(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS
MAIN EXAMINATIONS

UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

END OF TRIEMESTER EXAMINATIONS
FOR THE DEGREE
OF
BACHELOR OF MEDICINE AND BACHELOR OF SURGURY

COURSE CODE: MBS 101

COURSE TITLE: MEDICAL BIOCHEMISTRY I

DATE: 20/04/22 **TIME:3 HOURS**

INSTRUCTIONS TO CANDIDATES

Answer ALL questions in section A and B and ANY THREE selected from section C

TIME: 3 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 8 Printed Pages. Please Turn Over.

SECTION A: MULTIPLE CHOICE QUESTIONS (1 mark each, total 40 marks) Answer all questionS

1. Which of the following is a non-reducing sugar
   A. Sucrose
   B. Xylose
   C. Lactose
   D. Maltose
   E. Ribose
2. Table sugar is:
   A. Glucose
   B. Sucrose
   C. Lactose
   D. Maltose
   E. Mannose
3. Mucins are key components of
   A. Saliva
   B. Urine
   C. Blood
   D. Mucus
   E. A,B and C
4. Glucose and galactose differ structurally in orientation of OH on
   A. C1
   B. C2
   C. C5
   D. C4
   E. C3
5. Which of the following sugars is a ketose
   A. Glucose
   B. Galactose
   C. Fructose
   D. Ribose
   E. None of the above
6. Starch and glycogen are polymers of
   A. Galactose
   B. Glucose
   C. Fructose

D. Mannose
E. Lactose

7. What is the orientation of the glycosidic bond in a maltose unit
   A. α, (1→4)
   B. α,β (1→6)
   C. β(1→4)
   D. α(1→6)
   E. None of the above
8. Ribulose is the same as which of the following
   A. Ketotetrose
   B. Ketopentose
   C. Ketoaldose
   D. Aldotetrose
   E. Aldopentose
9. Starch formation is the linkage of the following bonds
   A. α-1,4 glycosidic bonds only
   B. α-1,4- and β-1,4- glycosidic bonds
   C. beta- 1,4- glycosidic bonds only
   D. phosphodiester bonds only
   E. A, B and C
10. Which of the following amino acids is optically inactive
   A. Serine
   B. Threonine
   C. Tyrosine
   D. Glycine
   E. Proline
11. Which bond is present in the primary structure of a protein
   A. Hydrogen bond
   B. Peptide bond
   C. Ionic bond
   D. Disulphide bond
   E. Ester bond
12. Which of the following statements is **TRUE** about proteins
   A. Proteins are made up of amino acids
   B. Proteins are essential for the development of skin, teeth and bones
   C. Protein is the only nutrient that can build, repair and maintain body tissues
   D. All of the above
   E. None of the above
13. Which amino acid listed below is a basic amino acid
   A. Asparagine
   B. Alanine
   C. Glutamine
   D. Arginine
   E. serine
14. Select an amino acid containing a pyrrrolidone ring in its structure
   A. Tryptophan

B. Proline
C. Tyrosine
D. Isoleucine
E. Phenylalanine

15. Identify an acidic amino acid
A. Methionine
B. Cysteine
C. Aspartic acid
D. Leucine
E. None of the above

16. Which amino acid is involved in synthesis of nitrogenous bases
A. Tyrosine
B. Glycine
C. Cysteine
D. Tryptophan
E. Glutamine

17. Which of the following proteins is a fibrous protein
A. Hemoglobin
B. Keratin
C. Immunoglobulin
D. Myosin
E. All of the above

18. Which of the following factors is **NOT** responsible for denaturation of proteins
A. Heat
B. Charge
C. pH change
D. Organic solvents
E. A, C and D

19. Which of the following is responsible for specifying the 3D shape of a protein
A. The peptide bond
B. The amino acid sequence
C. Interaction with other polypeptides
D. Interaction with molecular chaperons
E. The polypeptide chain

20. ———— is **NOT** a classified form of conjugated proteins
A. Lipoproteins
B. Glycoproteins
C. Metalloproteins
D. Complete proteins
E. A, B and C

21. Choose a statement that is **FALSE** about deoxyribonucleic acid.
A. It is double-stranded
B. It uses the nitrogenous base thymine
C. The sugar in it is deoxyribose.
D. It is a left handed helix.
E. Each turn of the helix involves 10 bases pairs.

