

25 JUN 2023

KATHMANDU UNIVERSITY  
End Semester Examination  
June/July, 2023

Marks Scored:

Level : B.Tech.  
Year : III

Course : BIOT 308  
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date :

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Mark [X] in the most appropriate option.

- Lactase dehydrogenase is an example of  
 Oxidoreductase    Lyases    Isomerases    Ligases
- The unit of specific activity of an enzyme is  
 Units/ml    Units/mg    Units/min    Units/ml.mg
- Enzymes can increase the reaction rate over uncatalyzed reaction by  
  $10^5$  fold     $10^8$  fold     $10^{17}$  fold     $10^{30}$  fold
- Non-Protein organic part of the protein is  
 Co factor    Co Enzyme    Apo enzyme    Iso enzyme
- Sephadex G-100 can fractionate globular proteins in the molecular weight (Da) range of  
 1000- 3000    2000-20000    4000-150000    4000-200000
- The inhibition of alkaline phosphatase by L-phenylalanine is an example of  
 Competitive inhibition    Uncompetitive inhibition  
 Noncompetitive inhibition    Mixed inhibition
- The enzyme nitrogenase is regulated by  
 Covalent modification    Ligand induced modification  
 Ionic modification    Conformational modification
- The catalytic efficiency of different enzymes can be compared by  
  $K_{cat}/K_m$      $K_m$      $K_{cat}$      $V_{max}$
- In determining the steady state kinetic constants for a system, it is best to cover substrate concentrations that yield velocities of  
 10-70 % of  $V_{max}$     20-80 % of  $V_{max}$   
 30-70 % of  $V_{max}$     40-90 % of  $V_{max}$
- Which of the following is the experimental method of determination of kinetic constants using untransformed data?  
 Nonlinear regression    Lineweaver–Burk Plots  
 Eadie–Hofstee Plots    Direct Plots

11. The free Energy of enzymatic reaction is **TRUE**  
 Depends of substrate and product concentration  
 Independent of temperature  
 Depends on enzyme concentration  
 Depends on ph
12. In general, a linear decrease in activation energy results in an  
 exponential decrease in reaction rate       exponential increase in reaction rate  
 linear increase in reaction rate               unchanged reaction rate
13. The mechanism of serine proteases is an example of  
 Covalent catalysis                               Acid base catalysis  
 mixed catalysis                                       redox catalysis
14. The number of amino acid residues in active site that takes part in catalysis by chymotrypsin is  
 1                               2                               3                               4
15. During the enzymatic action of Triosephosphate isomerase "Glu165" acts as a  
 base                               acid                               oxidizing group       reducing group
16. For the SDS Page of enzyme with molecular size 10kDa – 70kDa the gel % to use  
 12%                               10%                               7%                               5%
17. For protein that undergoes dimerization during isolation which method is suitable for determination of molecular weight  
 SDS PAGE     Gel filtration  
 Analytical centrifugation                               Mass Spectroscopy
18. The most common method of determination of amino acid composition of an enzyme  
 Acid hydrolysis     Alkaline hydrolysis  
 Edman degradation     sangers method
19. Both  $k_m$  and  $v_{max}$  are affected in  
 Noncompetitive inhibition                               competitive inhibition  
 uncompetitive inhibition                                       tight inhibition
20. For SDS-PAGE analysis of enzymes, 10 % polyacrylamide gel can be used for the enzymes with molecular weight range of  
 25-200 kDa               10- 70 kDa               20-200 kDa               10-200 kDa

SECTION "B"  
 [10Q × 1=10 marks]

Fill in the blanks.

21. The tightly bound cofactors which cannot be removed by dialysis is called \_\_\_\_\_  
 \_\_\_\_\_.

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22. The techniques for determination of three-dimensional dynamic structure of enzyme in solution is \_\_\_\_\_.
23. The sensitivity of ninhydrin test for determination of amino acid composition of an enzyme by acid hydrolysis is \_\_\_\_\_.
24. Fructose 1,6 biphosphatase inhibition by AMP is an example of \_\_\_\_\_ inhibition.
25. \_\_\_\_\_ is the substrate concentration that results in half-maximal velocity for the enzymatic reaction
26. In \_\_\_\_\_ effect, simply binding the substrate molecule within the enzyme active site contribute to enzyme assisted rate acceleration.
27. Enzymes are restricted to using amino acid side chains with  $pK$  values between \_\_\_\_\_ as general acids and bases.
28. During the enzymatic action of chymotrypsin, the amino acid residue that helps transform water into hydroxide ion is \_\_\_\_\_.
29. An enzyme is least soluble at its \_\_\_\_\_ point.
30. Enzyme works by \_\_\_\_\_ the activation energy of the reaction.

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F. M. : 55

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SECTION "C"  
[3Q × 8 = 24 marks]

Attempt *ANY THREE* questions.

1. Define enzymes. Explain the remarkable properties of enzymes with examples.
2. What are the assumptions in steady state kinetic model? Derive the Michaelis-Menten kinetic equation with steady state model.
3. Explain the mechanism of enzymatic action of Triosephosphate isomerase.
4. Explain the various types of enzyme inhibition and their diagnosis using Lineweaver Burk plot.

SECTION "D"  
[31 marks]

Attempt *ANY Six* question (**Q5 is compulsory**)

5. Write short notes on *ANY TWO*. [2Q × 3 = 6 marks]
  - a. Catalytic turnover
  - b. Michaelis constant
  - c. Enzyme regulation
6. Explain significance of  $K_m$  in the study of enzyme properties [5]
7. Explain the "Edman Degradation" method for the determination of amino acid sequence of an enzyme. [5]
8. Explain how kinetic parameters can be determined using Lineweaver-Burk plots. [5]
9. Explain enzyme catalysis in terms of energetics of a reaction pathway with a diagram. [5]
10. Draw a schematic diagram for steps involved in the purification of adenylate kinase from pig muscles. [5]
11. List the six different classes of enzymes with an example of each class. [5]