



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**Faculty of Health, Applied Sciences and Natural Resources**

**Department of Health Sciences**

<b>QUALIFICATION:</b> BACHELOR OF MEDICAL LABORATORY SCIENCES	
<b>QUALIFICATION CODE:</b> 08BMLS	<b>LEVEL:</b> 5
<b>COURSE:</b> CELL AND MOLECULAR BIOLOGY	<b>COURSE CODE:</b> CMB521S
<b>DATE:</b> NOVEMBER 2022	<b>SESSION:</b> THEORY
<b>DURATION:</b> 3 HOURS	<b>MARKS:</b> 100

<b>FIRST OPPORTUNITY EXAMINATION QUESTION PAPER</b>	
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<b>MODERATOR:</b>	Ms Vanessa Tjijenda

<b>INSTRUCTIONS</b>
<ol style="list-style-type: none"><li>1. Answer all questions.</li><li>2. Please write neatly and legibly.</li><li>3. Do not use the left side margin of the exam paper. This must be allowed for the examiner.</li><li>4. No books, notes and other additional aids are allowed.</li><li>5. Mark all answers clearly with their respective question numbers.</li></ol>

**Permissible material**

Non programmable calculator is allowed.

**THIS EXAMINATION PAPER CONSISTS OF 10 PAGES** (Excluding this front page)

## Section A (20 marks)

### Question 1

[20]

1. Evaluate the statements in each numbered section and choose the correct answer. Write the letter of the correct answer next to the corresponding number. **(One (1) mark is allocated for each correct answer. There is only one (1) correct answer for each question.)**
- 1.1 Which of the following cell organelles is absent in animal cells and present in a plant cell? (1)
- (a) Cell wall
  - (b) Cytoplasm
  - (c) Vacuoles
  - (d) Mitochondria
- 1.2 Which of the following statements is true about the cell wall? (1)
- (a) The cell wall is mainly composed of lipid.
  - (b) The cell wall is mainly composed of starch.
  - (c) The cell wall is mainly composed of protein.
  - (d) The cell wall is mainly composed of cellulose.
- 1.3 Which of the following statements is true about cell theory? (1)
- (a) The Cell theory does not apply to fungi.
  - (b) The Cell theory does not apply to virus.
  - (c) The Cell theory does not apply to algae.
  - (d) The Cell theory does not apply to microbes.

- 1.4. \_\_\_\_\_ is a jellylike substance found floating inside the plasma membrane. (1)
- (a) Cell sap
  - (b) Cytoplasm
  - (c) Karyoplasm
  - (d) Mitochondria
- 1.5. Which of the following cell organelles is called the powerhouse of the cell? (1)
- (a) Nucleus
  - (b) Lysosomes
  - (c) Chloroplast
  - (d) Mitochondria
- 1.6 \_\_\_\_\_ is the study of the cell, its types, structure, functions and its organelles. (1)
- (a) Biology
  - (b) Cell Biology
  - (c) Microbiology
  - (d) Biotechnology
- 1.7 Which of the following cell organelles is absent in prokaryotic cells? (1)
- (a) Nucleus
  - (b) Lysosome
  - (c) Endoplasmic Reticulum
  - (d) All of the above
- 1.8 Which of the following cell organelles is involved in the storage of food, and other nutrients, required for a cell to survive? (1)
- (a) Vacuoles
  - (b) Lysosome
  - (c) Mitochondria
  - (d) Cell membrane

- 1.9 \_\_\_\_\_ is involved in the synthesis of phospholipids. (1)
- (a) Mitochondria
  - (b) Cytoplasm
  - (c) Endoplasmic Reticulum
  - (d) Smooth Endoplasmic Reticulum
- 1.10 Which of the following statements is true about chromosomes? (1)
- (a) It is present within the nucleus.
  - (b) It carries genes and helps in inheritance.
  - (c) It is composed of DNA in the form of Chromatin and protein.
  - (d) All of the above.
- 1.11 Which of the following statements is true about the Golgi bodies? (1)
- (a) It is a sac-like organelle.
  - (b) It is located near the nucleus.
  - (c) It helps in transporting the particles throughout the cell.
  - (d) All of the above.
- 1.12 Which of the following statements is true about the nucleus? (1)
- (a) It is absent in prokaryotes.
  - (b) It is called the brain of the cell.
  - (c) It contains DNA and other genetic materials.
  - (d) All of the above.
- 1.13 Which among the following is studded with millions of membrane bound ribosomes. (1)
- (a) Rough endoplasmic reticulum
  - (b) Smooth endoplasmic reticulum
  - (c) Symplast
  - (d) Nucleus

