

**UNIVERSITY OF KWAZULU-NATAL**  
**SCHOOL OF AGRICULTURAL, EARTH & ENVIRONMENTAL SCIENCES**  
**DISCIPLINE OF GEOGRAPHY**  
**MAIN EXAMINATION: NOVEMBER 2014**  
**COURSE & CODE: ENVIRONMENTAL SYSTEMS, ENVS 120**

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**DURATION: 3 HOURS**

**TOTAL MARKS: 150**

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**Internal Examiner: Prof S Proches, Dr J Finch, Mr T Wiggill**  
**Internal Moderator: Prof H Beckedahl**

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**NOTE: THIS PAPER CONSISTS OF (14) PAGES. PLEASE SEE THAT YOU HAVE THEM ALL.**

**INSTRUCTIONS: THERE IS NO NEGATIVE MARKING FOR THE MULTIPLE CHOICE. ANSWER THE MULTIPLE CHOICE ON THE ORGANE MCQ SHEET PROVIDED.**

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**SECTION A: MULTIPLE CHOICE**

- 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 (1)
- 2) In order to better understand the extent of current extinctions it will be necessary to do which of the following?  
a) Focus intensely on identifying more species of mammals and birds  
b) Monitor atmospheric carbon dioxide levels  
c) Differentiate between plant extinction and animal extinction  
d) Use the average extinction rates of vertebrates as a baseline  
e) Identify more of the yet unknown species of organisms on our planet (1)
- 3) The latitudinal gradient in species richness is usually also matched in what other context  
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 (1)
- 4) 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 (1)

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- 5) 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
- (1)
- 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) Sparse clumps of plants
- (1)
- 7) Which of the following is not one of the world's main biomes?
- a) Forest
  - b) Tundra
  - c) Savanna
  - d) Desert
  - e) Monsoon
- (1)
- 8) Chaparral vegetation is found in which of the following biome?
- a) Tropical rainforest
  - b) Taiga
  - c) Deciduous forest
  - d) Mediterranean vegetation
  - e) Tundra
- (1)
- 9) 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
- (1)
- 10) Which of these ecosystems has the highest primary productivity per square meter?
- a) Open ocean
  - b) Tropical rain forest
  - c) Boreal forest
  - d) Temperate forest
  - e) Savannah
- (1)

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- 11) Which biome is dominant in eastern North America?  
a) Rainforest  
b) Desert  
c) Grassland  
d) Deciduous forest  
e) Mediterranean vegetation (1)
- 12) Which of the following is not a broad biome types  
a) Forest  
b) Tundra  
c) Desert  
d) Wetlands  
e) Grassland (1)
- 13) 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 (1)
- 14) The biome found in the Amazon basin, Indonesia, Cameroon, Vietnam, and the western coast of India is  
a) Deciduous forest  
b) Tundra  
c) Savanna  
d) Tropical rainforest  
e) Desert (1)
- 15) 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 (1)
- 16) All of the following statements about ecology are correct except:  
a) Ecology is the study of the interactions between biotic and abiotic aspects of the environment  
b) Ecology is a discipline that is independent from natural selection and evolutionary history  
c) Ecologists may study populations and communities of organisms  
d) Ecology spans increasingly comprehensive levels of organization, from individuals to ecosystems  
e) Ecological studies may involve the use of models and computers (1)

