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REDEEMER'S UNIVERSITY

DEPARTMENT OF CHEMICAL SCIENCES

BSc (Hons) BIOCHEMISTRY DEGREE

BCH 401: ADVANCED ENZYMOLOGY (2 UNITS)

FIRST SEMESTER EXAMINATION

2018/2019 SESSION

TIME ALLOWED **2 HOURS**

Answer Question 1 and 2 other questions

QUESTION 1

1. Differentiate between nucleophiles and electrophiles.
2. What are the limitations of steady state kinetics?
3. Write concisely on transition state stabilization.
4. Distinguish between the double displacement and sequential bisubstrate reaction mechanisms.
5. Give reasons why peptide bonds are naturally resistant to hydrolysis.
6. Differentiate between a synthetase and a synthase.
7. Briefly explain the concept of suicide inhibition.
8. Enumerate four differences between competitive and non-competitive inhibition.
9. An enzyme catalyzed reaction has a K_m of 8 mM and a V_{max} of 40 Nms^{-1}. What is the reaction velocity when the substrate concentration is 0.5mM?
10. The IUBMB code for 1.1.1.27 designates which enzyme?

[20 marks]

QUESTION 2

(a) Starting from first principles, derive the Michaelis-Menten equation. [10 marks]

(b) Re-arrange the Michaelis-Menten equation into linear transformations. Sketch the plots and indicate the kinetic parameters in each case. [10 marks]

QUESTION 3

(a) Using a suitable example, discuss the mechanism of metal ion catalysis. [10 marks]
(b) Explain, briefly, the activation of zymogens using chymotrypsinogen as an example. [4 marks]
(c) Briefly explain the concept of catalytic triad? [4 marks]
(d) Methanol is toxic to humans. Why? [2 marks]

QUESTION 4

(a) Write a concise note on multi-enzyme complexes using pyruvate dehydrogenase complex as an example. [10 marks]

(b) Using appropriate illustrations, discuss the KNF molecular model of cooperativity. [10 marks]

QUESTION 5

(a) What are oligomeric proteins? [3 marks]
(b) Briefly discuss lactate dehydrogenase as a classical oligomeric protein. [7 marks]
(c) Provide one key difference between a multi-enzyme complex and an oligomeric protein. [2 marks]
(d) Sketch the linear plot of the Hill's equation and indicate the slope and horizontal intercept equivalents. [3 marks]
(e) An oligomeric enzyme has an activity of 85 units/ml in the presence of 12.4 mM of its substrate during catalysis. Determine the dissociation constant (Kd) of the enzyme-catalyzed reaction, if the enzyme's maximum activity was 240 units/ml and Hill's coefficient, $n_H = 3$. [5 marks]

Biochemistry (BCH)

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