FACULTY	AGRICULTURE, ENGINEERING AND NATURAL SCIENCES		
SCHOOL	AGRICULTURE AND FISHERIES SCIENCES		
DEPARTMENT	ANIMAL PRODUCTION, AGRIBUSINESS & ECONOMICS		
MODULE	BIOCHEMISTRY		
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DURATION	3 hours	**MARKS**	100
FIRST OPPORTUNITY EXAMINATION PAPER			

First Opportunity Examination:

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Internal Moderator: Dr T. O. Amushendje

External Moderator: Prof. Evison Bhebhe

This First Opportunity Examination Paper consists of 5 pages, including this front page.

Instructions

This first opportunity examination paper consists of four sections that are divided into sections A, B, C, and D.

1. Read the questions carefully. Follow the instructions preceding each part/section.
2. Answer ALL questions.
3. Write clearly and concisely.
4. Pay attention to the questions, where you are asked to explain or discuss, listing of keywords is not adequate.
5. Please be reminded that cheating in the examination will result in a failing grade.
6. Hand the answer booklet to the invigilator at the end of the examination

UNIVERSITY OF NAMIBIA EXAMINATIONS

SECTION A: Multiple Choice Questions (1 mark per question) [15 marks]

1. What is the pH of a 0.015 M aqueous solution of barium hydroxide?
   a. 12.18
   b. 1.52
   c. 12.48
   d. 1.82

2. How is the conjugate base made?
   a. By removing a hydrogen ion from an acid
   b. By removing a hydrogen ion from a base
   c. By adding a hydrogen ion to an acid
   d. By adding a hydrogen ion to a base

3. What is the concentration of 20ml NaOH that can be neutralized by 25ml of 1M HCl?
   a. 0.8 M
   b. 1.25 M
   c. IM
   d. 0.02M

4. Allosteric inhibition of an enzyme involves which of the following?
   a. Binding of an inhibitor to a site other than the substrate binding site
   b. Binding of an inhibitor competitively to the substrate binding site
   c. Binding of an inhibitor noncompetitively to the substrate binding site
   d. Cooperative binding of substrate to an enzyme with four or more subunits

5. Which statement describes the polarity of a water molecule?
   a. The oxygen end has a partial positive charge and the hydrogen has a partial negative charge
   b. The oxygen end has a partial negative charge and the hydrogen has a partial positive charge
   c. Electrons are shared evenly between the hydrogens and oxygen
   d. The charge on each end of the molecule is balanced

6. Which of the following statements is false about gluconeogenesis?
   a. From hydrolysis of tri-acyl-glycerol, fatty acids can be used as a carbon source
   b. From red blood cells, lactate can be used as a carbon source
   c. From the hydrolysis of tri-acyl-glycerol, glycerol is converted to glucose in gluconeogenesis
   d. From muscle vigorous muscle activity, lactate can be used as a carbon source

7. A sugar, phosphate group and a nitrogen base make up the building blocks from which organic compound?
   a. Carbohydrates
   b. Lipids
   c. Nucleic acids
   d. Proteins

8. Which of the following statements is correct about oxidative pentose pathway?
   a. It generates NADH
   b. The pathway supplies ribose 5- phosphate and NADPH in the quantities the cell requires
   c. It oxidizes NADPH to NADP+
   d. Glucose 6- phosphatase catalyzes the rate limiting reaction of pathway

9. Which of the following statement is incorrect?
   a. Cytosine and thymine are the only pyrimidines
   b. Pyrimidines are one ringed structure
   c. Purine are two ringed structures
   d. Cytosine and uracil are pyrimidines

10. An organism has numerous amino acids that need to be changed into a protein chain, which reaction will be used?
   a. Dehydration
   b. Hydrolysis
   c. Photosynthesis
   d. Respiration

11. Which of the following is the amphibolic pathway?
   a. HMP shunt
   b. Glycolysis
   c. Gluconeogenesis
   d. Citric acid cycle

12. Transamination reaction in amino acid synthesis is catalyzed by which enzyme?
   a. Nitric oxide synthase
   b. Decarboxylase
   c. Aminotransferase
   d. Glutamate decarboxylase

13. Name the most active organs in the animal body which have the ability to synthesize triacylglycerol.
   a. Spleen
   b. Kidney
   c. Liver and intestines
   d. Adipose tissue

14. The rate-limiting step of fatty acid synthesis is catalyzed by which enzyme?
   a. Pyruvate dehydrogenase
   b. Acetyl CoA carboxylase
   c. ATP-citrate lyase
   d. Malic enzyme

15. Acetyl CoA, the cytoplasmic substrate for fatty acid synthesis, is formed in mitochondria. However, the inner mitochondrial membrane is impermeable to acetyl CoA. Which of the following compounds is the form in which the carbon of acetyl CoA is transported to the cytoplasm?
    a. Malate
    b. Acetate
    c. Pyruvate
    d. Citrate

SECTION B: Short Answer Questions (3-5 marks per part/question) **[35 marks]**

1. Draw the structures of the following molecules:
    a. Alpha-D- glucose in a ring form [3]
    b. Pyruvate [3]
    c. Linolenic acid (c18 delta 9 12 15) [3]

2. What three metabolic processes produce ATP? [3]

3. State two (2) organs in which gluconeogenesis takes place [2]

4. The synthesis of _____ is the irreversible reaction, first committed and rate limiting step in fatty acid synthesis. [2]

5. Why free ammonia is poisonous for the brain? [4]

6. Gluconeogenesis pathway costs a cell more ATP than glycolysis produces. Why do you think a cell would commit itself to a more costly pathway? [4]

7. Why is it that a human brain cannot use fatty acids as a source of energy in glucose gets depleted? [2]

8. Concerning Pentose Phosphate Pathway, answer the following questions:
    a. What is the synonym for the pathway? [1]
    b. In what organ, does this process occur? [1]
    c. What molecule is needed in the first step of the pathway? [1]
    d. The pathway is mainly required for the production of what type of sugars? [1]
    e. NADPH is a byproduct of the pathway, what is this product mainly used for? [3]

9. Why is it that the skeletal muscle cannot carry out gluconeogenesis process? [2]

SECTION C: Structured Questions (10 marks per question) [40 marks]

1. Discuss the steps involved in metabolizing triacylglycerol (TAG) to yield energy in the form of ATP. Include the quantities of the important products generated [10]

2. Concerning thermodynamics,
   a. Define Gibbs Free Energy [2]
   b. Describe exergonic and endergonic reactions and give two metabolic examples of each. [8]

3. Describe how ATP is produced using the following processes
   a. Substrate level phosphorylation [5]
   b. Oxidative phosphorylation [5]

4. Explain how the sugar fructose is fed into the glycolytic pathway. [10]

SECTION D: True or False Questions (1 mark per question) [10 marks]

STATEMENT	True or False
1. Triacylglycerol is stored in the body as cytoplasmic lipids droplets	
2. Deoxyribose is a sugar found in ATP	
3. Oxidation of 3 molecules of glucose by pentose phosphate pathway results in the production of 3 molecules of pentose, 4 molecules of NADPH and 3 molecules of carbon dioxide	
4. Glucose 6-phosphate, glycerol and pyruvate are important precursors of glucose in animals	
5. Animals cannot convert acetyl-coA from fatty acids into glucose.	
6. The enzymes involved in feedback inhibition are apoenzymes	
7. A human/animal body can digest itself	
8. All enzymes of the TCA cycle reside in the mitochondrial membrane	
9. Ionic bonds between bases and phosphate groups are broken down during DNA replication	
10. Polysaccharides, fats and proteins break down into metabolites of TCA cycle	

END OF EXAM