

A-LEVEL

Multiple-choice questions on enzymes .

1. Which of the following best describes enzymes?

- A) Inorganic molecules
- B) Protein catalysts
- C) Lipid messengers
- D) Nucleic acids

Answer: B) Protein catalysts

Explanation: Enzymes are biological catalysts, typically proteins, that speed up chemical reactions by lowering the activation energy.

2. What is the primary function of enzymes in living organisms?

- A) Energy storage
- B) Information transfer
- C) Catalyzing chemical reactions
- D) Structural support

Answer: C) Catalyzing chemical reactions

Explanation: Enzymes accelerate chemical reactions in living organisms without being consumed in the process.

3. Which factor does NOT affect enzyme activity?

- A) pH
- B) Temperature
- C) Pressure
- D) Substrate concentration

Answer: C) Pressure

Explanation: While pH, temperature, and substrate concentration affect enzyme activity, pressure has a minimal impact.

4. What is the region on an enzyme where the substrate binds called?

- A) Coenzyme
- B) Active site
- C) Allosteric site
- D) Inhibitory site

Answer: B) Active site

Explanation: The active site is the specific region on an enzyme where the substrate binds and the catalytic reaction takes place.

5. Enzymes can be denatured by excessive:

- A) pH
- B) Substrate concentration
- C) Temperature
- D) All of the above

Answer: D) All of the above

Explanation: Enzymes can be denatured by extremes in pH, substrate concentration, and temperature.

6. What is the role of coenzymes in enzyme function?

- A) Provide structural support
- B) Catalyze reactions
- C) Act as cofactors
- D) Transfer chemical groups

Answer: D) Transfer chemical groups

Explanation: Coenzymes assist enzymes by transferring chemical groups during reactions.

7. Enzymes are highly specific in their actions due to:

- A) Their size
- B) Their shape
- C) Their charge
- D) Their mass

Answer: B) Their shape

Explanation: Enzyme specificity is determined by the three-dimensional shape of their active sites.

8. Which of the following is an example of an allosteric enzyme?

- A) Amylase
- B) Catalase
- C) ATP synthase
- D) Hexokinase

Answer: C) ATP synthase

Explanation: Allosteric enzymes have regulatory sites separate from their active sites, affecting their activity.

9. Competitive inhibition involves a substance that:

- A) Binds to the active site
- B) Binds to an allosteric site
- C) Enhances enzyme activity
- D) Promotes substrate binding

Answer: A) Binds to the active site

Explanation: Competitive inhibitors compete with the substrate for the active site.

10. Which of the following is NOT a factor influencing enzyme activity?

- A) Enzyme concentration
- B) Substrate specificity
- C) Product concentration
- D) Cofactor availability

Answer: C) Product concentration

Explanation: Product concentration does not directly influence enzyme activity.

11. The process of an enzyme binding to a substrate and forming an enzyme-substrate complex is known as:

- A) Denaturation
- B) Hydrolysis
- C) Catalysis
- D) Induction

Answer: C) Catalysis

Explanation: Catalysis involves the formation of an enzyme-substrate complex leading to the reaction.

12. Enzymes can be inhibited irreversibly by:

- A) Competitive inhibitors
- B) Allosteric inhibitors
- C) Irreversible inhibitors
- D) Non-competitive inhibitors

Answer: C) Irreversible inhibitors

Explanation: Irreversible inhibitors form covalent bonds with enzymes, leading to permanent inhibition.

13. Which of the following is an example of a zymogen or proenzyme?

- A) Pepsinogen
- B) Amylase
- C) Catalase
- D) Lipase

Answer: A) Pepsinogen

Explanation: Pepsinogen is an inactive precursor of the enzyme pepsin.

14. The Michaelis-Menten equation describes the relationship between:

- A) Enzyme concentration and reaction rate
- B) Substrate concentration and reaction rate
- C) Temperature and enzyme activity
- D) pH and enzyme activity

Answer: B) Substrate concentration and reaction rate

Explanation: The Michaelis-Menten equation describes the kinetics of enzyme-catalyzed reactions.

15. What is the function of an enzyme cofactor?

- A) Catalyze reactions
- B) Provide structural support
- C) Enhance enzyme-substrate binding
- D) Transfer chemical groups

Answer: A) Catalyze reactions

Explanation: Cofactors assist enzymes in catalyzing reactions by participating in the reaction mechanism.

16. Which of the following is an example of a noncompetitive inhibitor?

- A) Penicillin
- B) Aspirin
- C) Cyanide
- D) Cyanamide

Answer: C) Cyanide

Explanation: Noncompetitive inhibitors bind to sites other than the active site, altering enzyme conformation.

17. An enzyme-substrate complex is stabilized by:

- A) Hydrophobic interactions
- B) Ionic bonds
- C) Hydrogen bonds
- D) All of the above

Answer: D) All of the above

Explanation: Enzyme-substrate complex stability is influenced by various interactions, including hydrophobic, ionic, and hydrogen bonds.

18. What is the effect of an increase in substrate concentration on enzyme activity?

- A) Decrease in activity
- B) No effect
- C) Increase in activity until saturation
- D) Inhibition

Answer: C) Increase in activity until saturation

Explanation: Initially, an increase in substrate concentration leads to increased enzyme activity until saturation is reached.

19. Which of the following is an example of a feedback inhibition mechanism?

- A) Glycolysis
- B) Citric acid cycle
- C) Krebs cycle
- D) Calvin cycle

Answer: B) Citric acid cycle

Explanation: Feedback inhibition involves the product of a pathway inhibiting an earlier step to regulate metabolic processes.

