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| <b>QUALIFICATION : BACHELOR of MEDICAL LABORATORY</b> |                             |
| <b>QUALIFICATION CODE: 08BMLS</b>                     | <b>LEVEL: 5</b>             |
| <b>COURSE: CELL AND MOLECULAR BIOLOGY</b>             | <b>COURSE CODE: CMB521S</b> |
| <b>DATE: NOVEMBER 2023</b>                            | <b>SESSION: 1</b>           |
| <b>DURATION: 3 HOURS</b>                              | <b>MARKS: 100</b>           |

### **FIRST OPPORTUNITY: EXAMINATION QUESTION PAPER**

**EXAMINER:** Ms Belinda Roselin Tsauses

**MODERATOR:** Ms Edwig Shingenge

#### **INSTRUCTIONS:**

1. Answer all questions in the answer book.
2. Please write neatly and legibly.
3. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
4. No books, notes and other additional aids are allowed.
5. Mark all answers clearly with their respective question numbers.

#### **PERMISSIBLE MATERIALS:**

1. None.

#### **ATTACHEMENTS**

1. None.

**This paper consists of 5 pages including this front page**

## QUESTION 1: MULTIPLE CHOICE QUESTIONS

[10 MARKS]

Evaluate the statements in each numbered section and select the most appropriate answer or phrase from the given possibilities. Fill in the appropriate letter next to the number of the correct statement/phrase in your ANSWER BOOK. [10]

1.1 Paracrine signaling: (1)

- a) Only affects cells in close proximity.
- b) Targets a distant cell through the bloodstream.
- c) Occurs when a cell signals itself.
- d) Targets a cell connected by gap junctions.

1.2 Internal receptors, also known as intracellular or cytoplasmic receptors, are found in the: (1)

- a) Nucleus.
- b) Cell membrane.
- c) Cytoplasm.
- d) Golgi apparatus.

1.3 Cell-surface receptors, also known as transmembrane receptors, are: integral proteins that bind to external signaling molecules. (1)

- a) Integral proteins.
- b) Channel proteins.
- c) Cell organelles.
- d) Vesicles.

1.4 An example of paracrine signaling is: (1)

- a) A mechanism used by cancer cells for survival.
- b) Localized inflammation at infection site.
- c) Cancer metastasis.
- d) None of the above.

1.5 This process, in which homologous chromosomes trade parts in meiosis is called: (1)

- a) Swapping.
- b) Crossing over.
- c) DNA replication.
- d) None of the above.

1.6 The process of translation takes place in the: (1)

- a) Ribosomes.
- b) Lysosomes.
- c) Nucleus.
- d) Cytoplasm.

- 1.7 The function of t-RNA is to: (1)
- a) Encode amino acid sequence of a polypeptide.
  - b) Form complexes that are used in RNA processing in eukaryotes.
  - c) Bring amino acids to ribosomes during translation.
  - d) All of the above.
- 1.8 In RNA, pyrimidines are nitrogenous bases that includes: (1)
- a) Adenine and Guanine.
  - b) Cytosine and Uracil.
  - c) Cytosine and Thymine.
  - d) Cytosine and Guanine.
- 1.9 In terms of the genetic code, the start codon is: (1)
- a) AUG.
  - b) UAA.
  - c) UAG.
  - d) UGA.
- 1.10 In mitosis, the mitotic spindle is responsible for: (1)
- a) Dividing the cell into two.
  - b) Carrying out cytoplasmic division.
  - c) DNA replication.
  - d) Nuclear division.

**QUESTION 2: TRUE/FALSE QUESTIONS**

**[10 MARKS]**

Evaluate the statements and select whether the statement is true or false. Write the word 'True' or 'False' next to the corresponding number in your ANSWER BOOK. [10]

- 2.1 Anton van Leeuwenhoek was the first person to record the appearance of human cells, such as red blood cells, spermatozoa, bacteria, yeasts, diatoms. (1)
- 2.2 Schwann and Schleiden published the cell theory. (1)
- 2.3 Eukaryotes do not have centrioles. (1)
- 2.4 An offspring inherits mitochondria, and as a result mitochondrial DNA from their mother. (1)
- 2.5 Ribosomes are manufactured in the nucleolus. (1)
- 2.6 Centrioles play a role in organizing microtubules that serve as the cell's skeletal system. (1)
- 2.7 Ribosomes are the site of DNA replication in the cell. (1)
- 2.8 The nucleus is the site that is responsible for the cells metabolic activities. (1)
- 2.9 The main difference between the different categories of signalling is the distance that the signal travels to reach the target cell. (1)

