50

(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS
MAIN EXAMINATIONS

UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR

END OF TERM TWO EXAMINATIONS
FOR THE DEGREE
OF
BACHELOR OF MEDICINE AND BACHELOR OF SURGERY

COURSE CODE: MBS 101

COURSE TITLE: MEDICAL BIOCHEMISTRY II

DATE: 19:04:23 **TIME: 8.AM-10AM**

INSTRUCTIONS TO CANDIDATES

Answer ALL questions in section A, B and C

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

SECTION A: MULTIPLE CHOICE QUESTIONS (1 mark each. Total 40 marks). Answer all questions

1. Which of the following sugars is a ketopentose
   A. Mannose
   B. Arabinose
   C. Ribulose
   D. Fructose
   E. Ribose
2. 2-deoxy-D-ribose is the same as
   A. Ketotetrose
   B. Aldopentose
   C. Aldohexose
   D. Ketopentose
   E. Aldotriose
3. Heparin, a blood anticoagulant is a polymer of
   A. Glucose
   B. Galactose
   C. Gluose and mannose
   D. Glucosamine and glucuronic acid
   E. A and B
4. What is the main role of mucins in the body
   A. Provide energy
   B. Serve as lubricants
   C. Are structural components of cell membranes
   D. Offer mechanical support
   E. None of the above
5. Glucose and mannose differ in structure at
   A. C1
   B. C6
   C. C4
   D. C2
   E. C3
6. Glycogen formation is the linkage of glucose with the following bonds
   A. α-1,4-glycosidic bonds only
   B. β-1,4-glycosidic bonds only
   C. α-1,6-glycosidic bonds only
   D. α-1,4- and β1,4-glycosidic bonds
   E. α-1,4- and α-1,6-glycosidic bonds
7. which of the following is a non-reducing sugar
   A. Ribose
   B. Maltose
   C. Sucrose

D. Lactose
E. Glucose

8. How many stereoisomers can be formed from a glucose molecule
   A. 2
   B. 4
   C. 8
   D. 16
   E. 1
9. Compare the number of reducing ends to non-reducing ends in a molecule of glycogen
   A. Number of reducing ends and non-reducing ends are equal
   B. Glycogen molecule has many reducing ends but one non-reducing end
   C. Glycogen molecule has many non-reducing ends but one reducing end
   D. Glycogen has many non-reducing ends but no reducing end
   E. None of the above
10. Identify a milk sugar
   A. Lactose
   B. Maltose
   C. Sucrose
   D. Mannose
   E. Galactose
11. Which amino acid is optically inactive
   A. Alanine
   B. Glycine
   C. Glutamate
   D. Lysine
   E. Glutamine
12. Which amino acid has an imidazole group
   A. Arginine
   B. Lysine
   C. Aspartate
   D. Proline
   E. Histidine
13. Which of the following amino acids has negatively charged side chain
   A. Glycine
   B. Asparagine
   C. Leucine
   D. Aspartate
   E. Glutamine
14. Select a branched chain amino acid
   A. Alanine
   B. Glutamine
   C. Histidine
   D. Valine

E. None of the above

15. Select S-containing amino acid
    A. Methionine
    B. Asparagine
    C. Isoleucine
    D. Leucine
    E. Glutamate
16. Which of the following proteins is a globular protein
    A. Keratin
    B. Collagen
    C. Myoglobin
    D. Elastin
    E. A, B, and C
17. Which of the following factors is **NOT** responsible for denaturation of proteins
    A. Organic solvents
    B. pH
    C. Heat
    D. Charge
    E. All of the above
18. Which of the following is responsible for specifying the 3D shape of a protein
    A. Interaction with other molecular chaperons
    B. Interaction with other polypeptides
    C. The peptide bond
    D. The polypeptide chain
19. Which of the following groups of proteins is **NOT** a form of conjugated protein
    A. Nucleoprotein
    B. Metalloprotein
    C. Complete protein
    D. Lipoprotein
    E. Glycoprotein
20. Which of the following amino acids is the precursor for thyroid hormone
    A. Tyrosine
    B. Proline
    C. Leucine
    D. Cysteine
    E. Valine
21. Biological membranes are associated with all of the following **EXCEPT**
    A. Prevent free diffusion of ionic solutes.
    B. Release of proteins when damaged.
    C. Contain specific systems for the transport of uncharged molecules.
    D. Proteins and nucleic acids cross freely.
    E. Bilayer in nature

