

**THIRD YEAR BSc. MLT**  
**BIOCHEMISTRY III**

**ENZYMOLGY**

**ESSAY 10 marks**

1. Write detailed about mechanism of enzyme action
  - Explain each mechanism in detail with suitable diagram
2. Factors affecting enzyme action. Add a note about Michaelis mention constant.
  - Explain each factors affecting in detail with diagrams
  - Explain Michaelis mention constant.
3. Classification of enzymes. Add a note about coenzymes
  - Explain each classifications with suitable examples
  - Write note on coenzyme definition,
  - Types with examples
4. Write detail about the enzyme pattern in liver diseases
  - List the enzymes
  - Write the abnormal pattern in various stages
5. Write detail about the enzyme pattern in MI
  - List the enzymes.
  - Write the abnormal pattern in various stages
6. Add in detailed about enzyme inhibition and add note on allosteric inhibition
  - Definition
  - Explain types with suitable examples.
  - Allosteric inhibition- definition with mode of inhibition and examples
7. Define enzyme. Classify enzymes according to IUB system with one example each. Mention the enzymes commonly estimated after myocardial infarction.
  - Definition

- Explain each classifications with suitable examples
  - List the enzymes after myocardial infarction.
  - Write the abnormal pattern in various stages
8. Describe kinetic method of estimation of enzyme activity. Describe any one method of estimation of creatine kinase.
- Explain about kinetic methods.
  - Different methods
  - One method for creatine kinase.
9. Plasma enzyme pattern in myocardial infarction, liver and muscle diseases and its diagnostic significances.
- List the enzymes patterns in all these conditions
  - Explain diagnostics significance
10. Discuss the role of isoenzymes as a diagnostic tool.
- Write definition
  - Classifications
  - Significances
  - Determinations

### SHORT ANSWER 5 MARKS

1. Classification of enzymes
  - Explain each classifications with suitable examples
2. Cofactor
  - Write definition
  - Types with suitable examples
3. Mechanism of enzyme action
  - Explain each mechanism in detail with suitable diagram
4. Michaelis-Menten constant
  - Write definition
  - Theory

- Constant derivation and significances
- 5. Enzyme inhibition
  - Write definition
  - Types with suitable examples
- 6. Immobilization of enzymes
  - Write definition,
  - Methods with suitable examples
- 7. Endpiont assay and kinetic assay
  - Write definition
  - Types
  - Significances with suitable examples
- 8. Creatine kinase
  - Write definition
  - Function,
  - Classification,
  - Normal values,
  - Significances
  - Determination methods
- 9. Creatine kinase and its determination
  - Write definition
  - Function
  - Classification
  - Normal values
  - Significances
  - Determination methods
- 10. Transaminases
  - Write definition
  - Types
  - Functions
  - Clinical significances,

- Normal values
  - Determination methods
11. Enzyme pattern in MI
- List the enzymes.
  - Write the abnormal pattern in various stages
12. Enzyme pattern ins liver diseses
- List the enzymes.
  - Write the abnormal pattern in various stages
13. Enzyme pattern in muscle diseases
- List the enzymes.
  - Write the abnormal pattern in various stages
14. Amylase and its determination
- Write definition
  - Function,
  - Classification
  - Normal values,
  - Significances
  - Determination methods
15. GGT
- Write definition
  - Function
  - Normal values
  - Significances
  - Determination methods
16. Isoenzymes
- Write definition
  - Classifications
  - Significances
  - Determinations

17. Competitive inhibition
  - Write definition
  - Types with suitable examples
18. Estimation of ceruloplasmin
  - Write definition
  - Function,
  - Normal values,
  - Significances
  - Determination methods
19. Effect of pH on enzyme activity.
  - Explain the factors affecting in detail
20. Iso enzymes of alkaline phosphatase
  - Write definition
  - Explain iso enzymes of alkaline phosphatase
  - Significances
  - Determinations
21. Estimation of Alanine transaminase
  - Write definition
  - Function,
  - Classification
  - Normal values,
  - Significances
  - Determination methods
22. Factors affecting enzyme action
  - Explain each factors affecting in detail with diagrams
23. Describe allosteric regulation and feedback inhibition with suitable examples.
  - Explain each regulation with example
24. Principles and methods for the estimation of amylase and lipase
  - Write definition

