Student Name (optional)……...…….. Student Number:……..…

UNIVERSITY OF KWAZULU-NATAL
PIETERMARITZBURG CAMPUS
School of Agricultural, Earth and Environmental Sciences
Discipline of Geography
November 2014 Examinations
ENVS120: Environmental Systems

DURATION: ***3 HOURS*** **TOTAL MARKS:** ***150 Marks***

Internal Examiners**:** Prof. T. Hill
Ms. D. Trotter
Dr. J. Odindi

Moderator: H. Beckedahl

PLEASE NOTE THERE ARE SEPARATE INSTRUCTIONS FOR EACH SECTION

This paper consists of 23 pages.

SECTION A (MCQ) – 75 marks

75 MCQ questions carrying 1 mark each (25 questions per section (i) Biogeography (ii) Atmosphere (iii) Lithosphere & Hydrosphere)

5 possible answers per question
Negative marking **does not** apply
Answered on the MCQ sheet provided

SECTION B (BIOGEOGRAPHY) – 25 marks

Short question/s and mini essay

SECTION C (ATMOSPHERE) – 25 marks

Short question/s and mini essay

SECTION D (LITHOSPHERE AND HYDROSPHERE) – 25 marks

Short question/s and mini essay

SECTION A: MQC [75 marks]
PLEASE ANSWER ON THE ANSWER SHEETS PROVIDED (On pages 18-20)

Choose one correct answer only. Negative marking **does not** apply. **(75 x 1 mark = 75 marks)**

1. Which of the following terms includes all of the others?
a) genetic diversity
b) species diversity
c) biodiversity
d) ecosystem diversity
e) generic diversity

2. The latitudinal gradient in species richness is synonymous with:
a) Species with depth in the ocean
b) Species with altitude on mountains
c) Species with distance from shore in the ocean
d) Species with distance from shore on land
e) Species with distance from forest in non-forest ecosystems

3. Which of the following best describes floral kingdoms?
a) Areas across which we find plants influenced by the environment.
b) Areas across which we find animals influenced by plants.
c) Areas across which we find homogeneous assemblages of plants.
d) Areas across which we find the same biomes.
e) Areas where we find more plants than animals.

4. A species of animal or plant that is found in only one region or location and nowhere else in the world is referred to as:
a) cosmopolitan
b) endemic
c) phylum
d) indigenous
e) diploid

5. Which of the following biomes has the least biodiversity?
a) Tundra
b) Boreal Forest
c) Temperate Deciduous Forest
d) Grasslands
e) Savanna

6. Which of the following characterizes tropical rainforest?
a) emergent trees
b) seasonal shedding of leaves
c) needle-shaped leaves
d) numerous trees spaced far apart
e) event driven system

7. Chaparral and Kwongan vegetation is associated with:
a) tropical rainforest
b) taiga
c) deciduous forest
d) mediterranean vegetation
e) tundra

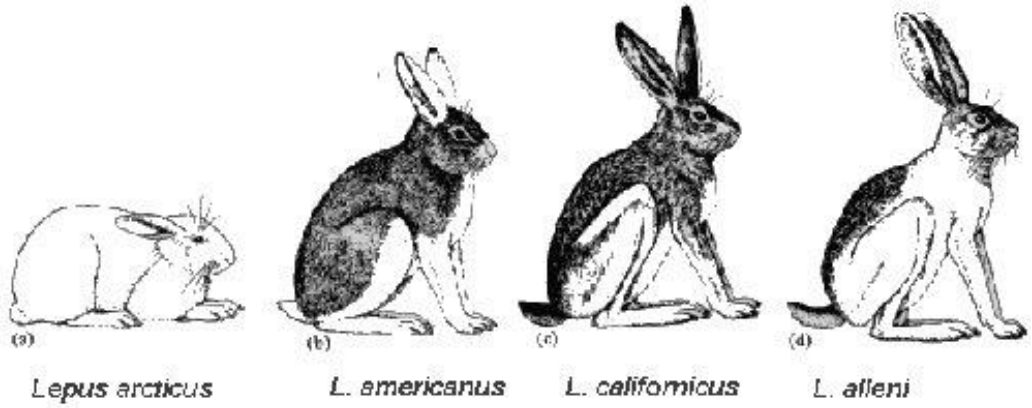
8. Which of the following statements best describes the interaction between fire and ecosystems?
a) The chance of fire in a given ecosystem is highly predictable over the short term.
b) Many kinds of plants and plant communities have adapted to frequent fires.
c) The prevention of forest fires has allowed more productive and stable plant communities to develop.
d) Fynbos communities have evolved to the extent that they rarely burn.
e) Fire is unnatural in ecosystems and should be prevented.

