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: 2008**

Instructions

1. This paper consists of section A, and B with total of seven 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 carefully the map extract of Tanga, sheet 130/1 provided, then answer the following questions.

(a) Calculate the distance of the railway line (in km) from grid reference 044360 to grid reference 090386.

The distance of the railway line is determined by:
- Identifying the railway line between the given grid references.
- Measuring the straight-line or curved distance using a ruler or a map measurer.
- Converting the measured distance to real-world units using the given map scale.

If the scale is 1:50,000, a measured distance of 1 cm on the map would correspond to 0.5 km in reality. The actual length can be obtained from precise measurement.

(b) Determine the trend alignment of part of the coastline from Ras Kazone grid reference 137417 to grid reference 148360.

To determine the trend alignment:
- Identify the section of the coastline between the two grid references.
- Observe the general direction of the coastline, whether it follows a straight, curved, or irregular pattern.
- Use compass directions such as north-south, northeast-southwest, or any other appropriate orientation.

If the coastline runs from grid 137417 to 148360, it likely follows a northeast-southwest or east-west trend, depending on its exact position on the map.

(c) With evidence from the map, explain the relationship between relief and drainage.

Relief and drainage are closely related because:
- Higher elevations, such as hills and mountains, are sources of rivers and streams due to gravitational water flow.
- Steep slopes result in fast-flowing rivers with high erosion rates, while gentle slopes allow meandering rivers with wider floodplains.
- Low-lying areas, such as valleys, tend to have slower-moving rivers that deposit sediments, forming deltas and floodplains.
- The presence of contour lines on the map indicates how rivers follow natural depressions in the land.

(d) Draw an annotated cross profile from grid reference 030375 to grid reference 053443.

A cross-profile shows the elevation changes along a straight line between two points on a map. The steps include:
- Identifying the contour lines along the chosen section.
- Plotting the elevation changes against the distance.
- Marking significant features such as peaks, valleys, and river channels.
- Labeling key points to show variations in terrain.

(e) What type of landforms are depicted on the map?

The landforms on the map can include:
- Hills and mountains, indicated by closely spaced contour lines.
- Valleys, which appear as elongated depressions between highlands.
- River channels, where blue lines or narrow depressions indicate water flow.
- Coastal features such as beaches, cliffs, or deltas, depending on the region.
- Plains and plateaus, where contour lines are widely spaced, indicating low relief.

(f) With evidence from the map, suggest possible economic activities that are taking place in the area.

Possible economic activities include:
- Agriculture, if the map shows cultivated land, irrigation schemes, or settlements near fertile areas.
- Fishing, if there are water bodies such as rivers, lakes, or coastal regions.
- Trade and commerce, indicated by roads, railway lines, and urban centers.
- Tourism, if there are geographical attractions such as mountains, forests, or historical sites.
- Mining, if there are symbols representing mineral resources or quarries.

(g) Explain clearly the factors that affect the content of a topographical map.

The content of a topographical map is influenced by:
- Scale, which determines the level of detail shown. Large-scale maps show more details, while small-scale maps generalize features.
- Elevation and relief, which are represented through contour lines, spot heights, and shading.
- Human activities, such as roads, buildings, and settlements, which affect land use representation.
- Vegetation and land cover, which show forests, grasslands, wetlands, or desert areas.
- Water bodies, including rivers, lakes, and coastlines, which influence topographical features.

2. Refer to figure 1, which shows hypothetical altitude values of country X.

(a) Draw the form lines on it, with vertical intervals of 50 metres.

To draw form lines:
- Identify altitude points that are close to each other and group them based on 50-meter intervals.
- Smoothly connect the points with similar altitudes to create contour lines.
- Ensure the lines follow a logical elevation pattern, indicating peaks, slopes, and depressions.
- Label the contour lines appropriately to indicate the altitude levels.

(b) Enumerate the advantages and disadvantages of isopleth maps.

Advantages:
- Show continuous data variation across a region, making it easy to interpret trends.
- Provide a clear representation of gradual changes, such as temperature, rainfall, or elevation.

- Useful for climatic and geographical studies by indicating distribution patterns.

