enzyme inhibition. Herein, we explained different types of enzyme inhibition mechanisms and discussed their kinetic characteristics and compared them with those of uninhibited reactions.

12.6 TERMINAL QUESTIONS

1. What are the effects of pH and temperature on enzyme activity?
2. Write the Michaelis-Menten equation and state the meaning of all the terms involved.
3. What is the difference between the Turnover Number (k_{cat}) and the Michaelis constant (K_M)?
4. List different mechanisms of enzyme inhibition.
5. Explain the difference between competitive and uncompetitive inhibition.
6. How does the presence of a competitive inhibitor affect the Michaelis-Menten equation and the Lineweaver-Burk plot?
7. What are the characteristic features of the Lineweaver-Burk plot for competitive, uncompetitive and non-competitive inhibitions?

12.7 ANSWERS

Self-Assessment Questions

1. Enzymes are biological catalysts that speed up chemical reactions in living organisms without themselves getting consumed. The three important characteristics of enzymes are:
   - Catalytic power
   - Specificity and
   - Regulation
2. According to Koshland's hypothesis on mechanism of enzyme action, the binding of the substrate to the enzyme causes alteration in the geometry of the enzyme such that the appropriate groups in the substrate and in the enzyme are in the correct orientation. It differs from the Fischer's hypothesis in that it considers the dynamic nature of enzyme (protein) whereas Fischer assumed the enzyme to have a fixed structure.
3. Lineweaver-Burk plot is an example of double reciprocal plot whereas Hanes-Wolf plot is a single reciprocal plot.
4. Lineweaver-Burk plot is a plot of $\frac{1}{R}$ versus the reciprocal of the substrate concentration, 1/[S]. It is a straight line with slope of $\frac{K_M}{k_2[E]_0}$ and the intercept equal to $\frac{1}{k_2[E]_0}$. The reciprocal of the intercept gives the value of

R_{max} which can then be used along with the slope of the line to get the value of K_M.

5. In case of competitive inhibition the slope of line in the Lineweaver-Burk plot depends on the concentration of the inhibitor whereas in case of uncompetitive inhibition it remains unchanged on changing the concentration of the inhibitor.

Terminal Questions

1. The enzymes show their activity at optimum temperature and pH. Any variation (increase or decrease) in pH or the temperature would decrease the activity of the enzyme.

2. The simplified Michaelis-Menten equation is:

$$R = \frac{R_{max}[S]}{K_M + [S]}$$

The terms are as under:

R : the initial rate of the enzyme catalysed reaction

R_{max}: the maximum rate

[S]: substrate concentration

K_M: Michaelis constant

3. The turnover number of an enzyme is the number of substrate molecules or the moles of the substrate that is converted to product per second per mole of enzyme (or per mole of active site for a multi-subunit enzyme) when the enzyme is fully saturated with the substrate. On the other hand, Michaelis constant refers to the substrate concentration at which the initial rate of the enzyme catalysed reaction is one half of the maximum rate.

4. The different mechanisms of enzyme inhibition are:

   - Competitive inhibition
   - Uncompetitive inhibition
   - Non-competitive inhibition

5. In competitive inhibition there is competition between the substrate, S, and the inhibitor, I, for the active site on the enzyme. On the other hand, in case of uncompetitive inhibition the inhibitor binds to the enzyme substrate complex and makes it unavailable for the product formation.