



*(University of Choice)*

**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY**

**(MMUST)**

**MAIN CAMPUS**

**UNIVERSITY EXAMINATIONS**

**MAIN EXAM**

**2022/2023 ACADEMIC YEAR**

**FIRST YEAR SECOND SEMESTER EXAMINATION**

**FOR THE DEGREE OF BACHELORS OF SCIENCE IN CLINICAL MEDICINE,  
PHYSIOTHERAPY AND HEALTH PROFESSION EDUCATION**

**COURSE CODE: BIO 111**

**COURSE TITLE: BIOCHEMISTRY II**

**DATE: THURSDAY 13<sup>TH</sup> APRIL 2023**

**TIME: 8:00-10:00 AM**

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**INSTRUCTIONS TO CANDIDATES:**

**TIME: 2 Hours**

MMUST observes ZERO tolerance to examination cheating

Paper Consists of 5 Printed Pages. Please Turn Over



**This paper consists of three sections. Section A and B are compulsory. Section C has four questions of which you are to choose only TWO**

**SECTION A: ANSWER ALL QUESTIONS (20 Mrks)**

1. Select a metabolic reaction below in which Thiamine pyrophosphate (TPP) **DOES NOT** act as a coenzyme.

- A. Hexokinase which converts glucose to glucose 6 phosphate (Phosphorylation)
- B.  $\alpha$ -Ketoglutarate dehydrogenase complex and converts  $\alpha$ -Ketoglutarate to succinyl-CoA (oxidative decarboxylation).
- C. Transketolase in transketolation reaction in HMP pathway of glucose metabolism.
- D. B1 is required in Tryptophan metabolism for the activity of Tryptophan pyrrolase.

2. The common pathway of blood coagulation involves the factors below **EXCEPT?**

- A. The factor X-mediated generation of thrombin from prothrombin facilitated by factor V
- B. Calcium
- C. Prekallikrein
- D. Platelet phospholipid, with the ultimate production of fibrin from fibrinogen.

3. Exopeptidases are enzymes that are involved in the degradation of proteins. Which of the statements below is **FALSE** in regard to these enzymes?

- A. Produced in the pancreas that
- B. Catalyses the removal of an amino acid from the end of a polypeptide chain.
- C. Cleaves the end of a polypeptide chain.
- D. Examples include aminopeptidase and hexokinase.

4. The synthesis of Inosine Monophosphate (IMP) is characterized by the following **EXCEPT?**

- A. Starts from ribose-5-phosphate (R-5-P)
- B. Basic pathway for biosynthesis of pyrimidine ribonucleotides
- C. Requires 11 steps overall
- D. Occurs primarily in the liver

5. Which of the following defects of urea cycle is **WRONGLY** matched with the enzyme involved?

	<b>Defect</b>	<b>Enzyme involved</b>
A	Hyperammonemia type I	Carbamoyl phosphate synthase I
B	Hyperammonemia type II	Ornithine transcarbamoylase
C	Citrullinemia	Arginosuccinate synthetase
D	Arginosuccinic aciduria	Arginase

6. Hypoparathyroidism is characterised by the following **EXCEPT** one. Which one?

- A. The bones becomes weak
- B. Parathyroid glands does not secrete sufficient PTH
- C. Osteocytic reabsorption of calcium decreases
- D. Level of Calcium in the body fluid decreases

7. Which of the following is **NOT** an element source of pyrimidine base?
- A. Glutamine
  - B. Aspartate
  - C. Alanine
  - D. Carbon dioxide
8. Oxidation of glycerol involves three metabolic steps. Which among the ones below is **NOT**?
- A. Reduction
  - B. Phosphorylation
  - C. Oxidation
  - D. Isomerisation
9. The characteristics of de novo synthesis of purines involve the following **EXCEPT**?
- A. Purines are synthesized using 5-phosphoribose (R-5-P) as the starting material step by step.
  - B. The product is UMP (uridine monophosphate)
  - C. PRPP (5-phosphoribosyl-1-pyrophosphate) is active donor of R-5-P.
  - D. AMP and GMP are synthesized further at the base of IMP (Inosine-5'-Monophosphate).
10. Which of the statement below is **FALSE** in regard to different metabolic circumstances under which amino acids undergo oxidative degradation in animals?
- A. Some amino acids that are released from protein breakdown and are not needed for new protein synthesis.
  - B. When a diet is rich in protein and the ingested amino acids exceed the body's needs for protein synthesis.
  - C. During a diet is rich in carbohydrates and the ingested glucose exceed the body's requirements.
  - D. During starvation or in uncontrolled diabetes mellitus, when carbohydrates are either unavailable or not properly utilized, cellular proteins are used as fuel.
11. Below are cardiovascular risk factors associated with increased plasma fibrinogen levels as a result of acute-phase response. Which one is **NOT**?
- A. Coronary artery disease
  - B. Diabetes
  - C. Hypertension
  - D. Hypolipidermia
12. Which of the following statements below **DOES NOT** describe the biochemical functions of Vitamin D?
- A. Renal reabsorption of calcium and phosphorus done by 1,25 (OH)<sub>2</sub>D<sub>3</sub>.
  - B. Increases the pH in certain parts of the gut and produces increase in urinary pH.
  - C. Counteracts the inhibitory effect of calcium ions on the hydrolysis of phytate.
  - D. Increase the citrate content of bone, blood, tissues and urinary level.
13. Select the statement that **DOES NOT** the roles of Thrombin.

