogeneous rocks
  - gentle to steep slopes
  - presence of a basin in which rivers converge
  - heavy | reliable rainfall | Large catchments

Identification of the pattern 01mk
Conditions Max. 03mks
04mks

Subject ..... Paper code ..... Personal Number

margin

5

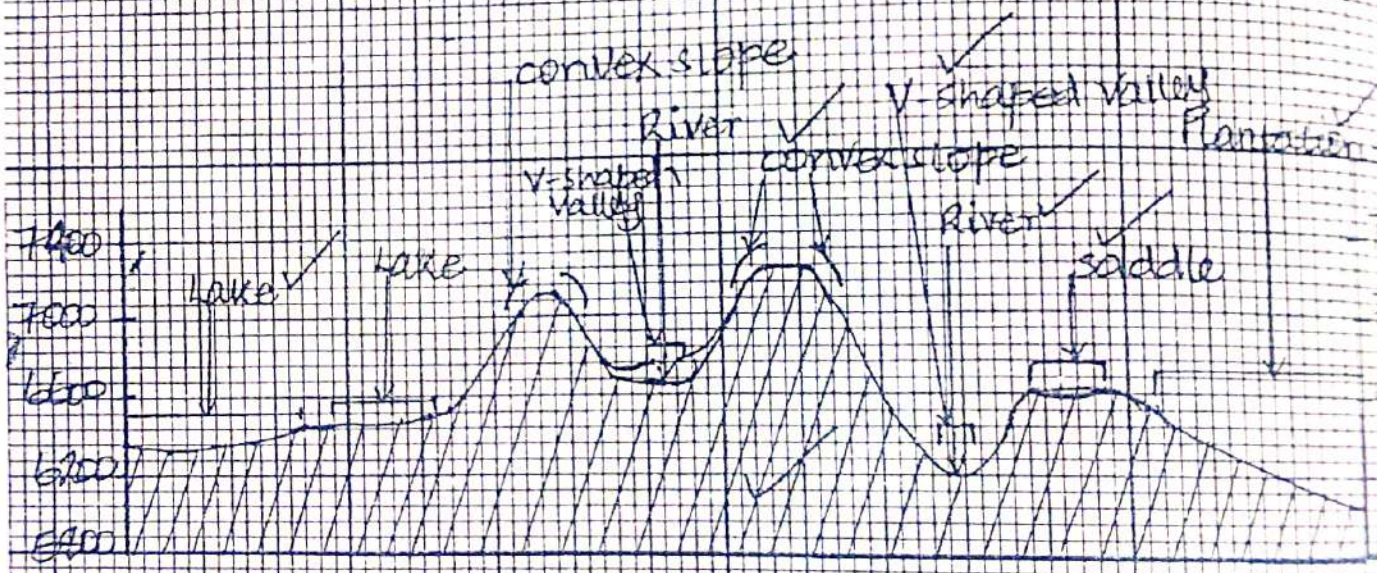
d) Explaining problems faced by people living in the area.

- Soil erosion because of steep slopes of hills/ridges eg Katenga, Bukoora, Shebeya Kacwekano etc.
- Mass Wasting / Landslides due to steep slopes of hills/ridges eg Kitooma, Kyabahinga etc and steep banks / cliffs of lake Bunyonyi
- Difficult road construction due to steep slopes of ridges and hills eg Ndaragi, Buture Rikungiri etc / remoteness / inaccessibility.
- Wild animals attack and threaten people from lake Bunyonyi, Kagoma, Kaijengye swamps and Rwanyena forest.
- Accidents / drowning due to lake Bunyonyi or water body and settlements around it & Islands.
- Pests and disease vectors that attack people due to presence of swamps eg Kagoma, Rwabakazi, forests eg Rwanyena or lake Bunyonyi.
- Limited land for settlement because of steep slopes around Kaabagirwa etc
- Limited land for agriculture due to steep slopes of ridges and hills
- Seasonal flooding due to swamps / lowlands eg in NE, SW, lake in the central etc

any 3+2 = 06

(b) A cross section of Kakale from GR 520580 to 330580 showing drainage features, a saddle, a slope, V-shaped valley and a plantation fa...

Vertical scale 1cm reps 100ft



HD = 8KM

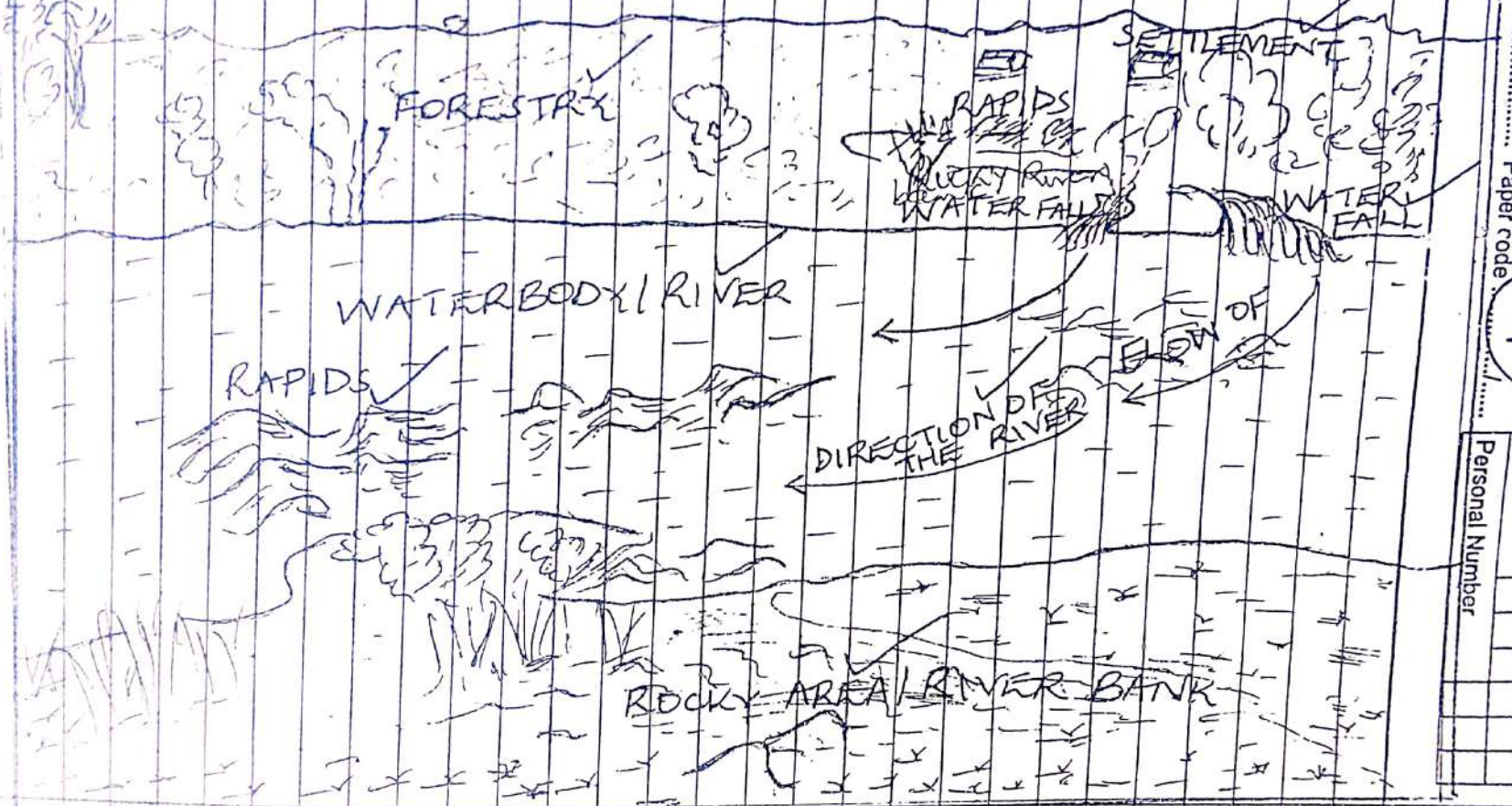
Marginal information 03MKS

Features 06MKS

09MKS

[redacted] [redacted] [redacted] of the area shown on the photograph showing a river, rapids and falls, rocky area river bank, landuses and direction of flow of the river.

Marginal information – 03
Features – 07
10 MKS



10MKS

Do not write in this margin

Candidate's Name .....
Signature .....
Subject 2(a) ..... Paper code 7

Random No.	
Personal Number	

Do not write in this margin

Scanned with CamScanner

Candidate's Name .....
Signature .....
Subject ..... Paper code .....