9. Who was described as "Darwin's bulldog:
a) Wallace
b) Hooker
c) Sclater
d) Von Humboldt
e) Lyell

10. From the ground up, the layers of a tropical rainforest are:
a) ground layer, emergents, understory, canopy
b) ground layer, canopy, understory, emergents
c) understory, ground layer, emergent, canopy
d) understory, ground layer, canopy, emergents
e) ground layer, understory, canopy, emergents

11. Wildfires are most beneficial to the savanna biome in that they can:
a) reduce the number of herbivores.
b) reduce the shade because only the trees burn.
c) reduce the number of carnivores.
d) kill the harmful decomposers.
e) reduce dead vegetation and add soil nutrients.

12. The diagram below is a good illustration of:



a) Golger's rule
b) Allan's rule
c) Cope's rule
d) Bergmann's rule
e) Merriam's rule

13. According to _____, the size of warm-blooded vertebrates tends to be larger in cooler climates.
a) Golger's rule
b) Allan's rule
c) Cope's rule
d) Merriam's life zones
e) Bergman's rule

14. The gradual spread of individuals outward from the margins of a species' range is known as:
a) Diffusion
b) Recolonisation
c) Jump dispersal
d) Flow
e) Sweepstakes

15. Dwarf shrubs and sclerophyllous leaves are found in _____.
a) monsoon forest
b) needleleaf forest
c) chaparral
d) tundra
e) low-latitude rainforest

16. Oceanic islands are characterised by:
a) Species exchange during times are former low sea-level
b) Cosmopolitan species
c) Low levels of endemism
d) Land bridge connections with the mainland
e) Volcanic origin

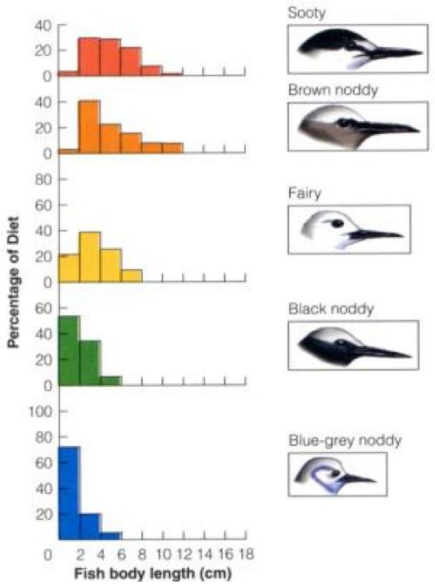
17. If the pollinators of a long-lived tree species were to die out, this could lead to?
a) Extirpation
b) The Ghost of Competition Past
c) Extinction
d) Competitive exclusion
e) All of the above

18. Chytridiomycosis has caused in a global decline in:
a) Reptiles
b) Amphibians
c) Birds
d) Invertebrates
e) Mammals

19. Temperate deciduous forest is characterised by:
a) Continuous slow growth
b) Winter rainfall
c) Poor nutrient availability
d) High species diversity
e) Seasonal investment strategy

20. Which of the following is not an example of a dispersal event / process?
a) "Sweepstakes"
b) Recolonization
c) Disjunction
d) Diffusion
e) Secular migration

21. The following diagram illustrates _____.



a) Generalist species
b) Niche partitioning
c) Competitive exclusion
d) Adaptive radiation
e) Succession

22. Tropical deciduous forests differ from tropical rainforest because:
a) the colder temperatures cause leaf fall
b) the rainforest has more surface vegetation
c) leaf fall occurs during the dry season
d) the species diversity is much higher in the deciduous forest
e) ALL of these

23. The orientation of a slope is called its:
a) aspect
b) gradient
c) steepness
d) latitude
e) microclimate

24. Within the savanna biome the ratio of trees: grasslands in not related to:
a) Rainfall patterns
b) Grazing and herbivore density
c) Fire management
d) Seasonality
e) Human activity

