



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES**

**DEPARTMENT OF NATURAL AND APPLIED SCIENCES**

<b>QUALIFICATION:</b> BACHELOR OF SCIENCE (MAJOR AND MINOR)	
<b>QUALIFICATION CODE:</b> 07BOSC	<b>LEVEL:</b> 5
<b>COURSE NAME:</b> GENERAL BIOLOGY 1A	<b>COURSE CODE:</b> GNB501S
<b>SESSION:</b> JUNE 2022	<b>PAPER:</b> THEORY
<b>DURATION:</b> 3 HOURS	<b>MARKS:</b> 100

<b>FIRST OPPORTUNITY EXAMINATION QUESTION PAPER</b>	
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<b>INSTRUCTIONS</b>	
<ol style="list-style-type: none"><li>1. Write clearly and neatly</li><li>2. Number the answers clearly</li><li>3. All written work <b>MUST</b> be done in blue or black ink</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>	

**THIS QUESTION PAPER CONSISTS OF 10 PAGES**  
(Including this front page)

**QUESTION 1**

**Multiple choices questions**

**[20]**

- 1.1 Which is the lowest level of biological organization that biologists consider to be alive? (1)
- (a) A protein
  - (b) DNA
  - (c) A cell
  - (d) A multicellular organism
- 1.2 What is the total magnification of an object viewed at 40X objectives with a light compound microscope at NUST's General Biology 1A laboratory? (1)
- (a) 40X
  - (b) 100X
  - (c) 400X
  - (d) 1000X
- 1.3 Maltose, sucrose, and lactose differ from one another; (1)
- (a) Because not all of them exist in a ring form.
  - (b) In the number of carbons in the sugar.
  - (c) In the number of hexose monomers involved.
  - (d) By the linkage of the monomers.
- 1.4 Junctions that permit the transfer of water, ions, and molecules between adjacent plant cells are; (1)
- (a) tight junctions
  - (b) desmosomes
  - (c) gap junction
  - (d) plasmodesmata
- 1.5 The different shapes and functions of proteins are determined by (1)
- (a) the R groups of the amino acids they contain
  - (b) the amino groups of the amino acids they contain
  - (c) the carboxyl groups of the amino acids they contain
  - (d) whether or not they contain any amino acids
- 1.6 In meiosis; (1)
- (a) Homologous chromosomes pair at prophase II.
  - (b) Chromosomes segregate from their homologous partners at anaphase I.
  - (c) The centromeres split at anaphase I.
  - (d) Reduction of chromosome number occurs in meiosis II.

- 1.7 The DNA content in a diploid cell in  $G_2$  is  $X$ . If that cell goes into meiosis at metaphase II, the DNA content will be: (1)
- (a)  $0.5X$ .
  - (b)  $X$ .
  - (c)  $2X$ .
  - (d)  $4X$ .
- 1.8 Which of the following sequences of events describes the general life cycle of an animal? (1)
- (a)  $2n$  – meiosis –  $2n$  – fertilization –  $1n$
  - (b)  $1n$  – meiosis –  $2n$  – fertilization –  $1n$
  - (c)  $2n$  – meiosis –  $1n$  – fertilization –  $2n$
  - (d)  $2n$  – mitosis –  $1n$  – fertilization –  $2n$
- 1.9 Which of the following statements about mitosis is *incorrect*? (1)
- (a) Microtubules from the spindle poles attach to the kinetochores on the chromosomes.
  - (b) In anaphase, the spindle separate sister chromatids and pulls them apart.
  - (c) In metaphase, spindle microtubules align the chromosomes at the spindle midpoint.
  - (d) Cytokinesis describes the movement of chromosomes.
- 1.10 Through a microscope, you see a cell plate beginning to develop across the **middle of the cell and nuclei** re-forming on either side of the **cell plate**. This cell is most likely; (1)
- (a) an animal cell in the process of cytokinesis
  - (b) a plant cell in the process of cytokinesis
  - (c) an animal cell in the S phase of the cell cycle
  - (d) a plant cell in metaphase
- 1.11 What is the correct scientific name for humans? (1)
- (a) *sapiens homo*
  - (b) *sapiens Homo*
  - (c) *homo sapiens*
  - (d) *Homo sapiens*
- 1.12 In macromolecules, lipids that are liquid at room temperature; (1)
- (a) Are fats
  - (b) Contain more hydrogen atoms than lipids that are solids at room temperature.
  - (c) If polyunsaturated, contain several double bonds in their fatty acid chains.
  - (d) Lack glycerol.

- 1.13 RNA differs from DNA because; (1)
- (a) RNA may contain the pyrimidine uracil, and DNA does not.
  - (b) RNA is always single-stranded when functioning, and DNA is always double-stranded.
  - (c) RNA is more stable and is broken down by enzymes less easily than DNA.
  - (d) RNA is a much larger molecule than DNA.