- 1.14 Ribosomes are sites for \_\_\_\_\_ . (1)  
(a) protein synthesis  
(b) photosynthesis  
(c) fat synthesis  
(d) respiration
- 1.15 Ribosomes are made up of \_\_\_\_\_ . (1)  
(a) DNA and RNA  
(b) RNA and Protein  
(c) DNA and Protein  
(d) RNA and Amino acids
- 1.16 The full form of DNA is \_\_\_\_\_ . (1)  
(a) deoxyriboneutral acid  
(b) delta nucleic acid  
(c) deoxyribonucleic acid  
(d) dyoxyenucleic acid
- 1.17 The lipid bilayer is \_\_\_\_\_ . (1)  
(a) hydrophilic  
(b) hydrophobic  
(c) hydrophilic and hydrophobic  
(d) None of the above.
- 1.18 Which molecules make the membrane a rigid structure? (1)  
(a) Cholesterol molecules  
(b) Proteins  
(c) Phospholipids  
(d) All of the above

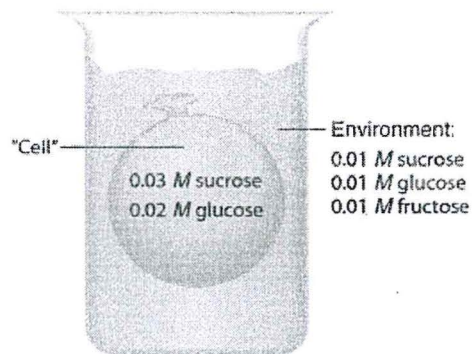
- 1.19 The functional unit of life is called \_\_\_\_\_ . (1)
- (a) cell
  - (b) egg
  - (c) nucleus
  - (d) none of the above
- 1.20 The cell is discovered by \_\_\_\_\_ . (1)
- (a) Robert Brown
  - (b) Robert Hooke
  - (c) John Mendal
  - (d) Charles Darwin

### Section B (30 marks)

#### Question 2

[16]

- 2.1 Describe the fluid mosaic membrane. (7)
- 2.2 Differentiate between simple and facilitated diffusion. (2)
- 2.3 An artificial cell consisting of an aqueous solution enclosed in a selectively permeable membrane is immersed in a beaker containing a different solution. The membrane is permeable to water and to the simple sugars glucose and fructose, but impermeable to the disaccharide sucrose.





- 2.3.1 Copy the above illustration and draw solid arrows to indicate the net movement of solutes into and/ or out of the cell. (2)
- 2.3.2 Draw a dashed arrow to show the net osmotic movement of water, if any. (1)
- 2.3.3 Is the solution outside the cell isotonic, hypotonic, or hypertonic? (1)
- 2.3.4 Will the artificial cell become more flaccid, more turgid, or stay the same? (1)
- 2.3.5 Eventually, will the two solutions have the same or different solute concentrations? Motivate your answer. (2)

**Question 3**

**[14]**

- 3.1 What do you understand by the term vesicular transport? (2)
- 3.2 Compare exocytosis and endocytosis in vesicular transport with reference to the following:
- 3.2.1 Definition (2)
- 3.2.2 Function (4)
- 3.2.3 Types (4)
- 3.2.4 Examples (2)

Present your answers in a table.

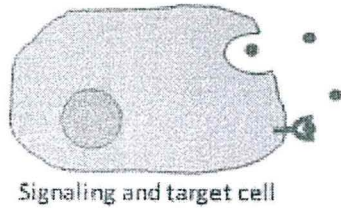
Section C (26 marks)

**Question 4**

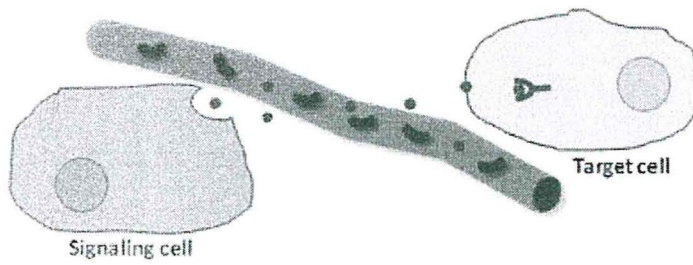
[13]

4.1 Study the diagrams below and indicate which of the four (4) categories of cell communication is depicted by each diagram. Give a brief description of each category.

