9th CLASS BIOLOGY

Chapter 6

ENZYMES

60 Solved MCQs with Explanations

Complete Chapter Review — 3 MCQs per page

✔️ **Correct answers highlighted in green** with detailed explanations

Reference: **scholareye.xyz**

ENZYMES — MCQ Bank (Q1 – Q60)

Q1. Metabolism is best defined as:

✔️ **A. The sum of all chemical reactions in an organism**

B. Only the breakdown reactions in a cell

C. Only the building-up reactions in a cell

D. The digestion of food in the stomach

Explanation: *Metabolism includes both catabolic (breakdown) and anabolic (building-up) reactions that occur within an organism to sustain life.*

Q2. The two sub-sets of metabolism are:

A. Digestion and absorption

✔️ **B. Catabolism and anabolism**

C. Respiration and photosynthesis

D. Hydrolysis and synthesis

Explanation: *Metabolism is divided into catabolism (breakdown of molecules) and anabolism (building up of molecules).*

Q3. Catabolism involves:

A. Building up of complex molecules from simpler ones

✔️ **B. Breakdown of complex molecules into simpler ones, releasing energy**

C. Storage of energy in complex molecules

D. Formation of proteins from amino acids

Explanation: *Catabolism breaks complex molecules into simpler ones and releases energy in the process, e.g. cellular respiration.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q4. In cellular respiration, glucose is broken down into:

✔️ **A. CO_2 and H_2O**

B. Amino acids

C. Fatty acids and glycerol

D. Starch and glucose

Explanation: *Cellular respiration is a catabolic process in which glucose is broken down into carbon dioxide and water to release energy.*

Q5. Lipolysis is the breakdown of lipid (fat) into:

A. Glucose and oxygen

B. Amino acids

✔️ **C. Fatty acids and glycerol**

D. Starch

Explanation: *Lipolysis breaks a lipid molecule into fatty acids and glycerol, which can then be used to obtain energy.*

Q6. Photosynthesis joins CO_2 and H_2O using sunlight to make:

✔️ **A. Glucose (with oxygen released as a byproduct)**

B. Fatty acids

C. Amino acids

D. Starch only

Explanation: *Photosynthesis is an anabolic process where CO_2 and H_2O combine, using sunlight, to form glucose; oxygen is released as a byproduct.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q7. Protein synthesis is an example of:

A. Catabolism

✔️ **B. Anabolism**

C. Lipolysis

D. Neither catabolism nor anabolism

Explanation: *Protein synthesis builds proteins by joining amino acids together, which is a building-up (anabolic) process.*

Q8. Anabolism is best described as a process that:

A. Breaks down complex molecules and releases energy

✔️ **B. Builds up complex molecules from simpler ones and consumes energy**

C. Occurs only outside living cells

D. Converts proteins into amino acids

Explanation: *Anabolism involves building up complex molecules from simpler ones, and this process consumes energy, e.g. photosynthesis and protein synthesis.*

Q9. According to the passage, hummingbirds have one of the highest metabolic rates because they:

A. Sleep for most of the day

✔️ **B. Need to eat constantly to keep up their energy levels**

C. Do not require any food

D. Store fat instead of using energy

Explanation: *The high metabolic rate of hummingbirds means they must eat constantly to maintain their energy levels.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q10. Enzymes are best defined as:

A. Inorganic catalysts found only outside cells

✔️ **B. Biological catalysts that speed up chemical reactions without being consumed**

C. Molecules that slow down chemical reactions

D. Simple sugars used for energy

Explanation: *Enzymes are biological catalysts that speed up chemical reactions in living organisms without being consumed in the process.*

Q11. Enzymes are primarily composed of:

A. Carbohydrates

B. Lipids

✔️ **C. Proteins**

D. Nucleic acids only

Explanation: *Enzymes are predominantly proteins, typically containing 100 to 1,000 amino acids.*

Q12. How many times faster can enzymes speed up biochemical reactions compared to uncatalyzed reactions?

