



# Chapter

# 3

# Enzymes

## Introduction and Characteristics

### KIPS MCQs

- (1) The biologically active proteins are known as:
  - (a) Glycoproteins
  - (b) Enzymes
  - (c) Activators
  - (d) Inhibitors
- (2) The detachable cofactor is known as if it is organic:
  - (a) Activator
  - (b) Prosthetic group
  - (c) Co-enzyme
  - (d) None of these
- (3) Enzymes involved in synthesis of proteins are found in close association with:
  - (a) Haemoglobin
  - (b) Chloroplast
  - (c) Mitochondria
  - (d) Ribosomes
- (4) Enzyme is \_\_\_\_\_ dimensional globular protein.
  - (a) One
  - (b) Two
  - (c) Three
  - (d) Many
- (5) "Most enzymes do not float in cytoplasm". This statement is:
  - (a) True
  - (b) False
  - (c) May be true, may be false
  - (d) None of these
- (6) Enzymes are composed of hundreds of:
  - (a) Nucleotides
  - (b) Amino acids
  - (c) Glucose
  - (d) Fatty acids
- (7) If the non-protein part is covalently bonded, then it is known as:
  - (a) Activator
  - (b) Co-enzyme
  - (c) Prosthetic group
  - (d) Cofactor
- (8) Many enzymes require non protein component called \_\_\_\_\_ for their proper functioning.
  - (a) Cofactor
  - (b) Activator
  - (c) Coenzyme
  - (d) Prosthetic group
- (9) An enzyme with its cofactor removed is called:
  - (a) Holoenzyme
  - (b) Apoenzyme
  - (c) Co enzyme
  - (d) Prosthetic group
- (10) An enzyme with its non-protein part is called:
  - (a) Holoenzyme
  - (b) Apoenzyme
  - (c) Co enzyme
  - (d) Prosthetic group
- (11) The activator may be a:
  - (a) Organic
  - (b) Metallic ion
  - (c) Carbon compound
  - (d) None of these
- (12) These represents the essential raw materials from which coenzymes are made:
  - (a) Vitamins
  - (b) Metal ions
  - (c) Proteins
  - (d) NADP

- (13) Which structure acts as a bridge between enzyme and its substrate?  
 (a) Cofactor (b) Catalytic site  
 (c) Binding site (d) Apo enzyme
- (14) Endo enzymes are active:  
 (a) Within the cells (b) Outside the cells  
 (c) Not at all (d) Rarely
- (15) Enzymes found in mitochondria are involved in process of:  
 (a) Transpiration (b) Photosynthesis  
 (c) Respiration (d) Conduction
- (16) The protein part of an enzyme is known as:  
 (a) Cofactor (b) Co-enzyme  
 (c) Prosthetic group (d) Apoenzyme
- (17) The enzymes are \_\_\_\_\_ proteins.  
 (a) Fibrous (b) Globular  
 (c) Angular (d) Spherical
- (18) An enzyme reacts only with its specific:  
 (a) Surface (b) Product  
 (c) Substrate (d) Reactant
- (19) Enzymes are very \_\_\_\_\_ in their action.  
 (a) General (b) Specific  
 (c) Precise (d) Exact
- (20) Which one of the following is an activated form of enzyme?  
 (a) Trypsinogen (b) Pepsinogen  
 (c) Sucrase (d) Both 'a' & 'b'
- (21) Inorganic ion acting as detachable co-factor is:  
 (a) Activator (b) Prosthetic group  
 (c) Coenzyme (d) Holoenzyme
- (22) The biological catalyst is/are:  
 (a) Proteins (b) Activators  
 (c) Coenzyme (d) Enzyme
- (23) Point out the form of enzyme in active position:  
 (a) Apoenzyme (b) Enzyme with irreversible inhibitor  
 (c) Denatured enzyme (d) Holoenzyme
- (24) Vitamins are important in formation of:  
 (a) Activator (b) Apoenzyme  
 (c) Coenzyme (d) All of the above
- (25) The cofactor acts as bridge between.  
 (a) Enzyme and substrate (b) Enzyme and product  
 (c) Co enzyme and substrate (d) Cofactor and substrate

**PAST PAPERS MCQs**

- (26) If non-protein part is loosely attached to protein part, it is known as: (RWP 2017)  
 (a) Co-factor (b) Co-enzyme  
 (c) Holo-enzyme (d) Prosthetic group
- (27) An enzyme reacts only with its specific: (LHR 2018)  
 (a) Surface (b) Product  
 (c) Substrate (d) Inhibitor

