nAmIBIA UnIVERSITY
OF SCIEnCE AnD TECHnOLOGY

FACULTY OF NATURAL RESOURCES AND SPATIAL SCIENCES

DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES SCIENCES

QUALIFICATION: BACHELOR OF NATURAL RESOURCES MANAGEMENT (NATURE CONSERVATION)	
QUALIFICATION CODE: 07BNTC	LEVEL: 7
COURSE CODE: NCE510S	COURSE NAME: Nature Conservation Ecology 1
DATE: June 2019	
DURATION: 3 HOURS	MARKS: 150

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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INSTRUCTIONS
1. Answer ALL the questions.
2. Write clearly and neatly.
3. Number the answers clearly.

PERMISSIBLE MATERIALS

1. Examination question paper
2. Answering book

THIS QUESTION PAPER CONSISTS OF 6 PAGES (Including this front page)

Section A

Question 1

Provide definitions for the following words/phrases.

1.1	Alluvial	(1)
1.2	Immobilization	(1)
1.3	Ecotone	(1)
1.4	Exploitation	(1)
1.5	Insectivore	(1)
1.6	Gravitational water	(1)
1.7	Gross Primary Production (GPP)	(1)
1.8	Pyramid of numbers	(1)
1.9	Anthropogenic	(1)
1.10	Protocooperation	(1)
		[10]

Question 2

Provide the word(s) that best explain the definitions below.

1.1	The study of a single species in relation to other components of the ecosystem.	(1)
1.2	The water quantity and quality at which point the soil can no longer provide the plant with enough moisture to remain turgid.	(1)
1.3	Energy cannot be created or destroyed - may be transformed	(1)
1.4	The pattern of variation of rainfall, temperature, wind and meteorological parameters over time period.	(1)
1.5	Surface soil particles bind together to form an impermeable layer.	(1)
1.6	The reduction of nitrates to nitrogen gas (N_2), completing the nitrogen cycle and replenishing the atmospheric nitrogen.	(1)
1.7	Values at which animals are most successful.	(1)
1.8	Neither population affects the other.	(1)
1.9	A term used to refer to the imbalance between the tree/grass ratio. (too many trees and not enough grasses)	(1)
1.10	A complex pattern of interconnected food chains in a community/ecosystem.	(1)
		[10]

Section B

Question 3

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3.1	Discuss how altitude and aspect determines the structure of an ecosystem?	(4)
3.2	State which kind of climatic conditions prevail when the Subtropical High-Pressure Zone moves northwards.	(1)
3.3	Study the diagram bellow and answer the questions that follow:	
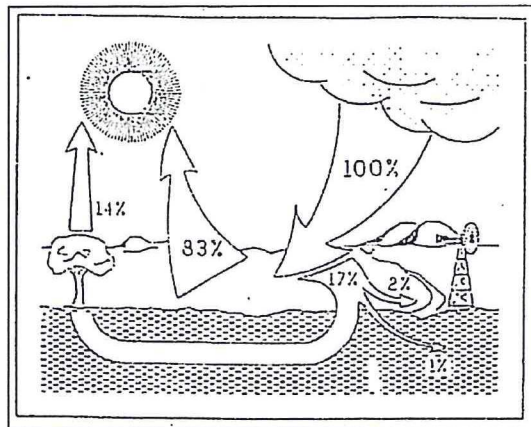
An average rainfall of 310mm was received in Mariental in 2018.

    a) How many mm of rainfall evaporated from the soil? (1)

b) How many mm of rainfall ran off into rivers? (1)

c) A total of 3.1 mm was stored in underground reservoirs. Discuss how this total would change if the soil was mainly a clay soil. (2)

[9]