Random No.
Personal Number

8

b) Process of formation of Waterfall.

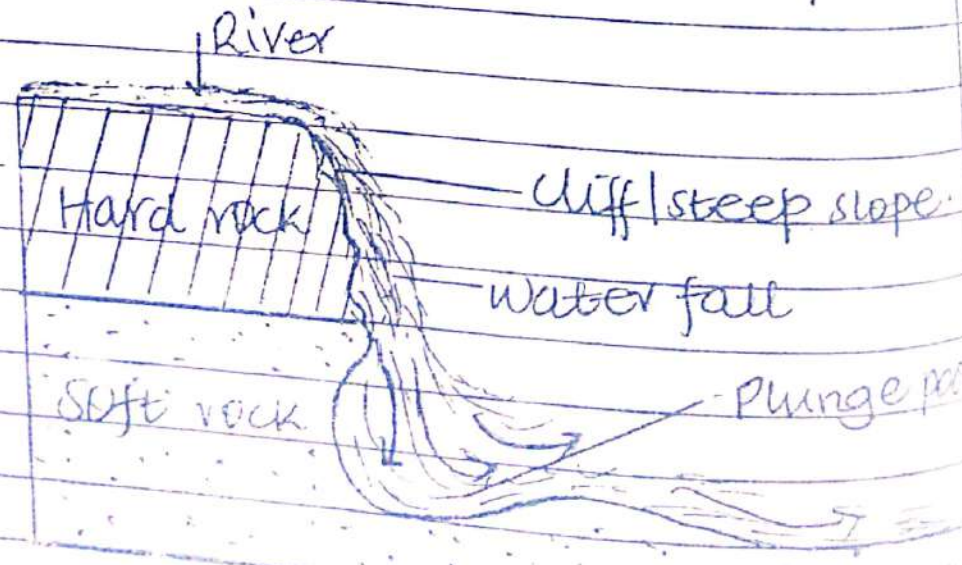
- A waterfall is a rapid/fast flow of river or water across a sharp break/steep slope along the channel bed.

OR

- It is a sharp break in the channel bed over which a river falls.

Formation of waterfall is due to either:

- Differences in the rock hardness ie alternating belts of hard and soft rocks laid over each other.
- Soft rocks are easily weathered and eroded due to steep gradient.
- Hard rocks remain protruding/resistant in the river channel forming a cliff or steep slope.
- The river falls/drops vertically fast, forming a waterfall.



Scanned with CamScanner

Candidate's Name .....
Signature .....
Subject ..... Paper code ..... 9 .....

Random No.						
Personal Number						

Do not write in this margin

OR Other Processes that may include:

- Faulting across a river bed leading to formation of faultline/escarpment, crossed by a river to form a waterfall.
- Vulcanicity forming resistant/hard dykes and sills, exposed/crossed by rivers hence cliffs. forming waterfalls.
- Glaciation ie tributary hanging valley enters a U-shaped glaciated, over-deepened main valley across a steep slope forming a water fall.
- River rejuvenation forming: a sharp break or knick point overwhich a river/water flows rapidly forming water fall.
- River flowing over edge of Plateau from a higher level to a lower level/plain forming a waterfall.

Factual marking basing on:

- Identification
- Definition
- Condition
- Process
- Diagram/illustration

05MKS

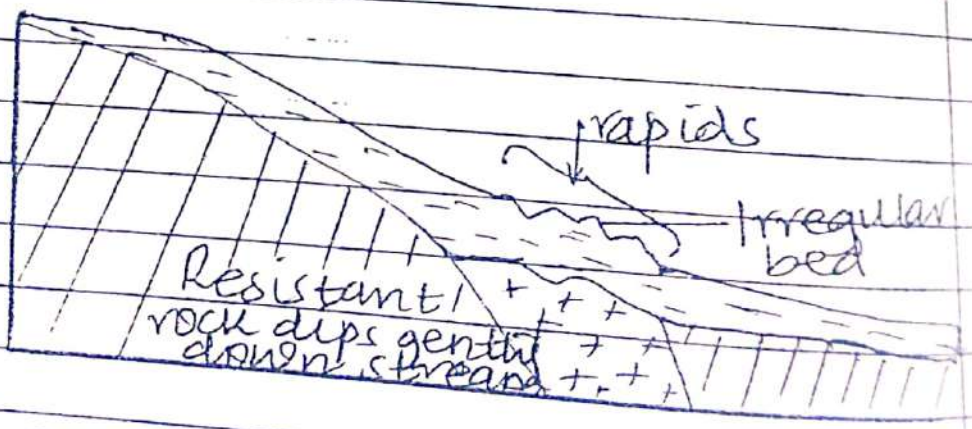
Scanned with CamScanner

Candidate's Name .....
Signature .....
Subject ..... Paper code 10

Random No.						
Personal Number						

OR. Process of formation rapids.

- Turbulent flow of water in a river channel
- Develop where the gradient of river bed increases without sudden break of slope/ vertical slope
- Soft rocks are easily eroded or removed and slope dips downstream,
- hard sections of rocks remain protruding hence irregular bed of river.
- River therefore flows at moderate rate or gently over it forming rapids.
- Presence of boulders deposits may make the channel irregular forming rapids.



Identification
definition
condition
Process
Diagram

05

Scanned with CamScanner

Candidate's Name .....
Signature .....
Subject ..... Paper code 11

Random No.						
Personal Number						

Do not write in this margin

c) Uses of the features shown on the photo to the economy of the area.

- Hydropower generation due to the presence of waterfalls/river
- Fishing because of the presence of the waterbody or river.
- Tourism based on waterfall, rapids, forests and rocky bank.
- source of water for domestic and industrial use from the river/waterbody/irrigat
- Firewood/woodfuel from the forests
- source of timber/building poles from the forests
- Study/research due to forests, rocks waterfalls and rapids
- Filming industry because of rocky bank, river and waterfall.
- Wildlife conservation because of the forests
- ~~Siting of telecommunication masts — uplands~~
- climate modification by the forest that attracts rainfall supporting agriculture
- source of medicine from the forests
- Agriculture - forests
- Dwaring, rocks
- Livestock rearing - pastures

IMK @ max 7

d) candidate should cite any river in E. Africa where rapids occur eg.

- R. Nile (Albert Nile, Victoria Nile)
- River semuliki · Murchison falls
- R. Tana · Karuma falls

Scanned with CamScanner

Candidate's Name .....
Signature .....
Subject ..... Paper code 12

Random No.						
Personal Number						

- River Makagarasi
- River Kilombero
- R. Nyamwamloa
- R. Sezibwa/sezibwa falls
- R. Mubuku etc.
- Isimba falls
- Itanda falls
- Thika falls
- Kindaruma
- Pangani falls

candidate may give the river or water fal

Evidence:

- Presence of water falls and rap
- Presence of a river
- Presence of a forested area along a river valley
- Presence of a river with steep and rocky banks

Area - 01MK
Basic evidence 01MK (falls and rapids)
Any other reason 01MK
03 MKS

TOTAL

Scanned with CamScanner

Subject ..... Paper code ..... Personal Number

13

(a) Distinguish between Igneous and Metamorphic rocks.
(b) Explain the importance of rocks to man in East Africa.

(a) Candidates are expected to bring out the differences between the two rock types independently.

- Igneous rocks:-
- Igneous rocks are fire-formed rocks from the process of Vulcanicity.
- Vulcanicity originates from the interior of the earth where temperatures are hot due to radioactivity and geochemical reactions.
- The heat generated melts the rocks to form magma which is intruded into the crust or extruded onto the earth's surface. The molten rocks cool and solidify to form the different types of Igneous rocks.

- Igneous rocks are characterised by the following:
  - they are crystalline in nature, some are spongy in appearance such as pumice, some are glassy in appearance such as obsidian, some are hard such as granite etc.

- Igneous rocks differ depending on:
  - rate of cooling and solidification: those that cool on the earth's surface have small crystals e.g. obsidian, basalt etc. these called extrusive / volcanic rocks

- Those that cool and solidify just below the earth surface | at shallow depth, cool at a moderate rate to form rocks with moderate | medium crystals e.g quartz etc. These are called Intermediate or hypabyssal rocks.

- Those that cool and solidify in the deeper layers of the crust have large crystals such as gabbro, granite etc. These are called plutonic or Abyssal rocks.

