NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Faculty of Health and Applied Sciences

Department of Health Sciences

QUALIFICATION: BACHELOR OF MEDICAL LABORATORY SCIENCES/BACHELOR OF HUMAN NUTRITION	
QUALIFICATION CODE: 08BMLS/08BOHN	**LEVEL**: 5
COURSE: BIOCHEMISTRY/INTRODUCTION TO BIOCHEMISTRY	**COURSE CODE**: BIO521S/IBC521S
SESSION: JANUARY 2020	**PAPER**: THEORY
DURATION: 3 HOURS	**MARKS**: 100

SUPPLEMENTARY/SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
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INSTRUCTIONS

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

Non-programmable calculator is allowed.

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

SECTION A [20]

Question 1: Multiple Choice

1.1 Which of the following sequences of organisation is likely to be seen in a multicellular organism, going from smallest to largest? (1)

a. Cell, organ, system, tissue

b. Cell, tissue, system, organism

c. Organism, system, organ, tissue

d. Tissue, system, cell, organ

1.2 Metal oxides are typically _____while non-metal oxides are typically _____. (1)

a. Amphoteric, basic

b. Amphoteric, acidic

c. Basic, acidic

d. Basic, amphoteric

1.3 Anion gap is the difference in the plasma concentrations of (1)

a. (Chloride) and (Bicarbonate)

b. (Sum of cations) and (Sum of anions)

c. (Sodium) and (Chloride)

d. (Sodium + Potassium) and (Chloride + Bicarbonate)

1.4 Name the amino acid which exists in two non-superimposable mirror images of each other. (1)

a. Anomer

b. Chiral carbon

c. Epimer

d. Enantiomer

1.5 Which of the following below is an example of enzyme specificity? (1)

a. Substrate specificity

b. Reaction specificity

c. Stereo specificity

d. All of these

1.6 What type of interactions between molecules in a living organism is strongest? (1)

a. Electrostatic interaction
b. Covalent bond
c. Hydrogen bonding
d. Van der Waals forces

1.7 Which of the amino acids below is the uncharged derivative of an acidic amino acid? (1)

a. Serine
b. Tyrosine
c. Glutamine
d. Cysteine

1.8 Which of the following is an amino acid found in proteins? (1)

a. Adenosine
b. Alanine
c. Adenine
d. Linoleic acid

1.9 Regulation of some enzymes by covalent modification involves addition or removal of (1)

a. Phosphate
b. Coenzyme
c. Sulphate
d. Acetate

1. 10 Coenzyme is (1)

a. Often a metal
b. Always an inorganic compound
c. Often a vitamin
d. Always a protein

1.11 In β–oxidation of fatty acids, which of the following are utilised as co-enzymes? (1)

a. FAD and NAD^+
b. FAD H_2 and $NADH^+ H^+$
c. NAD^+ and $NADP^+$
d. FAD and FMN

1.12 A deficiency of carnitine might interfere with (1)

a. ß-oxidation
b. Palmitate synthesis
c. Mobilisation of stored triacylglycerol from adipose tissue
d. Ketone body formation

1.13 Which of the following is an essential fatty acid? (1)

a. Linolenic acid
b. Linoleic acid
c. Arachidonic acid
d. All above

1.14 Pancreatic lipase converts triacylglycerols into (1)

a. 2-Monoacylglycerol
b. 3-Monoacylglycerol
c. 1-Monoacylglycerol
d. 2, 3-Diacylglycerol

1.15 Oxidation of fatty acids occurs (1)

a. In the cytosol
b. In the matrix of mitochondria
c. On inner mitochondrial membrane
d. On the microsomes

1.16 The following are functions of prostaglandins except (1)

a. Prevention of myocardial infraction
b. Lowering of blood pressure
c. Anti-inflammatory
d. Introduction of labour

1.17 The following are called reducing sugars EXCEPT (1)

a. Glucose

b. Lactose

c. Sucrose

d. Maltose

1.18 Which one of the following glycolytic enzymes is used in gluconeogenesis? (1)

a. Glucokinase

b. Pyruvate kinase

c. Aldolase

d. Phosphofructokinase

1.19 Codons are present on (1)

a. DNA

b. mRNA

c. tRNA

d. rRNA

1.20 In humans, the main product of purines is (1)

a. Ammonia

b. Uric acid

c. Urea

d. β-alanine

SECTION B [80]

Question 2: Fill the blank spaces only by writing down the number and the correct missing expression **[20]**