- (28) Co-enzyme is closely related to: (FSD 2019)  
 (a) Lipids (b) Vitamins  
 (c) Minerals (d) Water
- (29) Covalently bonded non-prosthetic part is called: (LCK 2019)  
 (a) Co-enzyme (b) Prosthetic group  
 (c) Activator (d) Co-factor
- (30) An activated enzyme consisting of polypeptide chain and a cofactor is known as: (DGK 2019, LHR 2021)  
 (a) Isoenzyme (b) Polyenzyme  
 (c) Holoenzyme (d) Apoenzyme
- (31) An enzyme with its co-enzyme or prosthetic group removed is designated as: (FSD 2021)  
 (a) Holoenzyme (b) Co-enzymes  
 (c) Apoenzyme (d) Activator
- (32) Enzymes involved in photosynthesis it's are found in: (LHR 2021)  
 (a) Lysosomes (b) Chloroplast  
 (c) Leucoplast (d) Vacuoles
- (33) If non-protein part of an enzyme is loosely attached to the protein part, it is known as \_\_\_\_\_. (GRW 2021)  
 (a) Activator (b) Prosthetic group  
 (c) Co-enzyme (d) Apo enzyme
- (34) The enzymes involved in cellular respiration are found in \_\_\_\_\_. (GRW 2021)  
 (a) Chloroplast (b) Ribosomes  
 (c) Mitochondria (d) Golgi bodies
- (35) The raw material from which coenzymes are made: (LHR 2022)  
 (a) Proteins (b) Nucleic acids  
 (c) Vitamins (d) Carbohydrates

**MECHANISM OF ENZYME ACTION**

**KIPS MCQs**

- (36) The active site consists of \_\_\_\_\_ amino acids.  
 (a) Many (b) Few  
 (c) One (d) 500
- (37) The active site of enzyme consist of \_\_\_\_\_ regions.  
 (a) One (b) Two  
 (c) Three (d) Many
- (38) Lock and key model was modified by:  
 (a) Koshland (b) E. Fischer  
 (c) Dr. Stahl (d) Watson
- (39) Enzymes increase rate of reaction by lowering \_\_\_\_\_ energy.  
 (a) Activation (b) Kinetic  
 (c) Potential (d) All of the above
- (40) Sometime the products of a substrate can inhibit the action of first enzyme in a series of reactions in a particular order is called:  
 (a) Precursor activation (b) Feedback inhibition  
 (c) Positive feedback (d) Anti metabolites inhibition

- (41) Induce fit model was proposed by \_\_\_\_\_ in \_\_\_\_\_.
- (a) Koshland, 1890 (b) Emil Fischer, 1890  
(c) Koshland, 1959 (d) Emil Fischer, 1959
- (42) According to lock and key model active site:
- (a) Change its shape after binding with substrate  
(b) Allow all molecules to enter  
(c) Can not bind with a specific substrate  
(d) Is a rigid structure

**PAST PAPERS MCQs**

- (43) Lock and key model was proposed by: (RWL 2021, MLT 2019)
- (a) Koshland (b) Fisher  
(c) Flemming (d) Watson
- (44) Emil Fischer proposed a lock and key model in: (GRW 2019)
- (a) 1990 (b) 1880  
(c) 1800 (d) 1890
- (45) An enzyme and its substrate react with each other through a definite charge bearing structure. (RWL 2022)
- (a) Active site (b) Binding site  
(c) Catalytic site (d) Reaction site

**Factor Affecting the Rate of Enzyme Action****KISPS MCQs**

- (46) Pepsin in stomach work optimally at \_\_\_\_\_ C.
- (a) 30°C (b) 35°C  
(c) 37°C (d) 40°C
- (47) Enzymes are highly sensitive for change in:
- (a) pH (b) Temperature  
(c) Both a and b (d) None of these
- (48) The optimum pH for pancreatic lipase is:
- (a) 9.70 (b) 6.80  
(c) 5.50 (d) 9.00
- (49) A slight change in pH may result in:
- (a) Change in ionization of active site of an enzyme  
(b) Change in ionization of substrate  
(c) Retard or even block enzyme activity  
(d) All of the above
- (50) After 40°C, the rate of reaction is \_\_\_\_\_ by increasing a temperature of 10°C in humans.
- (a) Doubles (b) Increased  
(c) Decreased (d) Remain constant
- (51) The acidic medium in stomach is maintained by:
- (a) Pepsinogen (b) Pepsin  
(c) NaHCO<sub>3</sub> (d) HCl
- (52) The ionization of amino acids at the active site can be changed by a slight change in:
- (a) Temperature (b) pH  
(c) Substrate concentration (d) Enzyme concentration
- (53) If increase in concentration of enzyme increases rate of reaction, then:
- (a) E < S (b) E > S  
(c) E = S (d) Both b & c