- Igneous rocks are also classified according to mineral composition into:-
  - Acidic | felsic rocks that are rich in Silica and Aluminium. These are light coloured and less dense.
  - Basic | mafic rocks are rich in Iron and magnesium. These are dark coloured and dense.
  - Intermediate rocks have moderate composition of Silica.

Impressional marking 08 marks

Consider:-
- Definition
- Process | origin
- Characteristics
- types and examples

WHILE,

Scanned with CamScanner

Paper code ..... Personal Number

15

. Metamorphic rocks :-

- are changed rocks from originally Igneous, Sedimentary or even metamorphic rocks to form new rocks.
- Causes of change are :-
  - Heat / thermal change or metamorphism from Volcanic activity
  - Pressure / dynamic change or metamorphism due to earth movements and the weight of overlying rocks.
  - both thermal and dynamic metamorphism (thermodynamism)

- Metamorphic rocks are characterised by being more compact, harder, tend to be brittle, Some can easily split into sheets e.g schist, Some are recrystallised and recleavaged.

. Examples of metamorphic rocks include; Marble from limestone, Quartzite from Sandstone, graphite from Coal, Gneiss from granite etc.

. Consider : - definition
- Agents of change
- Characteristics
- Examples.

Impressional marking - 07 marks 15mks.

Scanned with CamScanner

(b) Importance of rocks to man in East Africa

POSITIVE:- - Rocks are weathered to form particle soils for agricultu
e.g Igneous rocks (Basalt) in Mbale, Kabale, etc.
- Rocks are tourist attraction such as Coral limesto
rocks, marble, obsidian etc.
- Rocks are used as raw materials in industries e.g C
for tile, brick making, ceramics etc, graphite for pen
limestone/coral for cement manufacture etc.
- Rocks are used for building and road construction e
granite etc.
- Rocks are sources of valuable minerals e.g diamond
in Kimberlite rocks in Tanzania
- Rocks are used as fuel e.g coal in the Ruhuhu V
in Tanzania
- Some rocks store underground water exploited thro
drilling boreholes used for domestic/industrial use e
Sedimentary rocks.
- Some rocks are for decoration/ornamental purpos
e.g marble, obsidian etc.
- Rocks are used for research and study purpos
like limestone, etc.
- Rocks provide strong foundations for developm
of port facilities e.g Coral limestone at the coa
- Some rocks are medicinal e.g clay, rock salt et
- Some rocks are used as food supplements e.g
rock salt for livestock/humans.
- Some rocks can be used as sites for the fil
industry e.g limestone rocks in Nyakasura etc
- Rocks are mined e.g limestone etc
etc

Scanned with CamScanner

Paper code ..... Personal Number

17

- NEGATIVES:-
- Some rocks weather to form infertile soils that discourage agriculture e.g the Coral wanda in Pemba and Zanzibar.
- Porous basalt, pumice ~~limestone~~ rocks limit surface drainage leading to water shortage e.g in Kisoro etc.
- Hard resistant rocks e.g granite are barriers in construction of roads etc.
- Sedimentary rocks such as clay with a high Colloidal content/high water retention capacity lead to water logging and flooding.
- Clay rich rocks encourage masswasting in highland areas.

Factual marking: Positives - 07 mks
Negatives - 03 mks

10 mks

NB:- Examples of rocks should be attached to each importance/do not score when examples are not given.

25

Scanned with CamScanner

Qu 4 a) Examine the factors that determine the formation of glaciers in East Africa.

→ Candidate is expected to define a glacier i.e a glacier is ~~moving~~ large mass of mo ice and snow from higher level of accumulation to lower level.

→ Areas where glaciers occur in East Africa are upper slopes of Mt Rwenzori, Mt Kenya and Mt Kilimanjaro.

→ Glaciers occur under the process of snowfall and accumulation. More snowfall lead to accumulation in layers leading to stratification. There is compression and compaction leading to melting of snow and ice. Refreezing occurs and air is squeezed out by extreme compression forming a solid impermeable glacier that moves downslope.

→ Glaciers form under the following factors:

- Altitude:

In East Africa glaciers occur above 4700 metres above sea level on Mt Rwenzori, Mt Kenya and Mt Kilimanjaro. The 4700 metres above sea level is a

Scanned with CamScanner

a permanent snowline in East Africa above which there are very cold temperatures leading to accumulation of snow and ice that result into glaciers.

- Relief / Topography

The existence of valleys and depressions on high mountains of East Africa encourage accumulation of snow and ice. When the valleys and depressions are filled the steep slopes and gentle slopes encourage movement downslope.

- Rainfall / Precipitation in form of snow

Mountains of East Africa where glaciers occur receive snowfall, heavy rainfall particularly on the windward side which avail water vapour that accelerate the formation of snow and ice leading to formation of glacier.

Impression making (8 marks)

(b) Describe the landform features resulting from glacial erosion in East Africa.

→ Processes of glacial erosion in East Africa include:

- Plucking: Is a process by which [illegible] rock and any other loose fragments [illegible] away from the rock as the gl[illegible] downslope. It is most effective [illegible]

Scanned with CamScanner

are jointed rocks.

- Abrasion: Is the grinding process in which rock particles such as boulders and pebbles embedded in glacier are used as grinding tools to remove loose rock particles on the bottom and sides of glacier valleys.
- Basal sapping: Is the rotational slipping of ice which involves alternate freezing and thawing of water contained within cracks leading to gradual enlargement of cracks.

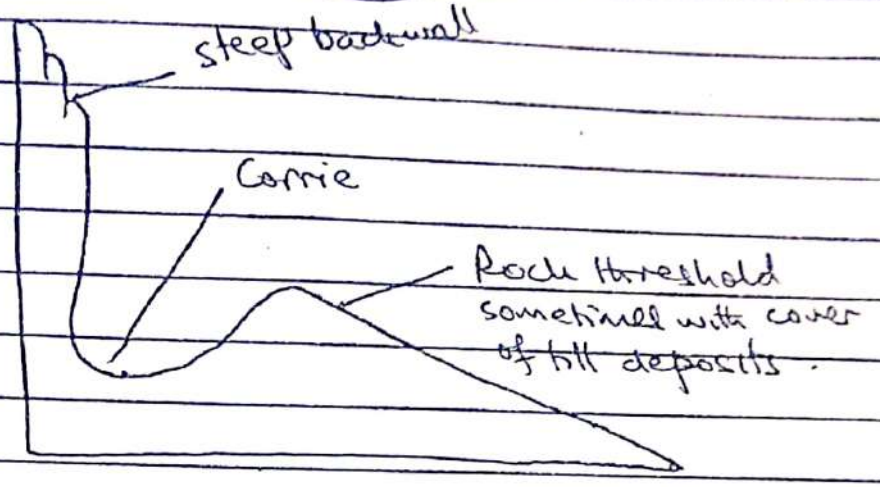
→ Landforms from glacial erosion include:

- CORRIE / CIRQUE / CWM: This is a semi-circular steep sided rock basin cut into glaciated mountain sides and valley heads. Starts formation as pre-glacial hollow periodically worked on by nivation and frost weathering leading to back-wall recession of sides of the depression. Plucking and abrasion help to deepen and widen the depression. The depression may later be filled with water to form lakes called tarns e.g those occupied by Lac du Speke, Lac Gris Lac Catherine on Mt Ruwenzori, Teleki tarn on Mt Kenya.

