

**UNIVERSITY OF KWAZULU- NATAL**  
**SCHOOL OF AGRICULTURAL, EARTH & ENVIRONMENTAL SCIENCES**  
**DISCIPLINE OF GEOGRAPHY**  
**EXAMINATION: NOVEMBER 2014**  
**MODULE NAME & CODE: ENVIRONMENTAL SYSTEMS**  
**ENVS120H2**

**DURATION : 3 HOURS**

**TOTAL MARKS: 150**

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**INTERNAL EXAMINERS: MR J LUTCHMIAH AND MR T WIGGILL**  
**INTERNAL MODERATOR: PROF H BECKEDAHL**

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**INSTRUCTIONS: ANSWER ALL QUESTIONS.**  
**ANSWER EACH SECTION IN A SEPARATE BOOKLET.**

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**SECTION A – ANSWER ALL QUESTIONS**

1. Discuss any two categories of atmospheric gases with respect to their properties and composition. (20)
2. Discuss the various causes and consequences of global warming. (20)
3. Provide a fully labelled diagram of the vertical structure of the atmosphere. (10)

**SECTION B – ANSWER ALL QUESTIONS**

4. Explain, with the aid of a fully labelled diagram, the role of the hydrological cycle. (20)
5. List the soil forming factors, and write short notes on any four of these. (20)
6. Provide a fully labelled diagram of the internal structure of the earth. List the properties of each layer. (10)

**SECTION C – ANSWER THE ESSAY IN THE BOOKLET AND THE MULTIPLE CHOICE QUESTIONS IN THE TABULATED SHEET**

- 7.1 The Finch species found across the Galapagos Islands in the Pacific Ocean provide excellent examples of evolutionary and ecological processes at work. Write an essay to highlight and explain these processes. (15)

2.

**7.2 MULTIPLE CHOICE QUESTIONS (ANSWER ALL QUESTIONS ON THE ANSWER SHEET PROVIDED.)**

**NB. NEGATIVE MARKING DOES NOT APPLY.**

**1) 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) epidemic
- e) diploid

**2) The process in which plants combine water, carbon dioxide, and solar energy to form carbohydrates is called**

- a) the carbon cycle
- b) the ecological process
- c) photosynthesis
- d) respiration
- e) the food web

**3) Scientific names for species must be written**

- a) in italics and/or underlined
- b) in bold
- c) in a different colour
- d) in a different font
- e) all of the above

**4) A byproduct of photosynthesis is**

- a) water
- b) PbS
- c) carbon dioxide
- d) oxygen
- e) ozone

**5) Trees that shed their leaves seasonally are called**

- a) epiphytes
- b) evergreen
- c) succulents
- d) deciduous
- e) none of the above

**6) The relationship between climate and vegetation was illustrated by**

- a) Allen's rule
- b) Mirriam's life zones
- c) Golger's law
- d) Gause's principle
- e) None of the above

3.

7) **Latitude and altitude play similar roles in that as they both increase**

- a) humidity increases
- b) temperature increases
- c) temperature decreases
- d) rainfall decreases
- e) all of the above

8) **The diagram below shows an example of \_\_\_\_\_**



- a) land bridges
- b) oceanic islands
- c) divergent plates
- d) rainfall increase
- e) none of the above

9) **Allopatric speciation is when**

- a) a barrier splits a population
- b) evolutionary process occur on isolated groups
- c) genetic polymorphism is not a major factor
- d) a new species forms
- e) all of the above

10) **The acquisition of similar biological traits in unrelated lineages refers to**

- a) speciation
- b) adaptation
- c) competition
- d) convergent evolution
- e) adaptive radiation

4.

**11) When there is a delay between impacts on a species (such as destruction of habitat) and the species ultimate disappearance, it is called**

- a) mass extinction
- b) false extinction
- c) extinction debt
- d) extantion
- e) none of the above

**12) According to \_\_\_\_\_ two species that compete for the exact same resources cannot stably coexist.**

- a) Allen's law
- b) Convergent evolution
- c) Frost's rule
- d) Competitive exclusion
- e) Cope's law

**13) The preservation of natural areas looks to**

- a) import more species to increase species richness
- b) remove all human use
- c) control the amount and type of human use
- d) reduce the impact of climate change
- e) all of the above

**14) The functional role played by an organism as well as the space it inhabits is referred to as**

- a) sere
- b) bioclimatic frontier
- c) habitat
- d) niche
- e) disjunction

**15) The platypus (a prototheria or monotreme) can**

- a) lay eggs
- b) use poison
- c) produce milk
- d) swim efficiently
- e) all of the above

**16) The limiting factor in temperate deciduous forests is**

- a) rainfall
- b) temperature
- c) sunlight
- d) nutrients
- e) none of the above

5.