- (54) When enzyme become saturated then adding more substrate will?  
 (a) Increase the rate of reaction (b) Have no effect on enzyme activity  
 (c) Decrease the activity (d) Denature the enzymes
- (55) The optimum pH for pepsin is:  
 (a) 2.00 (b) 4.50  
 (c) 7.00 (d) 9.70s
- (56) The optimum pH for salivary amylase is:  
 (a) 9.70 (b) 6.80  
 (c) 5.50 (d) 9.00
- PAST PAPERS MCQs**
- (57) The optimum pH of pancreatic lipase is: (SGD 2022)  
 (a) 6.0 (b) 7.0  
 (c) 8.0 (d) 9.0
- (58) The optimum pH of pepsin is: (FSD 2017, SGD 2017)  
 (a) 2.00 (b) 4.00  
 (c) 6.00 (d) 8.00
- (59) Optimum pH for enzyme pepsin is: (MTN 2017)  
 (a) 2 (b) 6.80  
 (c) 7 (d) 9
- (60) The optimum temperature for the enzymes of human body is: (SWL 2017)  
 (a) 25° C (b) 37° C  
 (c) 40° C (d) 45° C
- (61) The optimum pH for catalase activity is: (DGK 2017)  
 (a) 4.5 (b) 5.5  
 (c) 9.7 (d) 7.6
- (62) Optimum pH value for enzyme Arginase is: (BWP 2017)  
 (a) 7.60 (b) 9.70  
 (c) 6.40 (d) 5.2
- (63) Optimum pH for action of pancreatic lipase is: (LHR 2018)  
 (a) 3.00 (b) 5.00  
 (c) 7.00 (d) 9.00
- (64) Optimum pH for catalase is: (SWL 2019)  
 (a) 7.60 (b) 9.70  
 (c) 5.50 (d) 6.70
- (65) Optimum pH for Arginase enzyme is: (RVVP 2019, BWL 2022, SKG 2021)  
 (a) 4.50 (b) 5.50  
 (c) 9.70 (d) 7.60
- (66) pH value of 7.60 is optimum for enzyme: (BWL 2019)  
 (a) Arginase (b) Enterokinase  
 (c) Catalase (d) Sucrase
- (67) The enzyme with optimum pH 5.50 is: (LHR 2019)  
 (a) Arginase (b) Sucrase  
 (c) Pepsin (d) Enterokinase
- (68) The rate of enzyme reaction becomes double for each \_\_\_\_\_ rise in temperature. (DGK 2022)  
 (a) 10 °C (b) 15 °C  
 (c) 20 °C (d) 25 °C

- (69) The optimum pH for pepsin is: (SWL 2022)  
 (a) 2.000 (b) 4.50  
 (c) 5.50 (d) 7.60

**INHIBITORS****KIPS MCQs**

- (70) Which is the competitive inhibitor of succinic acid dehydrogenase?  
 (a) Succinic acid (b) Fumaric acid  
 (c) Malonic acid (d) Malic acid
- (71) Poisons, like cyanide, antibiotics, antimetabolites and some drugs are example of:  
 (a) Enzyme (b) Inhibitors  
 (c) Coenzyme (d) Holoenzyme
- (72) Which one of the following is an enzyme inhibitor?  
 (a) Cyanide (b) Antibiotics  
 (c) Antimetabolites (d) All of the above
- (73) Succinic acid dehydrogenase catalyze the breakdown of succinic acid into:  
 (a) Malonic acid (b) Fumaric acid  
 (c) Malic acid (d) Citric acid
- (74) Reversible inhibitors forms weak linkage with the:  
 (a) Product (b) Substrate  
 (c) Reactant (d) Enzyme
- (75) Active sites are not occupied by:  
 (a) Irreversible inhibitor (b) Competitive inhibitor  
 (c) Non-competitive inhibitor (d) All of the above
- (76) Which type of bond is formed by irreversible inhibitors with enzyme?  
 (a) Ionic (b) Covalent  
 (c) Hydrogen (d) Coordinate covalent
- (77) Which one of the following is an enzyme inhibitor?  
 (a) Cyanide (b) Antibiotics  
 (c) Anti metabolites (d) All of the aboves