- 1.14 In the Table below, assume that the setup was left unattended. Which of the following statements is *correct*? (1)

<b>Selectively permeable membrane</b>	
<b>Inside a cell</b>	<b>Outside fluids</b>
Solvent 90%	Solvent 95%
Solute 10%	Solute 5%

- (a) The retention of the cell to its environment is isotonic.
  - (b) The cell is in a hypertonic environment.
  - (c) The net flow of solvent is into the cell.
  - (d) The cell will soon shrink.
- 1.15 Phagocytosis illustrate which phenomenon? (1)
- (a) Receptor- mediated endocytosis.
  - (b) Bulk-phase endocytosis.
  - (c) Exocytosis.
  - (d) Pinocytosis.
- 1.16 Chiasmata; (1)
- (a) Form during metaphase II of meiosis.
  - (b) Occur between two nonhomologous chromosomes.
  - (c) Represent chromosomes independently assorting.
  - (d) Are sites of DNA exchange between homologous chromatids.
- 1.17 Which of these best distinguishes a prokaryotic cell from a eukaryotic cell? (1)
- (a) Prokaryotic cells have a cell wall, but eukaryotic cells never do.
  - (b) Prokaryotic cells are much larger than the eukaryotic cells.
  - (c) Prokaryotic cells have flagella, but eukaryotic cells do not have.
  - (d) Prokaryotic cells do not have a membrane-bounded nucleus, but eukaryotic cells do have such a nucleus.
- 1.18 In an experiment you cross a true-breeding orange-flowered plants and white-flowered plants. The phenotypic ratio of the F<sub>2</sub> generation will be? (1)
- (a) 3:1
  - (b) 1:3
  - (c) 1:2:1
  - (d) 4:0

1.19 The percentage of A in a double-stranded DNA is 20. What is the percentage of C in that DNA molecule? (1)

- (a) 20%
- (b) 40%
- (c) 60%
- (d) 30%

1.20 For the DNA template below, what would be the sequence of an RNA transcribed from it? (1)

3' -CAAATTGGCTTATTACCGGATG- 5'

- (a) 3' -CAAATTGGCTTATTACCGGATG- 5'
- (b) 3'-GUUUAACCGAAUGGCCUAC-5'
- (c) 5'-GTTTAACCGAATGGCCTAC-3'
- (d) 5'-GUUUAACCGAAUGGCCUAC-3'

**QUESTION 2: FILL IN THE BLANK**

**[10]**

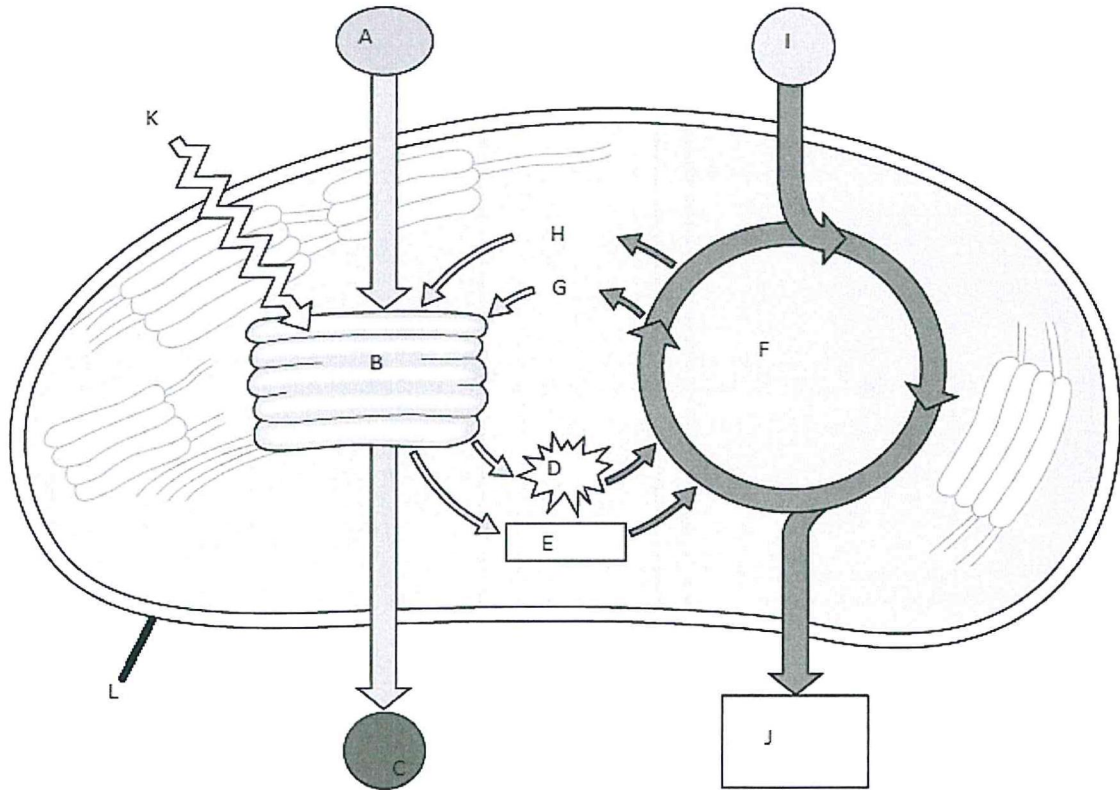
- 2.1 When cells use nutrient molecules to make their [arts and products, they carry out a sequence of chemical reactions. \_\_\_\_\_ is all the chemical reactions that occur in the cell. (1)
- 2.2 \_\_\_\_\_ have enzymes for oxidizing small organic molecules with the formation of hydrogen peroxide. (1)
- 2.3 A component of the plasma membrane that is responsible for reducing the permeability and maintains fluidity of the membrane to most biological molecules is called \_\_\_\_\_ . (1)
- 2.4 The specific type of protein that has a shape that allows a specific molecule to bind to it is called a \_\_\_\_\_ protein. (1)
- 2.5 Genetics refers to characters \_\_\_\_\_, meaning that they many factors, both genetic and environmental, collectively affect phenotype. (1)
- 2.6 The entire complex of DNA and proteins that is the building material of chromosomes is referred to as \_\_\_\_\_ . (1)
- 2.7 A mother chimpanzee 48 chromosomes its somatic cells. How many chromosomes will the offspring inherit from the father chimpanzee? \_\_\_\_\_ chromosomes (1)
- 2.8 During which stage of the cell cycle does each of the sister chromatids become an independent chromosome? (1)
- 2.9 All cells of the body except the gametes and their precursors are called \_\_\_\_\_ cells. (1)
- 2.10 Non-sex chromosomes are called \_\_\_\_\_ . (1)

