THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

113/1 **GEOGRAPHY 1**

(For Both School and Private Candidates)

Time: 3 Hours **ANSWERS** **Year: 1994**

Instructions

1. This paper consists of section A, and B with total of 13 questions.

2. Answer a total of five questions; two in section A, and three in questions in section B. Question number 1 is compulsory.

1. Study the map extract of Rusinga Island provided (MAP 1) and answer the following questions.

(a) Describe the drainage system of the area.

The drainage system of the area includes the presence of rivers, streams, and possibly lakes.
- If the area has a dendritic drainage pattern, it means the rivers and streams form a branching network, indicating uniform rock structure.
- If trellis drainage is present, it suggests a landscape with alternating layers of resistant and less resistant rocks.
- The presence of marshes or swamps may indicate poor drainage.
- The influence of human activities such as irrigation or dam construction can also be observed.

(b) Find the area occupied by the water body by grid method. Give the answer in square kilometers.

To find the area occupied by the water body:
- Identify the portion of the map representing the water body.
- Use the grid square method by counting full and partial grid squares covered by the water body.
- Multiply the number of squares by the area each square represents based on the map scale.
- The total sum gives the estimated area in square kilometers.

(c) Suggest the geomorphological processes that have moulded the landforms of the area.

The major geomorphological processes that shape the landscape include:
- Erosion: Wind and water erosion contribute to shaping valleys, cliffs, and slopes.
- Deposition: Sediments deposited by rivers, waves, or wind create features such as deltas and beaches.
- Weathering: Physical and chemical weathering break down rocks, influencing soil formation and landscape modification.
- Tectonic activity: Faulting and uplifting create escarpments and rift valleys.
- Wave action: If the area is near a water body, wave erosion and deposition can form cliffs, headlands, and beaches.

(d) The compass bearings of Lugongo and Sienga hills were 130° and 149° respectively. These bearings were taken from a steamer on the lake.

(i) Give the grid reference of the position of the steamer.

To determine the grid reference of the steamer:
- Identify the intersection point where the bearings from Lugongo and Sienga hills meet.
- Use a protractor to plot the angles on the map and find their intersection.
- The coordinates of this intersection point represent the grid reference of the steamer.

(ii) Measure the distance in kilometers from the position of the steamer to Kaswanga Pt.

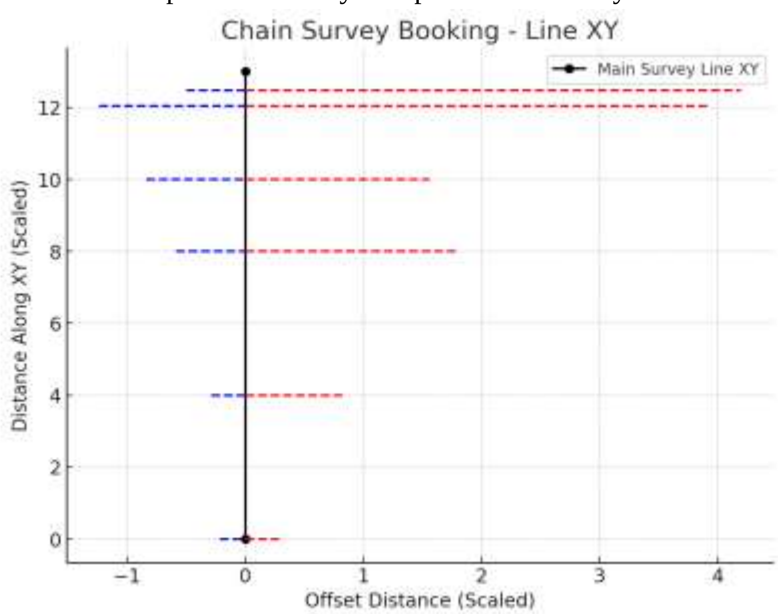
To measure the distance:
- Identify the location of the steamer and Kaswanga Pt on the map.
- Use a ruler to measure the straight-line distance between them.
- Convert the measured distance into real-world kilometers using the map scale.

(e) Calculate the bearing of Lugongo hill from Kiamera hill.

The bearing of Lugongo hill from Kiamera hill is calculated as follows:
- Identify the two locations on the map.
- Draw a straight line connecting them.
- Use a protractor to measure the angle clockwise from the north at Kiamera hill towards Lugongo hill.
- The measured angle is the bearing.

