Chapter: 03

Enzymes

Objective

1. Lock and key model was proposed by:

Ⓐ Lorenz Oken Ⓑ Rudolph Virchow **Ⓒ Emil Fisher** Ⓓ Koshland

2. Any factor that can alter the chemistry and shape of an enzyme can effect its rate of:

Ⓐ Photolysis Ⓑ Hydrolysis **Ⓒ Catalysis** Ⓓ Activity

3. The catalytic activity of an enzyme is restricted to its small portion called:

Ⓐ Catalytic site Ⓑ Binding site **Ⓒ Active site** Ⓓ Allosteric site

4. Koshland in 1959 proposed the modified form of:

Ⓐ Induce Fit model Ⓑ Fluid mosaic model
Ⓒ Unit membrane model **Ⓓ Lock and key model**

5. An enzyme and its substrate react with each other through definite charge bearing sites called ……... sits.

Ⓐ Binding **Ⓑ Active** Ⓒ Passive Ⓓ Catalytic

6. The active site of the enzyme is made up of two definite regions i.e., the binding site and the:

Ⓐ Non-binding site Ⓑ Non-catalytic site **Ⓒ Catalytic site** Ⓓ Inactive site

7. The non protein part of enzyme responsible for its proper functioning is known as:

Ⓐ Product Ⓑ Reactant **Ⓒ Cofactor** Ⓓ Substarte

8. Poisons like cyanide , antibiotics , anti-metabolites and some drugs are examples of:

Ⓐ Enzymes Ⓑ Coenzymes Ⓒ Holoenzymes **Ⓓ Inhibitors**

9. An inhibitor is a chemical …….. .

Ⓐ None of these **Ⓑ Substance** Ⓒ Protein Ⓓ Enzyme

10. An inhibitor react with enzyme but not transformed into …….. .

Ⓐ None of these Ⓑ Co-enzyme **Ⓒ Product** Ⓓ Enzyme

11. The inhibitor which may destroy the globular structure of enzyme is:

Ⓐ Reversible **Ⓑ Irreversible** Ⓒ Non-competitive Ⓓ Competitive

12. Irreversible inhibitors form which bond with active site?

Ⓐ Ionic bonds Ⓑ Hydrophobic Ⓒ Hydrogen bonds **Ⓓ Covalent bonds**

13 The reversible inhibitors usually constitute:

Ⓐ Medium linkage with enzyme Ⓑ Strong linkage with enzyme
Ⓒ Wear linkage with enzyme Ⓓ No linkage with enzyme

14. Because of the structural similarity with the substrate , competitive inhibitors may be selected by the bin ding sites , but are not able to activate the:

Ⓐ Active sites **Ⓑ Catalytic sites** Ⓒ Ac celerating sites Ⓓ Inactive sites

15. Non-competitive Inhibitors form enzyme inhibitor complex at a point other than the:

Ⓐ Binding site **Ⓑ Active site** Ⓒ Non-catalytic site Ⓓ Catalytic site

16. Optimum pH for the proper functioning of enzyme sucrase is:

Ⓐ 7.60 Ⓑ 4.50 **Ⓒ 5.50** Ⓓ 2.00

17. Optimum pH for sucrase is:

Ⓐ 6.50 Ⓑ 5.50 Ⓒ 3.50 **Ⓓ 4.50**

18. The optimum pH of salivary amylase is:

Ⓐ 8.80 Ⓑ 4.80 **Ⓒ 6.80** Ⓓ 2.80

19. The optimum pH of enzyme pepsin is:

Ⓐ 9 **Ⓑ 2** Ⓒ 7 Ⓓ 6.8

20. The enzyme with optimum pH = 7.60 is:

Ⓐ Sucrase Ⓑ Enterokinase **Ⓒ Catalase** Ⓓ Arginase

21. The Optimum temperature of human body enzyme is:

Ⓐ 57 ^{0}C Ⓑ 47 ^{0}C Ⓒ 27 ^{0}C **Ⓓ 37 ^{0}C**

22: A Little change in pH may leads to:

Ⓐ Effects enzyme only in high concentration Ⓑ Ionization of substrate
Ⓒ Ionization of active sites of enzyme Ⓓ Retard or even block enzyme activity

23. The optimum pH of Enterokinase is:

Ⓐ 3.50 **Ⓑ 7.50** Ⓒ 5.50 Ⓓ 1.50

24. Optimum pH of value for enzyme pepsin is:

Ⓐ 2.00 Ⓑ 5.50 Ⓒ 9.00 Ⓓ 4.50

25. An enzyme with its co-enzyme or prosthetic group removed is designated as:

Ⓐ Activator **Ⓑ Apoenzyme** Ⓒ Co-enzyme Ⓓ Holoenzyme

26. The detachable co-factor of an enzyme is known as:

Ⓐ Apo-enzyme Ⓑ Prosthetic group **Ⓒ Co-enzyme** Ⓓ Activato

27. If non-protein part is loosely attached to protein , it is known as:

Ⓐ Active site Ⓑ Holoenzyme Ⓒ Cofactor **Ⓓ Coenzyme**

28. An activated enzyme with co-enzyme is called:

Ⓐ Activators Ⓑ Coenzyme **Ⓒ Apoenzyme** Ⓓ Holoenzymes

29. Coenzyme are closely related to:

Ⓐ Enzymes **Ⓑ Vitamins** Ⓒ Non protein particles Ⓓ Amino Acids

30. An activated enzyme consisting of polypeptide chain and a factor is known as:

Ⓐ Coenzyme Ⓑ Prosthetic group **Ⓒ Holoenzyme** Ⓓ Apoenzyme

31. Covalently bounded non-protein part is called:

Ⓐ Co-factor **Ⓑ Prosthetic group** Ⓒ Activator Ⓓ Co-enzyme

32. If the non-protein part of enzyme is covalently bounded , then it is called:

Ⓐ Water Ⓑ Carbohydrates **Ⓒ Proteins** Ⓓ Co-enzyme

33. Enzyme are the most important biologically active group of:

Ⓐ Nucleis acids Ⓑ Lipids Ⓒ Carbohydrates **Ⓓ Proteins**

34: The cofactor usually acts as " bridge " between the:

Ⓐ Coenzyme & substrate Ⓑ Cofactor & substrate
Ⓒ Enzyme & substrate Ⓓ Enzyme & product