Disadvantages:
- Require accurate and extensive data to create meaningful representations.
- Difficult to construct manually, as interpolation of values is needed.
- May oversimplify complex variations, leading to loss of specific details.

3. (a) Distinguish oblique photographs from vertical aerial photographs.

Oblique photographs and vertical aerial photographs differ based on their angle of capture.

- Oblique photographs are taken at an angle to the ground, either high oblique, which includes the horizon, or low oblique, which does not include the horizon. These photographs provide a three-dimensional perspective of the landscape and are useful in identifying landforms and structures.

- Vertical aerial photographs are taken with the camera lens pointing directly downward, producing a bird's-eye view of the landscape. They are commonly used in mapping and geographic studies because they provide accurate scale and minimal distortion.

(b) Compare and contrast photographs and maps.

Photographs and maps are both used for representing geographical features, but they have significant differences.

- Photographs capture real images of the landscape as they appear, providing natural colors, textures, and detailed features. They are useful for visual analysis but can have distortions due to perspective.

- Maps are abstract representations of the Earth's surface, created through cartographic techniques. They use symbols, scales, and projections to simplify spatial information. Maps provide accurate measurements and standardized representation but lack the real-life appearance of photographs.

- While photographs show actual scenes, maps use interpretations and generalizations to highlight specific features.

4. A research process proceeds through a logical manner in order to obtain meaningful information.

Give an outline of research procedures.

The research process involves several systematic steps to ensure reliable and valid results.

- Identification of the problem. Define the research problem or question that needs to be investigated.

- Literature review. Gather and review existing information and studies related to the research topic.

- Formulation of objectives and hypotheses. Establish clear objectives and possible explanations that guide the study.

- Research design. Decide on the methodology, including data collection methods such as surveys, experiments, or field observations.

- Data collection. Gather relevant information using selected methods, ensuring accuracy and reliability.

- Data analysis and interpretation. Organize and analyze the collected data to derive meaningful insights and conclusions.

- Presentation of findings. Summarize the results in a structured format such as reports, charts, or graphs.

- Conclusion and recommendations. Draw conclusions based on the findings and suggest practical applications or further research.

5. (a) What is meant by triangle of error and how can one deal with it in setting a plane table?

The triangle of error refers to the small area formed when three plotted points from different observations do not exactly coincide on a plane table survey. This occurs due to minor errors in sighting, instrument setup, or environmental conditions.

To deal with the triangle of error:
- Check and adjust the alignment of the plane table to minimize observational mistakes.
- Ensure accurate leveling and centering of the instrument to avoid misplacement.
- Use multiple observations from different positions to improve accuracy.
- Take the center of the triangle as the most probable correct position and refine it through further measurements.

(b) Illustrate the meaning of intersection in plane table surveys.

Intersection in plane table surveys is a method used to determine the position of an unknown point by taking observations from two or more known stations.

- The surveyor sets up the plane table at two different locations and sights the unknown point from both stations.
- The observed rays from both stations intersect on the map, marking the exact position of the unknown point.
- This method is useful for plotting inaccessible objects such as towers, hills, or river junctions.

Intersection helps improve accuracy in mapping and reduces the need for direct measurements in difficult terrain.

6. Evidence Supporting the Theory of Plate Tectonics

The theory of plate tectonics is underpinned by multiple lines of evidence that collectively demonstrate the dynamic nature of Earth's lithosphere.

One compelling piece of evidence is the jigsaw-like fit of continental coastlines, notably the complementary shapes of South America and Africa. This observation suggests that these continents were once joined together and have since drifted apart.

Fossil distribution further supports this theory. Identical fossils of ancient plants and animals, such as the reptile Lystrosaurus and the fern Glossopteris, have been discovered on continents now separated by vast oceans, indicating these landmasses were once connected.

Geological formations, including mountain ranges and rock strata, exhibit remarkable similarities across continents. For instance, the Appalachian Mountains in North America align geologically with the Caledonian Mountains in Scotland and Scandinavia, suggesting a shared geological history prior to continental separation.

Paleoclimatic evidence also lends credence to plate tectonics. Glacial deposits and striations found in present-day warm regions imply these areas were once situated closer to the poles, consistent with the movement of continents over geological time.

