INSTRUCTIONS: ANSWER ANY TWO (2) QUESTIONS   **TIME: 2 HOURS**

1. a. An enzyme with a K_m of 1.2×10^{-2} M was assayed at the following substrate concentration (i) 2×10^{-4} M (ii) 5.6×10^{-3} M (iii) 1.1×10^{-2} M (iv) 2×10^{-3} M and (v) 0.05 M. The initial velocity observed at 5.6×10^{-3} M was 200 nmoles/L/min.

   i.   Calculate the **initial velocities** at the other substrate concentrations   **(4 marks)**

   ii.   If the amount of protein is 14.6 ng and the subunit molecular weight is 22900 Daltons. Estimate the **time taken** for this enzyme to complete one catalytic cycle and the **catalytic efficiency**.   **(4 marks)**

   b. Discuss enzyme classification and nomenclature   **(5 marks)**

   c. Briefly explain apoenzyme, holoenzyme and coenzyme   **(2 marks)**

   d. Briefly explain the significance of K_m, V_{max}, K_{cat} and K_{cat}/K_m **(3 marks)**

   e. Provide the diagnostic double reciprocal plots that distinguishes competitive, non-competitive and uncompetitive inhibition   **(2 marks)**

2. a. Discuss the effect of temperature, pH and inhibitors on enzyme activity   **(3 marks)**

   b. Discuss the catalytic mechanism of either chymotrypsin, lysozyme or ribonuclease   **(4 marks)**

   c. Derive the Michealis-Menten equation using **EITHER** steady state **OR** equilibrium approach for a single substrate catalyzed reaction   **(3 marks)**

   d. Using specific examples discuss the phenomenon termed suicide inhibition   **(3 marks)**

   e. Starch is hydrolyzed by alpha amylase to maltose by *Bacillus subtilis*. The kinetic data obtained is shown in the table below

[Starch] M	Reaction Rate (moles/L/min)
0.1×10^{-3}	0.11×10^{-6}
0.3×10^{-3}	0.25×10^{-6}
0.5×10^{-3}	0.34×10^{-6}
1.0×10^{-3}	0.45×10^{-6}

3.0×10^{-3}	0.58×10^{-6}
5.0×10^{-3}	0.61×10^{-6}
6.0×10^{-3}	0.74×10^{-6}
8.0×10^{-3}	0.82×10^{-5}

    i.   Does the enzyme obey Michealis-Menten equation   **(4 marks)**

   ii.   What is the value of K_m and V_{max} **(3 marks)**

3. From the table below

    a. What type of inhibition is exhibited   **(5 marks)**

    b. Determine the K_i, K_m and V_{max} of an enzyme inhibited at 1 mM of the Inhibitor   **(3 marks)**

[Substrate] Mm	Rate of Reaction (moles/L/min)	Rate of Reaction + 1 mM Inhibitor
0.15×10^{-4}	10.4×10^{-6}	4.1×10^{-6}
0.25×10^{-4}	14.5×10^{-6}	6.4×10^{-6}
0.5×10^{-4}	22.5×10^{-6}	11.3×10^{-6}
1.5×10^{-4}	33.8×10^{-6}	22.6×10^{-6}
4.5×10^{-4}	40.6×10^{-6}	33.8×10^{-6}
6.0×10^{-4}	47.5×10^{-6}	36.5×10^{-6}
9.0×10^{-4}	49.5×10^{-6}	40.5×10^{-6}

c. Mention 5 industrial enzymes and their applications   **(2 marks)**

d. Explain the lock and key model for mechanism of enzyme action   **(2 marks)**

e. Explain the mechanisms that exists for enzymatic catalysis   **(8 marks)**