**17) The Maputaland-Pondoland-Albany hotspot**

- a) is located only in Mozambique
- b) has a high vertebrate species diversity but a lower plant diversity
- c) has no protected areas within it
- d) receives rainfall throughout the year
- e) none of the above

**18) The savanna biome requires**

- a) winter rainfall
- b) cool temperatures
- c) no fire
- d) distinct dry and wet seasons
- e) none of the above

**19) Secular migration is**

- a) a form of speciation
- b) an extremely slow process
- c) a dispersal type
- d) a slow diffusion
- e) all of the above

**20) There is a lot of competition for \_\_\_\_\_ in tropical rainforests**

- a) light gaps
- b) nutrients
- c) rainfall
- d) warmer slopes (aspect)
- e) none of the above

**21) Species richness tends to be higher**

- a) in the tropics
- b) in specific localized areas
- c) near the equator
- d) in the Amazon and Cape Floristic Region
- e) all of the above

**22) Living organisms are defined by their ability to**

- a) reproduce sexually
- b) reproduce asexually
- c) recombine DNA
- d) reproduce vegetatively
- e) all of the above

**23) In the relationship between body size and biodiversity, the general trend we see is**

- a) a decrease in species richness with increased size
- b) an increase in species richness with increased size
- c) a variable species richness with decreased size
- d) a similar species richness across all sizes
- e) none of the above

6.

**24) *Homo sapiens* have existed for roughly**

- a) 1 millions years
- b) 500 000 years
- c) 100 000 years
- d) 10 000 years
- e) 5 000 years

**25) Two or more species using the same resources but at different times is an example of**

- a) competitive exclusion
- b) speciation
- c) niche partitioning
- d) Cope's law
- e) none of the above

**26) The biome with distinctive grassy and woody vegetation layers is known as**

- a) a grassland
- b) a forest
- c) the subtropical afro-montane Highveld
- d) a semi-arid habitat
- e) a savannah

**27) According to Allen's rule,**

- a) the size of bodily appendages of organisms is related to their biome's climatic temperature
- b) fur colour is related to humidity
- c) body size is related to climatic temperature
- d) competition cannot be sustained over long periods of time
- e) none of the above

**28) A Mediterranean type biome is unusual in that**

- a) it receives high rainfall but during cold periods
- b) it is limited by cold temperature throughout the year
- c) it is limited by rain throughout the year
- d) it has a high number of tropical tree species within it
- e) none of the above

**29) Taiga forests are known for**

- a) being the largest biome in the world
- b) having low temperatures throughout the year
- c) their evergreen tree species
- d) their high diversity of mushrooms
- e) all of the above

**30) The term 'vacant tree niche' is often used in regards to**

- a) deforested areas
- b) fynbos
- c) succulent karoo
- d) arid regions
- e) none of the above

7.

**31) Other than low rainfall, what other limiting factors may occur in desert environments**

- a) high temperatures during day and night time
- b) low levels of sunlight
- c) high humidity
- d) substrate stability
- e) none of the above

**32) Grasslands are heavily impacted upon by agriculture as**

- a) agricultural plant species are related to grasses
- b) the low occurrence of fire makes it ideal
- c) grasslands receive high levels of winter rainfall
- d) the warmer temperatures prevent from damaging the crops
- e) all of the above

**33) The slow migration of *Homo sapiens* across the globe is known as**

- a) the Out-of-Africa hypothesis
- b) secular migration
- c) jump dispersal
- d) the industrial revolution
- e) none of the above

**34) *Xenopus* has become wide spread due to**

- a) the activity of *Homo sapiens*
- b) the spread of fungal disease
- c) the transmission of *Chytridiomycosis*
- d) air dispersal
- e) none of the above

**35) The \_\_\_\_\_ is an example of an organism that no longer exists anywhere on the globe**

- a) T-rex (*Tyrannosaurus rex*)
- b) Quagga
- c) Tasmanian tiger
- d) Passenger pigeon
- e) All of the above

ANSWER SHEET

Surname: \_\_\_\_\_ Initials: \_\_\_\_\_

Student Number: \_\_\_\_\_ Seat Number \_\_\_\_\_

**Mark the correct answer with an X**

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**INSTRUCTIONS: ANSWER ALL QUESTIONS.**  
**ANSWER EACH SECTION IN A SEPARATE BOOKLET.**

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**SECTION A – ANSWER ALL QUESTIONS**

1. Discuss the causes and consequences of ozone depletion. (20)
2. Explain the radiation balance of the earth. (20)
3. Provide a fully labelled diagram of the vertical structure of the atmosphere. (10)

