

GEOGRAPHY FORM 4

MARKING SCHEME

SECTION A (60 marks)

QUESTION 1:

(a) Three reasons why the population pyramid has a wide base (3 marks - 1 mark each):

1. High birth rate/Fertility rate - Many children are born, creating a large youth population
2. Low infant mortality rate has improved - More children survive to reproductive age due to better healthcare
3. Young population structure - The country is in early stages of demographic transition with rapidly growing population

Accept any other relevant reasons such as:

- Limited family planning adoption
- Cultural factors favoring large families
- Early marriage and childbearing

(b) Approximate total population in 10-14 age group (2 marks):

Males: 10 million

Females: 10.5 million

Total: 20.5 million (Award 1 mark for reading from graph correctly, 1 mark for addition)

(c) Ratio of males to females aged 0-4 years (4 marks):

From graph: Males = 12 million, Females = 12.5 million

Ratio = 12 : 12.5 = 12 : 12.5 or simplified to 24 : 25 (1 mark for correct reading)

Or as decimal: $12/12.5 = 0.96 : 1$ (1 mark for correct ratio)

Explanation: The ratio shows that there are slightly more females than males in this age group, which is normal as female longevity is slightly higher. The near-equal ratio indicates relatively balanced natural birth rates between sexes. (2 marks for valid explanation of what the ratio tells us)

QUESTION 2:

(a) Total annual rainfall calculation (4 marks):

Climate Station A:

$50 + 40 + 80 + 120 + 100 + 30 + 20 + 30 + 40 + 90 + 120 + 80 = 800$ mm (2 marks - 1 for correct reading, 1 for addition)

Climate Station B: $200 + 220 + 250 + 240 + 180 + 80 + 60 + 70 + 100 + 180 + 220 + 200 = 1980$ mm (2 marks - 1 for correct reading, 1 for addition)

(b) Temperature pattern comparison (4 marks):

Climate Station A: Temperatures range from 23°C to 28°C, with highest temperatures in March-April (summer) and lowest in June-July (winter). Mean annual temperature approximately 25.5°C.

Climate Station B: Temperatures range from 16°C to 23°C, with highest temperatures in March-April (spring) and lowest in January and December (winter). Mean annual temperature approximately 20°C.

Differences: Station A is hotter with higher temperatures year-round. Station A has less temperature variation (5°C range) compared to Station B (7°C range). Station A shows more consistent temperatures while Station B shows distinct seasonal temperature changes.

Explanation: Station A is likely in tropical/equatorial region closer to equator with more consistent solar radiation. Station B is in higher latitude (temperate) region experiencing greater seasonal variation due to Earth's tilt. (Award 2 marks for comparison, 2 marks for explanation)

(c) Köppen climate classification (4 marks):

Climate Station A:

- Classification: Tropical Savanna (Aw or Am)
- Criteria: Annual rainfall 800 mm (moderate), high temperatures year-round 23-28°C, wet and dry seasons present
- Justification: Temperatures consistently warm, rainfall concentrated in certain months (monsoon influence)

Climate Station B:

- Classification: Temperate/Mild Oceanic (Cfb) or Temperate Continental (Dfb)
- Criteria: High annual rainfall 1980 mm, moderate temperatures 16-23°C, precipitation throughout year with winter minimum
- Justification: Adequate rainfall in all seasons, moderate temperatures suggest higher latitude, maritime influence

QUESTION 3:

(a) Soil horizon names (4 marks - 1 mark each):

1. A = O horizon (Organic layer/Litter layer/Humus layer) - Contains decomposed organic matter and plant debris
2. B = A horizon (Topsoil) - Contains humus and mineral particles, most fertile
3. C = B horizon (Subsoil) - Contains leached minerals, less fertile, weathered parent rock material
4. D = C horizon (Parent rock/Regolith) - Unweathered or partially weathered rock material

(b) Differences between horizon A and B (4 marks):

COMPOSITION:

- Horizon A (O): Consists mainly of organic matter (plant and animal remains), high humus content, dark color
- Horizon B (Topsoil): Mix of organic matter and mineral particles, moderate humus, lighter color than A

FORMATION:

- Horizon A: Formed from decomposition of plant material by microorganisms at surface
- Horizon B: Formed from weathering of parent rock mixed with organic matter moved down by percolating water (2 marks for composition, 2 marks for formation)

(c) Two major soil formation processes (4 marks - 2 marks each):

WEATHERING:

Physical weathering - Breaking down of rock into smaller particles by temperature changes, water/ice action, and mechanical processes. This increases surface area for chemical weathering.