22. Which of the ATP-driven active transporters is **NOT** matched with its function
    A. P- type - Transport of Na^+, K^+
    B. C-type – Transport Ca^{2+}
    C. V-type - Pumps H^+ into lysosomes and synaptic vesicles
    D. F-type - Transport protons by using ATP but synthesize ATP when function in reverse direction.
    E. ABC Transporter - A chloride channel involved in the causation of cystic fibrosis.
23. Select a symptom that is **NOT** associated with deficiency of vitamin B12.
    A. Night blindness
    B. Megaloblastic anaemia.
    C. Neurological disturbances
    D. Gastric atrophy and
    E. Malabsorption.
24. Choose a statement that is **ODD** concerning the physiological and medical significance of gangliosides
    A. They give integrity to the plasma membrane
    B. Act as specific receptors for certain pituitary glycoprotein hormones.
    C. A defect in their degradation results in Tay-Sachs disease
    D. Act in cell-cell recognition
    E. Act as receptor for cholera toxin
25. Which of the statement is **NOT TRUE** in regard to vitamin D deficiency?
    A. An individual experiencing vitamin D poisoning may complain of weakness, fatigue, loss of appetite, nausea, and vomiting
    B. Excessive exposure to sunlight does not lead to vitamin D toxicity
    C. Hypervitaminosis D induces hypercalcemia
    D. Severe vitamin D deficiency results in the failure of bone to mineralize
    E. Severe vitamin D deficiency results in neurological symptoms
26. In a single strand of a nucleic acid, nucleotides are linked by._____to form a polynucleotide
    A. Hydrogen bonds.
    B. Phosphodiester bonds.
    C. Ionic bonds.
    D. Van der Waals forces.
    E. Hydrophobic interactions.

27. The **MOST** abundant phospholipids in the plasma membrane is._____
    A. Phosphatidylglycerol
    B. Sphingolipids
    C. Phosphatidylcholine
    D. Cholesterol
    E. Glycerophospholipids

28. Which of the following conditions **DOES NOT** predispose a person to risk of vitamin K deficiency?
    A. Taking vitamin K anticoagulant drugs such as warfarin, Coumadin and heparin.
    B. Severe liver damage or disease and disorders of fat malabsorption.
    C. Children that are exclusively breast fed
    D. Taking large doses of vitamin A and vitamin E.
    E. Long-term use of antibiotics.

29. Choose a statement that is **FALSE** about absorptive pinocytosis
    A. It is a selective process
    B. Energy is obtained from hydrolysis of ATP
    C. It involves uptake of macromolecules such as low density lipoproteins
    D. The process involves high affinity receptors
    E. Presence of invaginations coated with a filamentous material

30. _____ is a polyunsaturated fatty acids that **MUST** be provided in the human diet
    A. 1,3-distearopalmitin
    B. Oleic
    C. Palmitoic acid
    D. Stearic acid
    E. Linolenic acid

31. Which is the **MAIN** biochemical function of vitamin E?
    A. Promotes normal growth and development
    B. Promotes normal red blood cell formation
    C. Acts as anti-blood clotting agent
    D. Act as an oxidant
    E. Plays some role in the body's ability to process glucose

32. _____is a lipid derived compound that **DOES NOT** play a regulatory role in the human body
    A. Estrogen
    B. Testosterone
    C. Retinol
    D. Prostaglandins
    E. Progesterone

