



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION: BACHELOR OF SCIENCE (MAJOR AND MINOR)	
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SUPPLEMENTARY/SECOND OPPORTUNITY QUESTION PAPER	
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<p style="text-align: center;">INSTRUCTIONS</p> <ol style="list-style-type: none">1. Write clearly and neatly2. Number the answers clearly3. All written work MUST be done in blue or black ink4. No books, notes and other additional aids are allowed5. Mark all answers clearly with their respective question numbers

THIS QUESTION PAPER CONSISTS OF 8 PAGES
(Including this front page)

QUESTION 1

Multiple choices questions

[20]

- 1.1 Which of these is not a property of all living organisms? (1)
- (a) Care for their offspring
 - (b) acquisition of materials and energy
 - (c) reproduction
 - (d) responding to the environment
- 1.2 What is the total magnification of an object viewed at 100X objective lens? (1)
- (a) 40X
 - (b) 100X
 - (c) 400X
 - (d) 1000X
- 1.3 During the cell cycle, the DNA mass of a cell: (1)
- (a) Decreases during the G₁.
 - (b) Decreases during the metaphase.
 - (c) Increases during the S phase.
 - (d) Increases during the G₂.
- 1.4 The major microtubule organizing center of the animal cell is: (1)
- (a) Chromosomes, composed of chromatids.
 - (b) The centrosome, composed of centrioles.
 - (c) Chromosomes, composed of centromere.
 - (d) Centrioles, composed of centrosome.
- 1.5 In glycolysis: (1)
- (a) Free oxygen is required for the reactions to occur.
 - (b) ATP is used when glucose and fructose-6-phosphate are phosphorylated, and ATP is synthesized when 3-phosphoglycerate and pyruvate are formed.
 - (c) The enzymes that move phosphate groups on and off the molecules are uncoupling proteins.
 - (d) The product with the highest potential energy in the pathway is pyruvate.
- 1.6 Which of the following statements about phosphofructokinase is *false*? (1)
- (a) It is located and has its main activity in the mitochondrial membrane.
 - (b) It can be inhibited by NADH to slow glycolysis.
 - (c) It can be inactivated by ATP at an inhibitory site on its surface.
 - (d) It can be activated by ADP at an excitatory site on its surface.
- 1.7 What would happen the centromere separate during Anaphase I of Meiosis? (1)
- (a) The sister chromatids would be separated earlier.
 - (b) The homologous chromosomes would be separated
 - (c) It will not have any significant implication on cell division.
 - (d) The microtubules fibers will elongate

- 1.8 If ADP is produced in excess in cellular respiration, this excess ADP will: (1)
- (a) Bind glucose to turn off glycolysis.
 - (b) Bind glucose-6-phosphate to turn off glycolysis.
 - (c) Bind phosphofructokinase to turn on or keep glycolysis turned on.
 - (d) Cause lactate to form.
- 1.9 You are writing this examination while breathing in oxygen and breathing out carbon dioxide. The carbon dioxide arises from: (1)
- (a) Glucose in glycolysis
 - (b) NAD⁺ redox reactions on the inner mitochondrial membrane.
 - (c) NADH redox reactions in the inner mitochondrial membrane.
 - (d) The oxidation of pyruvate, isocitrate and alpha-ketoglutarate in the citric acid cycle.
- 1.10 In the 1950s, a diet pill that had the effect of "poisoning" ATP synthase was tried. The person taking it could not use glucose and "lost weight" ---- and ultimately his or her life. Today, we know that the immediate effect of poisoning ATP synthase is: (1)
- (a) ATP would not be made in the electron transfer system.
 - (b) H⁺ movement across the inner mitochondrial membrane would increase.
 - (c) More than 32 ATP could be produced from a molecule of glucose.
 - (d) ADP would be united with phosphate more readily in the mitochondria.
- 1.11 An organism exists for long periods by using only CO₂ and H₂O. It could be classified as a(n): (1)
- (a) Herbivore.
 - (b) Carnivore.
 - (c) Decomposer.
 - (d) Autotroph.
- 1.12 During the light-dependent reactions: (1)
- (a) CO₂ is fixed.
 - (b) NADPH and ATP are synthesized using electrons derived from splitting water.
 - (c) Glucose is synthesized.
 - (d) Water is split and the electrons generated are used for glucose synthesis.
- 1.13 Which of the following is a correct step in the light-dependent reactions of the Z system? (1)
- (a) Light is absorbed at P700, and electrons flow through a pathway to NADP⁺, the final acceptor of the linear pathway.
 - (b) Electrons flow from photosystem II to water.
 - (c) NADP⁺ is oxidized to NADPH as it accepts electrons.
 - (d) Water is degraded to activate P680.
- 1.14 The light-dependent reactions of photosynthesis resemble aerobic respiration as both: (1)

- (a) Synthesize NADPH.
- (b) Synthesize NADH.
- (c) Require electron transfer systems to synthesize ATP.
- (d) Require oxygen as the final electron acceptor.

1.15 Which of the following statements about the C₄ cycle is *incorrect*? (1)

- (a) CO₂ initially combines with PEP.
- (b) PEP carboxylate catalyzes a reaction to produce oxaloacetate.
- (c) Oxaloacetate transfers electron from NADPH and is reduced to malate.
- (d) Less ATP is used to run the C₄ cycle than the C₃ cycle.

1.16 In one turn of the Calvin cycle, one molecule CO₂ generates: (1)

- (a) 6 ATP.
- (b) 6 NADH.
- (c) One (CH₂O) unit of carbohydrate.
- (d) One molecule of glucose.