**PAST PAPERS MCQs**

- (78) The competitive inhibitor of succinic acid is: (MLT 2022, GRW 2017)  
 (a) Fumaric acid (b) Malonic acid  
 (c) Citric acid (d) Acetic acid
- (79) The inhibitor which may destroy the globular structure of enzyme is: (MTN 2017)  
 (a) Competitive (b) Non-competitive  
 (c) Reversible (d) Irreversible
- (80) Poisons like cyanides, antibiotics and some drugs are examples of: (GRW 2018)  
 (a) Enzymes (b) Co-enzymes  
 (c) Inhibitors (d) Cofactors
- (81) Poisons like cyanide are examples of: (LHR 2019)  
 (a) Enzymes (b) Co-enzymes  
 (c) Inhibitors (d) Co-factors
- (82) Irreversible inhibitors form which bonds with active site: (MLT 2019)  
 (a) Hydrogen bonds (b) Covalent bonds  
 (c) Ionic bonds (d) Hydrophobic bonds

**ANSWER KEY**

(Topic-Wise Multiple Choice Questions)

1	b	21	a	41	c	61	d	81	
2	c	22	d	42	d	62		82	
3	d	23	d	43	b	63			
4	c	24	c	44	b	64			
5	a	25	a	45		65			
6	b	26	b	46	c	66			
7	c	27		47	c	67			
8	a	28	b	48	d	68			
9	b	29		49	d	69			
10	a	30	a	50	a	70	c		
11		31		51	d	71	b		
12	a	32		52	b	72	d		
13	a	33		53	a	73	b		
14	a	34		54	b	74	d		
15	b	35		55	a	75	c		
16	d	36	b	56	b	76	b		
17	b	37	b	57	d	77	d		
18	b	38	a	58		78	b		
19	C	39	a	59		79	d		
20	c	40	b	60	b	80			

**INTRODUCTION AND CHARACTERISTICS****KIPS QUESTIONS**

**Q:1 Define an enzyme.**

**Ans: Definition:**

All those biologically activated proteins, which catalyze chemical reactions and regain their original form at end of reaction, are called enzymes.

For example Pepsin, Enterokinase, Amylase etc.

**Q:2 Write any four characteristics of enzyme.**

**Ans:**

(1) **Nature**

They all are globular proteins.

(2) **Specificity**

They are specific in their action.

(3) **Sensitivity**

They are sensitive to a small change in pH, temperature and substrate concentration

(4) **Rate of reaction**

They increase the rate of reaction. However they are not used up in a chemical reaction.

**Q:3 What do you mean by active site of an enzyme?**

**Ans:** The active site is a three dimensional cavity bearing a specific charge.

The charge and shape of active site is formed by some amino acids present in the polypeptide chain of enzyme. These amino acids are brought close and are arranged in a specific way by coiling and folding of the polypeptide chain.

**Q:4 Define coenzyme.**

**Ans: Definition:**

If the non-protein portion is loosely attached to the protein part it is known as coenzyme. They are mostly made from vitamins. Only small quantities of vitamins are needed because co-enzyme can be used again and again.

For example Co-A, Co-Q etc.

**Q:5 Define activator.**

**Ans:** The detachable co – factor is known as an activator if it is an inorganic ion.

**Q:6 What do you mean by a co-factor? What is the importance of co-factor in proper functioning of an enzyme?**

**Ans: Co-factor:** The non-protein part of an enzyme is called cofactor.

**Importance:** It acts as bridge between substrate and enzyme.

**Q:7 Differentiate between apoenzyme and holoenzyme.**

**Ans:**

- An enzyme with its coenzyme or prosthetic group removed is called an **apoenzyme**.
- An activated enzyme consisting of polypeptide chain and a cofactor is known as **holoenzyme**.

