

LUSAKA APEX
MEDICAL UNIVERSITY



FACULTY OF PRE-MEDICAL SCIENCES

UNIVERSITY DEFERRED/SUPPLEMENTARY EXAMINATIONS
SEPTEMBER 2020

BS 1001

CELLS AND BIOMOLECULES

THURSDAY 24TH SEPTEMBER

DURATION: Four Hours

TOTAL MARKS: 100

Examiners: Ms. K. Malisa, Mr M. Mudenda & Ms. L. Chanda

INSTRUCTIONS FOR THE WHOLE PAPER

1. Write your Student Identity Number on ALL pages of the answer booklet(s).
2. Follow the instructions outlined in each section on the number of questions to answer.
3. Present your work in a clear and logical and legible manner.
4. Any disregard for examinations rules and regulations will result in you being disqualified from this examination.
5. Ensure that you upload your answer scripts in PDF format to the Moodle platform before the end of the exam duration.
6. Answer scripts with identical entries will automatically be disqualified.

SECTION A [40 Marks]

Answer All the questions in this section.

A1. The Scientific Method.

As a Principle Researcher on United States Government aided project, what steps would you undertake to investigate an outbreak of cholera within Kanyama compound of Lusaka? [10 Marks]

A2. The Origin of Life

- a) Which scientist proposed the theory of Biogenesis? [1 Mark]
- b) Briefly state the theory of spontaneous generation. [2 marks]
- c) Who conclusively proved the theory of spontaneous generation? [1 mark]
- d) In a quest to disprove the theory of spontaneous generation, several scientists conducted experiment to argue for or against spontaneous generation. What errors did John Needham make in his experiment trying to prove or disprove the theory of spontaneous generation? [2 mark]
- e) What does the term abiogenesis mean? [2 mark]
- f) In Louis Pasteur's experiment, why did he use swan neck flasks instead of Flasks with a straight neck? [2 Marks]

A3. Classification of Organisms

- a) What is the difference between homologous and analogous structures as used in classification? [2 Marks]
- b) Which scientist came up with a hierarchical system of classifying organisms? [1 Mark]
- c) Modern scientists classify organisms into six Kingdoms. List these kingdoms and give a brief description of each. [6 Marks]
- d) What do you understand by the term "molecular taxonomy"? [1 Mark]

A4. Early Developments and Discoveries in Biology

- (a) State the principals of the cell theory. [3 Marks]
- (b) State the principles of the modern cell theory. [4 Marks]
- (c) What are the differences between a phylogenetic tree and a cladogram? [3 Marks]

SECTION B [20 Marks]

Instruction: Question B1 is compulsory. Answer question B1 and any other one (1) question.

B1. Mitosis and Meiosis

- a) What is an Oogonium? In what process is it involved?
- b) What are the differences between binary fusion and mitosis?
- c) Mention the differences between prophase and prophase 1. [10 Marks]

B2. Prokaryotic and Eukaryotic Cells

- a) Metabolic reactions occur in the Whilst the synthesize protein in the cell. The stores genetic information and drives all the processes of the cell and thecontrols movement of materials into and out of the cell. (Fill in the blanks on your answer script). [5 Marks]
- b) An organism consists of ribosome, cytoplasm, cell wall, cell membrane and a nucleoid.
What type of cell is it? [1 mark]
- c) Which feature(s) do Prokaryotic and eukaryotic cells have in common? [1 mark]
- d) Peptidoglycan is found only in bacterial cells. True or false? [1 mark]
- e) What is the composition of the fluid found in the Cytoplasm? [1 mark]
- f) Which organism among plants, Bacteria, fungi and protozoa contain cells with cell wall?
[1 mark]

B3. Cell Membrane and Cell Transport

- a) In the sodium potassium pump, for each Adenosine Triphosphate (ATP) molecule used, how many potassium ions are pumped into the cell and how many sodium ions are pumped out of the cell? [2 marks]
- b) Which form of membrane transport does NOT require the expenditure of energy by the cell? [1 mark]
- c) Which molecule will be able to pass across the plasma membrane faster between a small ionic molecule and a non-polar molecule? [1 mark]
- d) Explain why the molecule mentioned in (c) above will be able to cross faster. [1 Mark]
- e) Give an example of the kind of molecule which will be able to cross the membrane fastest as in (c) [1 Mark]
- f) Explain what happens to cholesterol at high temperatures. [2 Marks]
- g) Which molecules are transported using pinocytosis? [1 Mark]
- h) When comparing a cell in a hypertonic solution and one in a hypotonic solution, which cell will have a higher water potential than its environment? [1 mark]

SECTION C [40 Marks]

Instruction: Answer any four (4) questions in this section.

C1. Water

Water has a number of unique properties that are essential for life. Most of these properties are as a result of the polar nature of water and its ability to form hydrogen bonds. Using your knowledge on the properties of water, answer the questions below.

- a) Why is it important for water to be a liquid over a broad range of temperatures? [2 Marks]
- b) Using a diagram demonstrate the formation of hydrogen bonds between water molecules. [5 Marks]
- c) List and define three unique properties of water. [3 Marks]

C2. Carbohydrates

- a) Given two biomolecules $C_7H_{16}O_7$ and $C_7H_{14}O_7$, which molecule is likely to be carbohydrate? Explain why the selected molecule qualifies to be a carbohydrate and state its biological name. [6 marks]
- b) State the role played by chitin in organisms and which specific organism it is found in. [2 marks]
- c) Draw the sugar Fructose. [2 Marks]

C3. Lipids

Using an illustration demonstrate the formation of a triglyceride. [10 Marks]

C4. Amino Acids and Proteins

Amino acids are organic compounds that contain amine and carboxyl functional groups, along with a side chain specific to each amino acid. Draw the structure of any amino acid, bonding with another amino acid to form a dipeptide. Name and label clearly the nature of the reaction and the bond/s formed. [10 Marks]

C5. Nucleic Acids

Humans have two types of nucleic acids in their bodies: DNA and RNA. These molecules contain the set of instructions for our cells: they determine who and what we are. Compare and contrast DNA and RNA. [10 Marks]

C6. Enzymes

Enzymes are globular proteins. What kind of protein structure do globular proteins exhibit and how does it come about? [10 Marks]

C7. Vitamins and Minerals

State the function and the results of deficiency of the following vitamins within our bodies; Vitamin A, D, E, K. [10 Marks]

-The End-