Scanned with CamScanner

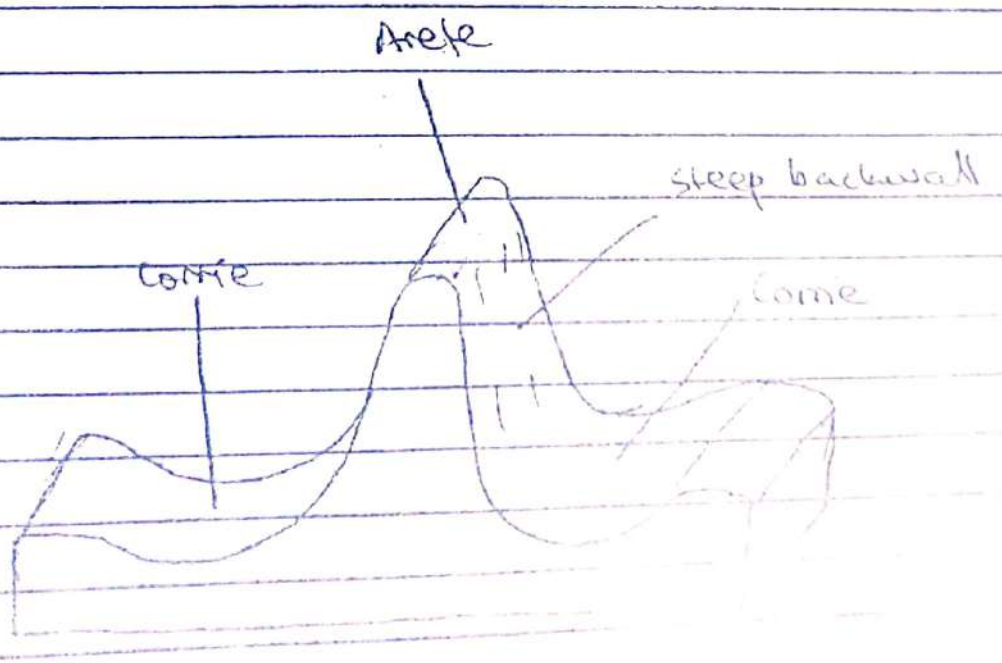
Subject ..... Paper code ..... Personal Number

21



ARETE:

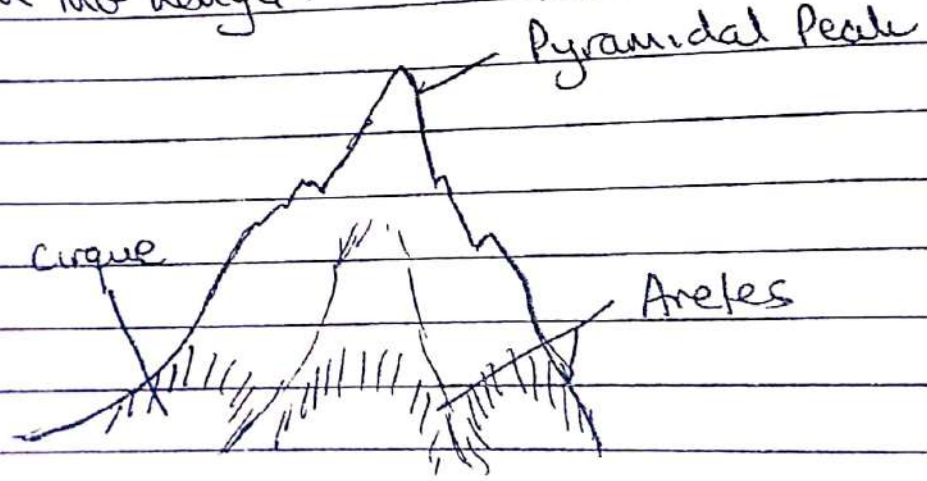
- This is a narrow steep sided rock ridge separating two corries / cirques.
- It results from backwall recession of two adjacent corries leading to formation of a sharp knife edge like ridge separating two corries / cirques. Plucking and abrasion assist in its formation



Scanned with CamScanner

PYRAMIDAL PEAK

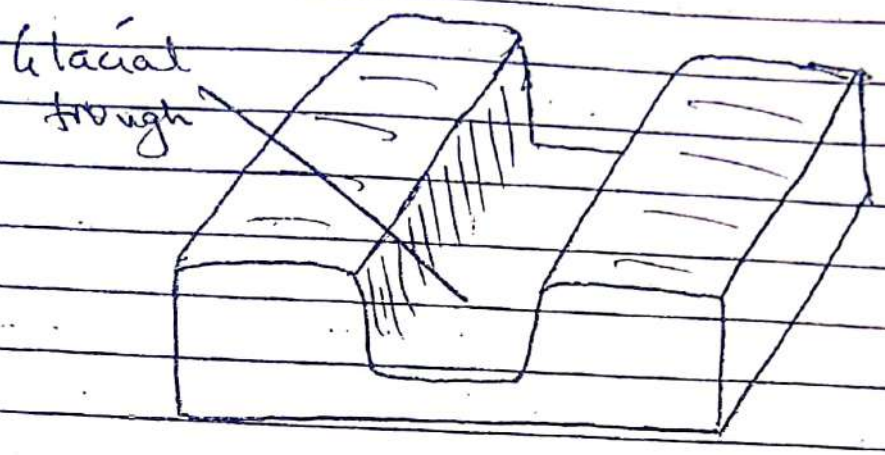
- This is a sharp rock pinnacle which is ste
sided surrounded by a system of radiating are
- Formed by backwall recession of two or
more corries from all sides of a mountain
- Plucking and abrasion help in formation.
- ~~Pyramidal Peak is suspended by weathering~~
- Examples include Margherita Peak ~~and~~ o
Mt Stanley ~~peak~~ on Mt Ruwenzori, Point Pigge
on Mt Kenya.



GLACIAL TROUGH

- Broad flat bottomed steep sided U-shaped valle
- Formed when plucking and abrasion
widen and deepen the pre-existing valley by vertica
and lateral erosion.
- Examples include Mobuku and Bujuku
valleys on Mt Ruwenzori, Gorges valle
on Mt Kenya and Karanga valley on
Mt Kilimanjaro.

Scanned with CamScanner



HANGING VALLEYS

- Tributary valleys above the main valley that descend steeply into main valley-/glacial trough.
- Formed when tributary valleys are occupied by small volumes of glacial ice compared to main valley resulting into overdeepening of main valley by plucking and abrasion leaving tributary valleys at higher level. They lead to alluvial fans in main valley.
- Examples include hanging valleys which are tributaries of Mobuku and Bujuku valleys on Mt Rwenzori.

ROCK STEPS

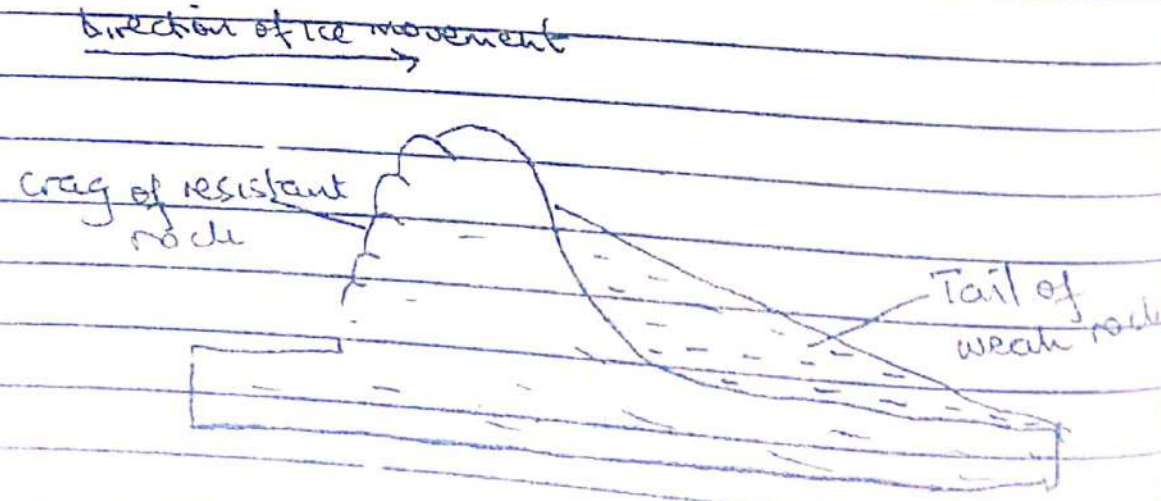
- These are rock projections in U-shaped valley
- Formed as a result of variation in rock resistance. Hard rocks resist erosion leading to rock projection in U shaped valley / glacial trough.

ROCK BASINS

- Circular depressions in U-shaped valley
- Formed due to unequal power of erosion due to varying thickness of ice. They are also formed due to variation in rock resistance. They are formed where there are soft / weak / jointed rocks on floor of U shaped valleys.
- basins occupied by Carr lake on Mt Kenya.

CRAG AND TAIL

- Mass of resistant rock outcrop steep on the upstream side which protects the soft rocks on leeward side
- The eroded material is deposited down stream to form an elongated tail.



