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

DURATION: 3 HOURS
TOTAL MARKS: 150 Marks

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Moderator: Prof. O Mutanga

PLEASE NOTE THERE ARE SEPARATE INSTRUCTIONS FOR EACH SECTION
This paper consists of 22 pages.
If Sections B, C, D are written in a single answer booklet, only the first section will be marked.

SECTION A (MCQ) – 75 marks
75 MCQ questions carrying 1 mark each (25 questions per section)
5 possible answers per question
Negative marking does not apply
Answered on the MCQ sheet provided

SECTION B (BIOGEOGRAPHY) – 25 marks
Answer in a new answer Book
Short questions and/or mini essay

SECTION C (ATMOSPHERE) – 25 marks
Answer in a new answer Book
Short questions and/or mini essay

SECTION D (LITHOSPHERE AND HYDROSPHERE) – 25 marks
Answer in a new answer Book
Short questions and/or mini essay
SECTION A: MQC [75 marks]

PLEASE ANSWER ON THE ANSWER SHEETS PROVIDED

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

1. 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

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

3. According to _______, two species that compete for the exact same resources cannot stably coexist.
   a) Bergmann’s Rule
   b) Golger’s Rule
   c) Cope’s Rule
   d) Frost’s Rule
   e) Gause’s Rule

4. If a species is endemic, it is (has):
   a) Confined to ground level and rarely reaches heights above a metre
   b) Symbiotic relationships with other plants
   c) Confined to a particular area
   d) Widely distributed but with large gaps between regions
   e) Found all around the world

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

6. Trees that shed their leaves seasonally are called:  
   a) Epiphytes  
   b) Evergreen  
   c) Succulents  
   d) Deciduous  
   e) Geophytes

7. Which of the following features does not characterize the tundra biome?  
   a) low temperatures  
   b) precipitation limited.  
   c) high soil nutrient status  
   d) permafrost present  
   e) short growing season

8. Who first recorded the tendency for plant diversity to decrease from the equator to the poles:  
   a) Linnaeus  
   b) Von Humboldt  
   c) Forster  
   d) Banks  
   e) Buffon

9. In a transect from the Tropic of Cancer toward the Arctic Circle, which of the following would be the correct order of vegetation types:  
   a) Desert, grassland, mediterranean vegetation, deciduous forest  
   b) Desert, mediterranean vegetation, deciduous forest, taiga  
   c) Rainforest, savanna, grassland, taiga  
   d) Rainforest, grassland, mediterranean vegetation, deciduous forest  
   e) Rainforest, savanna, grassland, mediterranean vegetation

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. According to the competitive exclusion principle, two species cannot continue to occupy the same:
   a) biome
   b) habitat
   c) territory
   d) range
   e) niche

12. According to most conservation biologists, the single greatest threat to global biodiversity is:
   a) insufficient recycling programs for non-renewable resources
   b) global climate change resulting from a variety of human activities
   c) stratospheric ozone depletion
   d) chemical pollution of water and air
   e) alteration or destruction of natural habitats

13. The Nile perch (Lates niloticus) is a good example of a(n):
   a) endangered endemic
   b) threatened migratory species
   c) primary consumer
   d) population sink
   e) introduced predator

14. The coelacanth is an example of a(n):
   a) Geographical relict
   b) Evolutionary relict
   c) Palaeoendemic species
   d) Neoendemic species
   e) Extinct species

15. 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

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

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

18. Who was described as “Darwin’s bulldog?”  
a) Wallace  
b) Hooker  
c) Sclater  
d) Von Humboldt  
e) Lyell

19. Which region is described as a ‘biodiversity hotspot’ in southern Africa?  
a) Mistbelt grasslands  
b) Miombo woodlands  
c) Succulent karoo  
d) Tropical Rainforests  
e) Sub-tropical thicket

20. Epiphytes are most commonly found in of the following assemblages of vegetation?  
a) low-latitude rainforest  
b) boreal forest  
c) midlatitude deciduous forest  
d) needleleaf forest  
e) coastal needleleaf forest

21. Dwarf shrubs and sclerophyllous leaves are found in _____________.  
a) monsoon forest  
b) needleleaf forest  
c) chaparral  
d) tundra  
e) low-latitude rainforest
22. 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

23. Chaparral and Kwongan vegetation is found in which of the following biome?
   a) tropical rainforest
   b) taiga
   c) deciduous forest
   d) mediterranean vegetation
   e) tundra

24. 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

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

26. The point on the Earth’s surface where the Sun is directly overhead is:
   a) subsolar point
   b) circle of illumination
   c) great circle
   d) small circle
   e) Arctic Circle

27. When the subsolar point is located at its highest latitude in the northern hemisphere it is:
   a) the summer solstice
   b) the winter solstice
c) the autumnal equinox  
d) the vernal equinox  
e) the spring equinox  