25. The 'Out of Africa" hypothesis suggests people moved from Siberia through the Bering Straits _____ ago?
a) 25 – 35 000
b) 5 – 15 000
c) 15 – 35 000
d) 40 – 55 000
e) 10 – 20 000

26. The Sun's rays strike the surface of the Earth at 90 degrees at the _____ on December 22.
a) Tropic of Cancer
b) Equator
c) Tropic of Capricorn
d) Arctic Circle
e) Antarctic Circle

27. At the moment of the aphelion, the Earth's position in its orbit is:
a) directly between the plane of the ecliptic and the Tropic of Capricorn
b) farthest from the Sun
c) closest to the Sun
d) farther from the Moon than at the perihelion
e) closer to the Moon than at the aphelion

28. Which of the following statements is incorrect?
a) The Earth rotates anticlockwise on its axis when viewed from the North Pole.
b) The circumference of the Earth at the Equator is greater than the circumference of the Earth around the poles.
c) The distance traveled during a complete rotation of the Earth by a person standing on one of the poles is approximately the same as someone else standing at the Equator.
d) The rotation of the Earth on its axis determines the length of a calendar day.
e) The lines of longitude converge at the poles.

29. Which of the following associations in the southern hemisphere is incorrect?
a) autumnal equinox – March 21
b) spring equinox – September 23
c) summer solstice – December 22
d) winter solstice – June 22
e) vernal equinox – March 21

30. When water evaporates from a surface:
a) energy is liberated and the surface is warmed
b) energy is absorbed and the surface is cooled
c) there is no change in energy
d) the type of surface determines whether heat is lost or gained by the surface
e) only latent heat is involved in the process

31. Which of the following has the longest wavelength?
a) ultraviolet (UV) radiation
b) visible light
c) X rays
d) infrared radiation
e) gamma radiation

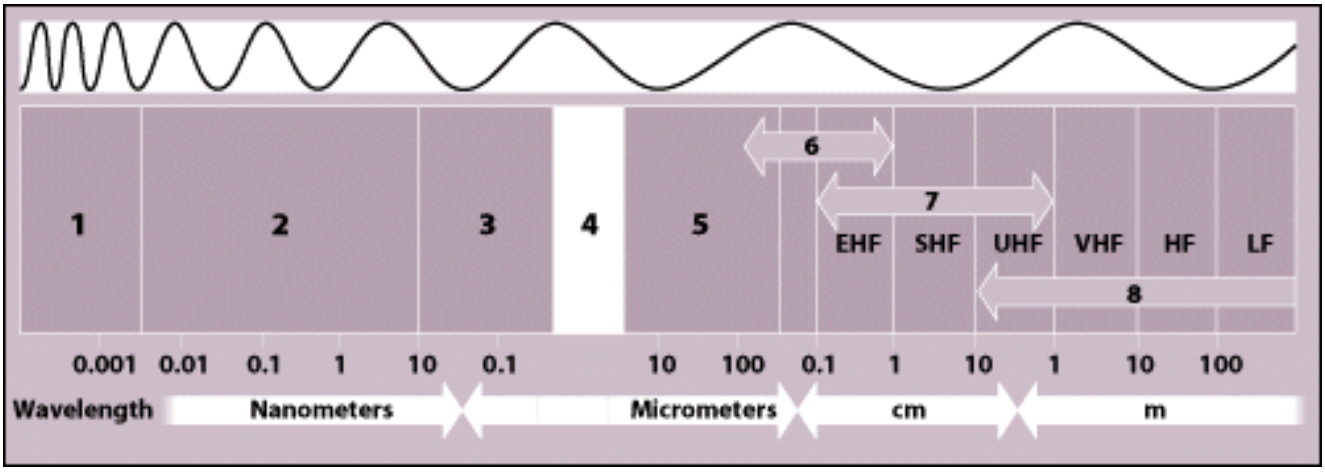
32. Which of the following constant gases accounts for the largest proportion of the air that surrounds us?
a) oxygen
b) nitrogen
c) carbon dioxide
d) argon
e) water vapor

