BINDURA UNIVERSITY OF SCIENCE EDUCATION

BIOLOGICAL SCIENCES DEPARTMENT

BACHELOR OF SCIENCE HONOURS DEGREE IN BIOTECHNOLOGY

ENZYMOLOGY & IMMUNOLOGY (BTECH234)

EXAMINATION 2 HOURS (100 MARKS)

NOV 2024

INSTRUCTIONS

Answer FOUR (4) questions. You MUST answer QUESTION 1 from Section A and any THREE (3) questions from SECTION B. Each question carries 25 marks. Where a question contains subdivisions, the mark value of each part is given in brackets. Illustrate your answer were appropriate with large clearly labeled diagrams. You should not spend more than 30 minutes on each question.

SECTION A (COMPULSORY)

1. (a) With the aid of a diagram describe the structures of the Major Histocompatibilty Class 1. [4]

   (b) Explain the symbols of Michael-Menten equation. [10]

   (c) Explain the process of endogenous antigen processing. [7]

   (d) Outline the biological functions of enzymes in living organisms. [4]

SECTION B. Choose any THREE (3) from FIVE (5) questions below.

2. (a) Describe the general structure of an antibody. [5]

   (b) Outline the roles played by antibodies in the host defence. [8]

   (c) Describe the allosterism of enzymes. [12]

3. (a) Describe any three (3) characteristics of the immune system. [10]
   (b) Describe the role played by cell mediated immunity. [10]
   (c) Using a diagram, describe the structure of T-Cell receptor. [5]

4. Describe the principle behind the ELISA technique.

5. Describe the modes of enzymatic regulation in the human body.

6. Suppose an enzyme catalyzed reaction of converting to 6-gluconic acid by 6-glucodehydrogenase gives the following rates:

Table 1: Effect of glucose concentration on the rate of gluconic acid production.

Glucose Concentration (mM)	Gluconic acid produced (M/min)
1×10^{-5}	0.15
2×10^{-5}	0.25
1×10^{-4}	0.60
3×10^{-4}	0.77
5×10^{-4}	0.81

(i) Perform a rough plot of these result, indicating the appropriate numerical values for the divisions, and the units for reaction velocity and substrate concentration. [10]

(ii) Identify if the shape of this curve suggests that the reaction will reach a maximal rate and explain your reason. [5]

(iii) By inspection of the curve, estimate the maximal rate. [5]

(iv) Draw a horizontal line on the graph to indicate your estimate for the maximal rate of this reaction (V_{max}). [4]

(v) Using your estimated V_{max} from the graph, determine the K_m value for this enzyme. [1]

END OF EXAMINATION PAPER