22. In humans, a dietary essential fatty acid is:
    A. Palmitic acid
    B. Stearic acid
    C. Oleic acid
    D. Linoleic acid
    E. Lauric acid
23. A lipid containing alcoholic amine residue is
    A. Phosphatidic acid
    B. Ganglioside
    C. Glucocerebroside
    D. Sphingomyelin
    E. Stearic acid
24. Which is a property of lipids in cell membranes
    A. The hydrophobic groups of lipid molecules are found on membrane surfaces.
    B. Some types of lipids are found preferentially in the outer membrane layer.
    C. Most of the lipids are hydrocarbons composed of five-carbon units.
    D. Most of the lipids function in transporting biomolecules into the cell.
    E. None of the above.
25. The importance of phospholipids as constituent of cell membrane is because they possess
    A. Fatty acids
    B. Both polar and nonpolar groups
    C. Glycerol
    D. Phosphoric acid
    E. Amino acids
26. Which of the following is **NOT** an example of a weak acid
    A. Lactic acid
    B. Carbonic acid
    C. Sulfuric acid
    D. Lenoleic acid
    E. C and D
27. Buffers are mixtures of:
    A. Strong acid and strong base
    B. Strong acid and weak base
    C. Weak acid and their conjugate base
    D. Weak acid and their conjugate weak acid
    E. Weak acid and strong base
28. If a solution has to be a buffer its pH should be:
    A. At its pKa value
    B. One point above its pH value
    C. At 7
    D. At 14
    E. At 0

29. The pH of pure water is neutral, the best explanation for this is:
    A. The pH of pure water is 7
    B. In pure water the concentration of H^+ and OH^- are the same
    C. Water do not contain free H^+ or OH^- ions
    D. Water will never ionize
    E. The difference in bond strength between hydrogen bonds and covalent bond
30. The most important peculiarity of water when compared to other solvents is that water has:
    A. High boiling point, high melting point and high heat of vaporization
    B. High boiling point, low melting point and high heat of vaporization
    C. Low boiling point, high melting point and low heat of vaporization
    D. Low boiling point, low melting point and high heat of vaporization
    E. Low boiling point, low melting point and low heat of vaporization
31. A solution of HCl with a concentration of $4x10^{-4}$ $molL^{-1}$ has a pH of?
    A. 2.67
    B. 3.21
    C. 3.40
    D. 4.31
    E. 5.01
32. Which carbon of the pentose is in ester linkage with the phosphate in a nucleotide structure?
    A. C1
    B. C2
    C. C3
    D. C4
    E. C5
33. Unusual nucleotide pseudouridylic acid is present in:
    A. mRNA
    B. tRNA
    C. rRNA
    D. hnRNA
    E. All of the above
34. A nucleoside can be composed of, except:
    A. Purine base
    B. Pentose sugar
    C. Phosphate group
    D. Pyrimidine base
    E. All of the above
35. DNA is present in:
    A. Only nucleus
    B. Only mitochondria
    C. Both nucleus and mitochondria
    D. Cytoplasm

E. Endoplasmic reticulum

36. The biologically active form of vitamin D '**calcitriol**' is synthesised in …… ……
    A. Liver
    B. Intestine
    C. Skin
    D. Heart
    E. bones
37. Select an enzyme that does **NOT** require flavin adenine nucleotide as a prosthetic group
    A. Xanthine oxidase
    B. Cytochrome-C-reductase
    C. D-amino acid oxidase
    D. Aldehyde oxidase
    E. Fumarate dehydrogenase
38. Which one is **NOT** a component of nicotinamide adenine dinucleotide (NAD^+)?
    A. Flavin
    B. Nicotinamide
    C. Two molecules of D-ribose
    D. Two molecules of phosphoric acid
    E. One molecule of adenine.
39. Deficiency of niacin manifests as ……
    A. Night blindness
    B. Pellagra
    C. Beriberi
    D. Cheilosis
    E. Scurvy
40. …… is **NOT** a clinical significance of Vitamin E deficiency
    A. Muscular dystrophy
    B. Cheilosis
    C. Haemolytic anaemia
    D. Dietary hepatic necrosis
    E. Macrocytic anaemia

SECTION B: SHORT ANSWER QUESTIONS (5 marks each. Total 30 marks). Answer all questions

1. Name and draw structures of **THREE** amino acids with aromatic side chains
2. Sketch a general titration curve for glycine against NaOH concentration as a function of pH, indicating the various ionic species at specific pH levels. (pK1=2.34; pK2=9.60)
3. Illustrate the structural differences between sucrose and maltose
4. When glycerol is condensed with one fatty acid it is called_____a_____; whereas when it is condensed with three fatty acids it is called _____b_____. Membrane lipids are _____c_____ as they contain both hydrophilic and hydrophobic regions. ____d_____ are cell membrane components that have carbohydrate residues attached to a sphingosine and fatty acid. Draw a (18: 2 Δ9,12) fatty acid: _____e_____.
5. Draw a schematic diagram of various stages of the life-cycle of a cell
6. Outline any **FIVE** biochemical roles of vitamin A

SECTION C: LONG ESSAY QUESTIONS (10 marks each. Total 30 marks). Answer all questions in this section.

1. Briefly account for stereochemistry of the monosaccharides
2. Describe the distinguishing features of the **FOUR** levels of conformations of proteins
3. Describe the structure of a biological membrane as proposed by the fluid mosaic model and indicate the location and placement of the various components of the cell membrane