BIOLOGICAL PROCESSES:

Decomposition - Microorganisms (bacteria, fungi) break down organic matter from dead plants and animals, producing humus. Root activity also breaks rocks and contributes to profile development. This enriches soil with nutrients and organic matter.

QUESTION 4:

(a) Five major processes in the water cycle (5 marks - 1 mark each):

5. EVAPORATION - Process where water from oceans, lakes, and rivers changes from liquid to vapor due to sun's heat
6. TRANSPIRATION - Release of water vapor from plants through their leaves
7. CONDENSATION - Process where water vapor cools and changes back to liquid water droplets, forming clouds
8. PRECIPITATION - Fall of water from clouds to Earth as rain, snow, or hail
9. INFILTRATION/PERCOLATION - Water soaks into the ground and moves downward through soil layers to groundwater

Accept: Run-off, sublimation, collection as alternative processes

(b) Human activities disrupting water cycle (4 marks):

10. DEFORESTATION - Removal of trees reduces transpiration and increases surface run-off, reducing infiltration
11. URBANIZATION - Concrete and asphalt surfaces prevent water infiltration, increasing flooding and run-off, reducing groundwater recharge
12. IRRIGATION - Excessive water extraction from rivers/groundwater alters natural water distribution, causes salinization
13. POLLUTION - Industrial waste contaminates water bodies, affecting evaporation and water quality (Award 1 mark per well-explained point, up to 4 marks)

(c) Freshwater accessibility calculation (3 marks):

Total water on Earth = 100%

Saltwater = 97%

Freshwater = 3%

Directly accessible for human use = 0.3% of total water (or $0.3/3 = 10\%$ of freshwater)

Calculation: 0.3% of total water = $0.3 \div 100 \times 100 = 0.3\%$

Or as fraction: $0.3/100 = 3/1000 = 0.003$

(Award 1 mark for correct identification of percentages, 1 mark for calculation method, 1 mark for correct answer)

QUESTION 5:

(a) Volcanic mountain parts (2 marks - 0.5 marks each):

- A = Crater/Vent - Opening at top of volcano where magma is expelled
- B = Cone/Cinder Cone - Main body of mountain formed from accumulated ash, cinder, and lava
- C = Lava Flow - River of molten rock flowing down the mountainside
- D = Base/Foundation/Bedrock - Original ground upon which volcano has grown

(b) Differentiation between volcanic and fold mountains (6 marks):

FORMATION:

- Volcanic: Formed from accumulation of erupted lava, ash, cinders, and other pyroclastic material
- Fold: Formed from compression and uplift of rock layers along plate boundaries, creating wrinkles/folds

COMPOSITION:

- Volcanic: Composed of igneous rocks (basalt, andesite) and pyroclastic materials
- Fold: Composed of metamorphic and sedimentary rocks forced together and metamorphosed

CHARACTERISTICS:

- Volcanic: Steep sided, symmetrical cone shape, crater at peak, young mountains, prone to earthquakes/eruptions
- Fold: Elongated ridges, parallel mountain ranges, older mountains, complex folded structure visible, less volcanic activity (Award 1 mark for each section: formation, composition, characteristics)

(c) Three ways mountains influence climate (5 marks - accept any three, award points proportionally):

14. **OROGRAPHIC RAINFALL/PRECIPITATION** - Air masses are forced upward by mountains, cooling and condensing to produce high rainfall on windward slopes. Leeward side receives less rain (rain shadow effect). Higher altitude = lower temperatures = increased precipitation as snow.
15. **TEMPERATURE VARIATION** - Temperature decreases with altitude at approximately 1°C per 100m (lapse rate). Mountain peaks are much colder than surrounding lowlands. This creates different climate zones at different elevations.
16. **WIND PATTERNS** - Mountains affect wind direction and speed, creating local wind systems like foehn winds, bora winds. Wind patterns influence cloud formation and precipitation distribution around mountains. (Award 1-2 marks per well-explained point)