2. Study the field book entries given in Fig. 1. Plot line XY and the offsets shown. Use a scale of 1 cm to 25 meters.

To plot line XY:
- Identify the field measurements for distances and angles.
- Use the given scale (1 cm = 25 m) to mark the distances accurately on graph paper.
- Plot the offsets by marking perpendicular distances from the main survey line.
- Connect the points smoothly to represent the surveyed area.

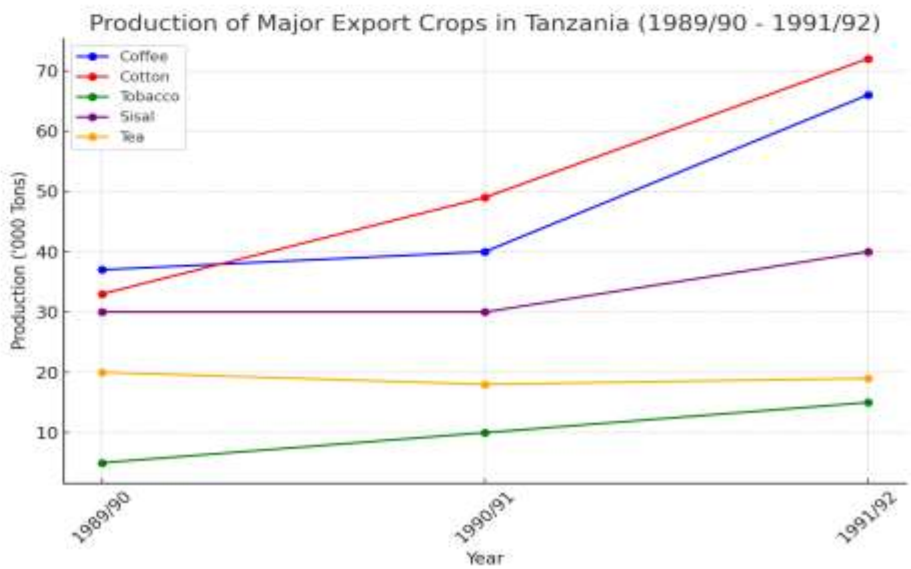


3. Study Table 1 below and answer the questions that follow.

Table 1: Production of Major Export Crops in Tanzania 1989/90 - 1991/92

Crop	1989/90	1990/91	1991/92
Coffee	37	40	66
Cotton	33	49	72
Tobacco	05	10	15
Sisal	30	30	40
Tea	20	18	19

(a) Draw a compound line graph to show the information given by the table.



(b) What are the advantages of using this method?

- It clearly shows trends over time, making it easy to identify increases or decreases in production.
- Different crop production values can be compared on the same graph.
- It provides a simple and effective way to analyze changes in agricultural output.
- It allows for predictions and decision-making in agricultural planning.

Despite its advantages, compound line graphs may become cluttered when too many variables are included, making interpretation more difficult.

5. Account for the location of the hot deserts.

Hot deserts are predominantly situated between 15° and 30° north and south of the equator, aligning closely with the Tropics of Cancer and Capricorn. This latitudinal positioning corresponds to regions known as the horse latitudes, characterized by high atmospheric pressure and descending air masses. The subsiding air inhibits cloud formation, resulting in minimal precipitation and creating arid conditions ideal for desert formation. Notable examples include the Sahara Desert in northern Africa and the Arabian Desert in the Middle East.

Additionally, many hot deserts are located on the western edges of continents. This placement is influenced by cold ocean currents running parallel to the coastlines, which cool the air above them. As this cool air moves inland, it warms up, reducing its relative humidity and leading to dry conditions. The Atacama Desert in South America and the Namib Desert in southwestern Africa exemplify deserts formed under such influences.

Furthermore, some deserts arise in the interior regions of continents, far from moisture-laden winds. As air masses travel over land, they lose moisture, and by the time they reach these inland areas, they are dry. The Gobi Desert in Asia is a prime example of a desert formed due to its distance from oceanic moisture sources.

In summary, the distribution of hot deserts is primarily determined by global atmospheric circulation patterns, proximity to cold ocean currents, and continental positioning relative to moisture sources.