33. Imbalances in net radiation between low and high latitudes results in:
a) poleward heat transfer
b) latent heat transfer
c) sensible heat transfer
d) counterradiation
e) the greenhouse effect

34. The term "albedo" refers to:
a) the amount of radiation absorbed by a body
b) the ability to insulate an object
c) the varying degree of seasonal changes in electromagnetic radiation
d) the ability to add to the greenhouse effect
e) the amount of electromagnetic radiation reflected by a body

35. Which of the following is a correct statement:
a) Insolation levels are constant on land surfaces
b) Insolation levels are constant on water surfaces
c) Insolation levels increase with higher Sun angle
d) Insolation levels are not related to latitude in any way
e) Insolation levels are affected by nighttime low temperatures

36. Which of the numbered sections on this figure corresponds with the infrared portion of the electromagnetic spectrum?



a) 3
b) 4
c) 5
d) 6
e) 7

37. Which of the following is not one of the major factors influencing surface temperature?
a) coastal compared to interior locations
b) surface type
c) elevation
d) insolation
e) cloudiness

38. Which of the following is true about the temperature change with increasing elevation above the Earth's surface?
a) Temperature decreases consistently through all atmospheric layers
b) Temperature increases through the troposphere and stratosphere, and then decreases
c) Temperature decreases in the troposphere and stratosphere, and then increases
d) Temperature decreases in the troposphere and increases in the stratosphere
e) Temperature increases in the troposphere and decreases in the stratosphere

39. Currently, which of the following gases contributes the most toward the greenhouse effect?
a) methane
b) CFCs
c) tropospheric aerosols
d) carbon dioxide
e) nitrous oxide

40. The transmission of sensible heat through matter by transfer of energy from one atom or molecule in the direction of decreasing temperature is:
a) convection
b) conduction
c) transpiration
d) latent heat transfer
e) lapse rate

41. Which of the following statements is incorrect?
a) Tropospheric aerosols as a result of human activity include sulfate particles, fine soot, and organic particles
b) Land cover alteration such as deforestation induces cooling
c) Solar output has decreased slightly, causing cooling
d) Volcanic aerosols have at times caused warming and at other times cooling
e) The effect of greenhouse gases has outweighed the cooling effects of other factors

42. Why is the wet adiabatic lapse less than the dry adiabatic lapse rate?
a) Water is colder at high altitudes
b) Dry air heats more quickly than wet air
c) Evaporation as air rises keeps air dry and therefore warmer
d) Condensation of water releases heat
e) Formation of water droplets absorbs latent heat

43. Which of the following conditions would lead to unstable air?
a) When air is dry and cool
b) When air is dry, cool, and descending
c) When the environmental lapse rate exceeds the adiabatic lapse rate
d) When the adiabatic lapse rate exceeds the environmental lapse rate
e) When the environmental lapse rate equals the adiabatic lapse rate

44. How does the magnitude of the Coriolis force vary with latitude?
a) Deflection is zero at the Equator and maximum at the poles
b) Deflection is zero at the poles and maximum at the Equator
c) Deflection is zero at the Equator and poles and maximum at midlatitudes
d) Deflection is zero at midlatitudes and maximum at the Equator and poles
e) Deflection is constant across the Earth's surface

45. The ITCZ is also referred to as the _____.
a) equatorial high
b) equatorial trough
c) midlatitude convergence zone
d) polar high
e) polar low

46. Trade winds _____.
a) are easterlies
b) are westerlies
c) flow from the ITCZ to the polar front
d) flow from the polar front to the subtropical belts
e) flow from the ITCZ to the subtropical high

47. Which of the following pressure systems has a wind circulation pattern that is clockwise, downward, and outward?
a) southern hemisphere low
b) southern hemisphere high

c) northern hemisphere low
d) northern hemisphere high
e) southern and northern hemisphere lows

48. Surface winds converge towards _____.
a) an anticyclone
b) a cyclone
c) an area of high pressure
d) the subtropical high
e) the polar high

49. A sea breeze flows _____.
a) during the day from the body of water towards the adjacent land area
b) during the day from the land surface towards the adjacent body of water
c) during the night from the body of water towards the adjacent land area
d) during the night from the land surface towards the adjacent body of water
e) during the night from mountain regions towards the adjacent body of water