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- 17) Which of the following levels of organization is arranged in the correct sequence from most to least inclusive?
- a) Ecosystem, community, population, individual
  - b) Community, ecosystem, individual, population
  - c) Individual, population, community, ecosystem
  - d) Population, ecosystem, individual, community
  - e) Individual, community, population, ecosystem (1)
- 18) Uniform spacing patterns in plants such as the savanna *Acacia* trees are most often associated with which of the following?
- a) The random distribution of seeds
  - b) The concentration of resources within the population's range
  - c) Antagonistic interactions among individuals in the population
  - d) Patterns of high humidity
  - e) Chance (1)
- 19) Communities can be linked by which of the following?  
I. predation; II. systematics; III. competition
- a) I only
  - b) III only
  - c) I and II only
  - d) I and III only
  - e) I, II, and III (1)
- 20) Which of the organisms listed below would not be considered a decomposer?
- a) Vulture
  - b) Zebra
  - c) Hyena
  - d) Bacterium
  - e) Dung beetle (1)
- 21) Algae floating at the surface of a freshwater pond would be said to occupy which level in a food chain?
- a) Producers
  - b) Primary consumers
  - c) Secondary consumers
  - d) Tertiary consumers
  - e) Decomposers (1)
- 22) Most wasp species smaller than 1 cm have larvae that feed inside the bodies of other insects. Once the adult wasps emerge from their bodies, the host insects die. Which of the following best describes these wasps?
- a) Parasites
  - b) Parasitoids
  - c) Predators
  - d) Decomposers
  - e) Competitors (1)

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- 23) Which of the following best defines an ecosystem?  
a) All the interactions between living things in an area  
b) All the interactions between non-living things in an area  
c) All interactions between trophic levels in an area  
d) All of the interactions between living things and their environment in an area  
e) All interactions within trophic levels in an area (1)
- 24) Which of the following best explains why there are seldom more than five trophic levels in a food chain?  
a) Most carnivores function at more than one trophic level  
b) Trophic levels above this number contain too many individuals  
c) Top carnivores are too few in number to prey effectively  
d) The ecosystem contains too much biomass  
e) Energy is lost from each trophic level (1)
- 25) Introduced species can have important effects on biological communities by  
a) Preying upon native species  
b) Displacing native species  
c) Reducing biodiversity  
d) Competing with native species for resources  
e) Doing all of the above (1)
- 26) Ranked from earliest to latest are:  
a) Mesozoic, Paleozoic, Cenozoic  
b) Cenozoic, Mesozoic, Paleozoic  
c) Cenozoic, Paleozoic, Mesozoic  
d) Mesozoic, Cenozoic, Paleozoic  
e) Paleozoic, Mesozoic, Cenozoic (1)
- 27) Felsic minerals tend to be \_\_\_\_\_.  
a) Light-colored and silica-rich  
b) Dark-colored and silica-poor  
c) Light-colored and silica-rich  
d) Dark-colored and silica-poor  
e) None of the above (1)
- 28) How does the age of ocean rock vary with distance from ocean ridges?  
a) Only young rocks are found near the ridges with progressively older rocks appearing with distance from the ridges  
b) The oldest rocks are found adjacent to the ridges, with progressively younger rocks found with distance from the ridges  
c) All rocks in oceans basins are the same age  
d) The age of rocks varies with distance from subduction zones only  
e) The age of rocks within ocean basins varies with depth rather than distance from ocean ridges (1)

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- 29) Which of the following rocks and their metamorphosed forms is correct?  
a) Sandstone and slate  
b) Shale and quartzite  
c) Shale and gneiss  
d) Limestone and marble  
e) Granite and limestone (1)
- 30) Which of the following is a type of chemically precipitated rock?  
a) Sandstone  
b) Coal  
c) Mudstone  
d) Limestone  
e) Conglomerate (1)
- 31) The ridge and valley system of the Appalachia Mountain, which has parallel hills and valleys, would have which type of drainage pattern?  
a) Dendritic  
b) Trellis  
c) Annular  
d) Radial  
e) None of the above (1)
- 32) 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 (1)
- 33) Subduction is BEST associated with  
a) Transform boundaries  
b) Convergent boundaries that have oceanic crust  
c) All convergent boundaries  
d) Divergent boundaries  
e) Passive boundaries (1)
- 34) A horst is a \_\_\_\_\_ whereas a graben is a (an) \_\_\_\_\_.  
a) Sunken block / raised block  
b) Raised block / sunken block  
c) Sunken block / downthrown block  
d) Raised block / upthrown block  
e) Sunken block / echelon block (1)
- 35) Lava associated with composite volcanoes is \_\_\_\_\_.  
a) Thick, gassy, and felsic  
b) Thick, gassy, and mafic  
c) Fluid, gassy, and mafic  
d) Fluid, with little gas, and felsic  
e) Fluid, with little gas, and mafic (1)

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36) Finely divided, partially decomposed organic matter is referred to as \_\_\_\_\_.