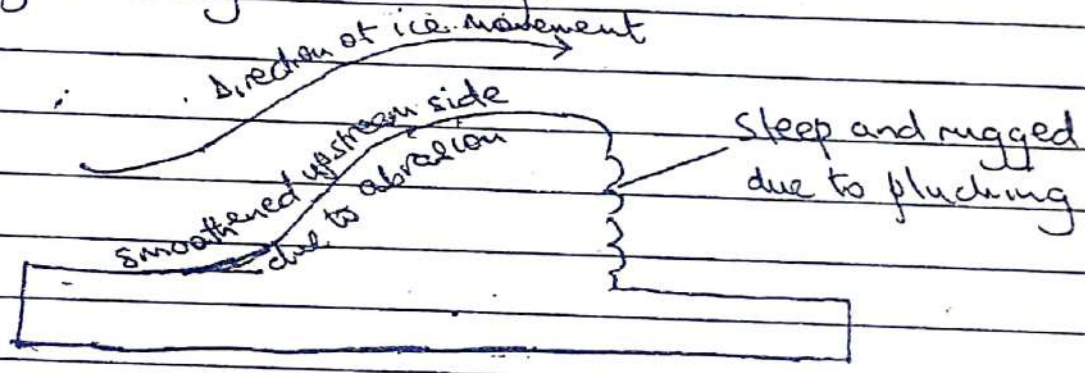
Scanned with CamScanner

Subject ..... Paper code ..... Personal Number

25

ROCHE MOUTONNEE

- This is a gentle sloping mass of rock on upstream side and steep and irregular on down stream side.
- Formed when the upstream side is smoothened by abrasion and down stream side is affected by plucking leading to steep rugged slope.
- Common in Mobuku valley on Mt Rwenzori and Gorges valley on Mt Kenya.



TRUNCATED SPURS

- Steep sided edged hills / spurs ending in the valley
- Formed when former interlocking spurs are affected by plucking leaving behind steep cliff like valley sides.

TROUGH END

- Steep rock wall forming abrupt end of a glaciated valley above which lies several cirques. As glacier straightens valley it also deepens where several glaciers joining forming a much larger and thicker glacier. Extra weight enables glacier greater downward erosion deepening the valley to form trough end.

IMPRESSION MARKING 17 MARKS

TOTAL = 25 MARKS

Scanned with CamScanner

Q5:
Account for the formation o the different types of Coral reefs along the East African Coast.

Candidate is expected to;
- Define the term Coral reef
- Explain the conditions
- Describe processes.
- Identify types
- Explain the theories.

Coral landforms are reefs or rock platforms which are seen jutting along the sea shore and Indian ocean Islands, formed as a result of deposition of shells/ skeletons of minute marine organisms known as polyps.

The conditions for the growth o Corals are;

Hot and warm temperatures o tropical climate between 20°c-30° is ideal for growth of Coral polyp this applies to areas 30°N and South of the equator eg Indian ocean coast.

Salty sea water of 27-40 pa

1000 Salinity that encourages Coral growth since Coral polyps take up Calcium Carbonate from sea water to build up their shells.

Polyps need oxygenated seawater since they are living organisms.

Shallow Continental shelf with depth not exeeding 60 metres which allows sun light to reach the sea bottom. This enables the process of photosynthesis for multiplication of planktons which is food for polyps.

Clear, Silt free ocean waters away from river mouths to allow penetration of Sun light and not to dilute the salty sea water.

Calm/still waters so as not to distabilise Coral formation.

Presence of solid rock bed along the Coast upon which Coral reefs grow/accumulation of shells.

Sea level changes caused Submergence of the Coast and encouraging the death of polyps and deposition of shells; while a fall in sea level exposes the Coral reefs leading to their

Scanned with CamScanner

death since they can't survive without water.

Processes of Coral reef formation are;

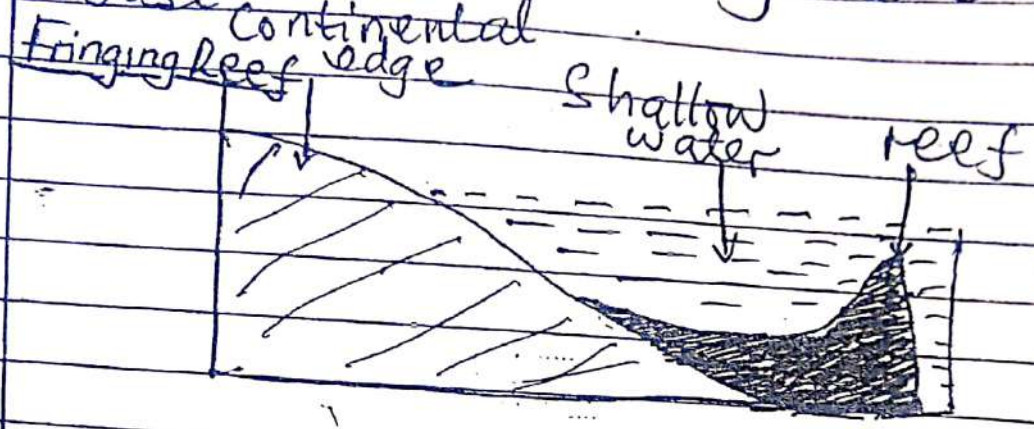
Death of coral polyps.
Deposition of Coral shells on the Continental shelf.
Accumulation of the deposited shells.
Compaction of accumulated materials due to increased weight of the overlying materials
Stratification of the compacted materials.
Cementation of the stratified materials by algae and other cementing materials.
Consolidation of cemented materials/layers when air is completely oozed out resulting into formation of Coral reefs.

Types of Coral reefs;

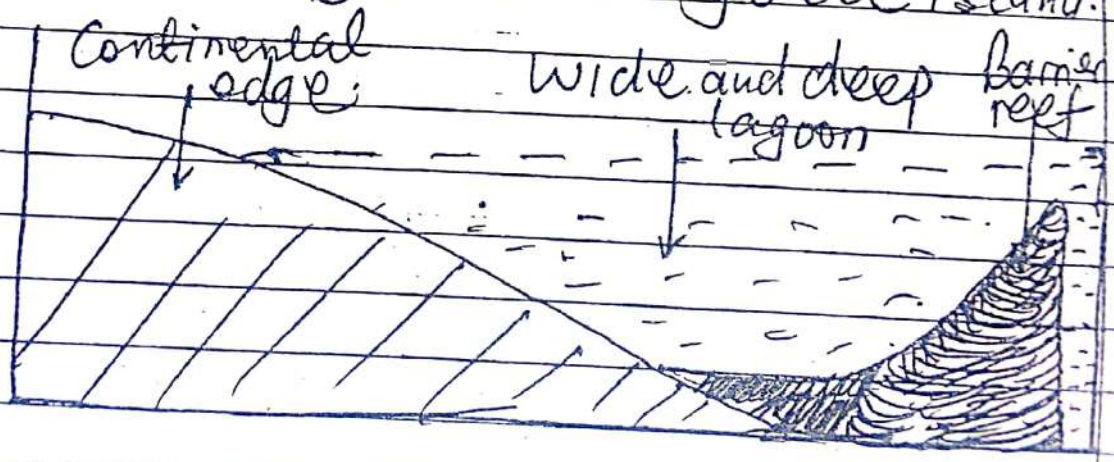
⇒ Fringing reef: joined to the coast or separated from the coast by a narrow and shallow lagoon eg at Mombasa, Kilifi,

Scanned with CamScanner

Dar-es-Salaam along the East African Coast

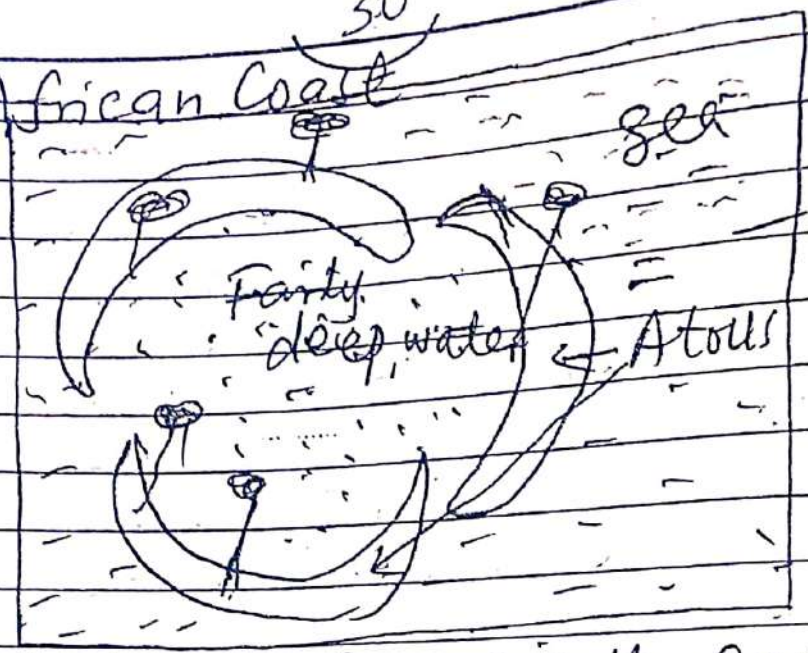


Barrier reef;
separated from the Coast by a wide and deep lagoon eg the one formed ~~at~~ the Madagascar and Mozambique on Mayotte Island.