**PAST PAPER QUESTIONS**

**Q:8 Differentiate between Enzyme and Co-enzyme.**

(MTN 2017)

**Q:9 Define apoenzyme and prosthetic group.**

(LHR 2017)

**Q:10 Differentiate between pepsin and pepsinogen.**

(LHR 2017)

**Q:11 Differentiate between prosthetic group and coenzymes.**

(GRW 2017)

**Q:12 Define cofactor and mention its function.**

(FSD 2017)

**Q:13 What is co-factor? Give its importance.**

(SWL 2017)

**Q:14 Write down any four characteristics of Enzymes.**

(MTN 2017)

**Q:15 What is Holoenzyme?**

(MTN 2017)



- Q:16 Differentiate between apoenzymes and holoenzymes? (DGK 2017)
- Q:17 What is Activator? Give one example. (BWP 2017)
- Q:18 Define prosthetic group and Holo-enzyme. (RWP 2017)
- Q:19 Give four characteristics of enzyme. (RWP 2017)
- Q:20 Write down any four characteristics of enzymes. (RWP 2017)
- Q:21 Differentiate between pepsin and pepsinogen. (LHR 2017)
- Q:22 Define apoenzyme and prosthetic group. (LHR 2017)
- Q:23 Differentiate between prosthetic group and coenzymes. (GRW 2017)
- Q:24 Define apoenzyme. (FSD 2019)
- Q:25 Differentiate between substrate and active site of enzymes. (GRW 2018)
- Q:26 Differentiate between prosthetic group and co-enzyme. (LHR-2017, 19)
- Q:27 How prosthetic group is different from co-enzyme. (SRD 2019)
- Q:28 Define co-factor and activator. (SRD 2019)
- Q:29 What is the difference between prosthetic group and coenzyme? (SWL 2019)
- Q:30 Define Coenzyme. (MLT 2019)
- Q:31 What is Activator? (MLT 2019)
- Q:32 Define co-factor. Write its function. (DGK 2019)
- Q:33 Differentiate between prosthetic group and coenzyme. (LHR 2019)
- Q:34 What is Activator? (MLT 2019)
- Q:35 Give any four characteristics of enzymes. (SWL 2019)
- Q:36 Define co-factor. Write its function. (GDK 2019)
- Q:37 Define Coenzyme. (MLT 2019)
- Q:38 What is prosthetic group? (FSD 2019)
- Q:39 Differentiate between pepsin and pepsinogen. (RWL 2019)
- Q:40 What is the difference between prosthetic group and coenzyme? (SWL 2019)
- Q:41 Give any four characteristics of enzymes. (SWL 2019)
- Q:42 Differentiate between Apoenzyme & Holoenzyme. (LHR 2021)
- Q:43 Differentiate between "apoenzyme" and "holoenzyme". (GRW 2019, 2021)
- Q:44 Define co-factor and activator. (LHR 2021)
- Q:45 Describe co-factor and co-enzyme. (LHR 2021)
- Q:46 What is a co-factor? Give its significance. (GRW 2021)
- Q:47 Differentiate between Holoenzyme and Apoenzyme. (MLT 2019, 2021)
- Q:48 Give four characteristics of enzymes. (GRW 2021)
- Q:49 Give four characteristics of enzymes. (GRW 2021)
- Q:50 How prosthetic group is different from co-enzyme. (FSD 2021)
- Q:51 Define co-factor and activator. (FSD 2021)
- Q:52 Give four characteristics of enzymes. (RWL 2021)
- Q:53 What are cofactor? Give their function in an enzymes catalyzed reaction. (MLT 2021)
- Q:54 Differentiate between an activator and a prosthetic group. (MLT 2021)
- Q:55 Define cofactor and write down its roles. (DGL 2021)
- Q:56 Differentiate between prosthetic group and coenzyme. (DGK 2021)
- Q:57 Define Apoenzyme and Holoenzyme. (BWP 2021)
- Q:58 Give difference between Prosthetic group and Activator. (BWP 2021)
- Q:59 Why some enzymes are produced in their inactive form? (DGK 2022)
- Q:60 Why some enzymes are potentially damaging in their active action? (MLT 2022)
- Q:61 Why some enzyme are not produced in active form? Give an example. (SWL 2022)
- Q:62 Why co-factors are considered necessary for enzyme action? (MLT 2022)
- Q:63 Why are enzymes considered integral part of ribosomes? (GRW 2022, RWP 2022)

- Q:64** Why some enzymes are tightly bound to sub – cellular organelles? **(BWP 2022)**  
**Q:65** Why in human body vitamins are required in small quantity? **(SGD 2022)**  
**Q:66** Why apoenzyme is non-functional? **(SGD 2022)**  
**Q:67** Why without enzyme life is impossible? **(SGD 2022)**

**MECHANISM OF ENZYME ACTION**

**KIPS QUESTIONS**

**Q:68** What is difference between substrate & product?

**Ans: Substrate:**

Any substance such as proteins, carbohydrates, lipids etc., which is acted upon by the enzymes is called substrate.

