

UNIVERSITY OF BOTSWANA

2003/2004 SEMESTER ONE EXAMS

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Course No: **BIO 111** Duration: **2 hours** Date: **30 November 2003**

Title of Paper: **PRINCIPLES OF BIOLOGY**

Subject: **BIOLOGICAL SCIENCES**

Morning(11.00-13.00)/ ~~Afternoon~~

INSTRUCTIONS:

Answer ALL questions in SECTION A and any TWO questions from Section B. Use illustrations and specific examples where necessary to supplement your answers.

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DEPARTMENT OF BIOLOGICAL SCIENCES

2003/2004 SEMESTER ONE EXAMINATIONS

Course Code: BIO111:

Course Name: PRINCIPLES OF BIOLOGY

30 November 2003

Duration: 2 hours

Answer ALL questions in SECTION A and any TWO questions from Section B. Use illustrations and specific examples where necessary to supplement your answers. Budget your time carefully.

SECTION A:

Answer ALL questions in SECTION A (allow 72 minutes for this section).

1. a. Describe the trend in Figure 1. (2 marks)
- b. Formulate a hypothesis to explain this observation. (3 marks)
- c. How might you test your hypothesis? (3 marks)

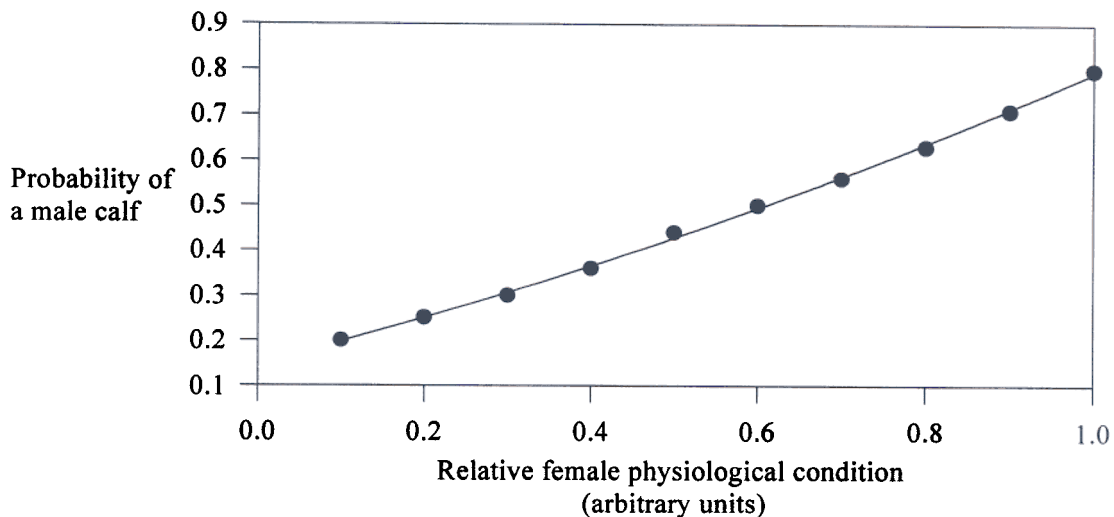


Figure 1: Relationship between relative physiological fitness of female kudu and their probability of producing a male offspring in the next breeding season.

2. a. At what point in the life of the eukaryotic cell do DNA molecules replicate? **(1 mark)**
- b. What are the functions of meiosis and mitosis and how do the end-products of these two processes differ? **(5 marks)**
- c. Describe the structure and function of the mitochondria and chloroplasts. **(4 marks)**
3. a. Write a short paragraph on the basis of modern biological classification. **(4 marks)**
- b. Why do you think that viruses are not included in the six kingdom classification system? **(2 marks)**
- c. Which two species are the most closely related? **(2 marks)**
- A Dovyalis zeyheri
- B Combretum Apiculatum
- C Vangueriopsis lanciflora
- D *Combretum zeyheri*
- E pterocarpus Angolensis
- F Vangueria lasioclados
- G gyrocarpus americanus
- d. Which species' names are presented in the correct format? **(2 marks)**
4. a. What would be the products of: i) replication, and ii) transcription, of the following single-stranded DNA template? **(2 marks)**
- ATTCGAGGCTTA**
- b. What are the characteristics of the genetic code? **(2 marks)**
- c. What are the specific functions of mRNA, rRNA and tRNA? **(3 marks)**
5. a. How are plants adapted to the desert ecosystem? **(2 marks)**
- b. Define natural selection and explain how it differs from artificial selection. **(2 marks)**

6. a. Why is the biological definition of the term “species” sometimes inadequate? **(3 marks)**
- b. What are the main mechanisms by which members of the same species are kept from interbreeding with members of other species? **(3 marks)**
7. What phenotype ratios would be expected in the F₂ progeny of a dihybrid cross between a true-breeding pink, unbanded snail (*Cepaea nemoralis*) and a true-breeding yellow, banded snail, in which pink is dominant to yellow and unbanded is dominant to banded? Show how you arrived at your answer. **(5 marks)**
8. Distinguish between the following terms:
- i. prokaryote vs eukaryote **(2 marks)**
 - ii. cell determination vs cell differentiation **(2 marks)**
 - iii. autotroph vs heterotroph **(2 marks)**
 - iv. carbohydrate structure vs protein structure **(4 marks)**

SECTION B:

Answer any TWO questions in SECTION B (allow 24 minutes for each question).

1. **EITHER:**

Discuss the contributions of microevolution and macroevolution towards the variety of living things.

OR:

Write an essay entitled: “The origin and history of life”. **(20 marks)**

2. Discuss the significance of genes and chromosomes in human health. **(20 marks)**
3. How do organisms obtain and use energy and how does the availability of energy effect their distribution, diversity and abundance? **(20 marks)**
4. Using specific examples, discuss how the environment brings about adaptation. **(20 marks)**

END OF EXAMINATION