INTERNATIONAL UNIVERSITY OF EAST AFRICA
'Learning to Succeed'

FACULTY OF SCIENCE AND TECHNOLOGY

END OF SEMESTER EXAMINATIONS - DECEMBER 2025

PROGRAMME: BSEM
YEAR/SEM: YEAR 1/SEMESTER 1
COURSE CODE: BSE1105
NAME: FUNDAMENTALS OF ECOLOGY

DATE:
TIME:

INSTRUCTIONS TO CANDIDATES:

SECTION A

Answer all questions in this section (compulsory)

Question 1:

1. Using examples, differentiate between biotic and abiotic factors in an ecosystem (8 marks)
2. Explain four ecosystem types as applied in Ecology. (8 marks)
3. Identify the advantages of in-situ conservation (8 marks)
4. Define the following conservation approaches (8 marks)
    a) Umbrella species
    b) Cloning
    c) Captive breeding
    d) Endangered species
5. Using illustrations, differentiate between a food chain and food web (8 marks)

Question 2:

1. List and briefly describe the five main levels of ecological organization.
(4 marks)
2. Explain the difference between abiotic and biotic components of an ecosystem and provide two examples of each.
(4 marks)
3. What is the difference between a fundamental niche and a realized niche?

(4 marks)

4. Briefly describe the two main processes involved in the biogeochemical cycle of carbon.
(4 marks)

5. Explain how the process of nitrogen fixation is crucial for ecosystems and name one group of organisms responsible for it.
(4 marks)

6. Differentiate between interspecific competition and intraspecific competition.
(4 marks)

7. Define "primary succession" and name one natural event that can initiate it.
(4 marks)

8. Explain the difference between density-dependent and density-independent factors that limit population growth, giving one example of each.
(4 marks)

9. Describe one positive and one negative interaction that can occur between two different species.
(4 marks)

10. What is the 10% rule of energy transfer in an ecological pyramid? Why does this limit the number of trophic levels in a food chain? (4 marks)

SECTION B

Answer only three (3) questions from this section

Question 1:

a) Choose a specific ecosystem (e.g., a forest, a lake, a desert) and discuss its structure and function (10 marks)

b) Explain the interactions between biotic and abiotic components. (10 marks)

Question 2:

a) Define the concept of ecological succession (4 marks).

b) Discuss the stages involved in ecological succession (8 marks).

c) Explain the factors that affect ecological succession (8 marks)

Question 3:

a) What is biodiversity conservation (4 marks).

b) How effective is ex-situ conservation over in-situ as approaches of preserving endangered species (8 marks).

c) Discuss the threats to biodiversity conservation in Africa (8 marks).

Question 4:

a) Analyze the potential impact on energy if primary producers in an aquatic ecosystem were significantly reduced (10 marks).

b) In a given ecosystem, if a producer generates 10,000kcal of energy, calculate how much energy would be available to a tertiary consumer, assuming 10% transfer rate between each

trophic level (10 marks).

Question 5:

a) Differentiate between primary and secondary succession. (10 marks)
b) Discuss human influence on succession patterns in degraded landscapes. (10 marks)

Question 6:

a) Describe the different types of feeding relationships found in ecosystems (herbivory, carnivory, omnivory, detritivory). (10 marks)
b) Explain how trophic interactions influence ecosystem structure and stability. (10 marks)

Question 7:

a) Discuss the Lotka–Volterra predator–prey model and its ecological implications. (10 marks)
b) Explain how predator–prey relationships influence population cycles in natural ecosystems. (10 marks)

Question 8:

a) Identify and explain the major human-induced threats to biodiversity in tropical ecosystems. (10 marks)
b) Discuss how habitat fragmentation affects species richness and ecosystem functioning. (10 marks)

Question 9:

a) Distinguish between in-situ and ex-situ conservation with relevant examples. (10 marks)
b) Evaluate the strengths and limitations of each conservation strategy in conserving endangered species. (10 marks)

Question 10:

a) Describe the 10% rule of energy transfer and its implications for trophic structure. (10 marks)
b) Discuss the three ecological pyramids (number, biomass & energy), including when they may appear inverted. (10 marks)

Question 11:

a) Explain the concepts of population density, abundance, and species richness. (10 marks)
b) Discuss the factors that influence population density in natural habitats. (10 marks)

Question 12:

a) Describe the mark–recapture method of estimating population size, including assumptions and limitations. (10 marks)
b) Explain alternative methods of population estimation such as quadrat sampling and transect sampling. (10 marks)