

GATE XL (Biochemistry)

Enzyme Kinetics:

1. Multiple Choice Question (MCQ - Single Correct)

An enzyme follows Michaelis-Menten kinetics with a **K_m** of **5 mM** and **V_{max}** of **100 μmol/min**. What will be the reaction velocity (**V**) when the substrate concentration is **5 mM**?

- (A) 25 μmol/min
- (B) 50 μmol/min
- (C) 75 μmol/min
- (D) 100 μmol/min

Answer: (B) 50 μmol/min

(Use the Michaelis-Menten equation: $V = \frac{V_{max}[S]}{K_m + [S]}$)

2. Multiple Choice Question (MCQ - Single Correct)

Which of the following statements about competitive inhibition is **correct**?

- (A) It decreases both **V_{max}** and **K_m**
- (B) It decreases **K_m** but does not affect **V_{max}**
- (C) It increases **K_m** but does not affect **V_{max}**
- (D) It decreases both **K_m** and **V_{max}**

Answer: (C) It increases **K_m** but does not affect **V_{max}**

3. Numerical Answer Type (NAT)

A reaction catalyzed by an enzyme follows Michaelis-Menten kinetics. If **V_{max} = 200 μmol/min** and the reaction velocity is **100 μmol/min** when the substrate concentration is **4 mM**, calculate **K_m** (in mM).

(Use the Michaelis-Menten equation to solve.)

Answer: 4 mM

4. Multiple Choice Question (MCQ - Multiple Correct)

Which of the following is/are correct about Lineweaver-Burk plots?

- (A) The **y-intercept** represents **1/V_{max}**
- (B) The **x-intercept** represents **-1/K_m**
- (C) It is a **hyperbolic** plot of enzyme kinetics
- (D) The slope is given by **K_m/V_{max}**

Answer: (A), (B), and (D)

5. Match the Following

Match the type of enzyme inhibition with its effect on kinetic parameters:

Type of Inhibition	Effect on K_m	Effect on V_{max}
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P. Competitive	I. Increases	X. Unchanged
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Q. Non-competitive	II. Unchanged	Y. Decreases
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R. Uncompetitive	III. Decreases	Z. Decreases
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Answer: P $\rightarrow$ (I, X), Q $\rightarrow$ (II, Y), R $\rightarrow$ (III, Z)