35. The detachable co-factor is known as an activator if it is:

Ⓐ Inorganic ion Ⓑ Non-ionic **Ⓒ Non-polar** Ⓓ Organic ion

36. Three dimensional globular protein is:

Ⓐ Antibiotic Ⓑ Glucose **Ⓒ Enzyme** Ⓓ Starch

37. Enzyme lowers down the energy of:

Ⓐ Ionic Ⓑ Potential Ⓒ Kinetic **Ⓓ Activation**

38. Which affects the functional specificity of enzymes?

Ⓐ Both B & D Ⓑ Configuration **Ⓒ Structure** Ⓓ Specific chemistry

39. Enzyme are very ..... in their action.

Ⓐ General Ⓑ Slow Ⓒ Fast **Ⓓ Specific**

40. Small amounts of an ..... can accelerate chemical reactions.

Ⓐ Protein **Ⓑ Enzyme** Ⓒ Lipid Ⓓ None of these

41. Some enzymes require a ..... for their proper functioning.

Ⓐ Apoenzyme Ⓑ Holoenzyme **Ⓒ Co-factor** Ⓓ Co-enzyme

42. Pepsinogen is an ..... form of pepsine.

Ⓐ Inhibitor Ⓑ None of these Ⓒ Active **Ⓓ Inactive**

43. An enzyme is a three dimensional ..... protein.

Ⓐ Insoluble **Ⓑ Globular** Ⓒ Elastic Ⓓ Fibrous

44. Induced fit model was proposed by:

Ⓐ Pasteur Ⓑ Jenner **Ⓒ Koshland** Ⓓ Emil Fisher

45. An enzyme reacts only with its specific:

Ⓐ Inhibitor **Ⓑ Substrate** Ⓒ Product Ⓓ Surface

46. According to Lock and Key model the active site is a:

Ⓐ Enzyme Ⓑ Liquid structure Ⓒ Flexible structure **Ⓓ Rigid structure**

47. Emil Fisher proposed a lock and key model in:

Ⓐ 1800 Ⓑ 1880 **Ⓒ 1890** Ⓓ 1990

48. Co-enzyme is closely related to:

Ⓐ Water **Ⓑ Vitamins** Ⓒ Proteins Ⓓ Lipids

49. Enzymes involved in respiration of polypeptide chain and co factor is known as:

Ⓐ Holoenzyme Ⓑ Prosthetic group Ⓒ Apo enzyme Ⓓ Co enzyme

50. If non protein is loosely attached to the protein part it is known as:

Ⓐ Coenzyme Ⓑ None of these **Ⓒ Cofactor** Ⓓ Apoenzyme

51. Biological activated protein is:

Ⓐ Inhibitors Ⓑ None of these Ⓒ Activators **Ⓓ Enzymes**

52. The vitamins are essential raw material for the synthesis of:

Ⓐ Prosthetic group Ⓑ Co-factor **Ⓒ Co-enzyme** Ⓓ Activators

Fill in the blanks

Q1: Enzymes are composed of hundreds of…… .

Q2: Some enzymes consist of a non-protein part known as a …… .

Q3: Many enzymes require non-protein component called …… for their proper functioning.

Q4: Enzymes are highly …… in nature.

Q5: The enzymes which carry out the synthesis of …… are integral parts of ribosomes.

Answers

1. **Amino acids**	2. **Co-factor**	3. **Co-factor**
4. Reactive	**5. Proteins**	

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Subjective

Q1: **What is catalyst?**

Ans: A substrate which in minute amounts promotes chemical change without itself being used up in the reaction.

Q2: **Where are the enzymes important in photosynthesis found in the green cells?**

Ans: These enzymes are found in chloroplasts.

Q3: **Do all the enzymes need a co-factor for their proper function?**

Ans: **No**, some enzymes require a co-factor for their proper functioning.

Q4: **What is the inactive state of the enzyme pepsin known as ?**

Ans: It is known as pepsinogen.

Q5: **How many types of inhibitor?**

Ans: There are two types of inhibitors:

- Irreversible.
- Reversible.

Q6: **What is the optimum temperature for human enzyme?**

Ans: It is 37C.

Q7: **Define enzyme.**

Ans: The enzyme us a proteinaceous compound that catalyses biochemical reactions.

Q8: **Write important characteristics of enzymes.**

Ans: Enzymes have the following characteristics:

- Globular proteins

- Increase reaction rate
- No effect on end product
- Required in small amount
- Specific in action
- Sensitivity
- Require a co-factor
- Lower the activation energy
- Inhibition
- Pure form
- May be damaging

Q9: **How do extreme changes in pH effect the enzyme activity?**

Ans: Extreme changes in pH cause the bonds in the enzyme to break, resulting in the enzyme denaturation.

Q10: **How can the effect of reversible inhibitors be naturalized?**

Ans: Their effect can be neutralized completely or partly by an increase in the concentration of the substrate.

Q11: **Name the scientist who proposed lock and key model in 1890 to account for substrate-enzyme interaction?**

Ans: The name of the scientist is Emil Fischer.

Q12: **What is substrate?**

Ans: Substrate is a substance on which enzyme acts.

Q13: **Name the definite regions of the active site of an enzyme?**

Ans: The definite regions are the binding site and the catalytic state.

Q14: **Quote few examples of inhibitors of enzyme.**

Ans: These are cyanides, antibodies, anti-metabolism and some drugs.

Q15: **What is co-enzyme?**

Ans: It is an organic compound which combines with an enzyme and plays an important part in its catalytic reaction, without being consumed in the process.

