ILARA-MOKIN, ONDO STATE

DEPARTMENT OF PHYSICAL AND CHEMICAL SCIENCES

2020/2021 FIRST SEMESTER B.Sc. DEGREE EXAMINATIONS

BCH 307: ENZYMOLOGY

INSTRUCTIONS: ANSWER ANY FOUR (4) QUESTIONS **TIME: 2 HOURS**

1. a. Briefly discuss enzyme classification and nomenclature **(4 marks)**
   b. Briefly explain apoenzyme, holoenzyme and coenzyme **(3 marks)**
   c. Mention 5 industrial enzymes and their applications **(3 marks)**
   d. Rearrange the Michealis-Menten equation to give
      (i.) Lineweaver-Burk and (ii.) Eadie-Hoftsee plots **(3 marks)**
   e. List 4 factors that affect enzyme activity **(2 marks)**
2. a. Use the Michealis-Menten equation to complete the enzymatic kinetic data set; the K_m is known to be 1 mmol/L.

[S] (mmol/L)	v (µmol/L/min)
0.5	50
1.0	-
2.0	-
3.0	-
10	-

(7 marks)

   b. Provide the diagnostic double reciprocal plots that distinguishes competitive, non-competitive and uncompetitive inhibition **(3 marks)**
   c. For a Michealis-Menten reaction,
   $k_1 = 5 \times 10^7\ M^{-1}s^{-1}$, $k_{-1} = 2 \times 10^4\ s^{-1}$ and $k_2 = 4 \times 10^2\ s^{-1}$.
   Calculate K_s and K_m for the reaction. Does substrate binding achieve equilibrium or the steady state **(5 marks)**
3. a. Discuss the catalytic mechanism of either chymotrypsin, carbonic anhydrase or ribonuclease **(10 marks)**
   b. For a typical Michealis-Menten equation, explain scenarios that exists when
   (i) $S<<<K_m$ (ii) $S>>>K_m$ (iii) $S=K_m$ **(5 marks)**

4. a. Derive the Michealis-Menten equation using **EITHER** steady state **OR** equilibrium approach for a single substrate catalyzed reaction **(10 marks)**

b. Using specific examples discuss the phenomenon termed suicide inhibition **(5 marks)**

5. a. Briefly explain metal ion catalysis **(5 marks)**

b. The effect of an inhibitor I on the rate of a single-substrate enzyme catalyzed reaction was investigated and gave the following results:

Substrate [S] mmol/L	Rate of reaction (Without inhibitor)	Rate of reaction (With 0.5 M inhibitor)	Rate of reaction (With 1.0 M inhibitor)
0.05	0.33	0.20	0.14
0.10	0.50	0.33	0.25
0.20	0.67	0.50	0.40
0.40	0.80	0.67	0.57
0.50	0.83	0.71	0.63

Determine the mode of action of the inhibitor **(10 marks)**

6. a. An ATPase was isolated from battong saliva and the following ATP hydrolysis-rate obtained. Determine the K_m and V_{max} **(12 marks)**

[ATP] (mmol/L)	v (µmol/L/min)
5.0	2.6
1.7	1.95
1.0	1.7
0.7	1.4
0.56	1.24

b. During a practical class, a student mistakenly ingested methanol, from your knowledge of enzyme inhibition, suggest possible implications of methanol ingestion and a possible quick remedy (first aid). Provide biochemical basis for your answer. **(3 marks)**