

UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER: DECEMBER 2009

TITLE OF PAPER: INTRODUCTORY BOTANY

COURSE CODE: B111

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 BRING THEIR CALCUALTORS

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

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## SECTION A

**ANSWER QUESTION 1 AND ONE OTHER QUESTION FROM THIS SECTION.****Question 1 (COMPULSORY)**

- (a) During which meiotic stage does each of the following events occur:
- (i) crossing over, (1 mark)
  - (ii) segregation of homologous chromosomes, (1 mark)
  - (iii) splitting of the centromere. (1 mark)
- (b) (i) Explain why enzymes are important in biological systems, highlighting how they contribute towards metabolism. (5 marks)
- (c) *N*-acetyl phenylalaninamide (NAPA) is an artificial substrate of an enzyme chymotrypsin which cuts alanine off NAPA. The data in the table below represent the initial rate of NAPA hydrolysis by chymotrypsin at various initial concentrations of NAPA.

[NAPA] (mM)	Initial velocity (mmol alanine min <sup>-1</sup> )
10	1.58
20	2.33
40	3.08
60	3.48
80	3.6
160	4.03

Partially adapted from Huang *et al.*, 1952. *J. Am Chem Soc.*: 74, 105-109.

- (i) Draw the Michaelis-Menten plot to estimate the  $K_m$  for NAPA and  $V_{max}$  of the reaction. (6 marks)
- (ii) Draw the Lineweaver-Burke plot to estimate the  $K_m$  for NAPA and  $V_{max}$  of the reaction. (9 marks)
- (iii) Comment on the differences in  $V_{max}$  and  $K_m$  values you got from the above two plots. (2 marks)

**[TOTAL MARKS = 25]**

**Question 2**

- (a) Explain the effect of the degree of fatty acid saturation on the fluidity of the fats/oils. (4 marks)
- (b) (i) Draw the general chemical formula of an amino acid. (1 mark)
- (ii) Write short notes on the primary, secondary, tertiary and quaternary structure of proteins. (20 marks)

**[TOTAL MARKS = 25]**

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**Question 3**

- (a) (i) Briefly explain what happens during the light-dependent and light independent reactions of photosynthesis. (4 marks)  
 (ii) Explain the role played by light, carbon dioxide and chlorophyll during photosynthesis (3 marks)
- (b) (i) Explain the term mutarotation. (2 marks)  
 (ii) State the functional group that is necessary for a monosaccharide to be a reducing sugar. (1 mark)
- (c) Draw a well-labelled structure of a plasma membrane. (6 marks)
- (d) Explain the role played by **any three** of the following during plant growth.  
 (i) auxin, (3 marks)  
 (ii) abscisic acid (ABA), (3 marks)  
 (iii) nitrogen, (3 marks)  
 (iv) phosphorous, (3 marks)  
 (v) ethylene, (3 marks)  
 (vi) gibberellins (GAs). (3 marks)

**[TOTAL MARKS = 25]****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 diatom, (1½ marks)  
 (vii) a green algae, (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 MARKS = 25]**

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**Question 5**

- (a) Give a comprehensive definition of a virus. (5 marks)
- (b) The recent pandemic of swine flu has had newspapers reporting its causal agent to be an A(H1N1) virus.  
(i) Is this the correct classification of the virus? (1 mark)  
(ii) What do the following stand for: A, H1, and N1? (2 marks)
- (c) Draw the following:  
(i) an icosahedral virus, (1½ marks)  
(ii) a retrovirus, (1½ marks)  
(iii) a rigid rod-shaped virus, (1½ marks)  
(iv) a bacteriophage. (1½ marks)
- (d) Explain how viruses multiply within their host cells. (5 marks)
- (e) What is the relevance of viruses to humans? Elaborate. (6 marks)
- [TOTAL MARKS = 25]**

**Question 6**

- (a) Indicate the functions of the following structures in bacteria.  
(i) a capsule, (1 mark)  
(ii) a pilus, (1 mark)  
(iii) an endospore, (1 mark)  
(iv) a flagellum, (1 mark)  
(v) poly- $\beta$ -hydroxybutyrate granules. (1 mark)
- (b) What are the shapes of bacteria? Elaborate (3 marks)
- (c) Distinguish between Gram-positive and Gram-negative cell walls of bacteria. (3 marks)
- (d) Given that the optimal conditions for bacterial growth are never met, explain the logistic curve of a bacterium. (8 marks)
- (e) Write an essay on "bacteria useful to humans". (6 marks)
- [TOTAL MARKS = 25]**

**END OF EXAM PAPER**