- Function,
  - Normal values,
  - Significances
  - Determination methods
25. Name the co enzymes of niacin and their role in metabolism
- Define
  - List co enzymes
  - Role in metabolism
26. Name the co enzymes of thiamine and their role in metabolism
- Define
  - List co enzymes
  - Role in metabolism
27. Markers of cholestasis
- List the enzymes.
  - Write the abnormal pattern in various stages
28. Iso enzymes of creatinine kinase
- Write definition
  - Explain iso enzymes of alkaline phosphatase
  - Significances
  - Determinations
29. Acid phosphatase
- Write definition
  - Types
  - Functions
  - Clinical significances,
  - Normal values
  - Determination methods
30. Principles and methods for estimation of glucose 6 phosphate dehydrogenase
- Write definition
  - Function,

- Normal values,
- Significances
- Determination methods

31. Clinical significance of AST

- Write definition
- Function,
- Normal values,
- Significances
- Determination methods

### ANSWER BRIEFLY 3 MARKS

1. Coenzyme
2. Active site of enzymes
3. Mechanism of enzyme action
4. Michaelis-Menten constant
5. Aldolase
6. GGT
7. Enolase
8. Flipped pattern of LDH
9. Troponin
10. LDH
11. Leucine aminopeptidase
12. Transaminase.
13. Ceruloplasmin.
14. Isoelectric focusing.
15. Non competitive inhibition.
16. Lipases
17. Co factors
18. Significance of  $K_m$
19. Clinical significance of glucose- 6- phosphate dehydrogenase
20. Significance of lactate dehydrogenase estimation.
21. Plasma enzyme pattern in liver disease.

22. Plasma enzymes in muscle dystrophy
23. Creatine kinase-MB
24. Estimation of amylase
25. Serum protein electrophoresis in multiple myeloma
26. Clinical significance of creatine kinase
27. Plasma enzyme pattern in liver disease
28. Enolase
29. 5' nucleotidase
30. Define optimum pH of enzyme action and give one example.
31. Immobilization of enzyme
32. Enzyme activity determination by end point assay
33. Cholinesterase
34. Creatinine clearance
35. Markers of cholestasis
36. Effect of temperature on enzyme action
37. Difference between end point assay and kinetic assay.
38.  $K_m$  value
39. Define optimum pH of enzyme action and give one example.
40. Immobilization of enzyme
41. Non protein enzymes
42. Mechanism of release of hepatic enzymes.
43. Regulatory enzyme
44. Pancreatic lipase.
45. Serum glutamate pyruvate transaminase
46. Gamma glutamyl transpeptidase
47. Isocitrate dehydrogenase.

## **HAEMOGLOBIN AND PORPHYRINS**

### **ESSAY 10 MARKS**

1. Structure of haemoglobin and add a note about haemoglobin variants
  - Structure,
  - Synthesis,



- Haemoglobin variants and its importance
2. Catabolism of heme, add a note about determination of bilirubin
    - Catabolism-site
    - Steps
    - Enzymes
    - Bilirubin-method,
    - Procedure
    - Normal range
  3. Define jaundice, add a note about classification of jaundice and its lab diagnosis
    - Define
    - Classification
    - Lab diagnosis in blood and urine
    - Significance
  4. Biosynthesis of haemoglobin
    - Structure
    - Site
    - Steps
    - Enzymes
    - Porphyria
  5. Write about porphyrias and add a note about the detection of porphyria
    - Define
    - Types
    - Clinical significance, lab diagnosis
  6. Write in detail the structure of haemoglobin
    - Structure and formation
  7. Describe the mechanism of carbon dioxide transport in blood and the role of Hb
    - Different mechanisms
    - Role of haemoglobin
  8. Give a brief account of chemistry of Hb and its properties

