

# UNIVERSITY OF BOTSWANA

## 2004/2005 SEMESTER ONE EXAMS

### FRONT PAGE

Course No: <b>BIO 111</b> Duration: <b>2 hours</b>	Date: <b>02 December 2004</b>
Title of Paper: <b>PRINCIPLES OF BIOLOGY</b>	
Subject: <b>BIOLOGICAL SCIENCES</b>	

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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**NO. OF PAGES INCLUDING THIS ONE [ 4 ]**

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# DEPARTMENT OF BIOLOGICAL SCIENCES

## 2004/2005 SEMESTER ONE EXAMINATIONS

Course Code: BIO111:

Course Name: PRINCIPLES OF BIOLOGY

02 December 2004

Duration: 2 hours

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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.

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### SECTION A: (60 marks)

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

1. In a survey of the invertebrate fauna of a local woodland habitat, the only crustaceans collected were woodlice and the only places they were found were under rocks and trees in moist, well-shaded areas.
  - a. Formulate a hypothesis to explain this observation (2 marks)
  - b. Outline a controlled experiment that would test your hypothesis. (4 marks)
  - c. Explain how you would present and interpret your results, emphasizing the difference between results that support versus those that violate your hypothesis. (4 marks)
  
2.
  - a. What are Darwin's four postulates? (4 marks)
  - b. Distinguish between the Big Bang and the Cambrian explosion. (2 marks)
  - c. Where and when does the scientific evidence indicate that modern *Homo sapiens* originated? (2 marks)
  - d. Why is bipedalism believed to be the first evolutionarily important step in the evolution of humans? (2 marks)

3. a. Why are genus and species names expressed in Latin? **(2 marks)**
- b. Give three examples of useful diagnostic characters in taxonomy. **(3 marks)**
- c. Distinguish between cladistics and phylogenetics. **(2 marks)**
4. a. Give three essential characteristics required by hereditary material. **(3 marks)**
- b. Summarise the structure of DNA and explain how it satisfies these three requirements. **(4 marks)**
- c. Distinguish between chromosome, chromatid and chromatin. **(3 marks)**
5. a. In maize, starchy seed is dominant to sugary seed. A pure-breeding starchy plant is crossed to a pure-breeding sugary plant.
- i. What is the phenotype of the  $F_1$  seeds? **(1 mark)**
- ii. The  $F_1$  plants are grown to maturity and allowed to self-fertilize. What is the expected ratio of starchy to sugary seed in the  $F_2$  progeny? **(2 marks)**
- b. In the sweet pea, tall is dominant to short and red flower is dominant to white. These genes assort independently. Pure-breeding tall red plants are crossed to pure-breeding short white plants. What proportion of the  $F_2$  progeny will have the same genotype as the  $F_1$  generation? **(2 marks)**
6. a. Describe the structural levels of Proteins? **(2 marks)**
- b. Outline the mechanisms by which proteins are produced in the cell. **(3 marks)**
- Give three functions of carbohydrates in living organisms. **(3 marks)**
7. a. In what ways do prokaryote cells differ from eukaryote cells? **(5 marks)**
- b. What are the functions of Meiosis and in which type of cell does it occur? **(2 marks)**
- c. What specific events during Meiosis I ensure that its functions are carried out successfully? **(3 marks)**

**SECTION B: (40 marks)**

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

**1. EITHER**

Viruses are not always regarded as living “organisms”. Discuss this statement in relation to their structure and mode of reproduction.

**OR:**

Describe the structure and life cycle of the HIV virus. **(20 marks)**

**2.** “Acquisition of knowledge is accompanied by risk and responsibility”. Critically discuss this statement, with emphasis on bioethics, conservation and biotechnology. **(20 marks)**

**3.** Discuss the hierarchical organization of multicellular eukaryotic organisms and explain how this emerges from a single diploid cell. **(20 marks)**

**4.** Using specific examples, discuss how the environment brings about adaptation. **(20 marks)**

**END OF EXAMINATION**