AMREF INTERNATIONAL UNIVERSITY

SCHOOL OF MEDICAL SCIENCES

DEPARTMENT OF REHABILIATION MEDICINE

BACHELOR OF SCIENCE IN PHYSIOTHERAPY

END OF TRIMESTER EXAMINATIONS JANUARY TO APRIL 2026

UNIT CODE: PHT 128

UNIT NAME: Biochemistry (Main exam)

DATE: 14 APRIL 2026

TIME: 2 Hours START:11.15AM-STOP:1.15PM

INSTRUCTIONS

1. **All students will have two (2) hours to complete the examination**
2. **This is an online exam, Attempt all questions as per the instruction**
3. **It is the student's responsibility to report any page and number missing in this paper.**
4. **Check that the paper is complete**
5. **Total number of pages is 9 including the cover.**
6. **Read through the paper quickly before you start.**

SECTION A: ANSWER ALL QUESTIONS **(30 MARKS)**

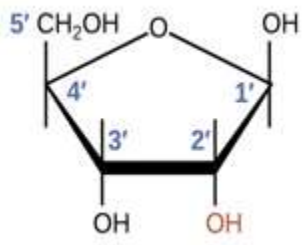
1. Which of the following statements is TRUE about amino acids with uncharged polar side chains?
   A. More hydrophilic because they form hydrogen bonds with water.
   B. Includes tyrosine, serine, threonine, cysteine, asparagine, and glutamine.
   C. Cysteine contains a hydroxyl group (-OH),
   D. Serine and threonine contain (-S-S-) bond.

2. Which of the following statement is true about nucleotides?
   A. Nucleotides are inorganic molecules that serve as monomer units for forming nucleic acids.
   B. Nucleotides are nitrogenous bases with 5-carbon sugar.
   C. Nucleotides plus a phosphate group yields a nucleoside
   D. Nucleotides also play a central role in metabolism at a fundamental, cellular level.
3. Which of the following statements is not a feature an active site on an enzyme?

   A. They take up a relative small part of the total volume of the enzyme.
   B. Substrates are bound to enzymes by multiple weak attraction at the active site.
   C. Active sites are clefts and crevices.
   D. Active sites are two dimensional entities formed by groups coming from different parts of a linear amino acid sequence.

4. Which of the following is not a function of lipids?
   A. Storage of energy
   B. Signaling
   C. Structural component of cell membranes
   D. Component of nucleic acids

5. Identify the molecule and nucleic acid where it is found.



   A. Deoxyribose, DNA
   B. Deoxyribose, RNA
   C. Ribose, DNA
   D. Ribose, RNA

6. In terms of DNA and RNA structure, what is a nucleotide?
   A. A nucleotide is a heterocyclic base
   B. A nucleotide is a sugar molecule covalently bonded to a heterocyclic base
   C. A nucleotide is a sugar molecule bonded to phosphate group/s and a heterocyclic base
   D. A nucleotide is a heterocyclic base bonded to phosphate group/s
7. In DNA structure, what is a histone octamer?
   A. A complex consisting of eight positively charged histone proteins (two of each H2A, H2B, H3 and H4) that aid in the packaging of DNA
   B. A complex consisting of eight negatively charged histone proteins (two of each H2A, H2B, H3 and H4) that aid in the packaging of DNA
   C. A complex consisting of nine positively charged histone proteins (H1 and two of each H2A, H2B, H3 and H4) that aid in the packaging of DNA.
   D. A complex consisting of nine negatively charged histone proteins (H1 and two of each H2A, H2B, H3 and H4) that aid in the packaging of DNA.
   1. Lipids are a diverse group of organic compounds that are insoluble in:
      a. Water
      b. Alcohol
      c. Acetone
      d. All of the above
8. Which of these is not a lipid?

