KATHMANDU UNIVERSITY
End Semester Examination [C]
November/December, 2023

Marks Scored:

Level : B.Tech.
Year : II

Course : BIOT 203
Semester : I

Exam Roll No.:

Time: 30 mins.

F. M. : 20

Registration No.:

Date 04 DEC 2023

SECTION "A"

[20Q × 1 = 20 marks]

Choose and encircle the most appropriate option.

1. The precursor for cholesterol synthesis is:
   a. malonyl-CoA b. acetyl-CoA c. propionyl-CoA d. succinyl-CoA

2. Which of the following statements is **NOT TRUE**?
   a. The most hydrophilic R groups are those of the amino acids asparagine and glutamine.
   b. Histidine residues facilitate many enzyme-catalyzed reactions by serving as proton donors/acceptors.
   c. Proline has an aliphatic side chain with a distinctive cyclic structure.
   d. The amino acid residues in protein molecules are exclusively L-stereoisomers.

3. The _____ effect is a distinguishing characteristic of enzymes and is responsible for the plateau in the plot of V_o versus [S].
   a. hypercatalytic b. hypocatalytic c. stimulating d. saturation

4. A coiled coil is an example of:
   a. secondary structure b. tertiary structure
   c. quaternary structure d. supramolecular structure

5. Which of the following statements is **NOT TRUE**?
   a. Gluconeogenesis and glycolysis are not identical pathways running in opposite directions.
   b. Liver glycogen serves as a reservoir of glucose for other tissues when dietary glucose is not available.
   c. Glucose 6-phosphatase, an enzyme responsible for dephosphorylating glucose, is present in liver, muscle, and adipose tissue.
   d. All the enzymes in the pentose phosphate pathway are located in the cytosol.

6. _____ help to generate a semipermeable barrier between cellular compartments and to regulate membrane fluidity.
   a. Integral membrane proteins b. Peripheral proteins
   c. Oligosaccharides of glycoproteins d. Cholesterol molecules

7. Anencephaly and spina bifida are caused by a deficiency of:
   a. Niacin b. riboflavin c. thiamin d. folate

8. Mitochondrial DNA and chloroplast DNA:
   a. are always circular b. are always linear
   c. can be circular or linear d. do not encode proteins.

9. During glycolysis, when one molecule of glucose is converted into two molecules of pyruvate, there is a net production of _____ molecules of ATP.
a. 2 b. 4 c. 6 d. 8

10. Which one of the following steps happens during oxidative phosphorylation?
a. As electrons flow through the electron transport chain, protons are pumped into the mitochondrial matrix.
b. Electrons pass sequentially through the electron transport chain located in the outer and inner membranes of the mitochondria.
c. The streaming of protons through the F_1 subunit causes the $\alpha_3\beta_3$ spheroid to rotate.
d. The entry of protons into the matrix of mitochondria is coupled with the production of ATP.

11. The N-glycosidic bond links:
a. base to sugar in a nucleotide.
b. sugar to phosphate in a nucleotide.
c. adjacent nucleotides in one strand of DNA.
d. complementary nucleotides in the DNA double helix.

12. Glucagon _____ free fatty acid release from adipocytes.
a. normalizes b. increases c. decreases d. does not effect

13. Which of the following statements is **NOT TRUE**?
a. Disulfide bonds play a special role in the structures of many proteins by forming covalent links.
b. The terminal stages of ammonia intoxication in humans are characterized by the onset of a comatose state accompanied by cerebral edema and increased cranial pressure.
c. Glutathione, which is derived from cholesterol, detoxifies hydrogen peroxide into water and donates electrons to several antioxidant enzymes.
d. Glutamine is a nontoxic transport form of ammonia and is normally present in the blood in much higher concentrations than other amino acids.