28. The summer solstice in the northern hemisphere occurs approximately on which of the following dates?  
a) March 21  
b) June 22  
c) July 23  
d) August 24  
e) September 25  

29. 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  

30. Which of the following statements about meridians is true?  
a) They originate at the equator at 0 degrees and reach the poles both north and south at 90 degrees  
b) They originate at the Equator at 90 degrees and reach the poles both north and south at 0 degrees  
c) They originate at 0 degrees longitude and reach a location approximately at the International Date Line at 180 degrees longitude  
d) They originate at 180 degrees longitude and reach a location approximately at the International Date Line at 0 degrees longitude  
e) Meridians never intersect  

31. Which of the following statements is true regarding latent heat transfer?  
a) Energy is released to a surface during the process of evaporation  
b) Energy is released to a surface during the process of condensation  
c) Energy is absorbed by ice during the process of freezing in the atmosphere  
d) Humidity is decreased following the release of latent heat  
e) Humidity is increased following the release of latent heat  

32. Which of the following is the correct order from greatest volume to least volume of gases in the troposphere?
a) oxygen, carbon dioxide, nitrogen, neon  
b) nitrogen, argon, oxygen, neon  
c) nitrogen, oxygen, argon, carbon dioxide  
d) oxygen, nitrogen, argon, carbon dioxide  
e) neon, argon, oxygen, nitrogen

33. The lower solar angles characteristic of high-latitude locations lead to lower levels of insolation because:
   a) the solar radiation has further to travel and so loses its strength  
   b) the solar radiation is spread over a larger unit area  
   c) the solar radiation is spread over a smaller unit area  
   d) the solar radiation must travel through more volume of atmosphere and so more radiation is reflected back to space  
   e) the high latitude regions receive solar radiation from the cooler part of the Sun

34. Ozone forms from the free atoms of which gas?
   a) nitrogen  
   b) argon  
   c) carbon dioxide  
   d) oxygen  
   e) water vapor

35. An increase in the frequency of electromagnetic radiation results in a:
   a) shorter wavelength  
   b) longer wavelength  
   a) lower energy levels  
   d) time shift with respect to energy levels  
   e) significant increase in absorption levels

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

![Image of electromagnetic spectrum]

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37. Which of the following is a source of atmospheric carbon dioxide?
   a) photosynthesis
   b) chlorofluorocarbons
   c) rice fields
   d) burning of fossil fuels
   e) melting ice

38. 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

39. During a temperature inversion _______.
   a) there is no change in air temperature as one ascends through the troposphere
   b) there is no change in air temperature as one descends through the troposphere
   c) temperatures increase as one ascends through the lower atmosphere
   d) temperatures decrease as one ascends through the lower atmosphere
   e) the stratosphere is the same temperature as the troposphere

40. A parcel of dry air at the base of a mountain range has a temperature of 30 degrees Celsius. If the parcel of air moved 500 meters up the slope, its temperature would be _______ degrees Celsius.
   a) 24
   b) 25
   c) 33
   d) 36
   e) 40

41. Which of the following is not one of the four important thermal differences between land and ocean surfaces?
a) Oceans have a higher heat capacity than land
b) Water is slower to heat than land
c) Warm water surfaces can mix with cooler water below
d) Dry soil has a higher heat capacity than water
e) Open water can be easily cooled by open evaporation

42. As a volume of air rises, __________.
   a) it expands and becomes cooler
   b) it expands and becomes warmer
c) it contracts and becomes cooler
d) it contracts and becomes warmer
e) it expands but its temperature does not change

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

44. The trade winds blow from ____________________.
   a) the subtropical high to the equatorial low
   b) the subtropical high to the subpolar low
c) the doldrums to the horse latitudes
d) the polar high to the subtropical high
e) the polar high to the doldrums

45. An air mass where air converges at the surface, ascends, and rotates in a clockwise direction is ____________________.
   a) a low pressure cell in the northern hemisphere
   b) a low pressure cell in the southern hemisphere
c) a high pressure cell in the northern hemisphere
d) a high pressure cell in the southern hemisphere
e) both a low pressure cell in the southern hemisphere or a high pressure cell in the northern hemisphere

46. Which of the following statements concerning the pressure gradient force is correct?
   a) In certain cases the force may be directed from lower to higher pressure
b) Pressure gradient force acts parallel to isobars

c) Pressure gradient force is greatest when isobars are spaced closest together

d) The pressure gradient force affects only vertical wind flow

e) Pressure gradient force is counterclockwise in the northern hemisphere

47. 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

48. Undulations in the westward flow of the upper-air westerlies are referred to as __________.

a) Hadley cells
b) gyres
c) jet streams
d) the polar front
e) Rossby waves

49. Which of the following is not part of Hadley cell circulation?

a) subtropical high pressure belts
b) the ITCZ
c) the polar high
d) high surface pressure
e) the Coriolis effect