- a) Colloids
- b) Humus
- c) Sesquioxides
- d) Regolith
- e) Litter

(1)

37) A layer of weathered rock upon which a soil may form is referred to as the \_\_\_\_\_.

- a) Bedrock
- b) Humus
- c) Colloids
- d) Litter
- e) Regolith

(1)

38) An acidic soil would have a pH of \_\_\_\_\_, an alkaline soil would have a pH of \_\_\_\_\_, and a neutral soil would have a pH of \_\_\_\_\_.

- a) 5, 9, 7
- b) 6, 8, 9
- c) 9, 8, 7
- d) 3, 4, 5
- e) 1, 2, 3

(1)

39) Large masses in a soil that are grouped together to form the soil structure are referred to as \_\_\_\_\_.

- a) Epipedons
- b) Bases
- c) Colloids
- d) Peds
- e) Horizons

(1)

40) Which of the following soils would be best described as "poorly developed"?

- a) Oxisol
- b) Alfisol
- c) Vertisol
- d) Ultisol
- e) Entisol

(1)

41) Which of the following transport processes would likely dominate in a muddy stream?

- a) Solution
- b) Suspension
- c) Saltation
- d) Traction
- e) Abrasion

(1)

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- 42) Changes in a stream's cross-sectional area and average velocity are related to changes in \_\_\_\_\_.
- a) Gradient of the stream channel
  - b) The amount of sediment in the stream
  - c) The flow velocity of the stream
  - d) The flow direction of the stream
  - e) Type of bedrock
- (1)
- 43) A stream in an equilibrium condition, whereby it can just carry the average of load of sediment that it receives from slopes and inflowing channels, is referred to as a/an \_\_\_\_\_.
- a) Gully
  - b) Meandering river
  - c) Alluvial river
  - d) Graded stream
  - e) Rill
- (1)
- 44) Which of the following statements describing the grading of a river is incorrect?
- a) In the final stages, lakes and waterfalls are abundant
  - b) Initially there are large fluctuations in slope profile
  - c) At intermediate stages, the stream profile becomes smoothed into a uniform curve
  - d) The angle of the final graded profile is lower than in earlier stages
  - e) At the earliest stage, there are large fluctuations in the slope profile
- (1)
- 45) The process whereby alluvium accumulates and raises the streambed is referred to as \_\_\_\_\_.
- a) Gradation
  - b) Abrasion
  - c) Alluviation
  - d) Aggradation
  - e) Degradation
- (1)
- 46) In the early stages of gradation and tributary extension, the capacity of a stream \_\_\_\_\_ the load supplied to it.
- a) Exceeds
  - b) Increases
  - c) Erodes
  - d) Weathers
  - e) Ignores
- (1)
- 47) Which of the following types of surface would not be prone to wind erosion?
- a) Unvegetated arid materials
  - b) Loose, dry debris
  - c) Moist clay-rich soils
  - d) Coastal locations
  - e) All of these are susceptible to wind erosion
- (1)



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- 48) Wave backwash flows \_\_\_\_\_.
- a) At the same angle that the original wave arrived
  - b) At right angles to the shoreline
  - c) At right angles to the direction of the original wave
  - d) Parallel to the sea edge
  - e) Parallel to the wind direction
- (1)
- 49) When water has a salinity of greater than 35 parts per thousand, the water is considered \_\_\_\_\_
- a) Saline
  - b) Brine
  - c) Brackish
  - d) Eustatic
  - e) Eutrophied
- (1)
- 50) A coral reef that lies out from the shoreline is referred to as a/an \_\_\_\_\_
- a) Atoll
  - b) Fringing reef
  - c) Barrier reef
  - d) Barrier island
  - e) Raised shoreline
- (1)
- 51) Rayleigh scattering occurs when the particle radius is \_\_\_\_\_
- a) Less than 1/10 of the wavelength
  - b) Similar size to the wavelength
  - c) Greater than the wavelength
  - d) Is unrelated to wavelength
  - e) None of the above
- (1)
- 52) Midlatitude cyclones in the South Africa generally \_\_\_\_\_
- a) Move from east to west
  - b) Move from west to east
  - c) Move from north to south
  - d) Move from south to north
  - e) Remain stationary
- (1)
- 53) Constant gasses make up approximately \_\_\_\_\_% of the atmosphere.
- a) Less than 1
  - b) 0.93
  - c) 20.95
  - d) 78.08
  - e) 99.9
- (1)
- 54) If a cloud forms close to the ground it is called \_\_\_\_\_.
- a) Dew
  - b) Low-lying stratus clouds
  - c) Fog
  - d) Ground-induced precipitation
  - e) A cloudbank
- (1)

