



UNIVERSITY  
OF  
JOHANNESBURG

<b><u>FACULTY</u></b>	: Science
<b><u>DEPARTMENT</u></b>	: Biochemistry
<b><u>CAMPUS</u></b>	: APK
<b><u>MODULE</u></b>	: BICH1A1 Environmental Biochemistry
<b><u>SEMESTER</u></b>	: First
<b><u>EXAM</u></b>	: May 2018

<b><u>DATE</u></b>	:	<b><u>SESSION</u></b>	: 08:30-11:30
<b><u>ASSESSOR</u></b>	: Dr I Mwaba		
<b><u>MODERATOR</u></b>	: Dr G Koorsen		
<b><u>DURATION</u></b>	: 2,5 HOURS	<b><u>MARKS</u></b>	: 85

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NUMBER OF PAGES: 3 PAGES

INSTRUCTIONS:

- 1 Answer ALL THE QUESTIONS.
  - 2 Number your answers clearly.
  - 3 Question paper to be returned with the answer books.
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## QUESTION 1

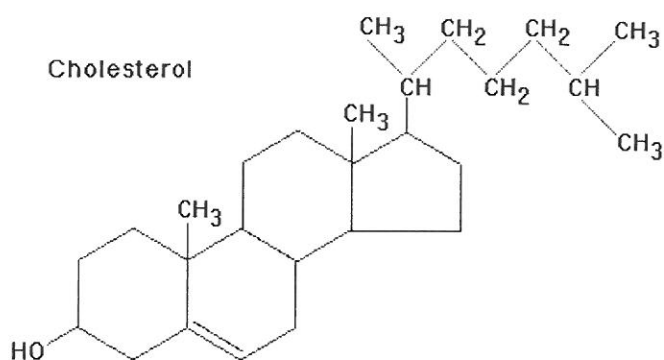
10 MARKS

- 1.1 Define the term "*Evolution*". (2)
- 1.2 What is electronegativity? (1)
- 1.3 How does electronegativity affect interactions between water molecules? (3)
- 1.4 Explain how table salt has emergent properties. (3)
- 1.5 Write a formula for a simple monosaccharide, with 3 carbons. (1)

## QUESTION 2

15 MARKS

- 2.1 Both cellulose and amylose are polymers of carbohydrates, made up of glucose monomers. However, although humans can metabolize amylose, we are not able to metabolize cellulose. Explain why this is the case, based on the structure of each of those polymers. (2)
- 2.2 Name 1 type of protein secondary structure. (1)
- 2.3 Glycine is an amino acid with a hydrogen as the R group. Draw the structure of Glycine. (2)
- 2.4 An amphipathic molecule is a molecule that has a hydrophilic and a hydrophobic part. Given the structure of cholesterol below, is the statement "*Cholesterol is an amphipathic molecule*" **true** or **false**? Justify your answer. (3)



- 2.5 List 3 structural similarities between the chloroplast and the mitochondrion. (3)
- 2.6 Name 1 motor protein associated with the cytoskeleton. (1)
- 2.7 What are the structural and functional differences between the smooth and the rough endoplasmic reticulum? (3)

### **QUESTION 3**

**15 MARKS**

- 3.1 State the second law of thermodynamics. (1)
- 3.2 Define the term "*chemical energy*". (1)
- 3.3 Draw the cycle of ATP regeneration, indicating how hydrolysis of ATP is used to drive cellular work. (3)
- 3.4 Is cellular respiration an example of an endergonic reaction or an exergonic reaction? Justify your answer. (3)
- 3.5 What is enzyme specificity, and what determines the specificity of an enzyme? (2)
- 3.6 Why is heating a cell to increase the rate of a chemical reaction a bad idea? (3)
- 3.7 What is feedback inhibition? (2)

### **QUESTION 4**

**20 MARKS**

- 4.1 What is the purpose of  $\text{NAD}^+$  and  $\text{FAD}^+$  in cellular respiration? (3)
- 4.2 How many ATP molecules (roughly) are produced from 1 glucose molecule? (1)
- 4.3 What molecule is produced after the first part of glycolysis? (1)
- 4.4 What is chemiosmosis. How does it lead to ATP formation? (5)
- 4.5 What is the role of carotenoids in plant leaves? (2)
- 4.6 Is the primary electron acceptor found in Photosystem I or II? Explain your answer. (3)
- 4.7 Fill in the blanks: (5)
  - a. The product of the Calvin Cycle is \_\_\_\_\_.
  - b. It takes \_\_\_\_\_ turns of the Calvin Cycle to produce the sugar in a.
  - c. Stage 4 of the Calvin Cycle is the \_\_\_\_\_ of ribulose 1,5- biphosphate.
  - d. In glycolysis \_\_\_\_\_ is oxidized.
  - e. In oxidative phosphorylation, \_\_\_\_\_ is reduced.

### **QUESTION 5**

**25 MARKS**

- 5.1 Explain the role of complementary base pairing in the functions of DNA. (2)
- 5.2 Explain the term "convergent evolution". (2)
- 5.3 Which nucleotide is not shared by RNA and DNA? (1)
- 5.4 What is the purpose of sexual reproduction? (1)

5.5 Complete the following table to compare mitosis and meiosis:

(7)

	Mitosis	Meiosis
Number of chromosomal duplications		
Number of cell divisions		
Number of daughter cells produced		
Number of chromosome in the daughter cells		
How the chromosome line up during metaphase		
Genetic relationship of the daughter cells to the parent cells		
Functions performed in the human body		

5.6 Describe, in detail, DNA replication of the leading strand (only). Include all enzymes involved and their functions. Include a diagram. (5)

5.7 Name of the process that produces a polypeptide from an RNA template? (1)

5.8 Define the term "retrovirus". (2)

5.9 What are the 3 ways in which bacteria can transfer DNA? (3)