- Structure
  - Chemistry and properties
9. What are different abnormal Hb and how they differ from the normal Hb
- Abnormal Hb
  - Major difference from normal
10. What is porphyria? Classify different types of porphyrias. Give an account of AIP
- Define
  - Types
  - Clinical significance
  - Lab diagnosis
  - AIP
11. Describe the catabolism of heme in the body
- Catabolism –define
  - Steps
  - Enzymes
  - Clinical significance
12. Classify jaundice. How do you investigate a case of jaundice
- Define
  - Classify
  - Clinical significance
  - Lab diagnosis
13. How bilirubin is formed in the body? Describe how it is excreted. Describe the biochemical changes in hepatocellular jaundice and obstructive jaundice
- Site
  - Synthesis and excretion of bilirubin
  - Biochemical changes in jaundice
14. What is the difference between hemoglobinopathies and thalassemias? Describe any one in detail
- Define
  - Types

- Chemistry with suitable example
15. Discuss the principle and the methods for the estimation of direct and total bilirubin. Explain briefly on urobilinogen and urobilin.
- Define bilirubin
  - Principle, methods for estimation.
  - Define urobilinogen and urobilin
  - Mention about test for urobilinogen and urobilin.
16. Describe how heme is synthesized. Add a note on its regulation.
- Structure
  - Site
  - Steps
  - Enzymes
  - Regulation.

### SHORT ANSWER 5 marks

1. ODC
  - Define
  - Stages
  - Graph
  - Importance
2. Function of Hb
  - Functions in detail
3. Transport of gases
  - Define
  - Types
  - Role
4. Structure of Hb
  - Structure
5. Thalassemia

- Define
  - Types
  - Clinical significance
6. Sickle cell anaemia
- Define
  - Causes
  - Types
  - Lab diagnosis
7. Haemoglobinopathies
- Define
  - Causes
  - Types
  - Lab diagnosis
8. Derivatives of Hb
- Define with suitable examples
9. CarboxyHb
- Define
  - Clinical significance
10. Met-Hb
- Define
  - Causes
  - Types
  - Lab diagnosis
11. Myoglobin
- Structure
  - Synthesis
  - Importance
12. Hyperbilirubinemias
- Define

- Causes
- Types
- Lab diagnosis

13. Griger-Najjar syndrome

- Define
- Causes
- Clinical features
- Lab diagnosis

14. Dubin-Johnson syndrome

- Define
- Causes
- Types
- Lab diagnosis

15. VD-bergh test

- Define
- Principle
- Procedure
- Significance

16. Jaundice

- Define
- Causes
- Types
- Lab diagnosis

17. Catabolism of heme

- Define
- Site steps
- Enzymes

18. AIP

- Define
- Causes

- Clinical significance
  - Lab diagnosis
19. Biosynthesis of heme
- Define
  - Site
  - Steps
  - Enzymes
20. Transport of oxygen by Hb
- Define
  - Different types
  - ODC
21. ALA
- Define
  - It's role
22. Rate limiting step of heme synthesis
- Site
  - Enzymes and its action
23. Regulation of heme synthesis
- Regulation
24. Formation and fate of bilirubin
- Bilirubin metabolism
25. Hemolytic jaundice
- Define
  - Causes
  - Clinical significance
  - Lab diagnosis
26. Urobilinogen
- Define
  - Formation

- Lab diagnosis
27. Isohydric transport of carbon dioxide
- Define
  - Different
  - Types of transport
28. Hbvariants
- Define
  - Explain with examples
29. Hbderivatives
- Define
  - Explain with examples
30. Estimation of direct and total bilirubin
- Lab diagnosis
  - Clinical significance
31. Porphyrins
- Define
  - Types
  - Lab diagnosis
32. Estimation of porphyrins
- Method
  - Principle
  - Procedure
33. Estimation of urobilinogen
- Method
  - Principle
  - Procedure
34. Fate of bilirubin
- Bilirubin metabolism