A. Only twice as fast

B. Ten times faster

✔️ **C. Millions of times faster**

D. They do not affect reaction speed

Explanation: *Most enzymes can speed up reactions millions of times faster than the corresponding uncatalyzed reactions.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q13. The molecules that undergo enzyme-controlled reactions are called:

✔️ **A. Substrates**

B. Cofactors

C. Coenzymes

D. Products

Explanation: *The substrate is the specific molecule that an enzyme acts upon during a reaction.*

Q14. A typical enzyme contains approximately how many amino acids?

A. 10 to 50

✔️ **B. 100 to 1,000**

C. 5,000 to 10,000

D. 1 to 10

Explanation: *Enzymes, being proteins, typically contain 100 to 1,000 amino acids.*

Q15. The globular structure of enzymes allows them to:

A. Dissolve easily in fats

✔️ **B. Form active sites that bind specifically to substrates**

C. Become inactive permanently

D. Change into carbohydrates

Explanation: *The three-dimensional globular structure of enzymes allows the formation of active sites that specifically bind substrates.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q16. The active site of an enzyme can be defined as:

✔️ **A. A pocket or cleft on the enzyme's surface involved in catalysis**

B. The entire surface of the enzyme

C. A separate molecule that helps digestion

D. The energy released during a reaction

Explanation: *The active site is one or more pockets or clefts on the enzyme's surface that are directly involved in catalysis.*

Q17. Which statement best describes the specificity of enzymes?

A. One enzyme can catalyse any reaction

✔️ **B. Enzymes are highly specific to the reactions and substrates they catalyse**

C. Enzymes work on any substrate equally well

D. Specificity applies only to extracellular enzymes

Explanation: *Enzymes are highly specific to the reactions they catalyse and are also very specific for the nature of the substrate.*

Q18. The enzyme amylase specifically catalyses the breakdown of:

A. Proteins into amino acids

B. Fats into fatty acids

✔️ **C. Starch into simple sugars**

D. Nucleic acids into nucleotides

Explanation: *Amylase is a specific example given in the chapter of an enzyme that breaks down starch into simple sugars.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q19. RNA molecules that act as enzymes are called:

A. Coenzymes

✔️ **B. Ribozymes**

C. Prosthetic groups

D. Cofactors

Explanation: *Some RNA molecules act as enzymes and are called ribozymes.*

Q20. Ribozymes are primarily found in:

A. The nucleus only

B. Mitochondria only

✔️ **C. Ribosomes (and specific viruses and bacteria)**

D. Cell membrane only

Explanation: *Ribozymes are primarily found in ribosomes and are also found in specific viruses and bacteria.*

Q21. Intracellular enzymes are those that:

✔️ **A. Operate within cells, e.g. enzymes of cellular respiration**

B. Are secreted outside the cell

C. Never require a substrate

D. Only exist in plants

Explanation: *Intracellular enzymes operate within the cell itself, such as the enzymes involved in cellular respiration.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q22. Extracellular enzymes are secreted outside the cell to catalyse reactions such as:

A. Photosynthesis inside chloroplasts

✔️ **B. Digestion of food in the stomach cavity**

C. DNA replication in the nucleus

D. ATP production in mitochondria

Explanation: *Extracellular enzymes are secreted outside the cells, e.g. enzymes secreted by stomach wall cells into the stomach cavity for digestion of food.*

Q23. Cofactors are best described as:

✔️ **A. Additional non-protein molecules required by many enzymes for full activity**

B. Waste products of enzyme reactions

C. A type of substrate

D. Enzymes that work outside the cell only

Explanation: *Many enzymes require additional non-protein molecules, called cofactors, to be fully active.*

Q24. The two main groups of cofactors are:

A. Prosthetic groups and coenzymes only

✔️ **B. Inorganic cofactors and organic cofactors**

C. Ribozymes and prosthetic groups

D. Substrates and products

Explanation: *Cofactors are grouped into inorganic cofactors and organic cofactors.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q25. Inorganic cofactors include:

A. Vitamins such as biotin

✔️ **B. Metal ions like iron and magnesium**

C. NAD and NADP

D. Amino acids

Explanation: *Inorganic cofactors include metal ions such as iron ions and magnesium ions.*

Q26. Organic cofactors are of two types, namely:

A. Metal ions and vitamins

✔️ **B. Prosthetic groups and coenzymes**

C. Substrates and active sites

D. Ribozymes and enzymes

Explanation: *Organic cofactors are divided into prosthetic groups and coenzymes.*

Q27. Prosthetic groups differ from coenzymes because they:

A. Loosely bind to the enzyme and are released during the reaction

✔️ **B. Tightly bind with the enzyme**

C. Are never associated with enzymes

D. Are always metal ions

Explanation: *Prosthetic groups tightly bind with the enzyme, unlike coenzymes which bind loosely and may be released during the reaction.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q28. Which of the following is an example of a prosthetic group?

A. NAD

B. NADP

✔️ **C. Biotin and the haem group**

D. Magnesium ion

Explanation: *Examples of prosthetic groups given in the chapter include certain vitamins such as biotin and the haem group.*

Q29. Coenzymes loosely bind to the enzyme and may be released during the reaction. Examples include:

A. Biotin and haem

✔️ **B. NAD and NADP**

C. Iron and magnesium ions

D. Ribozymes

Explanation: *Coenzymes include many vitamins and nucleotides such as NAD and NADP, which loosely bind to enzymes and may be released during the reaction.*

Q30. In complex metabolic reactions, multiple enzymes work:

A. Independently with no connection to each other

✔️ **B. In a sequence, where each enzyme catalyses a specific step**

C. Only once per cell's lifetime

D. By destroying the substrate completely

Explanation: *Multiple enzymes work in a sequence to carry out a series of reactions, with each enzyme catalysing a specific step.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q31. After an enzyme speeds up a reaction in a metabolic pathway, the product is:

A. Destroyed immediately

✔️ **B. Passed on to the next enzyme for further reaction**

C. Converted back into the original substrate

D. Stored permanently without further use

Explanation: *After speeding up its specific reaction, the product is passed on to the next enzyme in the sequence for further reaction.*

Q32. In the food industry, enzymes that break starch into simple sugars are used in production of:

✔️ **A. White bread, buns, and rolls**

B. Paper

C. Detergents

D. Fuel

Explanation: *Enzymes that break starch into simple sugars are used in the production of white bread, buns, and rolls, and also in cheese production.*

Q33. In the paper industry, enzymes are used to:

A. Increase the viscosity of starch

✔️ **B. Degrade starch to lower its viscosity, aiding in paper making**

C. Produce cheese

D. Ferment sugars into alcohol

Explanation: *In the paper industry, enzymes degrade starch to lower its viscosity, which aids in making paper.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q34. In biological detergents, protease enzymes are used to remove:

A. Starch residues from dishes

✔️ **B. Protein stains from clothes**

C. Fat stains only

D. Ink stains

Explanation: *Protease enzymes are used in biological detergents for the removal of protein stains from clothes.*

Q35. In dish washing detergents, amylase enzymes are used to remove:

A. Protein stains

B. Grease only

✔️ **C. Resistant starch residues**

D. Rust stains

Explanation: *Amylase enzymes are used in dish washing to remove resistant starch residues.*

Q36. In the fermentation industry, enzymes are used by microorganisms such as yeast to produce:

A. Only carbon dioxide

✔️ **B. Simple sugars, amino acids, and peptides for various human products**

C. Only oxygen

D. Only water

Explanation: *In the fermentation industry, enzymes degrade starch and proteins to produce simple sugars, amino acids, and peptides, used by microorganisms like yeast to make different products for human use.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q37. How many models have been proposed to explain the mechanism of enzyme action?