**Product:**

Any substance which are formed after the reaction between substrate and enzyme.

**Q:69** What is active site? How many regions are present on it? Write their roles also.

**Ans: Active Site:**

It is a charge bearing cavity of an enzyme that is involved in catalysis.

**Binding and Catalytic Places of Active Site**

Active site of enzyme is divided into two further sites. One is binding site and other catalytic site.

**Binding site**

Recognizes and binds proper substrate.

**Catalytic site**

Transforms the substrate into product or products.

**Q:70** What is lock & Key Model? Who proposed it?

**Ans: Lock & Key Model**

According to this model as one specific key can open only a specific lock, in the same manner a specific enzyme can transform only specific substrate into products.

**Proposed By**

Emil Fischer (1890) proposed a Lock and Key model to visualize substrate and enzyme interaction.

**Q:71** What is Induce Fit Model?

**Ans:** Koshland (1959) proposed Induce Fit model. He argued that when a substrate combines with an enzyme, it induces changes in the enzyme structure, the change in structure enables the enzyme to perform its catalytic activity more effectively.

**Q:72** Give differences between Lock & Key model and Induce Fit model.

Lock and key Model	Induced Fit Model
This model was presented by Emil Fischer in 1890	This model was presented by Koshland in 1959
According to this model, enzyme is a rigid structure	According to this model, enzyme is a flexible structure.

**PAST PAPER QUESTIONS**

- Q:73** What is lock and key model of enzyme action? **(GRW 2017)**  
**Q:74** Define induce fit model about catalysis. **(FSD 2017)**  
**Q:75** How enzyme catalyse series of chemical reactions. **(SGD 2017)**  
**Q:76** State lock and key model. **(SGD 2017)**  
**Q:77** What is lock and key model of Enzyme Action? **(MTN 2017)**

- Q:78 What is induced fit model? (DGK 2017)
- Q:79 What is Lock and Key Model? Who proposed this model? (BWP 2017)
- Q:80 What do you mean by induce fit model of enzyme action? (LHR 2017)
- Q:81 What is lock and key model of enzyme action? (GRW 2017)
- Q:82 What is lock and Key model? (RWP 2017)
- Q:83 Define feedback inhibition of enzymes with diagram. (LHR 2018)
- Q:84 Differentiate between substrate and active site of enzymes. (LHR 2018)
- Q:85 What is induce fit model of enzyme action, who proposed it? (LHR 2018)
- Q:86 Give lock and key model of enzyme. (GRW 2018)
- Q:87 Define feedback inhibition of enzymes with diagram. (GRW 2018)
- Q:88 Give lock and key model of enzyme. (GRW 2018)
- Q:89 What is induce fit model of enzyme action, who proposed it? (GRW 2018)
- Q:90 What is lock and key model? (FSD 2019)
- Q:91 What is lock and key model of enzyme? (SRD 2019)
- Q:92 Define lock and key model of enzyme. (LHR 2019)
- Q:93 What is enzyme to enzyme chain? (LHR 2019)
- Q:94 How enzyme substrate complex is formed? (LHR 2019)
- Q:95 What is induced fit model? Who proposed it? (GRW 2019)
- Q:96 What is active site of enzyme? How it works? (MLT 2019)
- Q:97 Differentiate between binding site and catalytic site. (SWL 2019)
- Q:98 What is active site of enzyme? How it works? (MLT 2019)
- Q:99 What lock and Key Model says about Substrate Enzyme interaction? (BWP 2019)
- Q:100 Define lock and key model of enzyme. (LHR 2019)
- Q:101 What is enzyme to enzyme chain? (LHR 2019)
- Q:102 How enzyme substrate complex is formed? (LHR 2019)
- Q:103 What is induced fit model? Who proposed it? (GRW 2019)
- Q:104 What is lock and key model of enzyme? (FSD 2021)
- Q:105 What do you mean by lock and key method? (LHR 2021)
- Q:106 Write the induce-fit model of enzyme action. (LHR 2021)
- Q:107 What do you know about "Induced Fit Model" of enzyme action? (GRW 2021)
- Q:108 Define active site and also give its two regions. (GRW 2021)
- Q:109 How enzyme-substrate complex is formed? (GRW 2021)
- Q:110 What is active site of an enzyme? (FWL 2021)
- Q:111 Define induce fit model of enzyme catalysis and who proposed it? (DGL 2021)
- Q:112 Define lock and key model of catalysis and who proposed it. (DGK 2021)
- Q:113 Why binding site and catalytic site are important for enzymes? (LHR 2022)
- Q:114 Why changes in enzyme structure are necessary for catalysis? (DGK 2022)
- Q:115 Why some enzymatic reactions occur in series to form the final products? Explain briefly. (FSD 2022)
- Q:116 Which model for enzyme substrate interaction is more supported? Discuss briefly that model. (FSD 2022)
- Q:117 How an enzyme is recognized and select a proper substrate? (BWP 2022)
- Q:118 How does enzyme accelerate metabolic energy? (GRW 2022, RWP2022)
- Q:119 Why is catalytic region of active site is necessary to enzyme? (GRW 2022, RWP 2022)