Atolls;
A ring of Coral reefs surrounding a fairly deep lagoon but generally broken in places by narrow channels e.g btn Zanzibar and Madagascar at Aldabra 700km from the

East African Coast



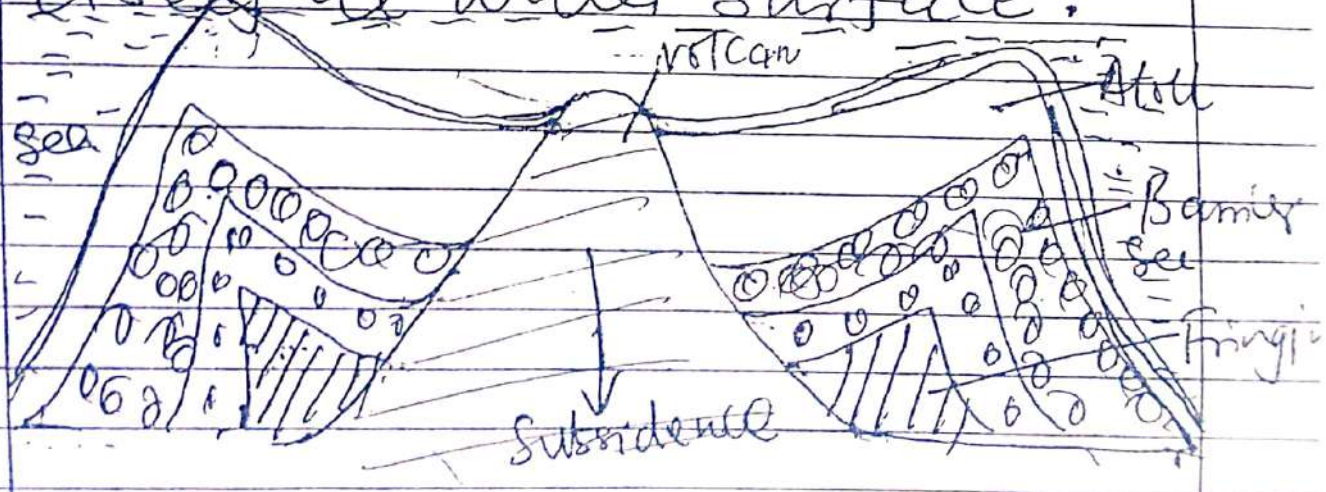
The Controvesy Comes in the existance of the barrier and Atoll reefs in deep waters where the Conditions are not in line with Coral reef formation, and thus the theories;

Darwins theory / Subsidence theory
There existed a volcanic Island, which formed from eruption/accumulation of magma.
Fringing reef Started its formation on the flanks of a volcanic Island.
The volcanic Island slowly Subsided due to increased weight of accumulating Coral reef as a result of Isostatic re-adjustment which followed

eruption.

Subsidence caused by fringing reef on the flanks of the volcanic Island to grow up and outwards towards the sea, resulting into a barrier reef and eventually into an atoll when the volcano was completely submerged.

The evolution (transformation) took place b'se the upward growth/accumulation of coral reef was able to keep the pace with the rate of subsidence of the volcano and maintain itself at water surface.



Subject ..... Paper code ..... Personal Number

(32)

Daly's theory (Deglaciation theory)

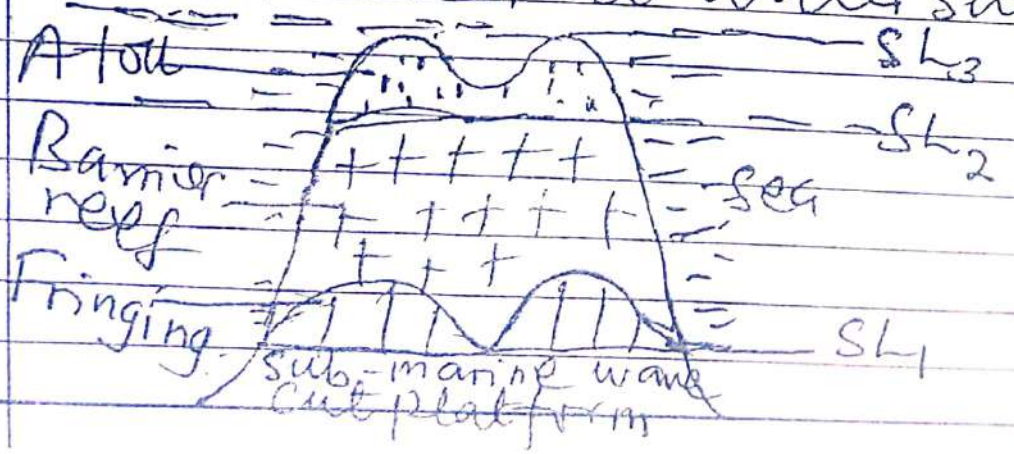
- The theory is based on changes and oscillations in climate and sea level. Formation of barrier and atoll was due to quarternary oscillations of climate and sea levels.
- There existed sub-marine platforms or hills from which peri-glacial coral reefs were eroded and planned to sea level.
- Temperatures were normal at one time which favoured growth of corals at the coast. Later climate conditions changed from warm to cold, sea level lowered considerably during cold glacial times as water was trapped as ice-sheet.

The polyps that remained were domant or died. Consequently wave action by erosion planed off all pre-glacial reefs and islands on which reefs were built, to the sea level of that time. This produced sub-marine platforms/wave-cut platforms. These platforms provided

Scanned with CamScanner

basis for upward growth of Corals when sea-temperature increased and ice sheets slowly melted (deglaciation) increasing vast quantities of glacial melt water into the sea such that there was a rise in sea level.

- As sea level rose, coral reefs which started growing on the platforms/hills as fringing reefs gradually transformed into barrier reef and finally into atolls, when the hills were completely submerged.
- This took place because the upward and outward growth of corals was able to keep pace with rate of rise in sea level and be maintained at water surface



Murray's theory/Antecendent theory.

There existed a stable Sub-marine platform on which pelagic deposits including Corals accumulated at a depth not more than 60 metre. Fringing reefs developed on the platforms. As the reefs grew upwards and outwards, they were pounded by waves so that masses of Coral fragments accumulated on the Sea-ward side, where they were cemented and Consolidated into hard rocks.

The Corals on the inner side died due to lack of food and the skeletons became dissolved such that a lagoon formed inside the reefs.

In the process, the fringing reef transformed into a barrier reef and finally in an atoll

→ Diagrams should be accompanied.

Scanned with CamScanner

Subject ..... Paper code ..... Personal Number

35

⇒ Any two Theories

Impressional Marking

25 mks

Scanned with CamScanner

Qn. 6: (36)

(a) Distinguish between environmental lapse rate and saturated adiabatic lapse rate.

⇒ Candidates are expected to bring out the differences between the two types of lapse rates; that is:

Environmental lapse rate refers to the actual rate at which atmospheric temperature decreases ~~while~~ with increase in altitude at a given place, at a specific time.

Environmental lapse rate (ELR) also often referred to as prevailing lapse rate or ambient lapse rate usually averages about 0.65°C/100 m or 3.5°F/1000 ft of ascent, that is, atmospheric temperature tends to fall (decrease) with relative increase in altitude, within the lower layer of the atmosphere or troposphere.

This phenomenon is actually brought about due to:

- reduced density of air as altitude (elevation) increases;
- The amount of water vapour in atmosphere also tends to decrease as elevation increases and

heat ~~rent~~ retention also decreases and thus, the higher you go, the cooler it becomes (within the troposphere).

- The environmental lapse rate is therefore denoted as negative
- Where the Environmental Lapse rate (ELR) meets the Adiabatic lapse (ALR) a dew point is formed and cloud formation begins.

Max = 3 marks

On the other hand;
Saturated Adiabatic lapse rate (SALR) or Wet/Moist lapse rate (W/MALR) refers to the rate at which air saturated with water vapour cools as it rises to greater/upper levels of the atmosphere.

- A saturated parcel of air cools at a rate which is slightly lower than that of dry air, that is between 0.3°C – 0.9°C/100m of ascent.

Since the air is saturated, some latent heat is thus lost which decreases the rate at which ascending air parcel cools down.