14. Of all chemical bonds, the strongest one is:
a. hydrogen bond b. ionic bond c. covalent bond d. hydrophobic interaction

15. _____ is shared by the citric acid cycle and the urea cycle.
a. Alpha-ketoglutarate b. Succinyl-CoA
c. Oxaloacetate d. Fumarate

16. Which of the following statements is **NOT TRUE**?
a. The occurrence of glycolysis and the TCA cycle in mitochondria facilitates electron flow to the respiratory chain.
b. Coenzyme A acts as an acetyl group carrier.
c. Weak interactions between enzyme and substrate are optimized in the transition state.
d. The tertiary structure of a globular protein is determined by its amino acid sequence.

17. The inhibition of aspartate transcarbamoylase (ATCase) by CTP is an example of:
a. competitive inhibition b. noncompetitive inhibition
c. suicide inhibition d. feedback inhibition

18. Chylomicrons, which are synthesized in the small intestine, _____.
    a. move through the bloodstream and enter the lymphatic system
    b. move through the lymphatic system and enter the bloodstream
    c. are remnants of low-density lipoproteins
    d. are the heaviest of all lipoproteins

19. Which of the following statements is **NOT TRUE**?
    a. Proteins are polymers of amino acids, with each amino acid residue joined to its neighbor by a specific type of covalent bond.
    b. Virtually all the mass of an atom is concentrated in the nucleus.
    c. Most vertebrate animals cannot use cellulose as a fuel source because they lack an enzyme to hydrolyze the $\alpha 1 \Rightarrow 4$ linkages.
    d. Hemoglobin has four polypeptide subunits, all of which are held together by noncovalent interactions.

20. Gout is a disease of the joints caused by an elevated concentration of _____ in the blood and tissues.
    a. acetic acid b. pyruvic acid c. lactic acid d. uric acid

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Semester : I
F. M. : 55

SECTION "B"

[5Q × 3 = 15 marks]

Attempt *ANY FIVE* questions.

1. With appropriate diagrams, write about the lock-and-key model and the induced-fit model of enzyme-substrate binding.

2. "Loss of protein structure results in loss of its function." Explain the foregoing statement with an example.

3. What are supramolecular complexes? Explain with a suitable example.

4. With appropriate examples, differentiate between glycoproteins and proteoglycans.

5. What are lipoproteins and their functions? Mention the biological roles of HDL and VLDL.

6. Explain Chargaff's rule. What did Rosalind Franklin contribute to elucidating the structure of DNA?

7. Define dietary fiber. What are the benefits of incorporating dietary fiber into your diet?

SECTION "C"

[5Q × 5 = 25 marks]

Attempt *ANY FIVE* questions.

8. What is mutarotation? Describe the mutarotation of D-glucose with the help of Fischer projection and Haworth perspective formula. [1+4]

9. Discuss the roles of mRNA, tRNA, and rRNA in protein synthesis. What are the functions of eukaryotic mRNA "cap" and "poly(A) tail"? [3+2]

10. Elaborate on the structure of the most abundant protein in the human body. Name a disease associated with that protein and describe the molecular basis of the disease. [2.5+1+1.5]

11. What are ketone bodies? What are their physiological roles? Discuss a pathological condition in which ketone bodies are overproduced. [1+2+2]

12. With an appropriate diagram, explain the urea cycle and mention its biological significance. [4+1]

13. Elaborate on the structure and functions of nuclear DNA and mitochondrial DNA. [3+2]

14. What triggers insulin release from the beta-cells of the islet of Langerhans? Describe the structure and metabolic functions of insulin. [1+4]

SECTION "D"

[2Q × 7.5 = 15 marks]

Attempt *ANY TWO* questions.

15. Using suitable figures, elaborate on all the forces stabilizing the three-dimensional structure of proteins.

16. "Cellular respiration occurs in three stages." Utilizing illustrations, explain the foregoing statement in detail, taking glucose as an example in the first stage.

17. 17. With the help of a flowchart, describe the β-oxidation of fatty acids. What is the significance of this pathway? How is the pathway regulated? [4+1+2.5]