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- 55) Fronts are associated with clouds because
- a) The warm air rises and cools adiabatically over the cooler air
  - b) The warm air is stable and cooled by radiation escaping to space
  - c) The cold air of the cold front can't hold as much moisture, so it becomes cloud banks
  - d) When air moves it becomes opaque
  - e) Friction along the front heats the air and makes clouds (1)
- 56) This layer of the atmosphere is generally warmed by longwave radiation emitted from the Earth as part of the global energy balance.
- a) Stratopause
  - b) Mesosphere
  - c) Troposphere
  - d) Thermosphere
  - e) Stratosphere (1)
- 57) Folds that develop in the Polar Front jet stream when significant temperature differences exist between tropical and polar air masses are called the
- a) Rossby waves
  - b) Polar Front jet stream
  - c) Zonal flow
  - d) Meridional flow
  - e) None of these (1)
- 58) As you increase in altitude, barometric pressure \_\_\_\_\_.
- a) Holds
  - b) Increases
  - c) Decreases
  - d) Is temperature dependant
  - e) None of these (1)
- 59) 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 (1)
- 60) In an anticyclone, also called a \_\_\_\_\_-pressure cell, air \_\_\_\_\_.
- a) Low / converges toward the center
  - b) Low / diverges away from the center
  - c) High / converges toward the center
  - d) High / diverges away from the center
  - e) High / ascends (1)
- 61) Which of the following statements are true about the effects of latitude and longitude on weather and climate?
- a) Latitude is the least important factor influencing climate
  - b) Longitude directly affects the length of day
  - c) Latitude affects radiation intensity and the length of day
  - d) Longitude is the most significant factor affecting weather
  - e) Latitude directly affects how cloudy it is on a particular day (1)

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- 62) The statement "It will be 32°C today" is an example of which term?  
a) Climate  
b) Weather  
c) Paleoclimate  
d) Seasonality  
e) Latitude (1)
- 63) The name given to the apparent deflecting influence of the Earth's rotation on moving objects such as wind and ocean currents is called \_\_\_\_\_.  
a) The aphelion effect  
b) The ecliptic process  
c) Parallelism  
d) The Coriolis effect  
e) The pressure gradient force (1)
- 64) Reflectance of an object is known as  
a) Albedo  
b) Angle of incidence  
c) Solar radiation  
d) Specific heat  
e) None of the above (1)
- 65) Which of the following orderings of atmospheric layers is correct as one moves from the Earth's surface through the atmosphere?  
a) Troposphere, stratosphere, mesosphere, thermosphere  
b) Troposphere, thermosphere, stratosphere, mesosphere  
c) Thermosphere, stratosphere, mesosphere, troposphere  
d) Stratosphere, thermosphere, troposphere, mesosphere  
e) Thermosphere, mesosphere, stratosphere, troposphere (1)
- 66) Which of the following surfaces would likely have the highest albedo?  
a) An area covered by pine forest  
b) An asphalt parking lot  
c) An area covered by snow  
d) An area covered by wet sand  
e) An area covered by dry sand (1)
- 67) Which of 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 vapour (1)