6. (a) Define:

(i) Superimposed Drainage Pattern
A superimposed drainage pattern develops when a river system, established on a landscape with a particular geological structure, maintains its course as it erodes downward into underlying, differently structured rocks. This results in the river cutting across resistant formations, such as ridges or folds, that were not present in the original landscape. The drainage pattern appears to disregard the current topography, as it was "superimposed" onto the existing geological structures.

(ii) River Rejuvenation
River rejuvenation refers to the process by which a river gains renewed erosive energy, often due to changes in base level, tectonic uplift, or variations in sea level. This increase in energy enhances the river's capacity to erode its bed vertically, leading to the development of features such as terraces, knick points, and incised meanders.

(b) Explain the main features of a rejuvenated river profile.

A rejuvenated river exhibits distinct geomorphological features resulting from renewed erosive activity:
Knick Points: These are sharp changes in the gradient of the river profile, often manifested as waterfalls or rapids. Knick points indicate a sudden increase in erosive power, typically due to tectonic uplift or a drop in sea level.

River Terraces: These are step-like landforms found on the sides of valleys, representing former riverbeds elevated above the current level. Terraces form as the river cuts deeper into its channel, leaving behind remnants of its previous courses.
Incised Meanders: These are deeply entrenched meandering bends in a river, resulting from vertical erosion into the bedrock. Incised meanders occur when a river with established meanders undergoes rejuvenation, increasing its downward erosive action.
These features collectively illustrate the dynamic response of river systems to environmental changes, reflecting adjustments in their energy and erosive capabilities.

7. Describe the formation of the following features:
(a) Caves and Blowholes
Caves along coastlines form primarily through the process of wave erosion. As waves continuously crash against rock faces, they exploit weaknesses such as joints, faults, or bedding planes. Over time, hydraulic action and abrasion enlarge these openings, creating cavities or caves.
Blowholes develop when sea caves extend landward and upward, approaching the surface. If the roof of the cave becomes thin enough, the pressure from incoming waves can force water and air through a vertical shaft, creating a blowhole. During high tides or storm conditions, water is expelled forcefully through these openings, producing impressive spouts.

(b) Wave-Cut Platforms
Wave-cut platforms are flat, bench-like surfaces found at the base of coastal cliffs. They form through the relentless action of waves eroding the base of a cliff, leading to undercutting. As erosion continues, the overhanging section of the cliff collapses, and the process repeats, causing the cliff to retreat landward. The gently sloping platform left behind is exposed during low tide and represents the former position of the cliff base.

(c) Spits and Bars
Spits are elongated ridges of sand or shingle that project from the coastline into the sea, often curving at their distal end. They form through the process of longshore drift, where sediment is transported along the shore by wave action. When there is a change in the coastline's direction, such as at a river mouth or bay, the sediment continues to deposit in the original direction of the drift, gradually building up to form a spit.
Bars are similar accumulations of sediment but differ in that they extend across a bay, connecting two headlands and often sealing off the bay from the open sea. This can lead to the formation of a lagoon behind the bar. Bars form when the supply of sediment is abundant, and the energy of the waves is sufficient to transport material across the bay.

(d) Beaches
Beaches are accumulations of sand, pebbles, or cobbles along the shoreline, formed by the deposition of sediments carried by waves and currents. The material composing a beach originates from the erosion of nearby cliffs, river sediments, or offshore sources. The shape and composition of a beach are dynamic, continually reshaped by the forces of

8. Give an account of the main characteristics of the tropical continental climate.

The tropical continental climate, often referred to as the tropical wet and dry climate, is typified by distinct wet and dry seasons, with consistently high temperatures throughout the year. This climate is prevalent in regions situated between the equatorial rainforest zones and the subtropical deserts, such as parts of Central Africa, South Asia, northern Australia, and Central America.

Temperature

In tropical continental climates, temperatures remain high year-round, typically ranging between 25°C and 35°C. The hottest period often occurs just before the onset of the rainy season, with temperatures frequently exceeding 32°C. Despite seasonal variations in precipitation, the thermal amplitude is relatively low, ensuring consistently warm conditions.

Precipitation

This climate features a pronounced wet season and a dry season. The wet season coincides with the period when the Intertropical Convergence Zone (ITCZ) shifts, bringing moist, tropical air masses and resulting in heavy, convectional rainfall. Conversely, during the dry season, the region is influenced by dry, continental air masses, leading to minimal rainfall. The duration and intensity of these seasons can vary, but the alternation between wet and dry periods is a defining characteristic.