33. Choose a statement that is **FALSE** about amphipathic compounds
    A. Orient their hydrophobic moiety towards the water phase
    B. They include all phospholipids
    C. Possess hydrophobic and hydrophilic groups in the same molecule
    D. They form spherical clusters called micelles
    E. Monovalent metal salts of long chain fatty acids are an example

34. The cleavage of phosphodityl inositol produces _____and _____

A. Diacyglycerol and Inositol triphosphate
B. Triacylglycerol and Inositol triphosphate
C. Diacylglycerol and Inositol diphosphate
D. Diacylglycerol and Inositol monophosphate
E. Triacylglycerol and Inositol diphosphate

35. Which of the following conditions are associated with poor absorption of fat soluble vitamins?
A. Cystic fibrosis
B. Renal disease
C. ulcerative colitis
D. Cholestatic liver disease
E. Crohn's disease

36. _____is **NOT** a biochemical function of thiamin
A. Oxidative decarboxylation of keto-acids
B. Transketolase reaction of hexose mono phosphate shunt as a carrier of ketol group.
C. In Tryptophan metabolism for the activity of Tryptophan pyrrolase.
D. In glycolysis for the activity of hexokinase
E. Coenzyme of pyruvate carboxylase in yeasts for the non-oxidative decarboxylation of pyruvate to acetaldehyde.

37. Which is **NOT** a feature of restriction endonuclease
A. Recognize a specific DNA sequence called restriction site
B. Used to create DNA fragments for cloning
C. Help to analyze positions of restriction sites in cloned or genomic DNA
D. Are found naturally in bacteria as a defense against viral DNA.
E. Break a hydrophobic linkage between a 3' carbon and phosphate

38. Select a statement that **DOES NOT** explain cell-based molecular cloning
A. Taq polymerase is used as a primer
B. Restriction enzymes are employed to cut DNA at specific sequences
C. Utilizes independently replicating DNA circles called plasmids
D. Foreign DNA are inserted into a plasmid and then replicated
E. DNA ligase is used to attach 2 pieces of DNA together

39. Choose a feature that **DOES NOT** refer to a replicon
A. A DNA sequence that DNA polymerase will bind to and initiate replication.
B. Replicons are usually species-specific.
C. Contain polylinker
D. Some replicons allow many copies of the plasmid in a cell, while others limit the copy number or one or two.
E. Carry a selectable marker

40. Tetrahydrofolate, the biological active form of folic acid is involved in the transfer and utilisation of the following with the **EXCEPTION** of._____

A. Methyl ($-CH_3$)
B. Carboxylate (–COO)
C. Formate (H.COOH)
D. Formimino group (–CH=NH)
E. Hydroxymethyl ($-CH_2OH$)

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

1. Define the following terms
   a) Zwitterion
   b) Isoelectric pH
   c) Reducing sugar
   d) Apoprotein
   e) Proteoses
2. List examples of essential amino acids
3. Using structures, differentiate between starch and cellulose
4. Outline the general features of the secondary structure of tRNA
5. Discuss vitamin A deficiency
6. Discuss cerebrosides using the headings below
   a. The components (1 mark)
   b. Where they are found in the body (1 mark)
   c. Classification (3 marks)

SECTION C: LONG ESSAY QUESTIONS (10 marks each total 30 marks). Answer any 3 questions

1. Giving examples, explain the importance of proteins in the diet (10 marks)
2. (a) Explain four characteristics of monosaccharides (5 marks)
   (b) State any three forms of dissacharides and give occurrence in each case (5 marks)
3. Riboflavin is a fat soluble vitamin. Draw its structures and hence discuss its role as a cofactor and related deficiency manifestation (10 marks)
4. Describe the four basic levels (order) of structure protein architecture
5. Biological membranes are cell structures with a wide range of biochemical functions.
   a) Draw the structure of the plasma membrane (4 marks)
   b) Explain the function of integral proteins (6 marks)