35. Bilirubin and related chromoprotein
- Define bilirubin
  - Define chromoprotein
  - Explain about the formation of bilirubin from chromo protein by break down.
36. Prescribe the methods for the estimation of porphyrins and their precursors in urine.
- Define porphyrias
  - Explain porphyrin and other precursors present in urines
  - Principle, methods for estimation.
37. Obstructive jaundice
- Define
  - Causes
  - Clinical significance
  - Lab diagnosis
38. Test done in obstructive jaundice
- Lab diagnosis
  - Clinical significance
39. Bohr effect
- Define DOC
  - Define bohr effect
  - Graphical explanation
40. Glycosylated haemoglobin
- Define
  - Clinical significance
41. Primary porphyria
- Define
  - Types
  - Lab diagnosis
42. Chromoproteins
- Define



- Types
- Lab diagnosis

43. Transport of carbon dioxide in blood

- Define
- Different types of transport

**ANSWER BRIEFLY 3 marks**

1. Bile pigment
2. Sickle cell anaemia
3. Thalassemias
4. Hemolytic jaundice
5. Dubin- Johnson syndrome
6. Hyperbilirubinemia
7. Gilberts disease
8. Hemoglobin variants
9. Methemoglobin
10. Acute intermittent porphyria
11. Myoglobin
12. Methemoglobin
13. Secondary porphyria
14. Detection of Hb derivative
15. Significance of 2,3 bis phosphor glycerate
16. Sample collection for bilirubin estimation.
17. Ehrlich's test
18. Watson-Schwartz test
19. Fouchets test
20. Carboxy hemoglobin
21. Soret band
22. Hamburger effect
23. Haldane effect

# CHROMATOGRAPHY

## ESSAY 10 MARKS

1. Define chromatography. Add a note about paper chromatography
  - Write definition
  - Principle
  - Parts
  - Procedures
  - Applications
  
2. HPLC and add its applications
  - Write definition
  - Principle
  - Parts
  - Procedures
  - Applications
  
3. Define aminoacidurias. Write about types of aminoacidurias and its lab diagnosis
  - Define aminoacidurias
  - Types
  - Lab diagnosis
  
4. Define chromatography and add a note on HPLC
  - Define
  - Principle
  - HPLC- principle, parts, procedures, and applications
  
5. Define chromatography and add a note on ion exchange chromatography
  - Definition
  - Classification
  - Ion exchange chromatography- principle, parts, procedures, application
  
6. Write detail about principle, parts, procedures, and applications of paper chromatography
  - Write definition
  - Principle
  - Parts

- Procedures
  - Applications
7. Explain the principle and procedures for chromatographic separation of amino acids. Discuss the salient features of gas chromatography.
- Define
  - Methods
  - Principle
  - Procedure, applications
8. Define chromatography .Discuss the diagnostic role of chromatography in aminoaciduriasis.
- Define chromatography
  - Define aminoaciduriasis
  - Detection by chromatographic method [aminogram]

### SHORT ANSWER 5 MARKS

1. Chromatography of lipids
- Define
  - Methods
  - Principle
  - Procedure, applications
2. Chromatography of sugars
- Define
  - Methods
  - Principle
  - Procedure
  - Applications
3. Solvent systems used in chromatography
- Define
  - Types
  - Ratio

- Preparation
- 4. Partition coefficient
  - Define
  - Principle
  - Importance
- 5. Relative R<sub>f</sub>
  - Define
  - Calculation
  - Importance
- 6. Aminoaciduria
  - Define
  - Types
  - Significance
- 7. Ion exchange chromatography
  - Principle
  - Procedure
  - Applications
- 8. Define chromatography and add a note on paper chromatography
  - Define
  - Principle
  - Procedure
- 9. GLC
  - Define
  - Principle
  - Procedure
  - Applications
- 10. TLC
  - Define
  - Principle