**SECTION B – ANSWER ALL QUESTIONS**

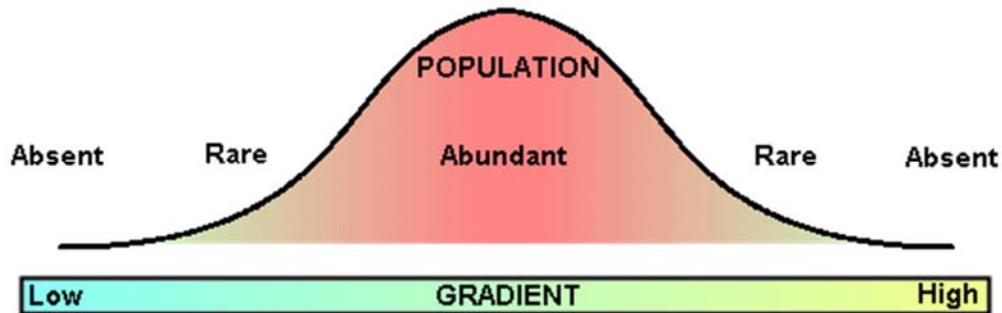
4. Explain, with the aid of a diagram, any two layers that constitute the internal structure of the earth with respect to the properties and composition. (20)
5. Discuss either igneous or sedimentary rocks with reference to their formation, mineral content and classification. (20)
6. Provide a fully labelled diagram of the hydrological cycle. (10)

**SECTION C – ANSWER THE ESSAY IN THE BOOKLET AND THE MULTIPLE CHOICE QUESTIONS IN THE TABULATED SHEET**

- 7.1 Define dispersal modes and dispersal events. Name and describe the different types of modes and events. (15)

**7.2 MULTIPLE CHOICE QUESTIONS (ANSWER ALL QUESTIONS ON THE ANSWER SHEET PROVIDED.)**  
**NB. NEGATIVE MARKING DOES NOT APPLY.**

**1) The diagram below shows a hypothetical example of**



- a) population growth
- b) species adaptation
- c) distributional limits
- d) extinction
- e) competitive exclusion

**2) Species movement away from an existing population or away from their parent organism is the definition for**

- a) speciation
- b) dispersal
- c) adaptation
- d) extinction
- e) all of the above

**3) Scientists previously thought that there was no life at the greatest depths of our oceans because of**

- a) absence of air
- b) too much heat
- c) absence of light
- d) all of the above
- e) none of the above

**4) One of the most common biomes in Africa is**

- a) taiga forest
- b) tundra
- c) temperate deciduous forest
- d) savannah
- e) none of the above

3.

**5) When we find 2 (or more) species with no present day competition between them, this is an example of**

- a) competitive exclusion
- b) extinction
- c) speciation
- d) adaptation
- e) none of the above

**6) Carbon stored in organic matter is largely in the form of**

- a) carbon dioxide
- b) carbon monoxide
- c) hydrocarbons
- d) calcium carbonates
- e) carbohydrates

**7) Which of the following features characterizes succulent plants?**

- a) buttress roots
- b) long life span
- c) thick stems and leaves
- d) large leaves and long stems
- e) shallow roots

**8) Which of the following is not one of the factors that acts to keep the spread of a species in check?**

- a) The species's spread may be limited by continued dispersal of individuals
- b) The species's spread may be limited by a variety of climatic variations
- c) The species's spread may be limited by parasites
- d) The species's spread may be limited by disease
- e) The limited distribution of another species upon which the initial species is dependent

**9) The grazing of plants by animals and insects is known as**

- a) commensalism
- b) symbiosis
- c) mutualism
- d) protooperation
- e) herbivory

**10) A natural collection of interbreeding individuals that are reproductively isolated from other such groups is referred to as a**

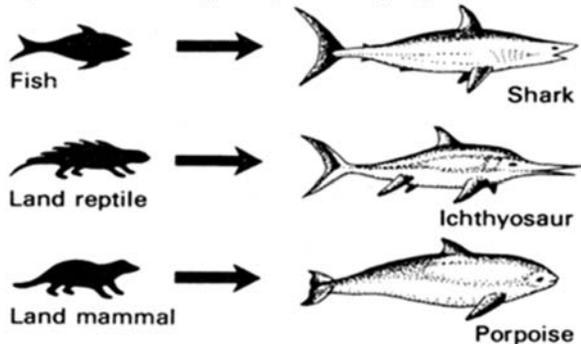
- a) species
- b) genus
- c) tetraploid
- d) polyploid
- e) diploid

4.