The discovery of symmetrical patterns of magnetic anomalies on either side of mid-ocean ridges has been pivotal. These patterns record geomagnetic reversals and indicate seafloor spreading, where new crust is formed at ridges and moves outward, carrying magnetic signatures that mirror across the ridge axis.

Additionally, the global distribution of seismic and volcanic activity aligns predominantly along plate boundaries. This correlation highlights the interactions between plates, such as collisions, separations, and lateral sliding, which manifest as earthquakes and volcanic eruptions.

7. Classification and Importance of Sedimentary Rocks

Sedimentary rocks are categorized based on their modes of formation into three primary types: clastic, chemical, and organic sedimentary rocks.

Clastic sedimentary rocks form from the accumulation and lithification of mechanical fragments of pre-existing rocks. These fragments, or clasts, are transported by agents like water, wind, or ice, and deposited in various environments. Sandstone, composed mainly of sand-sized particles, and shale, formed from fine clay particles, are typical examples.

Chemical sedimentary rocks result from the precipitation of minerals from solution, often due to evaporation or chemical changes. Limestone, primarily made of calcium carbonate, precipitates in marine settings, while rock salt forms from the evaporation of saline waters.

Organic sedimentary rocks develop from the accumulation of biological material. Coal originates from compressed plant debris in swampy environments, and certain limestones derive from the calcareous shells of marine organisms.

These rocks hold significant importance for humanity. Clastic rocks like sandstone serve as reservoirs for groundwater and hydrocarbons, making them crucial for water supply and energy resources. Chemical sedimentary rocks, such as limestone, are essential in construction and industrial processes, including cement production. Organic rocks like coal have historically been vital energy sources, fueling industrial advancements.

8. Factors Influencing the Evolution of Coastlines

Coastlines are dynamic interfaces shaped by a multitude of factors that drive their continuous evolution.

Tectonic activity plays a fundamental role by altering land elevations and configurations. Processes such as uplift can raise coastal areas, while subsidence can lead to submergence, both reshaping the coastal landscape over time.

Sea-level fluctuations, influenced by climatic changes and glacial cycles, significantly impact coastlines. Rising sea levels can inundate low-lying areas, leading to the formation of estuaries and bays, whereas falling sea levels can expose continental shelves, expanding coastal plains.

Erosional forces, including wave action, currents, and wind, continuously modify coastlines by wearing away rocks and sediments. This erosion can create features like cliffs, sea arches, and stacks. Conversely, depositional processes, where sediments accumulate, can form beaches, spits, and barrier islands.

Biological factors also contribute to coastal evolution. Coral reefs, for example, build up over time to form protective barriers, while mangroves and marsh vegetation stabilize sediments, reducing erosion and promoting land accretion.

Human activities, such as coastal development, dam construction, and dredging, have increasingly influenced coastal dynamics. These interventions can alter natural sediment transport, exacerbate erosion, and lead to habitat loss, thereby accelerating changes in coastal configurations.

9. Vertical Structure of the Atmosphere

The Earth's atmosphere is stratified into distinct layers, each characterized by unique temperature gradients, compositions, and phenomena.

The troposphere is the lowest layer, extending up to about 7-20 kilometers above the Earth's surface. It contains approximately 75% of the atmosphere's mass and is where most weather events occur. In this layer, temperature decreases with altitude.

Above the troposphere lies the stratosphere, reaching up to about 50 kilometers. This layer houses the ozone layer, which absorbs and scatters ultraviolet solar radiation. Unlike the troposphere, temperatures in the stratosphere increase with altitude due to this absorption of radiation.

The mesosphere extends from the stratosphere up to about 85 kilometers. Here, temperatures again decrease with altitude, making it the coldest atmospheric layer. This layer is also where most meteors burn up upon entering the Earth's atmosphere.

10. How do plants in deserts and semi-desert areas adapt to their climatic conditions?

Plants in deserts and semi-desert areas have developed various adaptations to survive in extreme conditions characterized by high temperatures, low rainfall, and intense sunlight.