- 2.10 Meiosis is a process where a single cell divides once to produce four cells containing half the original amount of genetic information. (1)

**SECTION B: SHORT ANSWER QUESTIONS**

**[35 MARKS]**

Please answer ALL of the questions in this section.

**QUESTION 3:**

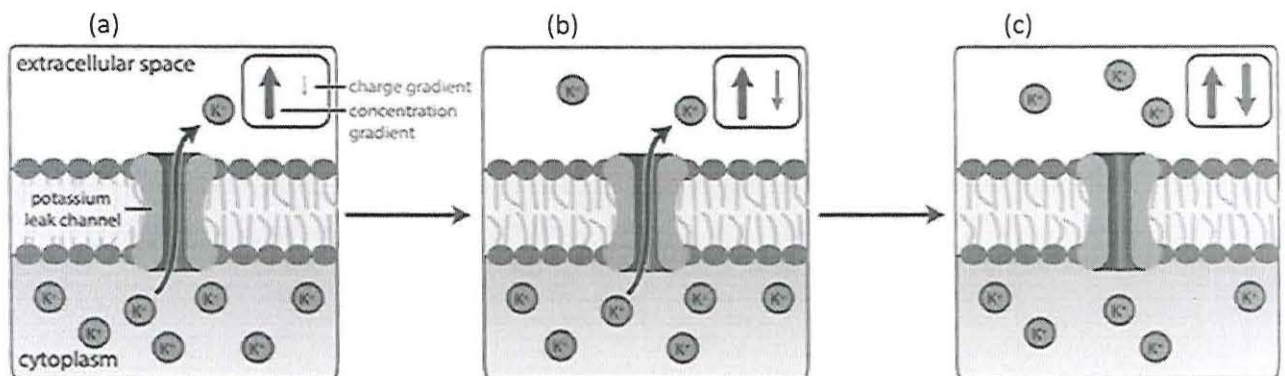
**[16 MARKS]**

- 3.1 Name and describe the role of three (3) main cell organelles in vesicular transport. (6)
- 3.2 Explain the four (4) steps involved in the retrieval pathway of vesicular transport. (4)
- 3.3 Briefly highlight the significance of endocytosis relating to its purpose in maintaining optimum biochemical functions. Give relevant examples to support your answers. (6)

**QUESTION 4:**

**[19 MARKS]**

- 4.1 Sketch a neatly labelled diagram depicting the fluid mosaic model of the cell membrane illustrating the following components:
- (a) Extracellular fluid (1)
  - (b) Intracellular fluid (1)
  - (c) Phospholipid bilayer (1)
  - (d) Hydrophobic tail (1)
  - (e) Hydrophilic head (1)
- 4.2 The diagrams below depict the concept of the “membrane potential”. For each diagram, demonstrate your understanding of this concept in your own words. **Two (2) marks are allocated per diagram.** (6)



4.3 Tabulate the difference between the following classes of functional membrane proteins based on the proteins and the function.

- |     |              |     |
|-----|--------------|-----|
| (a) | Transporters | (2) |
| (b) | Ion channels | (2) |
| (c) | Anchors      | (2) |
| (d) | Receptors    | (2) |

**SECTION C: LONG ANSWER QUESTIONS**

**[45 MARKS]**

Please answer ALL of the questions in this section. Give your answers in point form.

**QUESTION 5:**

**[15 MARKS]**

Discuss the Watson & Crick Model of DNA in detail and support your discussion with relevant examples.

(15)

**QUESTION 6:**

**[15 MARKS]**

Describe the action of enzymes that participate in the eukaryotic DNA replication process.

(15)

**QUESTION 7:**

**[15 MARKS]**

Explain the mechanism of proofreading and substantiate its importance in the DNA replication process.

(15)

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**END OF PAPER**