



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGY, CHEMISTRY AND PHYSICS

QUALIFICATION : BACHELOR OF SCIENCE	
QUALIFICATION CODE: 07BOSC	LEVEL: 7
COURSE: ECOLOGY	COURSE CODE: ECO701S
DATE: JUNE 2023	SESSION: 1st OPPORTUNITY
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER

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**THIS EXAMINATION PAPER CONSISTS OF FIVE (5) PAGES
(INCLUDING THIS FRONT PAGE)**

INSTRUCTIONS

1. All examination **RULES** apply
2. Answer **ALL** questions
3. Read all the questions carefully before answering
4. Marks are indicated at the end of each question
5. Write clearly and neatly.
6. All written work **MUST** be done in **BLUE** or **BLACK** ink.

Section A: Multiple choice questions (6 marks)

1. The primary stages of the nitrogen cycle are (starting with atmospheric N₂):
 - A. Ammonification, denitrification, nitrogen fixation, nitrification, assimilation
 - B. Nitrogen fixation, ammonification, assimilation, nitrification, phosphorylation
 - C. Nitrogen fixation, nitrification, assimilation, respiration, ammonification
 - D. Nitrogen fixation, nitrification, assimilation, ammonification, denitrification

2. Which of the following best describes a relationship in which two species both mutually benefit from each other's behaviours?
 - A. Competition
 - B. Parasitism
 - C. Commensalism
 - D. Mutualism

3. Which ecological inquiry method is an ecologist using when he or she sets up a greenhouse and measures the effects of different levels of carbon dioxide on an endangered plant species?
 - A. Questioning
 - B. Experimentation
 - C. Modelling
 - D. Forecasting

4. Introduced species can threaten biodiversity because they can
 - A. Cause desertification.
 - B. Cause biological magnification.
 - C. Crowd out native species.
 - D. Reduce the amount of fertile land.

5. An organism's niche is
 - A. The range of physical and biological conditions in which an organism lives and the way it obtains what it needs to survive and reproduce.
 - B. All the physical and biological factors in the organism's environment.
 - C. The range of temperatures that the organism needs to survive.
 - D. A full description of the place an organism lives.

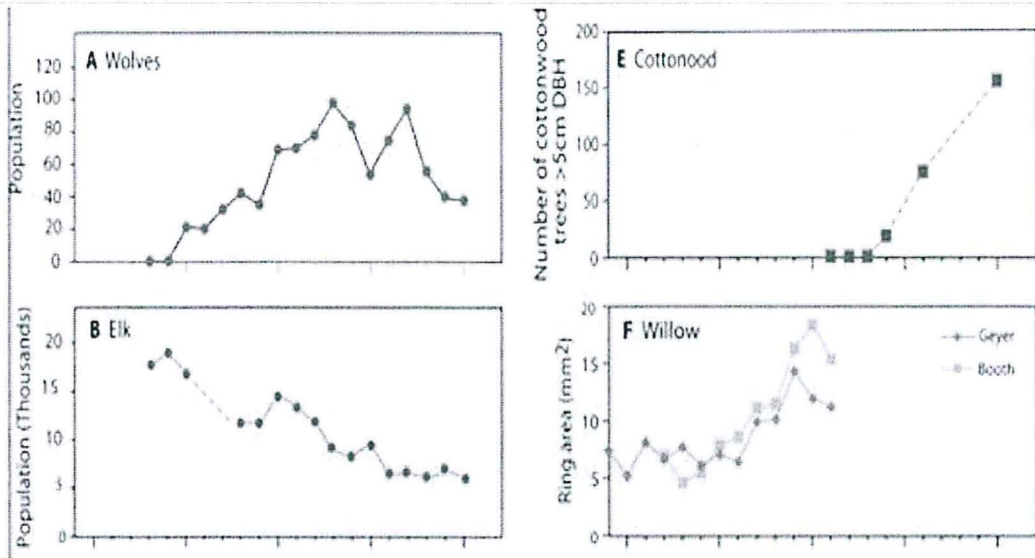
6. Which of the following statements about human population in industrialized countries is incorrect?
 - A. Life history is r selected.
 - B. Average family size is relatively small.
 - C. The population has undergone the demographic transition.
 - D. The survivorship curve is Type I

Section B: Answer all questions (94 Marks)