1.17 The oxygen released by photosynthesis comes from: (1)

- (a) CO₂.
- (b) H₂O.
- (c) Light.
- (d) NADPH.

1.18 What is usually the **last** step in the scientific method? (1)

- (a) formulate a hypothesis
- (b) conduct an experiment with a control group
- (c) draw a conclusion on the basis of the experiment
- (d) formulate a theory on the basis of the experiment

1.19 What is the name of the scientist who coined the name "cell"? (1)

- (a) Robert Hook
- (b) Anton Van Leeuwenhoek
- (c) Robert Brown
- (d) Luis Pasteur

1.20 The approach that scientists employ to gather information is known as the _____. (1)

- (a) Investigation
- (b) Research
- (c) Case study
- (d) Scientific method

QUESTION 2: FILL IN THE BLANK

[10]

2.1 The name of the scientist who came up with the cell theory cells comes pre-existing cells is _____ . (1)

2.2 A pair of homologous chromosomes lined up next to each other during meiosis are called a _____ . (1)

2.3 A sex chromosome is a chromosome that determines the sex of an organism; a(n) _____ is any other chromosome. (1)

2.4 _____ a structure of proteins attached to the centromere that links each sister chromatids to the spindle fibers. (1)

2.5 _____ is the breakdown of substances or compounds. Respiration is an example of a catabolic process; carbohydrates are broken down into CO₂ and water. (1)

2.6 Vesicles formed by the Golgi apparatus fuse at the midline of the cell to form the cell plate, a cell wall that elongates to separate the cell into two cells, is the description of _____ in a plant cell. (1)

2.7 **Water is split** during (a) _____, while **NADPH is made** during (b) _____. (2)

2.8 Prokaryotic organisms make up the kingdoms _____ and _____. (2)

QUESTION 3: Short answer questions

[30]

- 3.1 Name the polysaccharide found in the cell walls of fungi? (1)
- 3.2 The process by which a disaccharide is broken down into its monomers is called? (1)
- 3.3 Which organelle will produce steroid hormones in the testes and adrenal cortex while detoxifying alcohol in the liver? (1)
- 3.4 How many molecules of carbon dioxide are produced during the Krebs cycle? (1)
- 3.5 State the location at which the following processes of cellular respiration takes place in the cell; (a) glycolysis, (b) Electron Transport Chain and (c) the Krebs cycle? (3)
- 3.6 Briefly describe the replication fork. (1)
- 3.7 Junctions that permit the transfer of water, ions, and molecules between adjacent plant cells are called? (1)
- 3.8 Name the **3 types of RNA** molecules. (3)
- 3.9 State the **procedure** of precautions to be considered **when using a microscope**. (3)
- 3.10 Give two examples for each of the following (a) integral proteins and (b) peripheral proteins. (4)
- 3.11 Distinguish between passive transport and active transport. (4)
- 3.12 A cell in the basal layer of the skin contains 27 chromosomes and divides by mitosis to produce new skin cells. After ten successive divisions, how many chromosomes will the basal cell have? (2)
- 3.13 Cattle contain 16 chromosomes. How many homologous pairs of chromosomes does it contain? (1)
- 3.14 If yellow flower colour in a plant is controlled by an allele *F* and green flower colour is controlled by an allele *f*.
- (a) Which flower colour is dominant? (2)
- (b) If true-breeding yellow-flowered plants are crossed with true-breeding green-flowered plants, what will be the flower colour(s) of the F₁ plants? (2)

QUESTION 4: TRUE OR FALSE

[20]

4.1 Oxidative phosphorylation accounts for almost 90% of the ATP generated by respiration. A smaller amount of ATP is formed directly in a few reactions of glycolysis and the citric acid cycle via **substrate-level phosphorylation**. (2)

- a) True.
- b) False.

4.2 Humans have 46 chromosomes in their somatic cells. Each chromosome consists of a single long DNA molecule, elaborately coiled in association with various proteins. (2)

- a) True.
- b) False.

4.3 Homologous chromosomes have the same length, centromere position, and staining pattern. The chromosomes carry genes controlling the same inherited characters. (2)

- a) True.
- b) False.

4.4 After synthesis, regardless of the number of chromatids, the cell is still said to be diploid or $2n$. (2)

- a) True.
- b) False

4.5 The chromosome number generally correlates with the size or complexity of a species genome. (2)

- a) False.
- b) True.

4.6 Gametes do not undergo further cell division prior to fertilization. (2)

- a) True
- b) False

4.7 Either haploid or diploid cell can divide by mitosis, depending on the type of life cycle. Only diploid cells, however, can undergo meiosis. (2)

- a) True.
- b) False.

4.8 By Combining DNA inherited from two parents into a single chromosome, is an important source of genetic variation in sexual life cycles. (2)

- a) True.
- b) False.

4.9 During Metaphase I of the first meiotic division, each pair of homologous chromosomes is not positioned independently of other pairs. (2)

- a) False.
- b) True.

4.10 The terms Chromatin and chromosomes are similar but have distinct meanings. Chromatin refers to any chromatin refers to the daughter cells. Chromosomes refers to complete DNA molecule without proteins. (2)

- a) True
- b) False

QUESTION 5: Essay Questions

[20]

5.1 Briefly describe the binomial system of nomenclature. Give example (write the scientific name of the human beings as an example). (5)

5.2

- (a) Define **mitosis** and, (1)
- (b) Using sketches, describe the main stages of mitosis. (14)

THE END