

UNIVERSITY OF SWAZILAND
RE-SIT EXAMINATION PAPER: JULY 2016

TITLE OF PAPER: INTRODUCTORY BOTANY

COURSE CODE: BIO101

TIME ALLOWED: THREE HOURS

- INSTRUCTIONS:**
- 1. THIS PAPER IS DIVIDED INTO TWO SECTIONS**
 - 2. ANSWER 2 QUESTIONS FROM EACH SECTION IN TWO SEPARATE BOOKLETS.**
 - 3. ANSWER QUESTION 1 (COMPULSORY) AND ONE OTHER QUESTION FROM SECTION A.**
 - 4. ANSWER ANY TWO QUESTIONS FROM SECTION B.**
 - 5. EACH QUESTION CARRIES TWENTY FIVE (25) MARKS.**
 - 6. ILLUSTRATE YOUR ANSWERS WITH LARGE AND CLEARLY LABELLED DIAGRAMS WHERE APPROPRIATE.**

- SPECIAL REQUIREMENTS:**
- 1. GRAPH PAPER**
 - 2. CANDIDATES MAY USE CALCULATORS**

THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATORS

SECTION A

Question 1 (COMPULSORY)

- (a) (i) Draw the general structure of an amino acid. (1 marks)
 (ii) State three exceptional amino acids that do not have this general structure and explain how they differ from rest of the amino acids. (3 marks)
- (b) State any four functions of a plasma membrane. (4 marks)
- (c) State any three non-covalent interactions that stabilise the tertiary structure of proteins. (3 marks)
- (d) A kinase enzyme catalyses phosphorylation of glucose ($C_6H_{12}O_6$) into glucose-6-phosphate (G6P). An *in vitro* assay for this enzyme was performed by monitoring the production of G6P at varying initial concentration of glucose as shown in the table below.

$[C_6H_{12}O_6]$ (mM)	Initial velocity (mmol G6P/ second)
5	1.6
10	2.3
20	2.8
40	3.2
80	3.4
140	3.5

- (a) Draw the hyperbolic and double-reciprocal plots to estimate the constant K_m for the kinase and V_{max} of this reaction. Comment on any discrepancies in your values obtained using the two plots. (14 marks)

[Total marks = 25]

Question 2

- (a) State any one difference between the following (2 marks)
 (i) nucleoside and nucleotide,
 (ii) purine and pyrimidine.
- (b) State any four differences between the following (8 marks)
 (i) DNA and RNA,
 (ii) mitosis and meiosis.
- (d) Write short notes on the following: (15 marks)
 (i) plant secondary metabolites,
 (ii) gibberellins,
 (iii) Mutarotation.

[Total marks = 25]

Question 3

With the aid of a well-labelled diagram, describe the structure of a plasma membrane, highlighting how this structure is related to the membrane's different named functions (25 marks)

[Total marks = 25]

SECTION B

ANSWER ANY TWO (2) QUESTIONS FROM THIS SECTION.

Question 4

- (a) Name and draw an example of a Bacterium that has the following shapes:
(i) A spiral,
(ii) A bacillus,
(iii) A coccus,
(iv) A spirochaete,
(v) A streptobacillus,
(vi) A staphylococcus. (6 marks)
- (b) What are the functions of the following structures of bacteria?
(i) A cell wall,
(ii) An endospore,
(iii) A fimbriae,
(iv) A flagellum,
(v) A glycocalyx,
(vi) A pilus,
(vii) A plasma membrane,
(viii) A ribosome. (8 marks)
- (c) Why is an endospore called a resting structure? Of what advantage is an endospore to a bacterial cell? (3 marks)
- (d) Distinguish diagrammatically between a gram-positive and a gram negative cell wall of a bacterium. What are their staining properties? (3 marks)
- (e) Describe the conditions for bacterial growth and explain why bacteria don't occupy the entire universe. (5 marks)

[Total marks = 25]

Question 5

- (a) Indicate how field samples would help you to identify a fungus using both asexual and sexual spores produced by the fungus. (3 marks)
- (b) Draw the following:
(i) A perithecium,
(ii) An apothecium,
(iii) A cleistothecium,
(iv) A pycnidium,
(v) An acervulus,
(vi) A basidiocarp. (3 marks)
- (c) How does the death angel mushroom (*Amanita* spp) kill humans who have consumed it? How does this species' mode of action compare with that of toxins produced by *Aspergillus* spp? (3 marks)
- (d) Tabulate the most notorious human diseases caused by microorganisms and then use your comprehensive knowledge of mycology to explain the relevance of fungi to humans. (16 marks)

[Total marks = 25]

Question 6

- (a) Why are viruses called obligatory intracellular parasites? (1 mark)
- (b) List the properties that define a virus. What is a virion? (5 marks)
- (c) With specific examples explain the morphological classes of viruses. (8 marks)
- (d) Explain how viruses reproduce within host cells. How do host cells react towards viral infections? (5 marks)
- (e) Write a short essay to demonstrate your knowledge on the relevance of viruses to both plants and animals. (6 marks)

[Total marks = 25]

END OF EXAM PAPER