SECTION B (40 marks) -

Answer ANY FOUR out of 7 questions. Each question carries 10 marks. Use the following marking criteria for all essay questions:

QUESTION 7:

Expected Answer Structure:

CAUSES OF CLIMATE CHANGE (4-5 marks):

- Greenhouse gas emissions - Burning of fossil fuels (coal, oil, gas) releases CO₂, methane, nitrous oxide
- Deforestation - Removes carbon sinks and reduces oxygen production
- Industrial pollution - Manufacturing and energy production release pollutants
- Agriculture - Livestock farming produces methane, fertilizers release N₂O

EFFECTS ON ECOSYSTEMS (3-4 marks):

- Biodiversity loss - Species unable to adapt to rapid temperature changes, habitat destruction
- Coral bleaching - Rising ocean temperatures stress corals, destroying marine ecosystems

- Forest dieback - Increased droughts and pests damage forests
- Altered migration patterns - Animals shift habitats following food availability

EFFECTS ON HUMAN SOCIETIES (2-3 marks):

- Food security threats - Crop failures, reduced agricultural productivity
- Increased natural disasters - More severe hurricanes, floods, droughts
- Sea level rise - Flooding of coastal cities, small island nations threatened
- Climate refugees - Mass migration due to uninhabitable regions

QUESTION 8:

Expected Answer Structure:

ENVIRONMENTAL IMPACTS (3-4 marks):

- Land degradation - Loss of agricultural land, deforestation for urban expansion
- Water pollution - Industrial and domestic waste contaminates rivers and groundwater
- Air pollution - Vehicle emissions and factory pollution create smog
- Solid waste - Urban areas generate massive amounts of waste, often poorly managed

SOCIAL IMPACTS (2-3 marks):

- Slum development - Overcrowding, poor housing, inadequate services
- Unemployment - Job shortages despite population growth
- Social inequality - Wealth disparities become more pronounced

SUSTAINABLE STRATEGIES (4-5 marks):

- Green spaces - Parks, gardens for recreation and air purification
- Public transportation - Reduces vehicle emissions and traffic congestion
- Waste management - Recycling programs, proper landfill management
- Energy efficiency - Solar panels, energy-efficient buildings
- Urban planning - Controlled development, preservation of green belts

QUESTION 9:

Expected Answer Structure:

PHYSICAL FACTORS (2-3 marks):

- Climate - People prefer moderate climates; deserts/arctic areas are sparsely populated
- Altitude - High mountains are sparsely populated due to harsh conditions
- Water availability - Areas with adequate water are densely populated (river valleys, coastal areas)
- Soil quality - Fertile soils support higher populations

HUMAN/ECONOMIC FACTORS (2-3 marks):

- Economic opportunities - Industries concentrate populations in urban areas
- Infrastructure - Good transport, communication attract people to cities
- Historical factors - Ports, colonial cities developed as centers

EXAMPLES FROM TWO CONTINENTS (4-5 marks):

ASIA - Example: East Asia - High population densities in river valleys (Yellow River, Yangtze River in China, Mekong Delta in Southeast Asia). Plains with fertile soils and adequate rainfall support large populations. Coastal areas have major ports and commercial centers.

EUROPE - Example: Southern Europe - Mediterranean coast densely populated due to moderate climate and economic opportunities. Northern Scandinavia sparsely populated due to harsh climate and difficult terrain. River valleys (Rhine, Danube) are major population centers.

QUESTION 10:

Expected Answer Structure:

CONCEPT OF SUSTAINABLE DEVELOPMENT (2 marks):

Development that meets present needs without compromising future generations' ability to meet theirs. Balance between economic growth, social development, and environmental protection.