   (a) Fats

   (b) Oils

   (c) Proteins

   (d) Waxes

9. Beta-oxidation of fatty acids occurs in

   (a) Peroxisome

   (b) Peroxisome and Mitochondria

   (c) Mitochondria

   (d) Peroxisome, Mitochondria and ER

10. This is an example of derived lipids

    (a) Terpenes

    (b) Steroids

    (c) Carotenoids

    (d) All of the above

11. The specific gravity of lipid is

    (a) 1.5

    (b) 1.0

    (c) 0.8

    (d) 0.2

12. Which of the following is an Analogue of starch?

    A. Cellulose

    B. Glycogen

    C. Sucrose

    D. Pentose

13. Majority of the monosaccharides found in the human body are of

    A. L-type

    B. D-type

    C. DL-types

    D. None of the above

14. What is the name of a linkage between two monosaccharide?

    A. Ionic bond

    B. Covalent bond

    C. Hydrogen bond

    D. Glycosidic bond

15. If OH group is to left of last stereocenter carbon than configuration is

    A. D

    B. L

    C. α

    D. β

16. When mixed with iodine glycogen turns

    A. Blue

    B. Purple

    C. Pink

    D. Red

17. Lactose is an example of

    A. Polysaccharides

    B. Monosaccharides

    C. Disaccharides

    D. Oligosaccharides

18. A monosaccharide switches from an open chain to a cyclic form through

A. Hydroxylation

B. Carbation

C. Nucleophilic addition

D. Hydrogenation

19. Which term most precisely describes the cellular process of breaking down large molecules into smaller ones?

A. Catalysis
B. Metabolism
C. Anabolism
D. Catabolism

20. Which of the following is (are) true for anabolic pathways?

A) They do not depend on enzymes.

B) They are usually highly spontaneous chemical reactions.

C) They consume energy to build up polymers from monomers.

D) They release energy as they degrade polymers to monomers.

21. Why is ATP an important molecule in metabolism?

A. Its hydrolysis provides an input of free energy for exergonic reactions.
B. It provides energy coupling between exergonic and endergonic reactions.
C. Its terminal phosphate group contains a strong covalent bond that when hydrolyzed releases free energy.
D. Its terminal phosphate bond has higher energy than the other two.

22. Sucrose is a disaccharide, composed of the monosaccharides glucose and fructose. The hydroly sis of sucrose by the enzyme sucrase results in

A) Bringing glucose and fructose together to form sucrose.
B) The release of water from sucrose as the bond between glucose and fructose is broken.
C) Breaking the bond between glucose and fructose and forming new bonds from the atoms of water.
D) Production of water from the sugar as bonds are broken between the glucose monomers.

23. The active site of an enzyme is the region that

A) Binds allosteric regulators of the enzyme.
B) Is involved in the catalytic reaction of the enzyme.
C) Binds the products of the catalytic reaction.
D) Is inhibited by the presence of a coenzyme or a cofactor

24. Which of the following can be overcome by increasing substrate concentration in an enzymatic reaction?

A. denaturization of the enzyme
B. allosteric inhibition
C. competitive inhibition
D. saturation of the enzyme activity

25. Zinc, an essential trace element for most organisms, is present in the active site of the enzyme carboxypeptidase. The zinc most likely functions as a(n)

A) competitive inhibitor of the enzyme.
B) noncompetitive inhibitor of the enzyme.
C) allosteric activator of the enzyme.
D) cofactor necessary for enzyme activity.

26. What is the currency of readily available reducing power in cells?

A. NADH
B. ATP
C. NAD^+
D. NADPH

27. Which of the following is the reason why the body skeletal muscle prefers to store glucose (energy) as glycogen?
    A. Fat cannot be oxidized under anaerobic condition.
    B. Acetyl-CoA of fat oxidation cannot be converted to glucose.
    C. Skeletal muscle is unable to mobilize fat rapidly.
    D. All the above

28. What is the name of the process that converts glycogen to glucose and other small molecules?
    A. Glycogenolysis
    B. Glycogenesis
    C. Gluconeogenesis
    D. Glycolysis
29. Which of the following diseases does not occur as a result of a deficiency in ketone bodies metabolism?
    A. Hyper ketonemia
    B. Hepatic Encephalopathy
    C. ketonuria
    D. Ketoacidosis

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SECTION B: ANSWER ALL QUESTIONS **(20 MARKS)**

31. Explain FIVE medical application of proteins. (4 marks)
32. Describe the occurrence of cataracts a metabolic disorder. (4 Marks)
33. Explain medical application of fatty acids. (4 Marks)
34. Enumerate THREE medical importance of Krebs cycle. (3 marks)
35. Explain FIVE unique physical properties of water and their biological utility. (5 marks)

SECTION C: ANSWER ANY TWO QUESTIONS **(20 MARKS)**

36. Discuss enzyme classification and medical application. (10 marks)
37. Discuss role of insulin in metabolic regulation. (10 marks)
38. Discuss a glycolytic pathway stepwise and its significance in cells. (10 marks)