Scanned with CamScanner

- Saturated adiabatic lapse rate therefore occurs in a mass of rising air when it is either compressed (heated) or expanded (cooled) but without any influence of heating or cooling from the surrounding / external sources.
- Thus a parcel of saturated rising air cools adiabatically at the same rate as the environmental lapse rate until the ~~dew~~ dew point is reached.
- After the air parcel has reached its dew point and cooling has decreased to the wet adiabatic lapse rate, it will eventually rise to a point where ~~of~~ all of its water vapour has condensed to form clouds.

Max = 03 marks

Note: In part (a) consider the following

→ definition / description
→ Explanation of the phenomenon
→ Effects

Max (a) = 06

Scanned with CamScanner

6(b)

Explain the causes of temperature inversion in East Africa.

Temperature inversion refers to atmospheric condition in which air temperature increases with altitude/height in the troposphere. It is the reverse of the normal environmental lapse rate where temperatures decrease with increase in altitude/elevation. With temperature inversion, the higher you go, the warmer it becomes.

However, in the troposphere the increase in temperature with altitude is up to a certain level referred to as the temperature inversion point/level. Beyond this level the normal lapse rate applies.

In the troposphere temperature inversion is also a temporary phenomenon. It is mostly experienced in the morning hours. As temps rise or as the sun warms up the air, the condition later disappears.

There are basically two forms/levels of temperature inversion, namely:

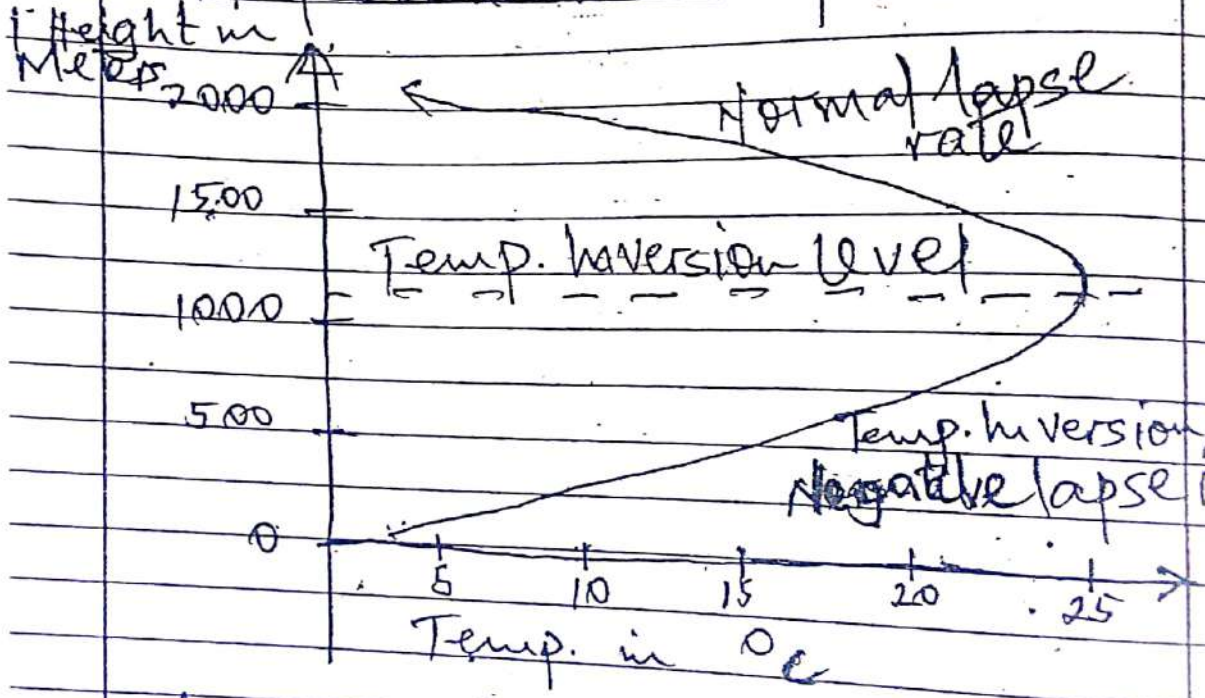
Scanned with CamScanner

Subject ..... Paper code ..... Personal Number

(40)

- low ground level inversion; especially in the hilly areas due to rapid out radiation or when warm air is advected over a cold surface.
- There is also high level inversion that occurs due to frontal convergence

Graph to illustrate temperature inversion



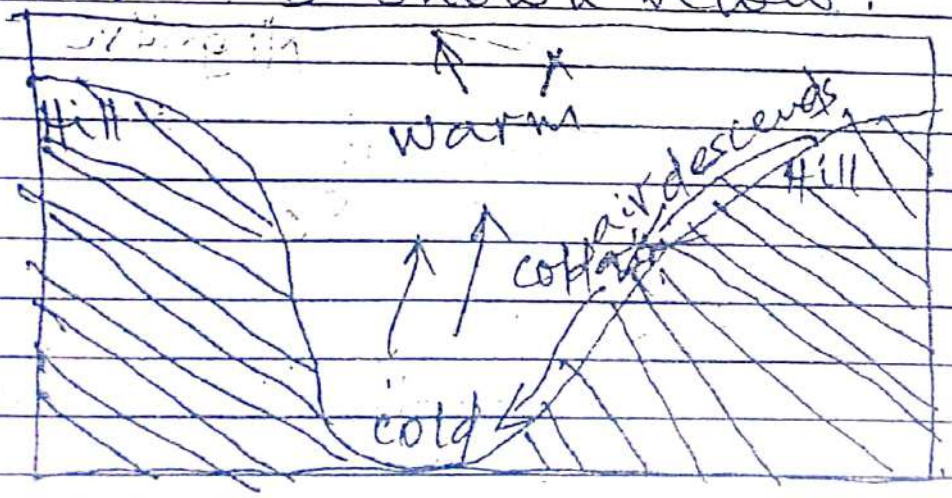
In East Africa temperature inversion is common in ~~hilly~~ hilly/Mountainous areas and in areas of limited cloud cover marked by air stability or calm weather eg in the Kigezi highlands, Kenya highlands and the semi-arid areas of East Africa

Subject ..... Paper code ...../...../..... Personal Number

The causes/conditions for temperature inversion may include the following:

→ Hilly and valley nature of relief:

Out radiation and valley rapid cooling at night on mt./hill slopes results into cold dense air. This cold/dense air then drains/descends down slope into the valley under the influence of gravity and collects in the valley/hollow displacing warm light air upwards to the higher levels. This results into the formation of mist/fog and is normally experienced in the early mornings. The subsidence of cold dense air results into temperature inversion as shown below:



Subject ..... Paper code ...../..... Personal Number

(42)

2(b) Cont.

→ Radiation cooling due to rapid out radiation by the earth surface at night due to limited or lack of cloud cover. ~~This increases loss of heat~~ This excessive loss of heat results into a cold surface that cools the air immediately above it. Meanwhile the air layers further above are warmer since some of the heat is retained by the Green House Gases (GHGs), water vapour and dust particles. This phenomenon may also be referred to as Nocturnal Radiation Temperature Inversion

→ Frontal convergence of two air-masses of different characteristics, that is, the meeting of warm light air mass and cold dense airmass at a frontal zone. The warm air being lighter is lifted above the cold dense air mass leading to temperature ~~inversion~~ increase with altitude. This is referred to as Frontal cyclonic temperature Inversion.

~~Advection also results into temp inversion. This is when a mass of warm air currents~~

Impression Marking ~~Total~~ Total 19 marks

2 Mks

Subject ..... Paper code ..... Personal Number

(43)

Q7 Account for the distribution of Savanna vegetation in East Africa.

Candidates should identify the different types of Savanna vegetation ie Savanna woodland, Savanna grassland and dry Savanna (bush and thicket) and show where they are found, give the X-teristics of each type and then give the conditions for the growth and distribution of each type of Savanna vegetation in East Africa.

Savanna woodland lies near the tropical rainforests. It is found in Western Tanzania, S.W. Tanzania (Miombo woodland), in Northern Uganda like at Timu, Molongole.

It is characterised by; continuous cover of trees.

