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University Examinations 2024/2025

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

HMM 3216: ENZYMOLOGY

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. Which of the following is NOT an enzyme classification category?
    A. Oxidoreductases
    B. Hydrolases
    C. Polymerases
    D. D. Lyases
2. What is the role of transferases?
    A. Catalyze oxidation-reduction reactions
    B. Transfer functional groups between molecules
    C. Break bonds by adding water

D. Form double bonds by removing atoms

3. The Michaelis constant (Km) is a measure of:

A. Enzyme efficiency

B. Enzyme velocity

C. Substrate affinity

D. Product concentration

4. Which type of enzyme inhibitor binds to the active site, competing with the substrate?

A. Non-competitive

B. Uncompetitive

C. Allosteric

D. Competitive

5. Enzymes that catalyze the rearrangement of molecules within a compound are called:

A. Ligases

B. Transferases

C. Isomerases

D. Lyases

6. Which of these factors affects enzyme activity?

A. Temperature

B. pH

C. Substrate concentration

D. D. All of the above

7. In enzyme kinetics, the maximum reaction rate (Vmax) represents:

A. The enzyme concentration

B. The maximum substrate concentration

C. The maximum velocity achieved by the enzyme

D. The enzyme turnover number

8. The specificity of an enzyme refers to:
    A. Its ability to catalyze only one type of reaction
    B. The number of substrates it can act on
    C. Its affinity for any substrate
    D. Its turnover rate
9. What is the active site of an enzyme?
    A. The part that binds to inhibitors
    B. The site where the substrate binds
    C. The part that breaks down enzymes
    D. The regulatory region
10. Which term describes the enzyme-substrate interaction model?
    A. Lock and key
    B. Loose fit
    C. Random fitting
    D. Open and close
11. Enzymes function as:
    A. Catalysts that increase reaction rates
    B. Inhibitors that decrease reaction rates
    C. Structural proteins in cells
    D. None of the above
12. Which type of enzyme inhibition is irreversible?
    A. Competitive
    B. Non-competitive
    C. Uncompetitive
    D. Covalent modification
13. Allosteric enzymes are regulated by:
    A. Substrate binding
    B. Product formation

C. Molecules binding at sites other than the active site

D. Changes in temperature

14. A zymogen is:

A. An enzyme with high specificity

B. An inactive precursor of an enzyme

C. An enzyme that catalyzes transfer reactions

D. A denatured enzyme

15. An enzyme that hydrolyzes proteins is known as a:

A. Carbohydrase

B. Lipase

C. Protease

D. Nuclease

16. Which enzyme catalyzes the breakdown of hydrogen peroxide?

A. Amylase

B. Catalase

C. Lipase

D. Protease

17. What is a holoenzyme?

A. A protein without a cofactor

B. An enzyme with its cofactor

C. A denatured enzyme

D. A non-functional enzyme

18. Feedback inhibition in enzyme activity often involves:

A. An increase in enzyme concentration

B. A decrease in substrate concentration

C. The end product binding to the enzyme

D. The enzyme denaturation

19. Which property of enzymes allows them to function repeatedly without being consumed?
    A. Their ability to lower activation energy
    B. Their specificity
    C. Their catalytic nature
    D. Their protein structure
20. The term "apoenzyme" refers to:
    A. A protein without its cofactor
    B. A complete enzyme with cofactor
    C. A denatured enzyme
    D. An enzyme inhibitor

SECTION B: SHORT ANSWER ALL QUESTIONS (40 MARKS)

1. Discuss two factors governing the rate of enzyme-catalyzed reactions (4 marks)
2. Outline four ways thermal inactivation of enzymes can be influenced (4 marks)
3. Briefly explain the mechanisms for the two-substrate reactions (4 marks)
4. Explain the Fischer's "lock and key" hypothesis of enzyme specificity (4 marks)
5. State four ways through which enzymes catalyze reactions (4 marks)

SECTION C: LONG ANSWER TWO QUESTIONS (40 MARKS)

1. Discuss inhibition and activation of enzyme activity (15 marks)
2. Discuss enzyme properties and kinetics (15 marks)
3. a. Discuss coenzymes and prosthetic groups (10 marks)
   b. Explain the progress of enzymatic reactions and measurement of reaction rates (5 marks)