

UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER: DECEMBER 2010

TITLE OF PAPER: INTRODUCTORY BOTANY

COURSE CODE: B111

TIME ALLOWED: THREE HOURS

- INSTRUCTIONS:
1. THIS PAPER IS DIVIDED INTO TWO SECTIONS
 2. ANSWER 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 BRING CALCULATORS

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

SECTION A

Question 1 (COMPULSORY)

- (a) Define K_m and V_{max} of an enzyme-catalysed reaction. (2 marks)
- (b) Explain how the enzyme-substrate affinity can be inferred from K_m . (3 marks)
- (c) 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

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. (20 marks)

Total: [25 marks]

Answer either Question 2 Question 3

Question 2

Describe the fluid mosaic model of plasma membranes, highlighting how membrane structure is suited to its function in biological systems. (25 marks)

Total: [25 marks]

Question 3

- (a) Put in tabular form any 4 differences between RNA and DNA. (4 marks)
- (b) The template strand of a gene being transcribed is 5'-TAGCTTAGT-3'. What will be the sequence of the RNA made from this template? (4 marks)
- (c) The sequence of one strand of DNA is 5'-TAAGCCTGC-3'. What is the sequence of the other (complementary strand)? (3 marks)
- (d) In human beings, the gene for β -globin is located on chromosome 11, and the gene for α -globin, which is another component of the hemoglobin protein, is located on chromosome 16. Would these two chromosomes be expected to pair with each other during meiosis? Explain your answer. (3 marks)
- (e) During which meiotic stage does each of the following events occur?
(i) chiasmata formation, (1 mark)

- (ii) segregation of homologous chromosomes, (1 mark)
- (iii) segregation of sister chromatids. (1 mark)

- (f) Choose two plant hormones and two mineral nutrients and explain their physiological roles in the plant. (8 marks)

Total: [25 marks]

SECTION B
ANSWER ANY TWO (2) QUESTIONS FROM THIS SECTION.

Question 4

- (a) Draw the following:
- (i) An euglenoid, (1½ marks)
 - (ii) A brown algae, (1½ marks)
 - (iii) A perithecium, (1½ marks)
 - (iv) An apothecium, (1½ marks)
 - (v) A basidiocarp, (1½ marks)
 - (vi) A *Pinnularia* spp, (1½ marks)
 - (vii) A *Chlamydomonas* spp, (1½ marks)
 - (viii) A cleistothecium, (1½ marks)
 - (ix) A pycnidium, (1½ marks)
 - (x) An acervulus. (1½ marks)
- (b) Explain the economic importance of fungi. (5 marks)
- (c) Write an essay on the importance of algae to the environment. (5 marks)
- Total: [25 marks]**

Question 5

- (a) Give a comprehensive definition of a virus. (6 marks)
- (b) Draw the following:
- (i) An icosahedral virus, (1 ½ marks)
 - (ii) A retrovirus, (1 ½ marks)
 - (iii) A rigid rod-shaped virus, (1 ½ marks)
 - (iv) A bacteriophage. (1 ½ marks)
- (c) Explain how viruses reproduce within their host cells. (5 marks)
- (d) What is the relevance of viruses to humans? Elaborate. (8 marks)
- Total: [25 marks]**

Question 6

- (a) Draw a well labelled diagram of a bacterium. (5 marks)
- (b) What are shapes of bacteria? Elaborate. (3 marks)
- (c) Distinguish between Gram-positive and Gram-negative cell walls of bacteria. (3 marks)
- (d) Explain the logistic curve of a bacterium. (8 marks)
- (e) Write an essay on "bacteria useful to humans". (6 marks)
- Total: [25 marks]**