- Trees are of hardwood and of mixed stand.
- Trees have medium height of about 8—16M high
- Trees are umbrella shaped
- Trees have twisted trunks with thick and rough barks
- Some of the trees have swollen trunks to store water to be used in

Subject ..... Paper code ..... Personal Number

the dry season.
- Trees are drought and fire resistant.
- Trees are deciduous in nature i.e shade off their leaves during the dry season to reduce moisture loss.
- Dominant tree species include; acacia, Baobab, cacti.
- Trees have tiny leaves to reduce on transpiration.
- Most trees develop branches close to the ground.
- Trees have waxy leaves.
- There is dense growth of grass, bushes & shrubs.

Another type is Savanna grassland which lies between woodland and dry Savanna found in Nyika plains of Kenya, Northern Uganda, Rift Valley areas of Western Uganda & areas around Bukoba in Tz.

Characterised by; Tall grass like elephant and spear grass of about 1 - 4 metres high.
- Grasses turn brown or yellow during the dry season and green during the wet season.
- It has scattered short trees and bushes grow within the grass and trees.

Scanned with CamScanner

Subject ..... Paper code ..... Personal Number

- The trees are deciduous in nature.
- Trees have tiny or small leaves to restrict transpiration.
- Trees are fire and drought resistant.

Another type is the dry bush and thicket/ dry Savanna common in Northern, N.W & N-E Kenya (Turkanaland), Central Tanzania, North-Eastern Uganda, Ankole-Masaka Corridor.

Characterised by; Stunted trees with woody stems.

- Have thorny bush trees with shrubs growing in between.
- The trees are short, with small waxy needle like leaves.
- The grasses are poor, very short & grow in bunches or tufts with bare land between the scattered thorny bushes.
- Species of trees include cacti, acacia, Euphobia.
- The trees are fire resistant.
- The trees are less than 8 metres in height.

The following are the general X-teristics for Savanna Vegetation.

- The trees are umbrella shaped.
- The trees are deciduous shading

Subject ..... Paper code ..... Personal Number

(46)

off leaves during the dry season.
- Dominant tree species include acacia, Baobab, cacti.
- Trees have thick barks.
- Trees have small leaves to reduce transpiration.
- Trees are fire & drought resistant.
- Trees have swollen trunks & long tap roots.
- Trees have waxy barks and leaves.

The following are the conditions that have led to the distribution of Savanna Vegetation in East Africa:

Climate in terms of rainfall has led to the distribution of Savanna vegn as follows; Moderate r/f of 760mm — 1000mm has led to growth of Savanna woodland with medium height trees.

Moderate rainfall of between 600mm — 750mm lead to growth of Savanna grassland with tall grasses.

Low r/f of between 300mm — 500mm lead to growth of dry bush & thickets with poor grasses & thorny bushes.

Hot temperatures of 25°c — 27°c lead to the growth of Savanna woodland and Savanna grassland

Scanned with CamScanner

Subject ..... Paper code ...../..... Personal Number

with drought resistant trees that have long tap roots.

Very hot temps. of over 27°c lead to growth of dry Savanna with stunted trees and poor grasses.

Moderate humidity of 50% - 60% lead to the growth of Savanna woodland with medium height trees

Humidity of 40% - 50% lead to growth of Savanna grasslands with tall grasses.

Low humidity of less than 30% lead to growth of dry Savanna with stunted trees & poor grasses.

Soils whereby Savanna woodland and Savanna grassland grow in areas with faithly fertile soils e.g Northern Uganda and dry Savanna grows in areas with skeletal, thin infertile soils like in Ankole-Masaka corridor.

Relief whereby lowland areas of Northern Uganda, Rift Valley areas, Nyika plains experience hot temps and low Hf. hence growth of dry Savanna vegetation.

Low altitude of less than 1500m a.s.l lead to hot temps & moderate

Subject ..... Paper code ..... Personal Number

48

r/f that supports the growth of Savanna woodland and Savanna grasslands.

Drainage i.e well drained areas lead to growth of all types of Savanna vegetation.

Man's activities like cutting down of trees for timber, wood fuel, building material have turned forests into Savanna woodland & Savanna grasslands, sinking of bore holes, overgrazing & bush burning have turned Savanna grassland to dry bush.

Govt policy of gazzeting national Parks and game reserves like Queen Elizabeth National Park, Kidepo Valley N. Park, etc have led to conservation of different types of Sav. Vegtn.

Pests & diseases like locusts, termites, grass-hoppers have eaten trees turning Savanna woodland into grasslands & dry Savanna e.g Nakasongola, N-E Uganda

Overgrazing by wild animals in National Parks have turned forests into woodlands, grasslands into dry Savanna e.g in Queen Elizabeth N. Park, Lake Mburo National Park.

N.B: Candidates may come up with a diff't approach where they explain the conditions for each type separately.

Impressional Marking — 25 marks

Scanned with CamScanner

Subject ..... Paper code ..... Personal Number

49

8(a) Differentiate between humification and laterisation process of soil formation.

• Humification.

Defn ✓ It's the rotting/decaying/decomposition of dead matter or organic matter to form humus.

Condition ✓ Common in areas with thick vegetation cover and other living organisms such as bacteria. It is also common in hot-wet conditions, speeding up decomposition.

Effect ✓ Produces dark coloured soils. It also improves soil fertility by producing humus.

Where ✓ It's dominant in areas with dense/thick vegetation cover, like Mabira, Budongo; etc.

04 mks

WHILE/WHEREAS

• Laterisation.

Defn ✓ Is the removal of soluble minerals like silica from top layer/'A' horizon to the bottom/"B" horizon, leaving behind iron and aluminium/magnesium compounds that form oxides.

Condn ✓ Occurs under conditions of hot temperatures and heavy rainfall (speeding up leaching & oxidation).

Effect ✓ It forms reddish/brown lateritic soils. It also forms impoverished or infertile soils.

where ✓ Common on hills of Buganda, Ntungamo, etc

NB Consider: • Definition/description.
• Condition.
• Effect.
• Where.

04 mks 08

FACTUAL MARKING

Subject ..... Paper code ..... Personal Number

50

(b) Describe the conditions leading to the formation of lateritic soils in East Africa.

Approach:
- Definition/description of lateritic soils.
- Location/areas where they are formed.
- Description of process of formation.
- Explain the conditions leading to their formation.

Definition/description:
- These are red or brown residual deposits created by weathering of rocks under hot-wet/humid tropical conditions.
- Lateritic soils consist of either iron or aluminum oxides and found either as hard pans of duricrusts or soft clays (which are sticky when wet) or as horizontal layers of granules/nodules/particles.

Location:
- Lateritic soils are found in various parts of Equatorial and Savannah regions of East Africa such as Central Western, Eastern Uganda; Central, Southern TZ and some parts of Kenya.

Process of formation:
- Due to chemical weathering of rocks by oxidation and solution under hot and wet conditions

- Soluble minerals like silica are removed by leaching from 'A' horizon to "B" horizon. Iron and aluminum compounds remain precipitated in the 'A' horizon / the top layer or horizon.

Exp. - In the dry season, they harden to form laterite duricrusts and in the wet season they become wet (plastic and sticky).

Conditions / factors:

- Climate

- Heavy rainfall facilitates leaching and chemical weathering hence weak dissolved minerals like silica are lost, leaving behind hard lateritic soils / leached reddish soils / hard pan.
- Hot temperatures speed up chemical weathering processes of oxidation and solution, decomposing rocks into residual lateritic soils / reddish soils.

- Relief

- Lateritic soils develop on gentle slopes and plains, allowing easy water percolation and leaching of 'A' horizon and deposition of leached materials in the 'B' horizon.
- Where there are steep slopes, there is little water absorption and alot of soil erosion, discouraging their formation.

Scanned with CamScanner

Subject ..... Paper code ..... Personal Number

52

- Nature of the parent rock:
✓ Soft and porous rocks, rich ~~on~~ in iron and aluminum, favour oxidation and leaching hence forming well developed laterite soils. The soluble minerals like silica are leached leading to the precipitation of iron and aluminum to form lateritic soils.
✓ Where rocks are extremely hard and impermeable, there is limited water percolation, chemical weathering and leaching, discouraging formation of laterite soils.
- Vegetation cover:
✓ Thick vegetation cover favours formation of laterite soils as plant roots hold soil particles together / one place for long, hence easily leached to form reddish, lateritic soils.
- Drainage
✓ Well drained conditions on gentle slopes and plains favour chemical weathering and leaching leading to the formation of well developed laterite soils.
- Human activities:
✓ Laterite soils form well where there is less human interference through quarrying, cultivation, deforestation etc.
- Time/geological time ~~is~~ Laterite soils are formed after a long period of time allowing formation of oxides, hence leached / hard laterite soils.

IMPRESSION MARKING → 14M