Question 4

4.1 Name two types of metamorphic rocks found in Namibia. (2)

4.2 List the four basic components of soil. (4)

4.3 State one defining characteristic of the E-horizon. (1)

4.4 Study the soil texture triangle below and answer the questions that follow:
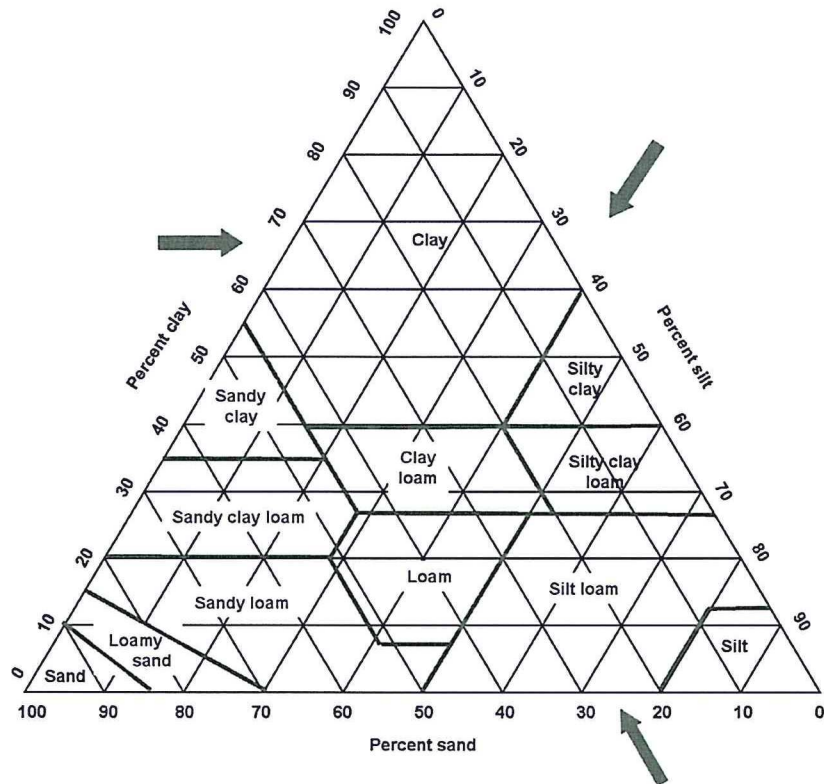
Determine the soil type for the following soil compositions:

a) 55% sand, 20% clay (1)

b) 45% silt, 5% clay (1)

4.5 Discuss how infiltration and nutrient adsorption differ between sandy, loam and clay soils. (6)

4.6 Explain why micropores are important in a soil and in which soil type is it most prevalent? (2)

4.7 Cation Exchange Capacity (CEC) is defined as the ability of colloids to attract exchangeable cations to their active sites. Discuss two reasons why sandy soils have a low CEC and how this effects plant growth in this soil type. (3)

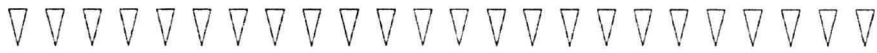4.8   Study the figure below and answer the questions that follow:
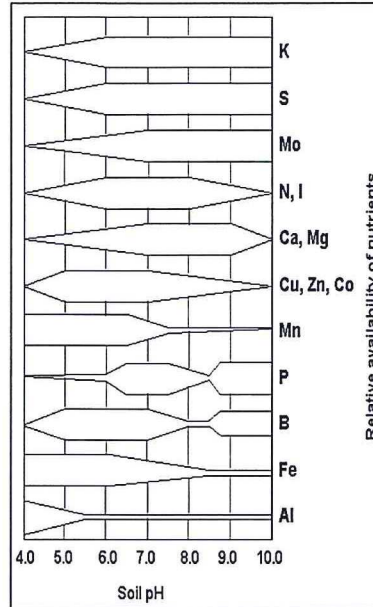
Soil pH

a)   At which soil pH's is Manganese least available to plants and what is the use of this nutrient to plants?   (2)

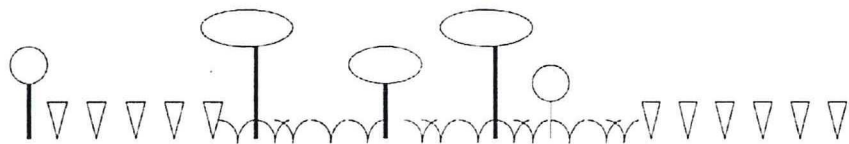b)   At which pH's is phosphorus most available to plants, and what type of nutrient is it?   (2)
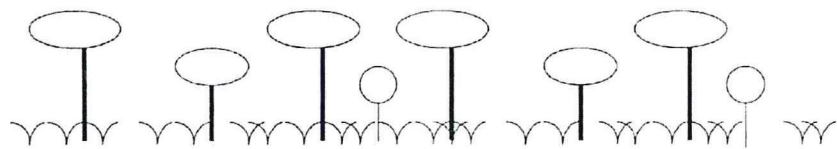
[24]

Question 5

5.1   Study the figure bellow and answer the questions that follow:

Key to growth forms:

ᐱ   = grass

ᐯ   = Woody shrub

Ⓠ   = tree

a) Three habitats a, b and c are represented above. Place them in order of expected browser species richness and explain your choice. (4)

b) Which habitat will have the lowest overall species richness? Explain your answer in terms of vertical and horizontal spatial heterogeneity. (4)

5.2 The grass assemblages of two habitats were recorded using the descending point method and the results are recorded below:

