

UNIVERSITY OF KWAZULU-NATAL
SCHOOL OF AGRICULTURAL, EARTH & ENVIRONMENTAL SCIENCES
DISCIPLINE OF GEOGRAPHY
MAIN EXAMINATION: JUNE 2015
COURSE & CODE: BIOPHYSICAL ENVIRONMENTS OF SOUTHERN
AFRICA, ENVS 210

DURATION: 3 HOURS

TOTAL MARKS: 150

Internal Examiners: Dr S Pillay & Mr J Lutchmiah
External Examiner: Dr J Odindi

NOTE: This paper consists of 8 pages and an MCQ answer sheet. Please ensure that you have them all.

Answer each section in a separate booklet.

SECTION A – BIOGEOGRAPHY

QUESTION 1

Answer any two (2) questions

- 1.1 Discuss the of significance of estuaries and factors that contribute to their degradation. (10)
- 1.2 Provide explanatory notes on any four (4) categories of zonobiomes. (10)
- 1.3 Explain, in detail, the factors that promote the occurrence of alluvial vegetation. (10)

QUESTION 2

Answer any one (1) question

- 2.1 Savannas, the world's major biomes, are the dominant vegetation type in the African continent. Provide in-depth explanations on the various aspects that characterize this biome. (30)
- 2.2 Wetlands, apart from supporting a variety of aquatic vegetation and lifeforms, also serve as reservoirs of freshwater. Explain, in detail, the characteristics, value and threats to freshwater wetlands. (30)

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SECTION B – GEOMORPHOLOGY

QUESTION 3

Answer any two (2) questions

- 3.1 Discuss, with examples, the relationship between Geomorphology and any two disciplines. (10)
- 3.2 Explain the role of vegetation and rainfall intensity in determining the rate of infiltration down a slope. (10)
- 3.3 Write explanatory notes on any two types of mass wasting. (10)

QUESTION 4

Answer any one (1) question

- 4.1 Weathering, a geomorphological phenomenon, can be attributed to physical, biological and chemical processes. Explain, in detail, the six types of physical/mechanical weathering processes. (30)
- 4.2 Discuss the role of sediment transport as a very important agent in influencing geomorphological change. (30)

SECTION C – CLIMATOLOGY

QUESTION 5

Explain how TWO of the following phenomena are formed: (10 x 2 = 20)

- 5.1 Gradient Winds
5.2 Cyclostrophic Winds
5.3 Geostrophic Winds

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QUESTION 6
Multiple Choice (30 marks)

Instructions:

Choose the most correct answer and colour in the circle corresponding to your choice of answer. Ensure that you write in your name and student number on the answer sheet before handing in.

NB: *No Negative marking to be employed.*

- 1. Precipitation in the mid-west (Karoo) of South Africa generally occurs as**
 - a. Orographic rainfall
 - b. Temperate disturbances
 - c. Convection driven storms
 - d. Tropical rainfall (1)

- 2. The southwest region of South Africa generally receives its rainfall as**
 - a. Temperate westerly disturbances
 - b. Tropical systems associated with the ITCZ
 - c. Orographic rainfall associated with a ridging anticyclone
 - d. Convective storms (1)

- 3. Köppen Climate Classification System uses a combination of _____, _____ & _____ to determine global climate zones**
 - a. Current weather; temperature; prevailing wind direction
 - b. Soil types; extreme weather events; temperature
 - c. Main climate; current weather; precipitation
 - d. Main climate; precipitation; temperature (1)

- 4. Water vapour has several important roles in the atmospheric heat budget, such as**
 - a. Trapping long wave radiation in Earth's atmosphere
 - b. Lowering average global temperatures
 - c. Trapping thermal condensation nuclei
 - d. Decreasing atmospheric temperatures due to cold cloud formation (1)

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5. Latent heat is

- a. Heat gained by the surrounding air upon commencement of evaporation
- b. The difference in temperature between cold clouds and warm clouds
- c. The temperature difference between snow and rain
- d. Energy required or given off upon the change of phase of water (1)

6. Collision and Coalescence

- a. Occurs when water vapour condenses on ice crystals
- b. Is a process of droplet growth in warm clouds
- c. Gives rise to graupel forms
- d. Allows for water vapour to occur below freezing point without sublimation (1)

7. Sublimation occurs when water vapour

- a. Increases due to cooler climatic conditions
- b. Transforms into ice due to sudden temperature decline
- c. Rises due to convection air currents
- d. Condenses, then collides and coalesces to form rainfall (1)

8. When there are extremely strong up and down draughts within a cloud system,

- a. The system is now called a tornado
- b. Coriolis force may cause a rotation in the system resulting in a tropical cyclone
- c. Rainfall is unlikely to fall
- d. The convection may cause hail to form (1)

9. Smog is defined as

- a. Fog that occurs when there is very little moisture in the atmosphere
- b. The condensation nuclei present because of smoke in the area
- c. An extremely thick fog
- d. A combination of industrial pollutants and mist (1)

