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University Examinations 2024/2025

SECOND YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF MEDICAL LABORATORY

HML 3214/HMU 3111: PROTEINS AND ENZYMES

DATE: JANUARY 2025 **TIME: 3 HOURS**

INSTRUCTIONS:
Answer ***All*** *questions*
Ensure that all your answers are properly numbered
Part I multiple Choice Questions (MCQ): Write the correct answer on the space provided in the answer booklet. Each MCQ is one mark
Part II: Short Answer Questions – Answer questions following each other on the answer booklet
Part III: Long Answer Questions – Answer each question on the answer booklet

SECTION A: MULTIPLE CHOICE QUESTIONS (20 marks)

1. In feedback inhibition, the product of a metabolic pathway acts as an inhibitor of:
   a) The enzyme responsible for the first step
   b) The enzyme responsible for the last step
   c) The enzyme with the lowest activity
   d) The enzyme responsible for the middle step

2. The following enzymes can be used for the diagnosis of liver disease
    a) Amylase
    b) plasma alanine aminotransferase (ALT)
    c) Gamma-glutamyl transferase(GGT)
    d) Alkaline phosphatase(ALP)
3. Which of the following is a form of reversible enzyme inhibition?
    a) Phosphorylation
    b) B.AlloSteric regulation
    c) Proteolytic cleavage
    d) Irreversible inhibition
4. What is the principle behind size-exclusion (gel filtration) chromatography?
    a) Small molecules are retained longer, while large molecules elute first
    b) Large molecules are retained longer, while small molecules elute first
    c) Molecules are separated based on charge
    d) Proteins are separated based on affinity for a ligand
5. Which of the following interactions is primarily responsible for stabilizing the tertiary structure of a protein?
    a) Hydrogen bonding
    b) Disulfide bridges
    c) Hydrophobic interactions.
    d) All of the above
6. Which of the following is an example of a post-translational modification
    a) RNA splicing
    b) Glycosylation
    c) DNA replication

d) Transcription

7. During a heart attack the following enzymes are elevated EXCEPT
   a) CK
   b) LDH
   c) AST
   d) ACP
8. Glycosylation often occurs in which part of the cell?
   a) Nucleus
   b) Golgi apparatus
   c) Mitochondria
   d) Cytosol
9. The short DNA fragments that are placed onto a microarray are called
   a) Markers
   b) Probes
   c) mRNA
   d) Test sequence
10. The following is true about an enzyme
    a) Enzymes reduces the rate of reaction as it approaches equilibrium
    b) Enzyme is not changed as a result of catalysis
    c) Enzyme changes the equilibrium constant of a reaction
    d) Enzymes is used up in the reaction
11. A protein part of an enzyme without any co-factors that may be required for the enzyme to function is called
    a) Isozyme
    b) Zymogen

c) Apo enzyme

d) Holo enzyme

12. In mass spectrometry, what is the role of the inonization source?

a) To separate ions based on their mass

b) To detect the ions and measure their abundance

c) To convert neutral molecules into charged ions

d) To fragment the molecules into smaller pieces

13. What is tandem mass spectrometry (MS/MS) commonly used for

a) To sequence nucleic acids

b) To perform two stages of ionization

c) To fragment ions and analyze their fragments

d) To measure the optical properties of ions

14. At which point does an enzyme-catalyzed reaction reachVmax?

a) When the enzyme is denatured

b) When all enzyme active sites are saturated with substrate

c) When substrate concentration is very low

d) When the product concentration is highest

15. Which of the following Amino acids has to be supplemented in the diet?

a) Phenylalanine

b) Cysteine

c) Glutamine

d) Asparagine

16. Factors that affect separation of amino acids include all of the following except:

a) Solubility

b) Size

c) Rate

d) Acid base property

17. What is the role of a cofactor in enzyme activity

a) It inhibits the enzyme

b) It changes the PH of the environment

c) It enhances or is essential for the enzymes function

d) It increases the enzyme's substrate concentration

18. Marasmus is NOT characterized by

a) Protein deficiency

b) Impaired growth

c) Replacement of tissue protein

d) Swelling of limbs

19. Enzymes that require metal ions such as Mg^{2+} or Zn2+ for their activity are called

a) Coenzymes

b) Prosthetic groups

c) Metalloenzymes

d) Inhibitors

20. Urokinase and streptokinase are example of therapeutic enzymes used to

a) Lower blood pressure

b) Dissolve blood clots in patients

c) Increase red blood cell production

d) Treat infections

SECTION B: SHORT ANSWER QUESTIONS (ANSWER ALL) (40 MARKS)

1. Define the following terms (5 marks)
   a) Protein micro array
   b) Allosteric site
   c) Proteome
   d) Apo enzyme
   e) Isozyme
2. Outline the various enzymes involved with the digestion of proteins in the small intestine (2.5 marks)
3. State 5 functions of proteins (2.5 marks)
4. Write on the hypothesis describing how an enzyme binds to a substrate (5 marks)
5. Outline the various types of post-translational modifications (PTMs) that occur during protein formation (5 marks)
6. Explain how, temperature, PH and the concentration of an enzyme can affect enzyme activity (10 marks)
7. Define enzyme inhibition. Explain in detail the different types of inhibitions with suitable examples (10 marks)

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

1. Discuss using different examples the diagnostic and therapeutic uses of enzymes (20 marks)
2. Write an assay on the different proteomic technologies used in a modern laboratory and the applications of each technique (20 marks)
3. Discuss in details the cause symptoms diagnosis and treatment of at least three inherited metabolic disorder (20 marks)