

UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER: DECEMBER 2012

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

SECTION A

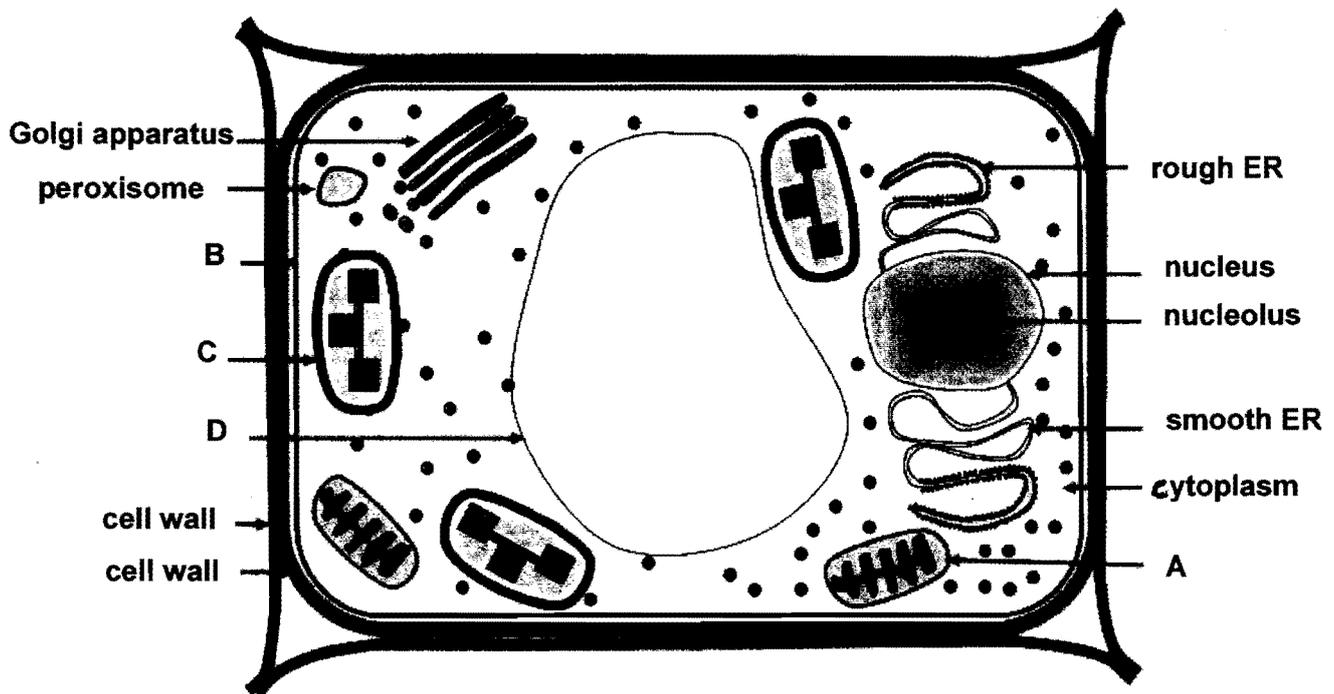
Question 1 (COMPULSORY)

- (a) Which of the following characteristics is(are) not a basic property of cells?
- Cells are highly complex and organized.
 - Cells possess a genetic program and the means to use it.
 - Cells are capable of producing more of themselves.
 - Cells acquire and utilize energy.
 - None of the above.
- (b) What characteristics distinguish prokaryotic and eukaryotic cells?
- Eukaryotes have membrane-bound organelles; prokaryotes do not.
 - Prokaryotes have relatively little DNA; eukaryotes have much more.
 - Eukaryotic chromosomes are linear; prokaryotic chromosomes are circular.
 - Prokaryotic DNA is naked or nearly naked; eukaryotic DNA is usually heavily associated with protein.
 - All of the above.
- (c) Which property below is not a characteristic of enzymes?
- They are required only in large amounts.
 - They can be altered reversibly during a reaction.
 - They reduce the activation energy of a reaction.
 - They are used over and over again.
 - They are specific on their substrates.
- (d) What kind of interaction is not involved in the binding of a substrate to a normally functioning enzyme?
- H bonds.
 - a transient covalent bond.
 - ionic bonds.
 - a permanent covalent bond.
 - hydrophobic interactions.
- (e) Doubling the concentration of enzyme will _____ the V_{max} and _____ the K_M .
- double, not alter.
 - not alter, double.
 - double, double.
 - not change, not alter.
 - halve, halve.

Note: Questions 1(a) to 1(e) carry 1 mark each

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(f) Identify organelles A, B, C & D, and then explain their roles in a plant cell. (8 marks)



(g) Draw a general structure of an amino acid (1 mark)

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

glycosidic bonds, nucleoside, nucleotides, disulphide bridges, phosphodiester bond, nucleic 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]

SECTION B

ANSWER ANY TWO (2) QUESTIONS FROM THIS SECTION.

Question 4

- (a) Draw the following: (6 marks)
- | | |
|-------------------|-------------------------|
| (i). a spiral, | (iv). a spirochete, |
| (ii). a bacillus, | (v). a streptobacillus, |
| (iii). a coccus, | (vi). a staphylococcus. |

- (b) Match the structures in column A to their functions in column B (8 marks)

Column A

- a. cell wall
- b. Endospore
- c. Fimbriae
- d. Flagella
- e. Glycocalyx
- f. Pili
- g. Plasma membrane
- h. Ribosomes

Column B

- 1. Attachment to surfaces
- 2. Cell wall formation
- 3. Motility
- 4. Protection from osmotic lysis
- 5. Protection from phagocytes
- 6. Resting
- 7. Protein synthesis
- 8. Selective permeability
- 9. Transfer of genetic material.

- (c) Why is an endospore called a resting structure? Of what advantage is an endospore to a bacterial cell? (3 marks)
- (d) If you are shown a diagram of a gram-positive and a gram-negative bacterium, how can you tell them apart? (3 marks)
- (e) Given that the optimal conditions for bacterial growth are never met, explain the logistic curve of an E-coli. (5 marks)

[Total marks = 25]

Question 5

- (a) Why do we classify viruses as obligatory intracellular parasites? (1 mark)
- (b) List the four properties that define a virus. What is a virion? (5 marks)
- (c) Name the four morphological classes of viruses, then diagram and give an example of each. (8 marks)
- (d) Explain how viruses multiply within their host cells. (5 marks)
- (e) Write a short essay to demonstrate your knowledge on the relevance of viruses to humans. (6 marks)

[Total marks = 25]

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Question 6

(a) Define the following mycological terms:

- (i). A homokaryon, (2 marks)
- (ii). A dikaryon, (2 marks)
- (iii). A heterokaryon, (2 marks)
- (iv). A monokaryon. (2 marks)

(b) Name the asexual and sexual spores produced by the following:

- (i). Deuteromycetes, (1 mark)
- (ii). Zygomycetes, (1 mark)
- (iii). Basidiomycetes, (1 mark)
- (iv). Ascomycetes. (1 mark)

(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) Use your comprehensive knowledge of mycology to explain the relevance of fungi to the environment. (10 marks)

[TOTAL MARKS = 25]

END OF EXAM PAPER