10. Under extremely dry conditions, if air temperature drops below freezing point

- a. Black frost is likely to occur
- b. Frost will occur due to sublimation
- c. High winds will disrupt the frost from forming
- d. The dry conditions prevent enhance condensation (1)

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11. Weather seeding refers to

- a. Releasing weather balloons in order to gain upper atmosphere data
 - b. Planting crop seeds according to the type of weather present in an area
 - c. The placement of steel rods in order to attract lighting away from buildings
 - d. Releasing of silver iodide into clouds to stimulate raindrop formation
- (1)

12. The primary driving force of wind is

- a. Altitude
 - b. Pressure gradient force
 - c. Coriolis Effect
 - d. Centrifugal circulation
- (1)

13. Geostrophic winds are a balancing of forces between

- a. Pressure gradient force and the force of the Earth's rotation
 - b. Coriolis force and gradient winds
 - c. Pressure gradient force and centrifugal force
 - d. All of the above
- (1)

14. Coriolis force causes

- a. Deflection of movement to the left in the southern hemisphere
 - b. Air to rotate clockwise around a low pressure system in South Africa
 - c. Bending of wind to the right in the northern hemisphere
 - d. All of the above
- (1)

15. During the development of a thunderstorm, these factors are required

- a. A big difference between air temperature and dew point temperature
 - b. Strong instability with rising thermals
 - c. Strong horizontal wind shear
 - d. Strong inversion layer close to the ground
- (1)

16. The reflective patterns of storm cells are measured using

- a. Satellite imagery
 - b. Radiosondes
 - c. Doppler weather radars
 - d. All of the above
- (1)

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17. During an El Nino, the following is expected:

- a. Pressures decrease off the coast of Peru
 - b. The high pressure over the coast of Peru weakens
 - c. Pressures increase over eastern Australia
 - d. All of the above
- (1)

18. The Southern Oscillation Index refers to pressure relationships between

- a. Australia and Peru
 - b. Darwin and Tahiti
 - c. The Atlantic Ocean and the Pacific Ocean
 - d. The rate at which ocean temperatures cool
- (1)

19. During a La Nina event,

- a. Low pressures over eastern Australia intensifies
 - b. High pressures over the eastern Pacific weakens
 - c. SST's over the eastern Australian ocean increases
 - d. Only a and c above
- (1)

20. El Nino causes

- a. A build up of warm surface water and sinking of the thermocline in the eastern Pacific
 - b. heat and moisture to rise from the ocean off Ecuador and Peru, resulting in more frequent storms
 - c. positive SST anomalies in the eastern Pacific
 - d. Only a and b above
- (1)

21. On average hurricanes measure around 650km in diameter, making them

- a. Planetary scale events
 - b. Macro-scale events
 - c. Meso-scale events
 - d. Micro-scale events
- (1)

22. The cold front of a midlatitude cyclone eventually catches up with the warm front, this is known as

- a. Inversion
 - b. Occlusion
 - c. Recirculation
 - d. None of the above
- (1)

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- 23. The Walker Circulation in the south Pacific Ocean is usually responsible for**
- a. Precipitation in the centre of the Pacific Ocean
 - b. Precipitation on the west coast of South America
 - c. Upwelling along the east coast of Australia
 - d. Upwelling along the west coast of South America (1)
- 24. A combination of _____ and the _____ is used to assess El Niño and La Niña presence**
- a. Precipitation in the eastern Pacific Ocean; Southern Oscillation Index
 - b. Sea surface temperatures in the eastern Pacific Ocean; Southern Oscillation Index
 - c. Atmospheric pressure in Darwin (Australia); ocean currents in the Pacific Ocean
 - d. None of the above (1)
- 25. To gain upper air weather observations, scientists use**
- a. Thermospheric buoys
 - b. Satellite imagery
 - c. Radiosondes and weather balloons
 - d. Only b and c above (1)
- 26. Infrared imagery on weather satellites is important as it can**
- a. Still takes images at night
 - b. Be used to determine sea temperatures
 - c. Measure thunderstorm convection
 - d. All of the above (1)
- 27. In cold clouds, ice crystals may grow because**
- a. Ice crystals are harder to melt
 - b. Water droplets generally solidify into ice crystals
 - c. Of the vapour pressure gradient between ice crystals and water droplets
 - d. Ice melts, coalesces with water drops and re-freezes (1)
- 28. As air temperature decreases to dew point temperature,**
- a. Relative humidity increases
 - b. Sublimation temperature decreases
 - c. Relative humidity remains constant
 - d. Evaporation is immanent (1)

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29. Observations for the SOI show the following:

- a. Typical Walker Circulation: SOI close to zero
 - b. Strong negative index (low phase): El Niño phase
 - c. Strong positive index (high phase): La Nina phase
 - d. All of the above
- (1)

30. ENSO affects southern African climates in the following way:

- a. Most profound impacts occur during December to February
 - b. Most La Nina years are associated with below-average rainfall
 - c. Most El Nino years are associated with above-average rainfall
 - d. All of the above
- (1)

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