**FACTOR AFFECTING THE RATE OF ENZYME ACTION****KIPS QUESTIONS**

**Q:120** How does enzyme concentration affect the rate of enzyme action?

**Ans:** If substrate concentration is unlimited then the rate of reaction depends on the amount of enzyme present at a specific time. If the amount of enzyme is doubled the reaction rate is also doubled. The increase in enzyme number causes increase in active sites. More active sites will convert more substrate into product(s), in a given time. After a certain limiting concentration, the rate of reaction will no longer depend upon this increase.

**Q:121** What is the effect of pH on enzyme activity?

**Ans.** Every enzyme functions most effectively over a narrow range of pH known as optimum pH. A slight change in pH can change the ionization of the amino acids at the active sites. Moreover it may affect the ionization of the substrates. Under these changed conditions enzyme activity is either retarded or blocked completely. Extreme changes in pH cause the bonds in the enzyme to break resulting in enzyme denaturation.

**PAST PAPER QUESTIONS**

**Q:122** How enzyme concentration affect enzyme action? (GRW 2017)

**Q:123** At high level of substrate concentration, enzyme reaction is not increased. Why? (FSD 2017)

**Q:124** What is the effect of substrate concentration on the rate of enzyme action? (MTN 2017)

**Q:125** How substrate concentration effects enzyme action? (DGK 2017)

**Q:126** What is effect of enzyme concentration on rate of reaction? (DGK 2017)

**Q:127** How enzyme concentration affect rate of enzyme action? (RWP 2017)

**Q:128** Write down the effect of high temperature on an enzyme. (SWL 2017)

**Q:129** Write down the effect of high temperature on an enzyme. (LHR-2017)

**Q:130** How enzyme concentration affect enzyme action? (GRW-2017)

**Q:131** How temperature affect Enzyme action? (MTN 2017)

**Q:132** What is effect of changed pH on the working of enzymes? (LHR 2018)

**Q:133** What is meant by optimum temperature? Give an example. (LHR 2018)

**Q:134** What is the role of enzyme concentration on the rate of enzyme action? (GRW 2018)

**Q:135** If more enzymes are added in a system its rate of reaction remain unchanged, why? (LHR 2019)

**Q:136** How enzyme concentration affects the rate of enzyme action? (MLT 2019)

**Q:137** At high level of substrate concentration, enzyme reaction is not increased. Why? (MLT 2019)

**Q:138** How enzyme concentration affect the rate enzyme action? (DGK 2019, LHR 2019)

**Q:139** How pH effects the rate of enzyme action? (FWL 2019)

**Q:140** How temperature affects rate of Enzyme Action? (EWF 2019, RWL 2019)

**Q:141** How enzyme concentration affects the rate of enzyme action? (MLT 2019)

**Q:142** At high level of substrate concentration, enzyme reaction is not increased. Why? (MLT 2019)

**Q:143** How enzyme concentration affects the rate of enzyme action? (LHR 2019)

**Q:144** If more enzymes are added in a system its rate of reaction remain unchanged, why? (LHR-2019)

**Q:145** How enzyme concentration affects the rate enzyme action? (DGK 2019)

**Q:146** Give a diagrammatic representation of an enzyme substrate reaction (Lock and Key model). (SWL 2021)

**Q:147** How pH effects the rate of enzyme action? (RWP 2021)

**Q:148** How temperature affects he rate of enzyme action? (RWP 2021)

**Q:149** Why enzymes are affected by extreme changes in pH? (LHR 2022)

- Q:150** Why optimum pH is necessary for proper functioning of enzymes? (DGK 2022)  