50. Which of the following can help create a historical record of temperature?
a) history of volcanic eruptions
b) rate of coral growth
c) tree ring number and width
d) data collected from ice cores
e) all of these

51. The layer of very soft rock within the Earth that allows for isostatic adjustments is the:
a) asthenosphere
b) inner core
c) lower mantle
d) outer core
e) lithosphere

52. Oceanic crust is mostly:
a) shale
b) basalt
c) limestone
d) granite
e) coal

53. Lava cools to form:
a) metamorphic rock
b) inorganic sedimentary rock
c) clastic sedimentary rock
d) intrusive igneous rock
e) extrusive igneous rock

54. A large, irregular magma chamber forms a(n):
a) laccolith
b) batholith
c) sill
d) dike
e) stock

55. The process whereby loose rock debris is cemented and compacted to form rock is called:
a) metamorphism
b) lithification
c) podzolization
d) subduction
e) laterization

56. The San Andreas fault can best be classified as a _____ fault.
a) rift
b) subduction
c) transform
d) divergent
e) normal

57. The East African Rift Valley demonstrates the early stage of the _____.
a) formation of a new ocean basin
b) formation of a new land mass
c) formation of a continental suture
d) formation of a transform plate boundary
e) formation of a new subduction zone

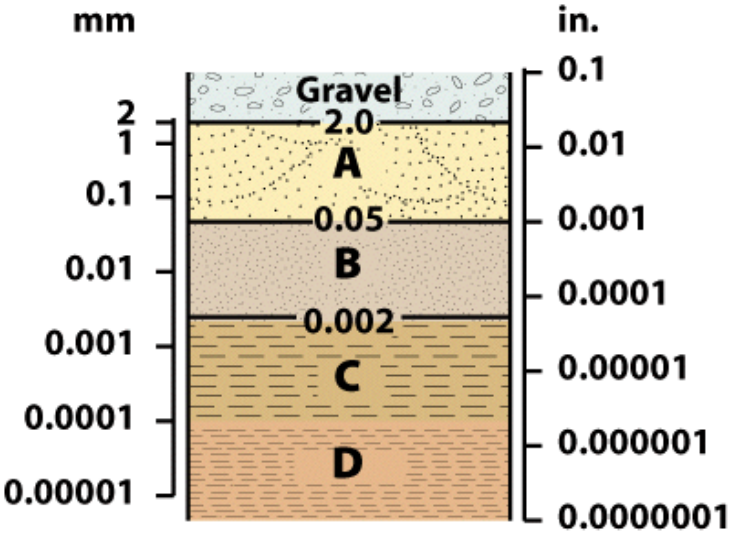
58. Divergent plate boundaries include:
a) east Africa
b) the Mid-Atlantic ridge
c) between the Nazca and Pacific plates

d) between the African and Antarctic plates
e) ALL of these

59. The accumulation of clays in the B horizon is the direct result of which of the following processes?
a) illuviation
b) eluviation
c) salinization
d) humification
e) transformation

60. Colloids are important to soil formation because _____.
a) they allow for easy transportation of water
b) they allow for breaks in the soil so that water and gases can travel through it
c) they attract base ions, which act as nutrients for plants
d) of their positive charge, which allows them to attract acidic compounds
e) they are a key source of moisture

61. On the illustration, the letter that represents silt-sized particles is _____.



a) A
b) B
c) C
d) D
e) None of the above

62. Which of the following are examples of trace elements in the soil:
a) molybdenum, copper, magnesium
b) phosphorus, nitrogen, potassium
c) phosphorus, nitrogen, potassium
d) copper, lead, zinc
e) titanium, potassium, lead

63. _____ is the general term applied to the combined action of all processes that cause rock to disintegrate physically and decompose chemically because of exposure near the Earth's surface.
a) Erosion
b) Mass wasting
c) Weathering
d) Soil creep
e) Talus

64. Which of the following is the potential result of water table depletion?
a) An increase in the base level of surrounding streams
b) The water table becomes more shallow
c) Volumes of groundwater increase
d) A sinking of the land known as subsidence
e) A decrease in the risk for groundwater contamination

65. Which of the following features defines the upper surface of groundwater?
a) the soil-water belt
b) the unsaturated zone
c) the saturated zone
d) the water table
e) the regolith