Vegetation

The vegetation in tropical continental climates is adapted to withstand both heavy rainfall and prolonged dry spells. Savannas, characterized by grasses interspersed with drought-resistant trees like acacias and baobabs, are common. These ecosystems are well-suited to the climatic rhythm, with flora exhibiting adaptations such as deep root systems and deciduous habits to conserve water during dry periods.

Human Activities

Agricultural practices in these regions are often synchronized with the seasonal rainfall patterns. Crops such as millet, sorghum, and maize are typically planted at the onset of the wet season to capitalize on the available moisture. However, the reliance on seasonal rains makes agriculture vulnerable to variations in precipitation, which can impact food security.

In summary, the tropical continental climate is marked by high temperatures, distinct wet and dry seasons, and vegetation adapted to these conditions. Understanding these characteristics is crucial for effective land use and resource management in regions where this climate prevails.

9. Discuss the nature and distribution of thunderstorms.

Thunderstorms are meteorological phenomena characterized by the presence of lightning and thunder, often accompanied by heavy rainfall, strong winds, and occasionally hail. They result from the rapid upward movement of warm, moist air, which cools and condenses to form cumulonimbus clouds. The nature and frequency of thunderstorms are influenced by factors such as geographic location, atmospheric conditions, and seasonal variations.

Nature of Thunderstorms

The development of a thunderstorm involves three primary stages:

1. Cumulus Stage: Warm, moist air rises and forms cumulus clouds.

2. Mature Stage: The cloud grows into a cumulonimbus cloud, leading to precipitation, lightning, and thunder.

3. Dissipating Stage: Downdrafts dominate, and the storm's intensity decreases.

Thunderstorms can vary in intensity from single-cell storms, lasting about an hour, to supercell storms, which are severe and can last several hours, often producing severe weather phenomena such as tornadoes.

Distribution of Thunderstorms

Thunderstorms occur globally but are most frequent in tropical and subtropical regions due to abundant warmth and moisture. Equatorial areas, such as the Congo Basin in Africa and the Amazon Basin in South America, experience thunderstorms almost daily. In these regions, intense solar heating leads to strong convection currents, fostering thunderstorm development.

In temperate regions, thunderstorms are more common during the spring and summer months when atmospheric conditions favor convection. For instance, the central United States, particularly in areas like Florida, experiences frequent thunderstorms due to the convergence of moist air from the Gulf of Mexico and dry air from the interior. In contrast, polar regions and high-latitude areas experience thunderstorms infrequently due to cooler surface temperatures and limited moisture.

Overall, the distribution of thunderstorms is closely linked to regional climatic conditions, with the highest frequency observed in warm, moist environments conducive to atmospheric instability.

10. Discuss the main factors which determine the speed and nature of mass wasting.

Mass wasting, or mass movement, refers to the downslope movement of soil, rock, and debris under the influence of gravity. The speed and nature of these movements are influenced by several interrelated factors:

1. Slope Angle

The steepness of a slope significantly affects mass wasting. Steeper slopes have a higher gravitational force component acting parallel to the surface, increasing the potential for material to move downslope. For instance, loose materials on a steep slope are more likely to experience rapid movements like landslides or rockfalls. Conversely, gentler slopes may undergo slower processes such as soil creep.

2. Material Composition

The type of materials present on a slope influences its stability. Unconsolidated materials, such as loose soil or sediment, are more prone to mass wasting compared to consolidated bedrock. Additionally, materials like clay can absorb water, reducing internal friction and making slopes more susceptible to movement.

3. Water Content

Water plays a dual role in mass wasting. While a small amount of moisture can increase cohesion among particles, excessive water reduces friction and adds weight to the slope, promoting instability. Heavy rainfall, rapid snowmelt, or over-irrigation can saturate soils, leading to events like mudflows or landslides.

4. Vegetation Cover

Vegetation stabilizes slopes through root systems that bind soil and absorb water. The removal of vegetation, due to activities like deforestation or wildfires, can decrease slope stability, increasing the likelihood of mass wasting events.

5. Geological Structure

The arrangement of rock layers and the presence of faults or joints can influence mass wasting. Slopes with layers inclined parallel to the surface are more prone to sliding, especially if weak materials like clay are present between stronger layers. Structural weaknesses can serve as planes of failure, facilitating movement.