Q16: **Write down the optimum pHs for th enzyme pepsin, enterokinase, salivary amylase, catalase and orginase.**

Ans: The optimum pHs for these are 2, 5.5, 6.8, 7.6 and 9.7 respectively.

Q17: **How dose heat accelerate chemical reactions at high temperature.**

Ans: Heat provides activation energy which serves to accelerate chemical reactions at high temperature.

Q18: **List two conditions that destroy enzymatic activity by disrupting bonds between the atoms in an enzyme?**

Ans: These conditions may be extreme increase in temperature and extreme changes in pH.

Q19: **Define prosthetic group.**

Ans: Prosthetic group is the non-protein part of an enzyme which is covalently bonded to the protein.

Q20: **How do irreversible inhibitors check the reaction rate?**

Ans: The irreversible inhibitors check the reaction rate by occupying the active sites of the enzyme or by destroying their globular structure.

Q21: **How do the irreversible inhibitors occupy the active sites if the enzyme?**

Ans: They occupy the active sites either by forming covalent bonds or by blocking the active sites physically.

Q22: **How do low and high temperatures respectively affect the enzyme activity?**

Ans: Low temperature decreases while the high temperature increases the enzyme activity but within certain limits.

Q23: **What are inhibitors?**

Ans: An inhibitor is a chemical substance that can react with the enzyme but it is not transformed into products and thus blocks the active site temporarily or permanently.

Q24: **Who and when proposed induce Fit Model regarding substrate and enzyme interaction?**

Ans: Koshland in1959 proposed induce fit model regarding substrate and enzyme interaction

Q25: **What sort of medium is required by an enzyme, for its activity?**

Ans: Aqueous medium is required by an enzyme, for its activity.

Q26: **Where are the enzymes involved in cellular respiration found in the living cells?**

Ans: These enzymes are found in the mitochondria.

Q27: **How do low and high temperature, respectively effect an enzyme activity?**

Ans: Low and high temperature, respectively effect an enzyme activity:

Temperature and Enzyme Activity:

- The rate of enzyme controlled reaction may increase with increase in temperature but up to certain limit. All enzymes can work at their specific temperature called as optimum temperature. For enzymes of human body 37C is the optimum temperature. Heat provides activation energy and therefore chemical reactions are accelerated at high temperature. Heat also supplies kinetic energy to the reacting molecules, causing them to move rapidly.
- Thus the reactants move more quickly and chances of their collision with each other are increased.However, further increase in heat energy also increases the vibrations of atoms which make up the enzyme molecule. If the vibrations become too violent, globular structure essential for enzyme activity is lost and the enzyme is said to be denatured.

Low Temperature:

- At low temperature kinetic energy become very low due to which enzyme activity cease.

Q28: **List two conditions that destroy enzymatic activity by disrupting bonds between the atoms in an enzyme.**

Ans: High temperature and high pH.

Q29: **Would bio-chemical reaction not operate, if the lining body were without enzymes?**

Ans: The bio-chemical reaction would operate but at such a slow speed that life would be impossible.

Q30: **Differentiate between apoenzyme and holoenzyme.**

Ans: An enzyme whose co-factor has been removed, rendering i.e., catalytically machine is known as an apo-enzyme. When apo-enzyme is combined with is co-enzyme, it forms a holoenzyme.

Q31: **Define co-factor?**

Ans: Any non-protein molecule or ion that is required for the proper functioning of an enzyme is called co-factor. Co-factor can be permanently bound to the active site or ma bind loosely with the substrate during catalysis.

Q32: **What is the active site of an enzyme?**

Ans: Active sites is the small portion of the enzyme to which is its catalytic activity restricted.

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Imp.Long Questions

Q1: Describe in detail the mechanism of enzyme action.

Q2: Give the effect of pH and temperature on the efficiency of an enzyme action.

Q3: What is the importance of enzymes in life?

Q4: Write a detailed note on inhibitors and its different types.

Q5: Explain how enzymes work in enzyme to enzyme chain or association?

Q6: Describe characteristics of enzymes.