1. A population of Springboks is split into two habitats by a river. After many years, the river is filled with sand due to siltation, and the two populations are reunited. However, individuals are now unable to breed across the different populations. They can only breed with individuals from their own group. What type of a speciation is this? Explain it in detail. [4]
2. Both the dominant and keystone species exert strong effects on the character of a community, but in different ways. How do dominant species and keystone species differ in influencing the character of the community? [2]
3. a. Describe the abiotic and biotic characteristics of wetland biome and where it is found in Namibia. [6]
b. State any four (4) human threats to the biodiversity of the wetland biome. [4]
c. As an renowned ecologist/biologist working in the Ministry of Environment, Forestry and Tourism, what are the strategies that you can implement to preserve the biodiversity in the wetland biome. [4]
4. Explain using examples the principle of;
a. Interspecific competition [2]
b. Competitive exclusion [2]
c. Resource partitioning [2]
5. Species 1 and Species 2 compete for a common limiting resource. The two-species dynamics follow the Lotka-Volterra competition model (logistic competition).

Species 1 has carrying capacity $K_1 = 100$;
Species 2 has $K_2 = 150$ with $\alpha_{12} = 0.5$.

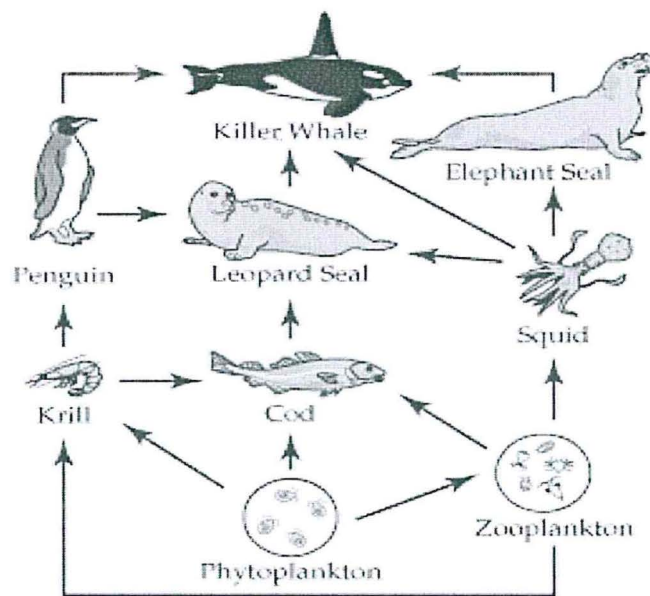
Suppose $\alpha_{21} = 1.5$. Analyze the 0-isoclines and predict the outcome of competition. [8]
6. Describe at least four (4) forces of evolution that drive changes in genetic makeup of population over time. [4]
7. The graphs below show the trends in (A) wolf population after being introduced into a national park and the populations of (B) Elk deer (C) cotton wood and (D) Willow trees. Examine the graphs and use them to answer the following questions below



- What is the best explanation for the change in elk population? [1]
 - How can the change in cottonwood abundance be explained? [1]
 - If the wolf were to be removed from the national park ecosystem, how would you expect the population of elk to change. [1]
8. Giving examples, describe the impact of human activities like mining and agriculture on terrestrial and aquatic ecosystems. [6]
9. The table below shows the number of different species of insects on an experimental field. Complete the table below and compute the Simpson Index (D) as well as Shannon index (H) of the insects in the field. [8]

Insect order	Description	Number of individuals	n/N	pi	pi ²	ln pi	pi ln pi
Wasp	black	6					
Wasp	Purple	5					
Bee	Stripped	1					
Grasshopper	Green with red legs	3					
Butterfly	Large blue	12					

10. Compare and contrast density-dependent growth regulation with density-independent growth regulation. Give an example of each as they might affect a caterpillar population. [5]
11. An ecological system is any set of components, living or non-living, that are connected together by regular interactions. An ecological system can be a single organism and its surroundings, a population or set of interacting populations in a certain habitat, or the entire community together with the abiotic environment with which these species interact, a unit termed an ecosystem. Describe different research methods that ecologists use to study ecosystems. [12]
12. a. With the aid of diagrams, describe the Phosphorous cycle? [8]
 b. Describe four (4) human activities that interfere with the Phosphorous cycle. [8]
13. Study the marine food web diagram shown below and answer the following questions.



- a. Name the primary producer [1]
 b. Name a primary consumer [1]
 c. Name a secondary consumer [1]
 d. What effect would a reduction in light have on this food web? [1]
 e. Explain your answer ind above. [1]
 f. Which speies would be most negatively impacted by a reduction of phytoplankton and why? [1]