20. Enzymes are classified into different classes based on their:

- A) Substrate specificity
- B) Active site structure
- C) Reaction type
- D) All of the above

Answer: D) All of the above

Explanation: Enzymes are classified based on substrate specificity, active site structure, and reaction type.

21. What is the role of an enzyme inhibitor?

- A) Enhance enzyme activity
- B) Slow down or block enzyme activity
- C) Stabilize enzyme-substrate complex
- D) Act as a coenzyme

Answer: B) Slow down or block enzyme activity

Explanation: Enzyme inhibitors reduce or block enzyme activity by interfering with the catalytic process.

22. Which of the following is a characteristic of allosteric enzymes?

- A) Single active site
- B) Sensitivity to pH changes
- C) Irreversible inhibition
- D) Cooperative binding

Answer: D) Cooperative binding

Explanation: Allosteric enzymes exhibit cooperative binding, where substrate binding to one site affects substrate binding to other sites.

23. What is the optimum pH for most enzymes in the human body?

- A) pH 2
- B) pH 7
- C) pH 9
- D) pH 12

Answer: B) pH 7

Explanation: Most enzymes in the human body function optimally at a neutral pH around 7.

24. The term "apoenzyme" refers to an enzyme:

- A) Without a cofactor
- B) Without a substrate
- C) Without an active site
- D) Without a coenzyme

Answer: A) Without a cofactor

Explanation: An apoenzyme is an enzyme lacking its cofactor or coenzyme.

25. Enzymes that catalyze the removal of electrons from substrates are known as:

- A) Oxidoreductases
- B) Transferases
- C) Hydrolases
- D) Lyases

Answer: A) Oxidoreductases

Explanation: Oxidoreductases catalyze oxidation-reduction reactions involving the transfer of electrons.

26. Which of the following is an example of an irreversible enzyme inhibitor?

- A) Penicillin
- B) Cyanide
- C) Aspirin
- D) Allopurinol

Answer: B) Cyanide

Explanation: Irreversible inhibitors, like cyanide, form covalent bonds with enzymes, leading to permanent inhibition.

27. What is the purpose of the activation energy in a chemical reaction?

- A) To slow down the reaction
- B) To speed up the reaction
- C) To stabilize the products
- D) To initiate the reaction

Answer: D) To initiate the reaction

Explanation: Activation energy is the energy required to initiate a chemical reaction.

28. Enzymes are sensitive to changes in temperature because:

- A) Temperature affects the pH
- B) Temperature alters enzyme structure
- C) Temperature affects substrate concentration
- D) Temperature influences coenzyme activity

Answer: B) Temperature alters enzyme structure

Explanation: Changes in temperature can denature enzymes by altering their three-dimensional structure.

29. Which of the following is an example of a coenzyme?

- A) Zinc
- B) Iron
- C) NAD^+

D) Calcium

Answer: C) NAD⁺

Explanation: NAD⁺ is a coenzyme involved in electron transfer reactions.

30. What is the primary function of an enzyme activator?

- A) Inhibit enzyme activity
- B) Enhance enzyme-substrate binding
- C) Stabilize the enzyme
- D) Increase the rate of enzymatic reactions

Answer: D) Increase the rate of enzymatic reactions

Explanation: Enzyme activators enhance the catalytic activity of enzymes.

31. What type of reaction does a ligase enzyme catalyze?

- A) Oxidation-reduction
- B) Hydrolysis

- C) Ligation or joining of molecules
- D) Isomerization

Answer: C) Ligation or joining of molecules

Explanation: Ligase enzymes catalyze the joining of molecules.

32. Which of the following is NOT a characteristic of enzyme-catalyzed reactions?
- A) They are reversible
 - B) They alter the equilibrium position
 - C) They require high activation energy
 - D) They are specific

Answer: C) They require high activation energy

Explanation: Enzymes lower the activation energy required for a reaction, making it more efficient.

33. The term "enzyme kinetics" refers to the study of:
- A) Enzyme structure

- B) Enzyme inhibition
- C) Enzyme activity rates
- D) Enzyme specificity

Answer: C) Enzyme activity rates

Explanation: Enzyme kinetics involves the study of the rates at which enzymes catalyze reactions.

34. Which of the following statements about cofactors is true?

- A) Cofactors are always proteins.
- B) Cofactors can be organic or inorganic.
- C) Cofactors are substrates.
- D) Cofactors are always coenzymes.

Answer: B) Cofactors can be organic or inorganic.

Explanation: Cofactors can be either organic (coenzymes) or inorganic (metal ions) molecules that assist enzyme function.

35. What is the significance of the induced-fit model in enzyme-substrate interactions?

- A) It explains how enzymes can denature.
- B) It describes how enzymes change shape upon substrate binding.
- C) It demonstrates the specificity of enzyme-substrate interactions.
- D) It shows how enzymes remain unchanged during reactions.

Answer: B) It describes how enzymes change shape upon substrate binding.

Explanation: The induced-fit model explains that enzymes undergo conformational changes upon substrate binding.

36. What is the role of the enzyme catalase in cells?

- A) Breaks down hydrogen peroxide
- B) Synthesizes DNA
- C) Catalyzes protein synthesis
- D) Converts glucose to ATP

Answer: A) Breaks down hydrogen peroxide

Explanation: Catalase is an enzyme that catalyzes the breakdown of hydrogen peroxide into water and oxygen.

37. Which of the following is an example of a protease enzyme?

- A) Amylase
- B) Lipase
- C) Trypsin
- D) Catalase

Answer: C) Trypsin

Explanation: Trypsin is a protease enzyme that cleaves peptide bonds in proteins.