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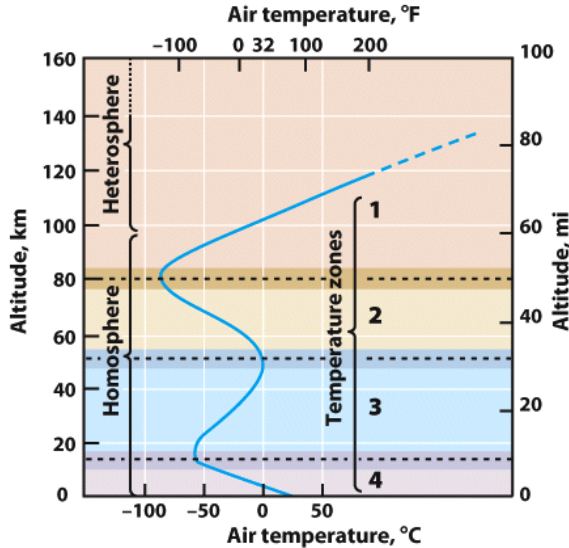
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- 68) Latent heat refers to which of the following?  
a) Heat that can be sensed by touching or feeling  
b) Heat energy that goes into breaking bonds between molecules when a substance changes physical states  
c) A form of heat energy that cannot be measured with a thermometer  
d) Both a and c  
e) Both b and c (1)
- 69) Carbon dioxide comprises \_\_\_\_\_ % of the Earth's lower atmosphere.  
a) 52%  
b) 0.0385%  
c) 3%  
d) 5%  
e) 10% (1)
- 70) The greenhouse effect refers to the  
a) Process through which counterradiation is returned to the surface  
b) Overall warming of the Earth's atmosphere over long periods of time  
c) Rapidly increasing amount of CO<sub>2</sub> in the atmosphere  
d) Decrease in the amount of shortwave radiation the Earth can radiate out to space  
e) Melting of the polar ice caps and subsequent raising of the oceans (1)
- 71) Which of the following is true?  
a) The Earth absorbs shortwave radiation from the Sun and emits energy as shortwave radiation  
b) The Earth absorbs shortwave radiation from the Sun and emits energy as longwave radiation  
c) The Earth absorbs longwave radiation from the Sun and emits energy as shortwave radiation  
d) The Earth absorbs longwave radiation from the Sun and emits energy as longwave radiation  
e) The Earth does not emit energy (1)
- 72) Select all of the answers that make the following statement true: "Atmospheric water vapor is especially vital because  
a) It absorbs and stores heat energy from the Sun"  
b) Along with carbon dioxide, it is an important component of the greenhouse effect"  
c) It moderates temperature and transports energy over the entire Earth"  
d) It does not reflect a large amount of energy from the Sun that would overheat the Earth"  
e) All of the above (1)
- 73) The temperature of the surface of the Sun is about \_\_\_\_\_.  
a) 6000°C  
b) 10,800°C  
c) 15,000,000°C  
d) 27,000,000°C  
e) Unknown (1)

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74) On this figure, the atmospheric layer that contains the ozone layer is labeled:



- a) 1
  - b) 2
  - c) 3
  - d) 4
- (1)

75) Overall, net radiation is greatest at \_\_\_\_\_ latitudes and smallest at \_\_\_\_\_ latitudes.

- a) Low / middle
  - b) Low / high
  - c) Middle / low
  - d) High / low
  - e) Middle / high
- (1)

**SECTION B: BIOSPHERE – MINI ESSAY**

76) Describe the changes in species diversity that occurred throughout the history of life, based on species representation in the fossil record. Where does the world stand in this respect at the present point? (25)

**SECTION C: LITHOSPHERE & HYDROSPHERE – MINI ESSAY**

77) With the aid of a labelled diagram, explain the process of shoreline retrogradation. (10)

78) Describe the major pedogenic processes. In your answer, include a description of one regionally specific - process associated with a particular soil order(s). (15)

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**DISCIPLINE OF GEOGRAPHY**  
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**SECTION D: ATMOSPHERE – MINI ESSAY**

- 79) Describe and compare land and sea breezes. Use diagrams to help illustrate your answer. (10)
- 80) Name and explain the different type of atmospheric stability. Use diagrams to illustrate your answer. (15)