**Q:151** Why substrate concentration affects the rate of enzyme action? (MLT 2022)  
**Q:152** What will happen to enzymatic reactions if the temperature becomes 50°C? (SWL 2022)  
**Q:153** Enzymes become denatured in what ways? Explain briefly. (SLV 2022)  
**Q:154** Why enzymes need optimum pH for their proper functioning? Give one example. (FSD 2022)  
**Q:155** Which are two conditions that destroy enzymatic activity by disrupting bonds between atoms in enzymes? Give response. (BWP 2022)

**INHIBITORS**

**KEY QUESTIONS**

**Q:156** What are enzyme inhibitors? Write their types.

**Ans:** **Inhibitors:**

An inhibitor is a chemical substance which can react (in place of substrate) with the enzyme but is not transformed into product(s) and thus blocks the active site temporarily or permanently.

For example Malonic Acid, which is an inhibitor of succinic dehydrogenase, it occupies the active site before attachment of original substrate i.e. succinic acid.

**Types:**

- (a) Irreversible Inhibitors
- (b) Reversible Inhibitors
  - (1) Competitive Inhibitors
  - (2) Non-competitive Inhibitors

**Q:157** What are the differences between Reversible and Irreversible inhibitors of enzymes?

**Ans:**

Irreversible inhibitors	Reversible inhibitors
The inhibitors that check the rate of enzyme controlled reaction by occupying the active sites or destroying the globular structure of the enzyme are called irreversible inhibitors.	The inhibitors whose effect can be neutralized completely or partly by an increase in the concentration of the substrate are called reversible inhibitors.
They form covalent bonds at active sites thus physically blocking the sites.	They form weak linkages with the enzyme.

**Q:158** What are the differences between competitive and non-competitive inhibitors?

**Ans:**

Competitive	Non-competitive
They bind with the enzyme by occupying the active site.	The non-competitive inhibitors form enzyme-inhibitors complex at a point other than active site and alter the structure of the enzyme
They are structurally similar to substrate.	They are structurally dissimilar than substrate.

**PAST PAPER QUESTIONS**

- Q:159 What are inhibitors? (DGK 2017)
- Q:160 What are non-competitive inhibitors? (SCD 2017, RWP 2017)
- Q:161 Differentiate between irreversible and reversible inhibitors. (BWP 2017)
- Q:162 Differentiate between competitive and non-competitive inhibitors. (IHR 2017, LHR 2018)
- Q:163 Define competitive inhibitors. (GRW 2018)
- Q:164 What are reversible and irreversible inhibitors? (GRW 2019)
- Q:165 What are competitive inhibitors? Why they are called reversible inhibitors? (DGK 2019)
- Q:166 What are Competitive and Non-competitive inhibitors? (BWP 2019)
- Q:167 What are reversible and irreversible inhibitors? (GRW 2019)
- Q:168 Differentiate between competitive and non-competitive inhibitors. (SWL 2017, MTN 2017, LHR 2021)
- Q:169 Define reversible inhibitors name two types. (LHR 2021)
- Q:170 What are enzyme inhibitors? Give two examples. (RWL 2021)
- Q:171 Define Reversible and Irreversible Inhibitors. (SWL 2021)
- Q:172 Differentiate between enzyme and inhibitors. (SWL 2021)
- Q:173 Define competitive inhibitor. Give example. (MLT 2021)
- Q:174 What are irreversible inhibitors? (MLT 2021)
- Q:175 What is a competitive inhibitor of an enzyme? (MLT 2021)
- Q:176 Define inhibitor and give two examples. (DGL 2021)
- Q:177 What are noncompetitive inhibitors? (DGK 2021)
- Q:178 What are Enzyme Inhibitors? Give example. (BWP 2021)
- Q:179 Why inhibitors affect enzyme function? Mention with examples. (LHR 2022)