66. Surface runoff is also known as _____ .
a) flooding
b) overland flow
c) infiltration
d) erosion
e) streamflow

67. The entire surface area within a drainage basin is known as its _____ .
a) landmass
b) flow potential
c) collection zone
d) watershed
e) acreage

68. The area between the soil–water belt and the water table where pore spaces are not saturated with water is called:
a) the saturated zone
b) the unsaturated zone
c) the aquiclude
d) an aquifer
e) an artesian well

69. When water percolates down from Earth's surface, it first passes through the:
a) saturated zone
b) unsaturated zone
c) water table
d) aquifer
e) subsidence

70. A place where water naturally seeps out of the ground is called a(n):
a) well
b) cone of depression
c) spring
d) aquiclude
e) aquifer

71. Which of the following features develops once a river has reached a graded condition?
a) lake
b) levee
c) terrace
d) braided channel
e) floodplain

72. Landforms shaped by _____ are described as fluvial landforms.
a) glacial ice

b) wave action
c) denudation
d) running water
e) wind erosion

73. When a meandering stream moves its channel, forms a lake, and then it fills in with sediment, it is called a(n):
a) natural levee
b) backswamp
c) floodplain
d) meander scar
e) oxbow lake

74. When two streams of the same order merge, the new stream is:
a) the same number
b) the next stream order higher
c) the next stream order lower
d) the sum of the two streams
e) It depends on the type of drainage pattern

75. Stream discharge is typically expressed in:
a) miles per hour
b) kilometers per second
c) meters per second
d) cubic meters per second
e) square meters per second

MCQ Answer sheet: **Student No_____**

Cross over the letter corresponding to the correct answer with an X.
To change your answer, shade in the incorrect block, then mark the correct block.

1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5	A	B	C	D	E
6	A	B	C	D	E
7	A	B	C	D	E
8	A	B	C	D	E
9	A	B	C	D	E
10	A	B	C	D	E
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13	A	B	C	D	E
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15	A	B	C	D	E
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18	A	B	C	D	E
19	A	B	C	D	E
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21	A	B	C	D	E
22	A	B	C	D	E
23	A	B	C	D	E
24	A	B	C	D	E
25	A	B	C	D	E

Student No_____

26	A	B	C	D	E
27	A	B	C	D	E
28	A	B	C	D	E
29	A	B	C	D	E
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48	A	B	C	D	E
49	A	B	C	D	E
50	A	B	C	D	E

Student No_____

51	A	B	C	D	E
52	A	B	C	D	E
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71	A	B	C	D	E
72	A	B	C	D	E
73	A	B	C	D	E
74	A	B	C	D	E
75	A	B	C	D	E

SECTION B: BIOGEOGRAPHY [25 marks]
PLEASE ANSWER IN A SEPARATE BOOKLET
(Put the question numbers on the booklet)