50. Overall, the most important climatic influence is:

a) latitude
b) seasonality
c) air mass circulation
d) maritime vs. continental relationships
e) topographic effects

51. Molten rock on the Earth’s surface is:

a) alluvium
b) lava
c) sediment
d) drift
e) magma
52. Magma that penetrates between rock layers forms a:
   a) laccolith
   b) batholith
   c) sill
   d) dike
   e) stock

53. Rocks that form from the cementation and compaction of loose rock debris and organic matter are:
   a) igneous
   b) metamorphic
   c) sedimentary
   d) clastic
   e) ALL of these

54. Rocks that form from broken rock fragments make rocks classified as:
   a) intrusive igneous
   b) foliated metamorphic
   c) clastic sedimentary
   d) organic sedimentary
   e) chemical sedimentary

55. What is another name for the oceanic crust?
   a) oksi
   b) sima
   c) sial
   d) alma
   e) None of the above

56. The East African Rift Valley is formed by ______________.
   a) compression
   b) volcanism
   c) retraction of the crust
   d) stress
   e) extension

57. The spreading apart of the Earth’s crust by magma rising between fractures in the Earth’s plates is:
a) subduction
b) rifting
c) laterization
d) overthrusting
e) exfoliation

58. The proportion of sand, silt, and clay in a soil is referred to as the ____________.
   a) soil profile
   b) soil configuration
   c) soil enrichment
d) soil structure
e) soil texture

59. An acidic soil would have a pH of __ __________, an alkaline soil would have a pH of ____________.
   a) 5, 9
   b) 6, 8
c) 9, 8
d) 3, 4
e) 1, 2

60. Which of the following are examples of soil secondary macro nutrients?
   a) Phosphorus, calcium, magnesium
   b) calcium, magnesium, sulphur
c) sulphur, nitrogen, potassium
d) calcium, magnesium, nitrogen
e) phosphorus, nitrogen, magnesium

61. Which of the following describes the order of soil horizons from the surface downwards?
   a) A, E, O, C, B
   b) A, O, E, B, C
c) O, A, E, B, C
d) O, E, A, B, C
e) O, A, B, E, C

62. Which of the following is most critical to weathering processes?
   a) salt
   b) oxygen
c) water
d) nitrogen

e) lava

63. ________________ is the source for sediment, which may be transformed into soil.

a) Bedrock
b) Colluvium
c) Alluvium
d) Regolith
e) All of the above

64. A topographic barrier that separates two drainage basins is referred to as a (an) __________.

a) trunk
b) brook
c) network
d) drainage divide
e) distributary

65. Stream discharge is defined as ____________________________________________.

a) height of water per unit time passing through a cross section of the stream at that location
b) volume of water per unit time passing through a cross section of the stream at that location
c) velocity of water passing through a cross section of the stream at that location
d) volume of water per unit time passing through a length of the stream
e) velocity of water per unit time passing through a length of the stream

66. When pore spaces become completely filled with water, the soil is considered to be at

__________ capacity.

a) water
b) saturated
c) field
d) hygroscopic
e) table

67. __________ is the top of the saturated zone.

a) A water table
b) An aquifer
c) An aquiclude
d) The cone of depression
e) Subsidence
68. ________ is the threshold at which, for a given soil, water is no longer available for plant uptake.
   a) Wilting point
   b) Hygroscopic water
   c) Capillary water
   d) Gravitational water
   e) Field capacity

69. When the pore spaces between sediment become too small and do not allow water to pass through, the sediment is said to be:
   a) permeable.
   b) impermeable.
   c) unsaturated.
   d) saturated.
   e) semipermeable.

70. ________ is the name of water that moves upward through the unsaturation zone.
   a) Infiltrated water
   b) Field capacity
   c) Hygroscopic water
   d) Capillary water
   e) Transport water

71. Which of the following transport processes would likely dominate in a muddy stream?
   a) solution
   b) suspension
   c) abrasion
   d) traction
   e) None of the above

72. A ________ stream has a low gradient, multiple threads, and a variable range of sediment loads.
   a) straight
   b) meandering
   c) braided
   d) oxbow
   e) none of these
73. __________ occurs most commonly in association with wet periods when soils are saturated and pore spaces can no longer absorb additional precipitation.
   a) Wilting point
   b) Runoff
   c) Capillary drainage
   d) A tributary
   e) A confluence

74. As a general rule, there is a(n) __________ relationship between increased stream order and stream size.
   a) neutral
   b) negative
   c) positive
   d) floating
   e) exponential

75. The correct term for a marine wave caused by volcanic or earthquake activity is a ________.
   a) hurricane
   b) storm surge
   c) pingo
   d) tsunami
   e) tombolo