UNIVERSITY OF BOTSWANA

2002/2003 SEMESTER ONE EXAMINATIONS

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Course No **BIO 111** Duration **3 hours** Date **December 2002**

Title of Paper: **PRINCIPLES OF BIOLOGY**

Subject **BIOLOGICAL SCIENCES**

Morning/ Afternoon

INSTRUCTIONS:

Answer ALL of SECTION A and TWO questions from SECTION B. Use specific examples and illustrations where appropriate.

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SEMESTER ONE EXAMINATIONS

BIO 111: PRINCIPLES OF BIOLOGY

December 2002 **Duration: 3 hours**

Answer ALL of SECTION A and TWO questions from SECTION B. Use specific examples and illustrations where appropriate.

SECTION A

Answer ALL questions in Section A

The Table below gives data for initial strength and final strength in the arm muscles (biceps) before and after a 16-week strength training programme.

Name	Age (Yrs)	Initial strength, IS, (kg)	Final strength, FS, (kg)	Gain in strength, G, (kg)	% increase in strength
Boitumelo	70	45	56		
Boitshoko	69	47	55		
Boingotlo	63	68	80		
Boipelo	62	62	68		
Boikhutso	60	84	88		
Boikaego	75	40	57		

a. Complete the table above. **[6 marks]**

b. Calculate the mean gain in strength for this group of individuals. **[2 marks]**

c. Plot a graph of % increase in strength against age **[5 marks]**

d. Describe the trend(s) in the graph. **[2 marks]**

e. Suggest a hypothesis to explain the observed trends. **[3 marks]**

2. A heterozygous organism has the genotype *Aa Bb Cc*.

a. List the combinations of alleles that are possible in the gametes of this organism? **[4 marks]**

b. If this individual is crossed with an individual that is a recessive homozygote (*aa bb cc*), what phenotype ratios would be expected in the offspring? **[4 marks]**

3. **a.** Distinguish between developmental potential and determination. **[4 marks]**

b. Explain the role of homeotic genes in development **[2 marks]**

4. The following DNA sequence is located on the sense strand of a bacterial nucleoid.

TACAAACGTTATTCGAGGCTTAAC

a. What base sequence would you expect in the mRNA transcribed from this DNA sequence? **[2 marks]**

b. How many amino acids would make up the polypeptide produced by translation of this mRNA molecule? **[1 mark]**

c. Why is enzyme structure important to its function? **[2 marks]**

d. Give one non-enzymatic role of polypeptides in a cell **[2 marks]**

5. **a.** Draw a meiotic cell with a chromosome number of 2n=4 at metaphase I and metaphase II. **[6 marks]**

b. Give TWO important characteristics of the gametes produced at the end of meiosis II. **[2 marks]**

6. Give two functions of a cell membrane **[2 marks]**

7. Distinguish between the contents of the Results section and the Discussion section of a Laboratory report. **[3 marks]**

8. **a.** Would you consider HIV to be living or non-living? Give reasons for your answer. **[2 marks]**

b. Distinguish between HIV and AIDS **[2 marks]**

9. Write the full reference for this book:

Title of book: Life: The Science of Biology
Authors: Willaim K. Purves, David Sadava, Gordon H. Orians, H. Craig Heller
Place of publication: Sunderland, USA
Date of publication: 2001
Publisher: Sinauer Associates Inc. **[2 marks]**

SECTION B

Answer TWO questions from Section B.

10. Discuss the adaptive advantage of genetic variation within a population. **[20 marks]**

11. The scientific method describes an approach that is used in scientific inquiry. Outline the steps of this method and explain the importance of each step in carrying out research. **[20 marks]**

12. What evidence do we have to suggest that life forms have changed over evolutionary time? **[20 marks]**

13 Classification has proved to be useful to Biologists, but it can be a difficult procedure. Do you agree or disagree with this statement? Give an explanation for your answer. **[20 marks]**

END OF EXAMINATION