2.1. _____ is the study that explains how different sequences of biochemical reactions interact with each other for survival of cell (organism) under various conditions. (1)

2.2 In Induced *Fit Model,* the enzyme molecule of amino acid residues that make up the _____ are not oriented properly in the absence of substrate. (1)

2.3 In spermatozoa, _____accounts for 90% of cell whereas in other cells, it accounts for less than 10% of the cell. (1)

2.4 _____amino acids are amino acids that can be converted to glucose. (1)

2.5 When the CO_2 level in the blood rises (as it does when you hold your breath), the excess CO_2 reacts with water to form additional carbonic acid and _____ blood pH. (1)

2.6 Lactic acid enhances tissue oxyhaemoglobin dissociation and expansion of the coronary vessels, therefore compensates _____ phenomena. (1)

2.7 Amino acids are _____for proteins. (1)

2.8 Deamination of an amino acid is coupled with amination of a _____ acid. (1)

2.9 To form polypeptides and proteins, amino acids are joined together by _____ bonds. (1)

2.10 Transcription continues until a _____sequence is reached. (1)

2.11 _____are long, rod-shaped molecules that are insoluble in water and physically tough. (1)

2.12 All inherited and expressed genetic information, involve processes such as replication, _____ and translation into proteins. (1)

2.13 One difference between 'chemical catalysts' and enzyme is that enzymes are _____in the type of reaction to be catalysed and they function within a moderate range of hydrogen ion concentration and temperature along with certain other specified conditions. (1)

2.14 Catalytic efficiency of enzymes can be regulated by _____or inhibition. (1)

2.15 Enzymes may be termed as 'molecular switches', which regulate the catalytic activity and transfer of_____in the biological system. (1)

2.16 Carbohydrates not only serve as major sources of energy but also function as _____ for the synthesis of lipids, amino acids, glycoproteins and proteoglycans in the body. (1)

2.17 _____ are formed by interaction between a monosaccharide or a monosaccharide residue and the hydroxyl group of a second compound that may or may not be a monosaccharide.

2.18 _____ is the disease in which lactate, the final product of anaerobic glycolysis, accumulates. (1)

2.19 _____ is a condition where ketone bodies in blood rise above normal levels. (1)

2.20 Phospholipids are major components of cell membranes. They are also part of lipoproteins and bile and act as lung _____. (1)

Question 3: Short Answers **[40]**

3.1 The major carbohydrates present in our diet are starch, glycogen, sucrose, lactose, maltose and very little concentrations of fructose and pentose.

a. Describe the structures and functions of chitin and starch. (4)

b. State briefly four regulation processes of blood glucose. (4)

c. What are the structural differences between maltose, sucrose and lactose? (3)

d. Name the three enzymes involved in the process of gluconeogenesis. (3)

e. Why is a Citric Acid Cycle said to be an anaplerotic process? (2)

3.2 The animal sources of protein and lipids include milk, butter, ghee, meat and fish.

a. Explain the difference between oil and fat. (2)

b. What are prostaglandins and what is its precursor? (3)

c. Why does butter soften at room temperature? (2)

d. Why does coconut oil solidify in winter? (2)

e. Name four biological functions of lipids. (4)

f. Name four lipid components found in biological membranes. (4)

g. State the position and functions of two types of membrane proteins. (4)

h. Name three glucogenic amino acids? (3)

Question 4: Calculations **[20]**

4.1. A buffer solution can be made by dissolving 0.25 g of sodium ethanoate in 200 cm^3 of 0.10 $moldm^{-3}$ ethanoic acid. Assume that the change in weight is negligible.

a. Define the term buffer solution (2)

b. Calculate the concentration of the sodium ethanoate. (2)

c. Calculate the pH of the resulting buffer solution if $K_a = 1.74 \times 10^{-5}$ (4)

4.2. During a practical exam, you were requested to prepare 1 L of a buffer solution containing 0.10 M HCN and 0.12 M CN^-. ($K_a = 7.2 \times 10^{-10}$)

a. What is the pH of this buffer? (2)

b. What is the pH if 0.01 mol of HCl is added to the buffer? (2)

c. What is the pH if 0.02 mol of NaOH is added to the original buffer? (3)

4.3 Calculate the fluoride ion concentration and pH of a solution that is 0.20 M in HF and 0.10 M in HCl. The equilibrium constant for the ionization of HF is 6.8×10^{-4}. (5)

END OF EXAM