UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER: DECEMBER 2014

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: NONE

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

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SECTION A

Question 1 (COMPULSORY)

(a) Suppose you were tasked to do qualitative tests of biomacromolecules in a sample using Lugol's test, Biuret test, Ninhydrin test, Benedict's test, Seliwanoff's test and Bial's test and obtained the following are the results:

Test	Results
Lugol's test	brown colourn
Benedict's test	Orange colour with a brick-red precipitate
Biuret test	Blue colour
Ninhydrin test	Purple colouration
Seliwanoff's test	Cherry red colouration
Bial's test	Muddy-brown coloured precipitate

Use the above results to investigate the substance(s) present in the sample. Explain the expected outcomes if all were to give positive tests, highlighting the mechanisms involved in the development of colourations. (14 marks)

(b) Use the following words to complete the paragraph that follows.

glycos⸳ ⸳ ᴅonds, nucleoside, nucleotides, disulphide bridges, phosphodiester bond, nucle.ᴄ acids, amino acids, proteins, thiol, ribose, deoxyribose.

Polysaccharides are polymers of monosaccharide units that are joined to each other via (i)_____. Some monosaccharides such as (ii)_____ or (iii)_____ are found in repeating monomer units of RNA or DNA. RNA and DNA are also known as (iv)_____. These repeating units are called (v)_____ and are formed when a (vi)_____ is phosphorylated. Monomer units in RNA and DNA are joined via (vii)_____. (viii)_____ are also polymeric biomacromolecules that are formed when (ix)_____ are joined via peptide bonds. In such molecules two cysteine residues may be far away from each other in a chain but may be locally adjacent to each other and their (x)_____ functional group can be covalently bonded via (xi)_____. (11 marks)

[Total marks = 25]

Question 2

(a)   State any one difference between the following   (3 marks)
      (i). nucleoside and nucleotide,
      (ii). purine and pyrimidine,
      (iii). osmosis and active transport.

(b)   State any four differences between the following   (8 marks)
      (i). DNA and RNA,
      (ii). mitosis and meiosis.

(c)   Explain any four of the following phenomena   (8 marks)
      (i). redox,
      (ii). epimerisation,
      (iii). mutarotation,
      (iv). anomerisation,
      (v). keto-enol tautomerism.

(d)   Write short notes on three of the following   (6 marks)
      (i) plant secondary metabolites,
      (ii) gibberellins,
      (iii) auxins,
      (iv) cytokinins,
      (v) plant macronutrients,
      (vi) degree of fatty acid saturation,
      (vii) fats and oils.

                                                     [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]

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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 pycinidium
   (v)   An acervulus
   (vi)   A basidiocarp   (3 marks)

c)   How does the death angel mushrooms (*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