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RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Applied Sciences
First Year – Semester I Examination – September/October 2019

BIO 1201 – CELL BIOLOGY AND BIOCHEMISTRY

Index Number: **Time: Two (02) hours**

This question paper consists of sections A, B and C. Answer ALL questions in section A and B and TWO (02) question from section C.

For official use Only						
Marks						
Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Total

Section A: Multiple choice questions (20 minutes)
Underline the **most suitable** option using a **pen**.

1.

a) A protein motif is
   i) the linear sequence of amino acids in a polypeptide chain.
   ii) a secondary structure that forms specific secondary structures.
   iii) the three-dimensional arrangement of atoms in a protein.
   iv) distinct functional or structural unit of a protein.

b) Which of the following fibres are part of the cytoskeleton?
   A. Intermediate filaments
   B. Microtubles
   C. Myosin filaments
   D. Actin filaments
   i) A & B
   ii) A, B & C
   iii) A, B & D
   iv) B, C & D

c) Sucrose is a molecule that is synthesized by the combination of
   i) glucose and fructose molecules
   ii) glucose and galactose molecules
   iii) fructose and galactose molecules
   iv) two glucose molecules molecules

d) Which one of the following is a component of both bacterial and eukaryotic cells?
   i) Ribosomes
   ii) Centrosomes
   iii) Peroxisomes
   iv) Lysosomes

e) Nuclear pores do not allow the entry and exit of
   i) DNA
   ii) RNA
   iii) Proteins
   iv) tRNA

f) Liver cells that detoxify drugs and cells in testes and ovaries that synthesize phospholipids and steroids contain a lot of
   i) rough endoplasmic reticulum
   ii) smooth endoplasmic reticulum
   iii) golgi apparatus
   iv) mitochondria

g) Glycogen is made up of repeating units of
   i) β glucose subunits with 1-2 linkage.
   ii) α glucose subunits with 1-4 linkage.
   iii) β glucose subunits with 1-4 linkage.
   iv) α glucose subunits with 1-2 linkage.

h) DNA strand is directly involved in the formation of **all except**
   i) mRNA strand
   ii) tRNA molecule
   iii) another DNA strand
   iv) Protein

i) Which of the following combinations of scientists were involved in deciphering the structure of DNA?

A. Frederick Sanger B. Rosalind Franklin
C. Francis Crick D. James Watson

   i) A, B & C
   ii) A, B & D
   iii) A, C & D
   iv) B, C & D

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j) Which of the following is not a function of nucleotides in cells?
   i) Carrying energy
   ii) Function as enzyme co-factors
   iii) Function as chemical messengers
   iv) Carrying hereditary information

k) DNA double strands are
   i) left handed helices.
   ii) composed only of four nitrogenous bases.
   iii) held together by phosphodiester bonds.
   iv) the only molecule that carries hereditary information.

l) Ionizable amino acids have R groups that contain
   i) O or only H.
   ii) acidic or basic groups.
   iii) $-CH_3$ or other R groups.
   iv) an aromatic ring.

m) Biological reactions in which macromolecules are built from smaller molecules are known as
   i) hydrosynthesis.
   ii) anabolic reactions.
   iii) catabolic reactions.
   iv) dehydration synthesis.

n) The genome of mitochondria bears
   i) genes that code for proteins used in oxidative phosphorylation.
   ii) genes that code for proteins used in mitochondrial metabolism.
   iii) genes that code for proteins used in mitochondrial division.
   iv) 95% of genes that code for proteins used in mitochondrial metabolism.

o) One of the major roles of the G_1 checkpoint is to check
   i) for the suitability of the cellular environment for replication.
   ii) whether the chromosomes are properly aligned.
   iii) whether the kinetochores are correctly attached to the spindles.
   iv) for the structural integrity of DNA.

p) Meiosis generates genetic diversity through
   i) the exchange of genetic material between homologous chromosomes
   ii) the random alignment of maternal and paternal chromosomes
   iii) the random alignment of the sister chromatids
   iv) all of the above

q) Which of the following is not a mechanism of cellular communication?
   i) through physical contact of cell membranes
   ii) through intracellular receptors
   iii) through second messenger molecules.
   iv) through cell surface receptors.

r) The role of second messengers like cAMP in cellular communication is to
   i) relay the signal molecule's message within the cytoplasm.
   ii) serve as cell surface receptors.
   iii) amplify the external signal within the cell.
   iv) serve as a intra-cellular receptors.

s) The advantage of using triglycerides/triglycerols as stored fats in animals is because
   i) it is a solid at room temperature.
   ii) it's density is lower.
   iii) it is hydrophobic.
   iv) it yields more energy.

t) The purpose of adding 5'-caps and Poly-A tails to the mRNA transcript is to
   i) ensure the accuracy of the translation process.
   ii) prevent the degradation of mRNA transcript in the cytosol.
   iii) to terminate the transcription process.
   iv) to signal the end of translation process.

(80 Marks)

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Section B: Structured Essay Questions (40 minutes)
Answer all sections only in the space provided.

2.

a) Define what DNA replication is.

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(5 Marks)

b) Explain why it is called 'semi-conservative replication'.

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(5 Marks)

c) State the **five (05)** interconnected steps of the replication process.

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(10 Marks)

d) Explain why RNA polymerase/Primase is essential for DNA replication.

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(5 Marks)

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e) Illustrate how DNA replication progresses semi-discontinuously at the replication fork.

(20 Marks)

f) DNA polymerase adds nucleotides in one direction to the two complimentary strands. Explain how this is made possible given the anti-parallel nature of the two strands.

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(15 Marks)

(Total: 60 Marks)

3.

a) Give **two (02)** main reasons for cell division.

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(8 Marks)

b) Name for the vegetative type of cell division seen in typical body/somatic cells.

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(2 Marks)

c) Name the **four (04)** stages of division in the above-mentioned cell division?

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(8 Marks)

d) State the major events taking place in the second stage of the above division using a labelled diagram.

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(13 Marks)

e) Name for the type of division seen only in reproductive cells.

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(2 Marks)

f) List the differences seen between the second phase of the first cell division in reproductive cells and the second phase of cell division in body/somatic cells using a labelled diagram.

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(18 Marks)

g) Name the phase of the cell cycle where the cell divides creating two daughter cells?

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(1 Mark)

h) List the differences in the above phase between plant and animal cells.

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(8 Marks)

(Total: 60 Marks)

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Section C: Essay questions (1 hour)

4. Write a comparative account on the different types of active methods used in the transportation of material across cell membranes.

(100 Marks)

5.

a) List **four (04)** cellular structures that you think that would be essential for the normal function of an eukaryotic cell. (10 marks)

b) Justify your selection of the above structures describing their structure and importance to the cell. (90 marks)

(100 Marks)

6. Biological macromolecules determine the structure and store genetic information and energy in all biological entities.
Justify the above statement drawing examples from the **four (04)** main types of biological macromolecules found in all life briefly describing their general structure and function.

(100 Marks)

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