6. Seismic Activity

Earthquakes can trigger mass wasting by shaking and destabilizing slopes, reducing the internal strength of materials, and overcoming frictional resistance. Seismic vibrations can induce landslides, especially in areas with pre-existing vulnerabilities.

In summary, the speed and nature of mass wasting are determined by a combination of slope characteristics, material properties, water content, vegetation, geological structures, and external triggers like seismic activity. Understanding these factors is crucial for assessing landslide hazards and implementing effective mitigation strategies.

11. Examine the distribution and characteristics of coniferous forests.

Coniferous forests, dominated by cone-bearing trees with needle-like leaves, are primarily found in the Northern Hemisphere, spanning across North America, Europe, and Asia. These forests are adapted to a range of climatic conditions and are classified into two main types: boreal (taiga) and temperate coniferous forests.

Distribution

Boreal Coniferous Forests: These forests form a continuous belt across high northern latitudes, covering vast areas of Canada, Alaska, Russia, and Scandinavia. They represent the world's largest terrestrial biome, known as the taiga.

Temperate Coniferous Forests: Located in coastal and mountainous regions with moderate climates, these forests are found along the Pacific coast of North America, in the southeastern United States, and in parts of Europe and Asia. They thrive in areas with high rainfall and mild temperatures.

Characteristics

Flora: Coniferous forests are predominantly composed of trees such as pines, spruces, firs, and larches. These species possess needle-like leaves and are mostly evergreen, retaining foliage throughout the year. The understory is typically sparse due to the dense canopy, but may include shrubs like junipers and a variety of mosses and lichens.

Fauna: These forests support a range of wildlife adapted to cooler climates, including large mammals like moose, deer, and bears, as well as smaller animals such as squirrels and various bird species. The dense canopy and abundant tree cover provide essential habitats and food sources for these species.

Climate: Boreal forests experience long, cold winters and short, mild summers, with precipitation primarily in the form of snow. Temperate coniferous forests, on the other hand, have milder winters and receive substantial rainfall, supporting lush vegetation growth.

Soil: The soil in coniferous forests is generally acidic and nutrient-poor, resulting from slow decomposition rates of needle litter. Despite this, these soils support vast tracts of forest due to the adaptability of coniferous species.

Coniferous forests play a vital role in global ecosystems by acting as significant carbon sinks, influencing climate regulation, and providing habitats for diverse species. They also hold substantial economic value, supplying timber and non-timber forest products. Conservation and sustainable management of these forests are essential to preserve their ecological and economic functions.

12. To what extent is water an agent of erosion in arid areas?

In arid areas, where precipitation is scarce and vegetation cover is minimal, water remains a significant agent of erosion, primarily due to the sporadic and intense nature of rainfall. Although wind is often considered the dominant erosional force in deserts, water plays a crucial role in shaping the landscape, particularly through flash floods, surface runoff, and ephemeral streams

Flash floods are among the most powerful erosional processes in arid regions. Due to the hard, compacted soils and lack of vegetation, rainwater is unable to infiltrate the ground efficiently. Instead, it flows rapidly across the surface, generating strong currents that erode loose sediment and carve out deep gullies and channels. These sudden floods can transport large volumes of sediment, reshaping desert landforms within a short period.

Surface runoff contributes significantly to erosion in arid regions. When rainfall occurs, the lack of plant roots to bind the soil together allows water to dislodge and carry sediment away. This process results in sheet erosion, where a thin layer of soil is washed away over large areas. Over time, repeated sheet erosion can lead to the formation of badlands, where steep, eroded slopes develop in soft sedimentary rock formations.

Ephemeral rivers and streams also play a vital role in arid-land erosion. Unlike permanent rivers, which flow continuously, ephemeral streams are active only during or immediately after heavy rains. Despite their short-lived nature, these streams exert significant erosive force, widening valleys and transporting sediment over great distances. Many arid regions contain dry riverbeds, known as wadis or arroyos, which are evidence of past and present fluvial activity.

Water erosion in arid environments leads to the formation of distinct landforms. Playas, or dry lake beds, develop where temporary lakes form after heavy rainfall, only to evaporate quickly, leaving behind layers of fine sediment. Mesas and buttes are shaped by the gradual removal of softer rock layers by intermittent water erosion, leaving behind flat-topped plateaus and isolated rock pillars.