QUESTION ONE

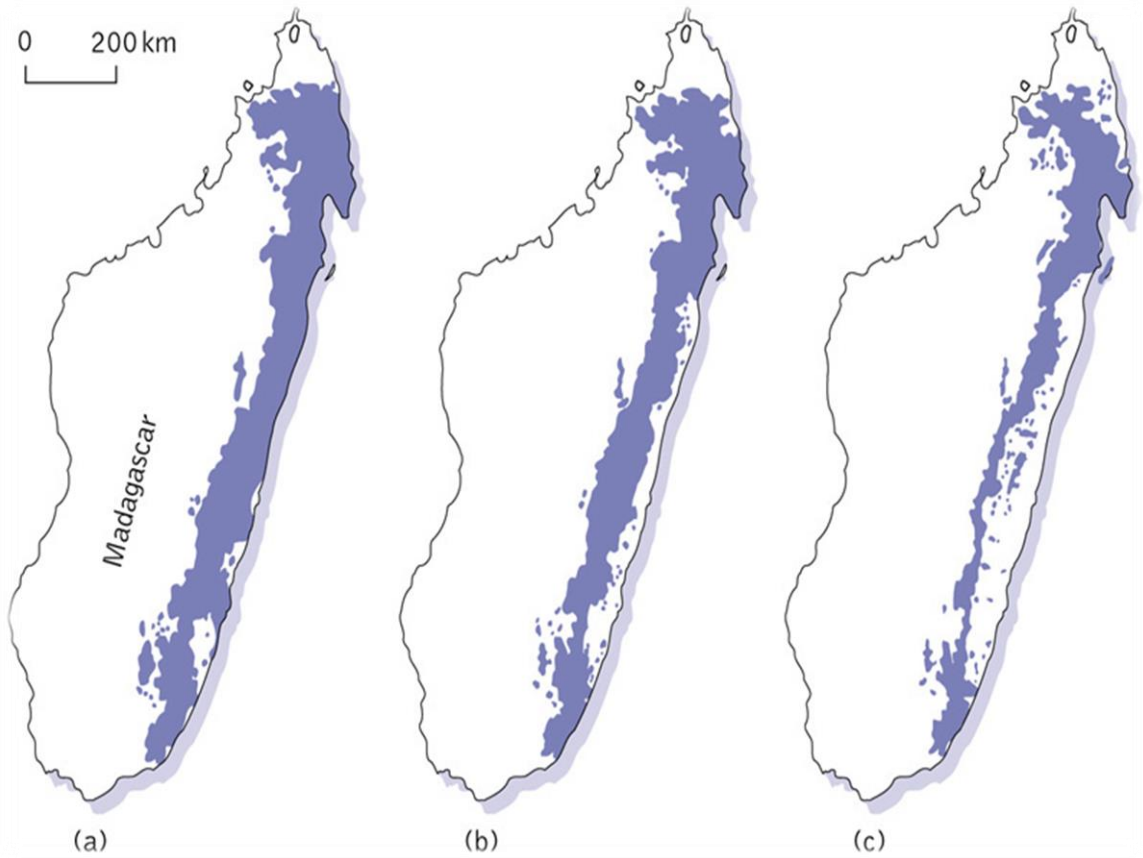

Figure 1: Changes in Madagascan forest extent over time – (a) Represents original extent; (b) Intermediate; and (c) Current.

Outline the biogeographic processes depicted in Figure 1 above. **(10 marks)**

QUESTION TWO

List the ecological and evolutionary process that Cichlid fish of East Africa illustrate.

(10 marks)

QUESTION THREE

Define and discuss with the aid of examples: Indicator, Keystone and Umbrella species.

(5 marks)

SECTION C: ATMOSPHERE [25 marks]
PLEASE ANSWER IN A SEPARATE BOOKLET
(Put the question numbers on the booklet)

QUESTION FOUR

With reference to the table below, provide in column A the correct term to match the definition provided in column B. **(5 x 2marks = 10 marks)**

i)	a) The point on Earth where the Sun angle is 90° and solar radiation strikes the surface most directly at any given point in time.
ii)	b) The scattering of light off of particles in the air up to about a tenth of the wavelength of the light.
iii)	c) The overall balance between incoming and outgoing radiation on Earth.
iv)	d) The rate at which an unsaturated body of air cools while lifting or warms while descending (10°C/1000m).
v)	e) Undulations that appear in the polar front jet stream when significant temperature differences exist between tropical and polar air masses.

QUESTION FIVE

Compare and contrast the global warming potential (GWP) of carbon dioxide and methane. In your response, provide reasons for why these greenhouse gas concentrations are increasing and their implications for future climate change. **(15 marks)**

SECTION D: LITHOSPHERE ND HYDROSPHERE [25 marks]
PLEASE ANSWER IN A SEPARATE BOOKLET
(Put the question numbers on the booklet)

QUESTION SIX

Match each description with the correct term: **(4 marks)**

i) contain mineral fragments derived from any of the three major rock groups that accumulate and lithify

ii) when upward moving magma spreads horizontally along a zone of rock weakness and pushes upward in such a way that the surface rocks are warped upward in a dome-like feature and the magma cools

iii) liquid rock that originates in the mantle and moves upward into the Earth's crust

iv) liquid rock that is flowing across the Earth's surface

Answer (i)-(iv) Choices:
magma
lava
clastics
laccolith

QUESTION SEVEN

Provide any five points of evidence for continental drift. **(5 marks)**

QUESTION EIGHT

Identify and discuss the four major factors that affect the rate of organic matter decomposition. **(16 marks)**