- Water storage. Some plants, such as cacti and succulents, store water in their stems, leaves, or roots to survive prolonged dry periods.
- Deep or extensive root systems. Some plants have deep taproots to reach underground water, while others develop widespread shallow roots to quickly absorb surface moisture when it rains.
- Reduced leaf surface area. Many desert plants have small, needle-like, or wax-coated leaves to minimize water loss through transpiration. Some, like cacti, have spines instead of leaves to reduce surface area.
- Dormancy during dry seasons. Some plants remain dormant during dry periods and grow only when there is enough moisture.
- Light-colored or reflective surfaces. Some plants have silvery or light-colored leaves that reflect sunlight, reducing heat absorption.
- Rapid life cycle. Some desert plants complete their life cycle quickly after rain, germinating, flowering, and producing seeds before the soil dries out again.

These adaptations help plants withstand harsh desert conditions and conserve water for survival.

11. Explain the role of humans in soil fertility and suggest ways of improving soil fertility.

Humans play a significant role in both the degradation and improvement of soil fertility.

Negative impacts on soil fertility include:
- Deforestation. Cutting down trees reduces organic matter input, increases soil erosion, and depletes nutrients.

- Overgrazing. Excessive grazing by livestock leads to soil compaction, loss of vegetation, and reduced fertility.
- Unsustainable farming practices. Continuous monoculture and excessive use of chemical fertilizers degrade soil structure and deplete essential nutrients.
- Poor irrigation techniques. Excessive irrigation causes soil salinization, reducing fertility over time.

Ways to improve soil fertility include:
- Crop rotation. Alternating different crops in the same field helps restore soil nutrients and break disease cycles.
- Organic farming. Using compost, manure, and cover crops enhances soil organic matter and microbial activity.
- Agroforestry. Planting trees alongside crops prevents soil erosion, provides shade, and improves soil structure.
- Conservation tillage. Reducing plowing helps retain moisture and maintain soil structure.
- Proper irrigation management. Using efficient irrigation systems such as drip irrigation reduces water loss and prevents soil degradation.

Sustainable farming practices can maintain and improve soil fertility for long-term agricultural productivity.

12. Account for the development of a long and cross profile of a river.

A river profile consists of two views: the long profile, which shows the river's gradient from source to mouth, and the cross profile, which shows the river's shape at different sections.
- Long profile. This represents the river's course from its source in the highlands to its mouth, where it enters a lake, sea, or ocean.
  - In the upper course, the river has a steep gradient, flows rapidly, and erodes vertically, forming V-shaped valleys and waterfalls.
  - In the middle course, the gradient decreases, and the river widens with a balanced erosion and deposition process, forming meanders and floodplains.
  - In the lower course, the river flows slowly with a gentle gradient, depositing sediments and forming deltas or estuaries.

- Cross profile. This shows the river's shape at different stages.
  - In the upper course, the cross-section is narrow and steep, forming deep valleys.
  - In the middle course, the river valley widens, and the channel becomes broader and deeper.
  - In the lower course, the river forms a broad U-shaped valley with floodplains and levees.

The long and cross profiles evolve due to erosion, transportation, and deposition processes acting over time.

13. Classify lakes according to their mode of formation.

Lakes are classified based on how they were formed.

- Tectonic lakes. These lakes form due to movements of the Earth's crust, such as faulting, warping, or subsidence. Examples include Lake Victoria and Lake Tanganyika.
- Volcanic lakes. These lakes form in volcanic craters, calderas, or lava depressions. Examples include Crater Lake in Oregon and Lake Nyos in Cameroon.
- Glacial lakes. These lakes form due to glacial erosion and deposition, such as cirque lakes and moraine-dammed lakes. Examples include the Great Lakes in North America.
- Riverine lakes. These lakes form along river courses due to meandering, natural levee breaches, or sediment deposition. Examples include oxbow lakes.
- Karst lakes. These lakes form in limestone regions where underground water dissolves rock, creating depressions that fill with water. Examples include cenotes in Mexico.
- Man-made lakes. These lakes are created by human activities, such as damming rivers for hydroelectric power or irrigation. Examples include Lake Nasser in Egypt and Lake Volta in Ghana.

Each type of lake forms through specific geological or environmental processes, shaping their unique characteristics.