- A. The primary role is the conversion of fibrinogen to fibrin and fibrin clot.
  - B. Activates Factors VIII, V, XI to generate more Xa and thrombin.
  - C. Activate Factor XI to crosslink the fibrin polymers.
  - D. Activates platelet through its receptors on platelets, mobilize calcium and promote aggregation.
14. Some of the drugs that inhibit protein synthesis act by binding to the 30s subunit of bacterial ribosome's. Which among the ones given below **DOES NOT** utilize this mechanism?
- A. Trimethoprim
  - B. Aminoglycoside
  - C. Tetracyclines
  - D. Spectinomycin
15. Below are statements that describe the characteristics of tricarboxylic acid (TCA) cycle **EXCEPT**?
- A. All compounds are tricarboxylic acids
  - B. Carbons from glucose are lost as  $\text{CO}_2$  (decarboxylation)
  - C. Several  $\text{NADH} + \text{H}^+$  are generated via oxidation of intermediates
  - D. One high energy phosphate compound (ATP) is produced
16. The statements below relate to the roles of Arginine Vasopressin. Which one is **NOT**?
- A. Induces contraction of Uterus
  - B. Increases aquaporins on distal tubules and collecting ducts in Kidneys
  - C. Action causes Reabsorption of water via distal tubules and collecting ducts
  - D. Causes constriction of Vascular Smooth Muscle
17. Below are the fates of ammonia ( $\text{NH}_3$ ) during its metabolism **EXCEPT**?
- A. Used in the synthesis of new amino acids
  - B. Convert to citric acid in the tricarboxylic acid (TCA) cycle
  - C. Convert to urea for excretion
  - D. Convert to the amide
18. The reactions of fatty acid synthesis occur in five separate stages. Which among those given below is **NOT** one of them?
- A. Loading of precursors via thioester derivatives
  - B. Condensation of the precursors
  - C. Dehydration
  - D. Adenylation
19. Certain hormones increase glycogen breakdown by activating adenylate cyclase. Which among the ones below **DOES NOT**?
- A. Glucagon
  - B. Epinephrine
  - C. Insulin
  - D. Adrenaline

20. Select the antibiotic that **DOES NOT** act by blocking the cross linking of peptidoglycan
- Bactracin
  - Vancomycin
  - Ristocetin
  - Spectinomycin

**SECTION B: ANSWER ALL QUESTIONS (40 MRKS)**

- State the following in relation to glucose metabolism
  - Two substrate level phosphorylation reactions in glycolysis (2 mrks)
  - Enzymes used to overcome the glycolysis in gluconeogenesis (3 mrks)
  - Biochemical importance of Tri Carboxylic acid (TCA) cycle (3 mrks)
- Enumerate the following about blood coagulation
  - Components of coagulation cascade (2 mrks)
  - Biochemical events involved in the common pathway (4 mrks)
  - Short notes on haemophilia A (3 mrks)
- Outline the following on lipid metabolism
  - Write a biochemical reaction for the oxidation of glycerol (3 mrks).
  - Differences on the synthesis and breakdown of fatty acids using table below as a guideline (4 mrks)

	Synthesis	Degradation
Activating group		
Electron carrier (coenzyme)		
Basic unit added or removed		
Cellular location		

- Illustrate the following concerning metabolism of nucleic acids.
  - The salvage process for the synthesis of pyrimidines (4 mrks)
  - The regulation of purine nucleotide biosynthesis by de novo pathway (4 mrks)
- Show the following processes in relation to glycogen
  - Glycogenolysis pathway (4 mrks)
  - Regulation of glycogenesis (4 mrks)

**SECTION C**

ANSWER ANY TWO QUESTIONS (40 MRKS)

**QUESTION ONE**

Hormones are chemical messengers synthesised by glands and released into the blood circulation to reach their target. Describe with specific examples the hormone receptors and their effects (20 mrks)

**QUESTION TWO**

Defects in the enzyme associated with metabolic processes result in errors of metabolism.

- Illustrate the metabolic pathway for the degradation of phenylalanine amino acid (10 mrks)
- Describe the clinical conditions that arise in defective degradation of phenylalanine (10 mrks)

**QUESTION THREE**

Biological buffers are used to resist change in pH in living organism. Discuss the following:

- The mechanism of Bicarbonate buffer system (10 mrks)
- Metabolic conditions associated with Bicarbonate buffer system (10 mrks)