Species	Total species count in Habitat A	Total species count in Habitat B
A	6	8
B	0	10
C	19	65
D	2	12
E	7	13
F	0	36
Total	34	144

a) Calculate the relative abundance (dominance) of species C in both habitats. (4)

b) Calculate species richness for both habitats. (2)

5.3 Explain how each of the following factors influence species diversity: (8)
   a) Age of community
   b) Disturbance
   c) Isolation
   d) Competition

5.4 Study the table below and answer the questions that follow:

Biome	Source	Production kg.msq/yr	Tons/ha/yr
Tropical rain forest	Whitaker & Likens (1973)	2	20
Savanna	Whitaker & Likens (1973)	0.7	7
Temperate grassland	Whitaker & Likens (1973)	0.5	5
Cultivated land	Whitaker & Likens (1973)	0.644	6.44
Boreal forest	Whitaker & Likens (1973)	0.8	8
Temperate deciduous forest	Whitaker & Likens (1973)	1.2	12
Tundra	Whitaker & Likens (1973)	0.144	1.44
Desert	Whitaker & Likens (1973)	0.071	0.71
Swamp and marsh	Whitaker & Likens (1973)	2.5	25
Lake and stream	Whitaker & Likens (1973)	0.5	5
Estuaries	Whitaker & Likens (1973)	1.8	18
Upwelling zones	Whitaker & Likens (1973)	0.5	5
Continental shelf	Whitaker & Likens (1973)	0.36	3.6
Open ocean	Whitaker & Likens (1973)	0.127	1.27
Fire climax grassland*	Tainton (1999)	0.35	3.5
Fire climax grassland*	Tainton (1999)	0.3	3
Climatic climax grassland*	Tainton (1999)	0.3	3
Climatic climax grassland*	Tainton (1999)	0.1	1
Savanna (moist)	Tainton (1999)	0.2	2
Savanna (dry)	Tainton (1999)	0.05	0.5
Karoo	Tainton (1999)	0.3	3
Karoo	Tainton (1999)	0.15	15
Karoo	Tainton (1999)	0.05	0.5

a) List the three least productive ecosystems in order of increasing primary productivity. (3)
b) Discuss two limiting factors that limit the primary productivity in the ecosystems mentioned above. (2)

5.5 Define exploitation efficiency and discuss three factors that affect this efficiency. (7)

5.6 Using the "ten percent rule", how many trophic levels could 1000 ha of Savanna support, assuming that the top predator weighs around 120 kg? Show your calculations and explain your conclusions. Indicate the feeding group of organisms found in each trophic level and give a realistic example at each level. Note: The Primary Productivity of a Savanna is 7 tons/ha/year (20)

[54]

Question 6

6.1 Name two reservoirs of Nitrogen? (2)

6.2 Define nitrification and discuss the two steps in this process with reference to the organisms involved. (3)

6.3 Volatilization and runoff are described as nitrogen "leaks" in the cycle. Describe how nitrogen is lost from the cycle because of these two leaks. (2)

6.4 Discuss five expected outcomes of climate change at ecosystem level in Namibia. (5)

[12]

Question 7

7.1 Consider the following grass species distribution maps for Namibia and answer the questions that follow:
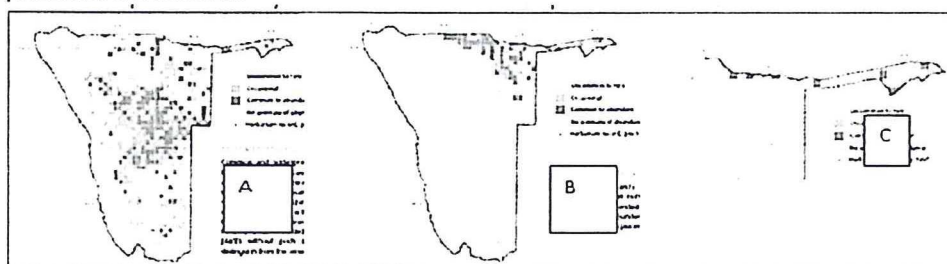
a) Class each of the species as eury-something or steno-something with regards to soil moisture. Explain each answer. (6)
b) Are species A and B sympatric or allopatric? Explain your answer. (2)
c) How would you describe each of the species with regards to their habitat tolerance? (3)
d) Provide an example of a stenophagic organism and explain why such an organism might be more vulnerable to extinction than a euryphagic organism. (3)
e) Explain the terms interspecific competition and intraspecific competition and provide an example of each. (4)

[18]

Question 8

8.1 State the characteristics of the early climax grass communities. (5)

8.2 Compare the prevailing circumstances during primary and secondary succession. (8)

[13]

Total [150]