**11) Tropical forests of Africa require**

- a) low rainfall
- b) rainfall only during summer
- c) poor nutrient cycling
- d) cool summer temperatures
- e) none of the above

**12) The following diagram displays**



- a) convergent evolution
- b) secular migration
- c) adaptive radiation
- d) competitive exclusion
- e) none of the above

**13) Species richness is generally greatest near**

- a) the polar regions
- b) the equator
- c) high altitudes
- d) subtropical regions
- e) all of the above

**14) Which of these is a limiting factor for plant distribution?**

- a) temperature
- b) rainfall
- c) nutrients
- d) sunlight
- e) all of the above

**15) Seeds that are dispersed by water need to be**

- a) able to float
- b) resistant to salt water
- c) resistant to submergence
- d) protected from oceanic conditions
- e) all of the above

5.

**16) Allen's rule explains that**

- a) the size of warm-blooded vertebrates tends to be larger in cooler climates
- b) the evolution of a group is often accompanied by an increase in size
- c) a relationship between climate and vegetation exists
- d) the extremities of species tend to be larger in warmer climates and smaller in cool climates
- e) none of the above

**17) The K-T extinction**

- a) was the only mass extinction to occur on Earth
- b) resulted in the extinction of all reptiles and mammals
- c) is being caused by human activity
- d) was the results of a large meteorite strike
- e) all of the above

**18) Tolerant species are species which have a**

- a) very tough exterior
- b) wide distributional limit
- c) small well-defined distributional limit
- d) can survive anywhere
- e) none of the above

**19) Ecosystem services include**

- a) wood for fire
- b) carbon sequestration
- c) medicinal use
- d) food
- e) all of the above

**20) The conservation of natural areas looks to**

- a) import more species to increase species richness
- b) remove all human use
- c) control the amount and type of human use
- d) reduce the impact of climate change
- e) all of the above

**21) The succulent karoo is not known for**

- a) its extremely dry climate
- b) its high species richness of grasses
- c) the number of invertebrates found in the region
- d) its richness in succulent and geophyte plants
- e) none of the above

**22) Correct fire management is vital in**

- a) Grasslands and savanna
- b) Grasslands and succulent karoo
- c) Fynbos and succulent karoo
- d) Savanna and nama karoo
- e) None of the above

**23) Flora fossils (such as that of *Glossoptera*) were used**

- a) as a local medicine in South America
- b) as proof of evolution
- c) to further support the theory of continental drift
- d) as evidence for the Out-of-Africa hypothesis
- e) none of the above

**24) Human beings are examples of**

- a) Prototheria
- b) Metatheria
- c) Eutheria
- d) Reptiles
- e) None of the above

**25) According to \_\_\_\_\_, the evolution of a group is often accompanied by an increase in size**

- a) Bergman's law
- b) Golger's rule
- c) Frost's rule
- d) Gause's law
- e) Cope's law

**26) Temperate deciduous forests are characterised by their**

- a) seasonal rainfall
- b) evergreen species diversity
- c) infertile soil
- d) location on the equator
- e) none of the above

**27) *Homo sapiens* are roughly**

- a) 10 000 years old
- b) 100 000 years old
- c) 1 000 000 years old
- d) 10 000 000 years old
- e) 100 000 000 years old

**28) Taiga forests are known for**

- a) being the largest biome in the world
- b) having low temperatures throughout the year
- c) their evergreen tree species
- d) their high diversity of mushrooms
- e) all of the above

**29) Grasslands are heavily impacted upon by agriculture as**

- a) agricultural plant species are related to grasses
- b) the low occurrence of fire makes it ideal
- c) grasslands receive high levels of winter rainfall
- d) the warmer temperatures prevent from damaging the crops
- e) all of the above

**30) The afro-montane regions act as**

- a) biogeographic islands for species
- b) areas of low species diversity
- c) natural protection from forestry industries
- d) protected areas for non-woody vegetation only
- e) none of the above

**31) There has been an alarming decline in amphibian numbers due to**

- a) chytridiomycosis
- b) the golden toad of Costa Rica
- c) excessive capturing from humans
- d) speciation
- e) all of the above

**32) The 6th extinction is said to be caused by**

- a) meteor strike
- b) human activity
- c) volcanic activity
- d) all if the above
- e) none of the above

**33) The term 'vacant tree niche' is often used in regards to**

- a) deforested areas
- b) fynbos
- c) succulent karoo
- d) arid regions
- e) none of the above

**34) The \_\_\_\_\_ is an example of an organism that no longer exists anywhere on the globe**

- a) T-rex (*Tyrannosaurus rex*)
- b) Quagga
- c) Tasmanian tiger
- d) Passenger pigeon
- e) all of the above

**35) \_\_\_\_\_ are known to have the highest species diversity**

- a) mammals
- b) vertebrates
- c) beetles
- d) reptiles
- e) none of the above

ANSWER SHEET

Surname: \_\_\_\_\_ Initials: \_\_\_\_\_

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**Mark the correct answer with an X**

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