**QUESTION 3: Short answer questions**

**[20]**

3.1 During **DNA replication**, what is the **function** of **helicases** and **DNA ligase**? (2)

3.2 Fill in the terms (A-L) associated with the diagram of the **light** and **dark reactions**. (6)



3.3 If two organisms, both with the genotype *AaBb*, are mated, what is the probability that of obtaining the genotypes *AABB* and *AaBb* in the *F*<sub>2</sub> generations? (2)

3.4 Distinguish the following terms (6)

3.4.1 Aquaporins and Amphipathic (2)

3.4.2 Glycolipids and Glycoproteins (2)

3.4.3 Decarboxylases; dehydrogenases (2)

3.5 State any four (4) substances that a **plant cell can make from G3P**, the product of the Calvin cycle. (2)

3.6 In terms on independent assortment of chromosomes, say an organism has a diploid number of 24. The number of possible combinations in the resulting gametes is \_\_\_\_\_. (2)

**QUESTION 4: TRUE OR FALSEE**

**[20]**

- 4.1 The sequence of amino acids in a polypeptide determines its final shape because various *R* groups interact differently. The function of a protein is dependent on its shape. (2)
- a. True
  - b. False
- 4.2 The nucleic acids DNA and RNA are polymers of nucleotides. DNA is the genetic material and RNA is an intermediary during the process of protein synthesis. (2)
- a. True
  - b. False
- 4.3 Small cells, not large cells, are likely to have an adequate surface area for the exchange of wastes for nutrients. (2)
- a. True
  - b. False
- 4.4 When using a 100x objective in laboratory to observe a specimen, oil is added. The oil is placed between the sample and the objective lens of the light microscope, the revolving power is decreased to hence provide the great details to be seen. (2)
- a. True
  - b. False
- 4.5 The swelling of a plant cell in a hypotonic solution creates turgor pressure. The cytoplasm expands because the large central vacuole gains water and the plasma membrane pushes against the rigid cell wall. Turgor pressure is important is extremely important to the maintenance of the plant's erect position. Suppose you forget to water your plants; they will die due to increased turgor pressure. (2)
- a. True
  - b. False
- 4.6 Fermentation, anaerobic respiration, and aerobic respiration are three alternative cellular pathways for producing ATP by harvesting chemical. All these pathways produce the same amount of ATP. (2)
- a. True
  - b. False
- 4.7 Photorespiration uses light and oxygen to produce  $\text{CO}_2$  thereby generating ATP. It increases the photosynthetic output by investing energy and  $\text{CO}_2$  to the Calvin cycle. (2)
- a. True
  - b. False



4.8 Before the cell can divide to form genetically identical daughter cells, all of its DNA must be replicated, and then the two copies of must be separated so that each daughter cell ends up with a complete genome. (2)

- a. True
- b. False

4.9 After duplication or replication, the cell is still said to be diploid,  $2n$ . Because it has only two sets of information regardless of the number of chromatids, which are merely copies of the information in one set. (2)

- a. True
- b. False

4.10 Homologous chromosomes are the same as sister chromatids. (2)

- a. True
- b. False

**QUESTION 5: Essay Questions**

**[30]**

5.1 Distinguish between the **four levels** of organization of protein molecules.

(8)

5.2 Meiosis

(15)

a) Define **meiosis**.

(3)

b) Discuss the **main stages** involved in meiosis.

(12)

***THE END***