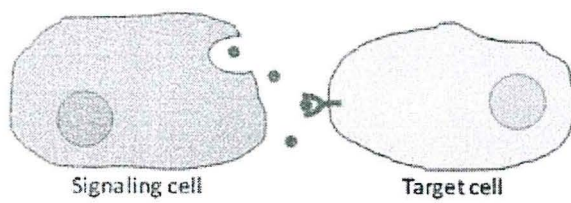
4.1.1



4.1.2

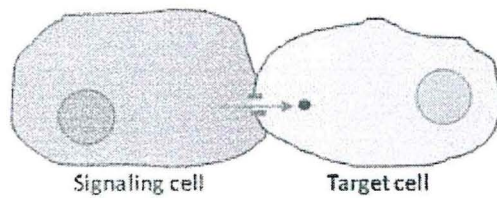


4.1.3





4.1.4



(2)

4.2 Discuss the implications of dysfunctional cell-to-cell adhesion in cancer metastasis. Give relevant examples as far as possible.

(5)

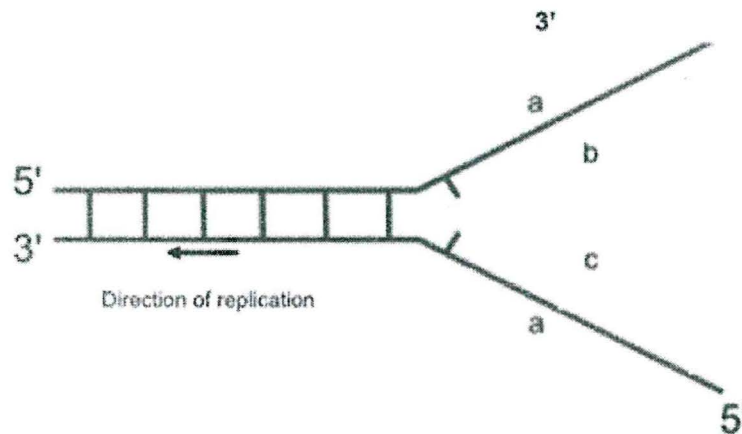
**Question 5**

**[13]**

5.1 Highlight the significance of the cell cycle control system.

(8)

5.2 Consider the following diagram that represents a DNA replication fork.



5.2.1 Which strand will be produced continuously?

(1)

5.2.2 What are the fragments called that are produced discontinuously?

(1)

5.2.3 What is the name of the enzyme that adds nucleotides to the daughter strands?

(1)

5.2.4 What does 5' and 3' mean?

(2)

## Section D (24 marks)

### Question 6

[13]

- 6.1 Draw a cell with relevant organelles and clearly indicate the site of transcription and translation on the diagram. Label your drawing. (4)
- 6.2 What are the three (3) major steps involved in RNA processing?  
Give your answer in the correct order. (3)
- 6.3 Tabulate the difference between transcription and translation on the following basis: (6)
- 6.3.1 Enzymes
- 6.3.2 Initiation
- 6.3.3 Elongation

### Question 7

[11]

- 7.1 Describe the Watson and Crick model of DNA. (5)
- 7.2 If the following DNA strands are used as a template for transcription, which RNA strand will be produced? Write your answer next to the corresponding number.
- 7.2.1 3' TCAACCGTTCAGTGA 5' (1)
- 7.2.2 3'- TACCGAGATGTATCAACT -5' (1)
- 7.3 List the stop codons? (3)

- 7.4 Using the codon chart, determine the sequence of amino acids that are produced when the sequence of RNA shown below is translated? (1)

5' UCU UGU CGA 3'

		Second letter				
		U	C	A	G	
First letter	U	UUU } Phe UUC } UUA } Leu UUG }	UCU } Ser UCC } UCA } UCG }	UAU } Tyr UAC } UAA Stop UAG Stop	UGU } Cys UGC } UGA Stop UGG Trp	U C A G
	C	CUU } Leu CUC } CUA } CUG }	CCU } Pro CCC } CCA } CCG }	CAU } His CAC } CAA } Gln CAG }	CGU } Arg CGC } CGA } CGG }	U C A G
	A	AUU } Ile AUC } AUA } AUG Met	ACU } Thr ACC } ACA } ACG }	AAU } Asn AAC } AAA } Lys AAG }	AGU } Ser AGC } AGA } Arg AGG }	U C A G
	G	GUU } Val GUC } GUA } GUG }	GCU } Ala GCC } GCA } GCG }	GAU } Asp GAC } GAA } Glu GAG }	GGU } Gly GGC } GGA } GGG }	U C A G

Good luck!