ROLE IN RESOURCE MANAGEMENT (4-5 marks):

- Renewable resources - Sustainable harvesting of forests, fish stocks at regeneration rates
- Non-renewable resources - Efficient use, recycling, developing alternatives
- Conservation - Protected areas, wildlife sanctuaries maintain biodiversity
- Alternative energy - Solar, wind power reduce fossil fuel dependence

BALANCING DEVELOPMENT WITH CONSERVATION (3-4 marks):

- Community-based initiatives - Local people benefit from conservation projects
- Payment for ecosystem services - Compensation for environmental protection
- Environmental impact assessment - Evaluate development projects before approval
- Green technology - Eco-friendly alternatives support development goals

QUESTION 11:

Expected Answer Structure:

CHARACTERISTICS (2-3 marks):

- High rainfall - 2000+ mm annually, distributed throughout year
- High temperatures - 20-25°C year-round
- Dense vegetation - Layered structure: emergent, canopy, understory, forest floor
- High biodiversity - Home to 50% of Earth's species

DISTRIBUTION (2 marks):

- Located between 10°N and 10°S - Congo Basin (Africa), Amazon (South America), Southeast Asia (Indonesia, Malaysia)
- Near equator in regions with equatorial or tropical humid climates

THREATS (3-4 marks):

- Deforestation - Logging, cattle ranching, agriculture (especially palm oil)
- Species extinction - Habitat loss threatens endemic species
- Climate change - Rising temperatures, altered rainfall patterns
- Illegal mining - Pollution and habitat destruction

CONSERVATION MEASURES (1-2 marks):

- Protected areas - National parks, nature reserves
- Sustainable logging - Selective cutting, reforestation
- International agreements - CITES, REDD+ programs
- Community involvement - Indigenous land rights, eco-tourism

QUESTION 12:

Expected Answer Structure:

PLATE TECTONIC THEORY (2 marks):

Earth's crust divided into several plates that move continuously. Movement at plate boundaries creates earthquakes and volcanic activity.

RELATIONSHIP TO EARTHQUAKES (3-4 marks):

- Convergent boundaries - Plates collide, one subducts under another, releasing seismic energy (e.g., Japan, Chile)
- Divergent boundaries - Plates separate, pressure builds, causing earthquakes (e.g., Mid-ocean ridges)
- Transform boundaries - Plates slide past each other horizontally, friction causes earthquakes (e.g., San Andreas Fault)
- Hotspots - Plumes of hot magma rising through plates create earthquakes/volcanoes independent of plate boundaries

RELATIONSHIP TO VOLCANOES (2-3 marks):

- Convergent boundaries - Subducting plate melts, magma rises (e.g., Ring of Fire in Pacific)
- Divergent boundaries - Magma rises to fill gap as plates separate (e.g., Iceland)
- Hotspots - Fixed plumes create volcanic chains as plate moves over them (e.g., Hawaiian Islands)

DISASTER RISK REDUCTION (1-2 marks):

- Monitoring - Seismographs, volcano observatories track plate movements
- Building codes - Earthquake-resistant structures in high-risk zones
- Early warning systems - Predict eruptions, issue evacuation orders
- Community preparedness - Education, drills, evacuation routes

QUESTION 13:

Expected Answer Structure:

FACTORS AFFECTING SETTLEMENT PATTERNS (3-4 marks):

- Physical factors - Water availability, relief, climate, soil fertility
- Economic factors - Employment opportunities, resource availability, trade routes
- Historical factors - Colonial settlements, religious centers, military stations
- Political factors - National borders, government policies, infrastructure investment

CHALLENGES OF RURAL SETTLEMENTS (2-3 marks):

- Limited services - Few schools, health facilities, poor roads
- Economic decline - Youth migration to cities, agricultural challenges
- Environmental degradation - Soil erosion, deforestation, overgrazing

CHALLENGES OF URBAN SETTLEMENTS (2-3 marks):

- Overcrowding - Slums, inadequate housing, congestion
- Pollution - Air, water, noise pollution from industry and vehicles
- Social problems - Crime, inequality, inadequate social services

PLANNING AND MANAGEMENT SOLUTIONS (1-2 marks):

- Rural development - Investment in infrastructure, education, healthcare
- Sustainable agriculture - Reduce rural poverty, improve living conditions
- Urban planning - Zoning, green spaces, affordable housing, public transport
- Environmental management - Pollution control, waste management, conservation