



Chapter 5

ENZYMES

Life would not be possible without metabolic activities going on. This in turn is dependent upon the catalytic molecules called the enzymes. With out enzymes, the dynamic, steady state of the cell would cease to exist.

Life is a complex, much more involving in perfect coordination of a vast number of chemical reactions. Some of these reactions result in synthesizing large molecules when a breaking large molecules and still others either utilize energy or liberate energy. All these reactions would occur very slowly at low temperature and adverse conditions, the conditions under which living cells carry on their life processes. But in the living system these reactions proceed at extremely high rates. This is due to the presence of some specialised substances or molecules which are synthesised inside the living cells. These substances are called **enzymes** (E_nzyme = in +zyme = yeast). The term enzyme was coined by Frederick Mather Pfliger (1828-1910). Enzymes may be defined as organic substances capable of catalysing specific biochemical reactions in living cells.

Just a few years ago, it was considered that all enzymes were proteins. During the 1930s, however, Thomas Dale and Casper Oliver discovered that certain molecules of ribonucleic acid also function as enzymes. These molecules are called **ribonucleases**, which catalyse reactions involved in processing genetic information to be used by a cell for growth and they are produced in a cell.

5.1 ENERGY OF ACTIVATION

The question arise here, how enzymes are able to accelerate such effective reaction and why thermodynamically favourable reactions do not proceed at their own at relatively noticeable in the absence of enzyme?

Chemical transformation requires that certain chemical bonds be broken within the reactants. To do so the reactants must contain sufficient kinetic energy (energy of motion) to overcome a barrier called energy of activation or activation energy. The important role played by the enzymes during reactions is that they lower the activation energy of the reaction. The enzyme reacts with the energy rich and energy poor molecules to form an intermediate complex. This complex approaches into product and enzyme. If activation energy of the complex is low, many molecules can participate in reaction. In this way activation energy is lowered by the enzyme but in this action equilibrium state of concentration of reactant and product is never altered, it remains the same.

5.2 CHARACTERISTICS OF ENZYME

Enzymes are substances produced in the protoplasm. They are synthesised in the cell. The basic properties of enzymes are:

(i) Most of the enzymes are polypeptides in nature. They are macromolecules of protein nature with higher molecular weight. They may entirely consist of protein e.g. **amylase** or **pepsin** or may contain, along with protein, a non-protein part, e.g. **haemoglobin**.

(ii) They react with both acidic and alkaline substances due to the presence of protein as their major part.

(iii) Enzymes generally act within the living cell where they have been synthesised but sometimes they diffuse out of the cell and perform catalytic function out side the cell or in other cells. An enzyme which acts within the same cell is called **intracellular enzymes** or **endoenzyme** and the enzyme which acts outside the cell is called **exoenzyme**.



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Table of Contents Xi Biology Text Gazi Azmal

1. Understanding the eBook Xi Biology Text Gazi Azmal
 - The Rise of Digital Reading Xi Biology Text Gazi Azmal
 - Advantages of eBooks Over Traditional Books
2. Identifying Xi Biology Text Gazi Azmal
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Xi Biology Text Gazi Azmal
 - User-Friendly Interface
4. Exploring eBook Recommendations from Xi Biology Text Gazi Azmal
 - Personalized Recommendations
 - Xi Biology Text Gazi Azmal User Reviews and Ratings
 - Xi Biology Text Gazi Azmal and Bestseller Lists
5. Accessing Xi Biology Text Gazi Azmal Free and Paid eBooks
 - Xi Biology Text Gazi Azmal Public Domain eBooks
 - Xi Biology Text Gazi Azmal eBook Subscription Services
 - Xi Biology Text Gazi Azmal Budget-Friendly Options
6. Navigating Xi Biology Text Gazi Azmal eBook Formats

- ePub, PDF, MOBI, and More
 - Xi Biology Text Gazi Azmal Compatibility with Devices
 - Xi Biology Text Gazi Azmal Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Xi Biology Text Gazi Azmal
 - Highlighting and Note-Taking Xi Biology Text Gazi Azmal
 - Interactive Elements Xi Biology Text Gazi Azmal
 8. Staying Engaged with Xi Biology Text Gazi Azmal
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Xi Biology Text Gazi Azmal
 9. Balancing eBooks and Physical Books Xi Biology Text Gazi Azmal
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Xi Biology Text Gazi Azmal
 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
 11. Cultivating a Reading Routine Xi Biology Text Gazi Azmal
 - Setting Reading Goals Xi Biology Text Gazi Azmal
 - Carving Out Dedicated Reading Time
 12. Sourcing Reliable Information of Xi Biology Text Gazi Azmal
 - Fact-Checking eBook Content of Xi Biology Text Gazi Azmal
 - Distinguishing Credible Sources
 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
 14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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