A. One

✔️ **B. Two**

C. Three

D. Four

Explanation: *Two models have been proposed to explain enzyme action: the Lock and Key model and the Induced Fit model.*

Q38. The Lock and Key model of enzyme action was proposed by:

A. Daniel Koshland

✔️ **B. Emil Fischer**

C. Charles Darwin

D. Louis Pasteur

Explanation: *The Lock and Key model was proposed by German chemist Emil Fischer.*

Q39. In which year was the Lock and Key model proposed?

A. 1858

✔️ **B. 1894**

C. 1958

D. 1994

Explanation: *Emil Fischer proposed the Lock and Key model of enzyme action in 1894.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q40. According to the Lock and Key model, the active site of the enzyme has:

A. A flexible, changeable structure

✔️ **B. A fixed structure into which the substrate fits precisely**

C. No specific structure

D. A structure that dissolves during reaction

Explanation: *According to the Lock and Key model, the active site of the enzyme has a fixed structure, and the substrate fits precisely into it.*

Q41. The temporary structure formed when a substrate fits into an enzyme's active site is called:

A. A ribozyme

B. A cofactor complex

✔️ **C. An enzyme-substrate complex**

D. A prosthetic complex

Explanation: *When the substrate fits into the active site, it forms an enzyme-substrate complex, after which the enzyme catalyzes the reaction.*

Q42. After the enzyme catalyzes the reaction in the Lock and Key model, what happens?

A. The enzyme is destroyed

✔️ **B. The substrate is transformed into product(s), which are then released**

C. The substrate remains unchanged forever

D. A new enzyme is created

Explanation: *The enzyme catalyzes the reaction, the substrate is transformed into product(s), and then the product(s) are released from the enzyme.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q43. The Induced Fit Model of enzyme action was proposed by:

A. Emil Fischer

✔ **B. Daniel Koshland**

C. Gregor Mendel

D. Robert Hooke

Explanation: *The Induced Fit Model was proposed by American biologist Daniel Koshland.*

Q44. In which year was the Induced Fit model proposed?

A. 1894

B. 1920

✔ **C. 1958**

D. 1975

Explanation: *Daniel Koshland proposed the Induced Fit model of enzyme action in 1958.*

Q45. According to the Induced Fit model, the active site of the enzyme is:

A. Rigid and fixed like a lock

✔ **B. Not rigid; it is reshaped when the substrate interacts with it**

C. Absent altogether

D. Made only of carbohydrates

Explanation: *According to the Induced Fit model, the active site of the enzyme is not rigid — when the substrate interacts with the enzyme, its active site is reshaped to perform its function.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q46. What happens to the enzyme's active site when the substrate interacts with it, according to the Induced Fit model?

A. It remains completely unchanged

B. It is destroyed

✔️ **C. It is reshaped to perform its function**

D. It splits into two enzymes

Explanation: *In the Induced Fit model, the active site is reshaped when the substrate interacts with it, allowing it to perform its catalytic function.*

Q47. Which model of enzyme action proposes that the active site changes shape to fit the substrate?

A. Lock and Key model

✔️ **B. Induced Fit model**

C. Both models equally

D. Neither model

Explanation: *The Induced Fit model, unlike the Lock and Key model, proposes that the active site changes shape (is reshaped) to fit the substrate.*

Q48. Emil Fischer, who proposed the Lock and Key model, was a:

A. American biologist

✔️ **B. German chemist**

C. British physicist

D. French botanist

Explanation: *Emil Fischer, the proposer of the Lock and Key model in 1894, was a German chemist.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q49. Daniel Koshland, who proposed the Induced Fit model, was a:

A. German chemist

✔️ **B. American biologist**

C. Italian physician

D. Swedish botanist

Explanation: *Daniel Koshland, who proposed the Induced Fit model in 1958, was an American biologist.*

Q50. A key characteristic that distinguishes enzymes as catalysts is that they:

A. Are consumed completely during the reaction

✔️ **B. Speed up reactions without being consumed in the process**

C. Only work at extremely high temperatures

D. Cannot be reused

Explanation: *Enzymes are biological catalysts that speed up reactions without being consumed in the process, so they can be used repeatedly.*

Q51. Enzymes are highly specific mainly for:

A. Only the temperature of the reaction

✔️ **B. The reactions they catalyse and the nature of their substrate**

C. The size of the organism

D. The color of the substrate

Explanation: *Enzymes are highly specific to the reactions they catalyse and are also very specific for the nature of the substrate.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q52. Which of the following best summarizes the role of the active site?

A. It stores energy for the whole cell

✔️ **B. It is the region directly involved in catalysis where the substrate binds**

C. It is a waste product of metabolism

D. It only exists in extracellular enzymes

Explanation: *The active site is one or more pockets/clefts on the enzyme surface that is directly involved in catalysis by binding the substrate.*

Q53. Iron and magnesium ions serve as examples of:

A. Organic cofactors

✔️ **B. Inorganic cofactors**

C. Coenzymes

D. Prosthetic groups

Explanation: *Iron ions and magnesium ions are examples of inorganic cofactors mentioned in the chapter.*

Q54. Vitamins acting as cofactors that bind loosely and may be released during a reaction are classified as:

A. Prosthetic groups

✔️ **B. Coenzymes**

C. Inorganic cofactors

D. Substrates

Explanation: *Vitamins that bind loosely and may be released during the reaction, such as those forming NAD and NADP, are classified as coenzymes.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q55. Which industry uses enzymes to degrade starch and proteins with the help of microorganisms like yeast?

A. Paper industry

✔️ **B. Fermentation industry**

C. Textile industry

D. Mining industry

Explanation: *The fermentation industry uses enzymes, along with microorganisms like yeast, to degrade starch and proteins into simple sugars, amino acids, and peptides.*

Q56. Which of these is NOT a component of metabolism as described in the chapter?

A. Catabolism

B. Anabolism

✔️ **C. Photosynthesis of light energy into sound energy**

D. Cellular respiration

Explanation: *Metabolism includes catabolism and anabolism (with examples like respiration and photosynthesis); 'converting light into sound energy' is not a real metabolic process.*

Q57. A biochemical reaction that would otherwise occur very slowly is made fast in cells mainly due to the action of:

A. Hormones

✔️ **B. Enzymes**

C. Vitamins alone

D. Water

Explanation: *Enzymes are remarkable proteins which speed up biochemical reactions that would otherwise occur at a very slow speed.*

ENZYMES — MCQ Bank (Q1 – Q60)

Q58. Which statement about enzyme-substrate specificity is TRUE?

A. One enzyme can act on all types of substrates equally

✔️ **B. An enzyme's active site is generally specific to a particular substrate's shape/nature**

C. Substrates never bind to active sites

D. Specificity does not affect the reaction rate

Explanation: *Enzymes are highly specific for the nature of the substrate, meaning their active site is generally suited to a particular substrate.*

Q59. A key difference between the Lock and Key and Induced Fit models is:

A. The Lock and Key model has a flexible active site, Induced Fit has a fixed one

✔️ **B. The Lock and Key model has a fixed active site, Induced Fit has a reshaping active site**

C. Both models describe an unchanging enzyme shape

D. There is no real difference between the two models

Explanation: *In the Lock and Key model the active site has a fixed structure, while in the Induced Fit model the active site is reshaped when the substrate binds.*

Q60. Enzymes are described in the chapter as biological catalysts mainly because they:

A. Are permanently changed into new substances after each reaction

✔️ **B. Speed up chemical reactions in living organisms without being consumed**

C. Only function in non-living systems

D. Slow down all metabolic reactions

Explanation: *Enzymes are called biological catalysts because they speed up chemical reactions in living organisms without being consumed in the process.*