- procedure
- Applications

11. Affinity chromatography

- Define.
- Principle
- Procedure
- Applications

12. HPLC

- Define
- Principle
- Procedure
- Applications

13. Molecular exclusion chromatography

- Define.
- Principle
- Procedure
- Applications

14. Chromatography of aminoacids

- Define.
- Principle
- Procedure
- Applications

15. Urinary aminogram

- Define
- Methods
- Principle
- Procedure

16. Adsorption chromatography

- Define.
- Principle

- Procedure
  - Applications
17. Homocystinuria
- Define.
  - Aminoaciduria
  - Lab test
18. Diagrammatic representation of ion exchange chromatography
- Define.
  - Principle
  - Procedure
  - Applications
19. Phenylketonuria
- Define.
  - Aminoaciduria
  - Lab test
20. Alkaptonuria
- Define.
  - Aminoaciduria
  - Lab test

**ANSWER BRIEFLY 3 MARKS**

1. Locating agent in paper chromatography
2. Solvent system
3. Relative R<sub>f</sub>
4. Ninhydrine
5. Ligands
6. Thin layer chromatography
7. Affinity chromatography
8. R<sub>f</sub> value
9. Application of HPLC

10. Principles of chromatography
11. Specific gravity of urine
12. Sample preparation for urine chromatography

## **ELECTROPHORESIS**

### **ESSAY 10 MARKS**

1. Write principle of electrophoresis and add detailed about paper electrophoresis
  - Principle
  - Requirements
  - Procedure
  - Merits and demerits
  - Application
2. Write principle of electrophoresis and add detailed about gel electrophoresis
  - Principle
  - Requirements
  - Procedure
  - Merits and demerits
  - Application
3. Write detail about serum electrophoresis and its interpretation
  - Principle
  - Requirements
  - Procedure
  - Merits and demerits
  - Application
4. Write detail about Hb electrophoresis and its interpretation
  - Principle
  - Requirements
  - Procedure
  - Merits and demerits
  - Application

5. Principle, types, and application of electrophoresis
  - Principle
  - Requirements
  - Procedure
  - Merits and demerits
  - Application
  
6. Mention the principle and procedure for electrophoresis of plasma proteins. Discuss the electrophoretic pattern in liver diseases, nephritic syndrome.
  - Principle
  - Requirements
  - Procedure
  - Merits and demerits
  - Application
  
7. Define electrophoresis and discuss the different types. Add a note on the recent advances in this techniques.
  - Define
  - Principle
  - Requirements
  - Types
  - Recent advances.

### **SHORT NOTES 5 MARKS**

1. Serum electrophoresis
  - Principle
  - Requirements
  - Procedure
  - Application
  
2. Hb electrophoresis
  - Principle
  - Requirements
  - Procedure
  - Application



3. Gel electrophoresis

- Principle
- Requirements
- Procedure
- Application

4. Disc electrophoresis

- Principle
- Requirements
- Procedure
- Application

5. Agar gel electrophoresis

- Principle
- Requirements
- Procedure
- Application

6. Agarose gel electrophoresis

- Principle
- Requirements
- Procedure
- Application

7. PAGE electrophoresis

- Principle
- Requirements
- Procedure
- Application

8. SDS-PAGE electrophoresis

- Principle
- Requirements
- Procedure
- Application

9. Capillary electrophoresis
  - Principle
  - Requirements
  - Procedure
  - Application
10. IsoElectric focussing
  - Principle
  - Requirements, procedure application
11. Multiple myeloma
  - Define
  - Clinical significance
  - Identification test
12. Immunoelectrophoresis
  - Principle
  - Requirements,
  - Procedure
  - Application
13. Diagrammatically explain the electrophoretic pattern in nephritic syndrome.
  - Principle
  - Requirements
  - Procedure
  - Diagram
  - Clinical significance

**ANSWER BRIEFLY 3 MARKS**

1. SDS-PAGE
2. Gel electrophoresis
3. Agarose
4. Iso electric focusing

5. FISH
6. Application of Agar in biochemistry
7. Electroendosmosis.

## **URINARY AND BILIARY CALCULI, CLEARANCE TESTS**

### **ESSAY 10 MARKS**

1. Write detail about urinary calculi and add a short note on biliary calculi
  - Formation
  - Types
  - Significance
  - Identification test
2. Write detail about clearance tests. Add a note on creatinine clearance
  - Define
  - Types
  - Clinical importance
  - Estimation
  - Normal range

### **SHORT NOTES 5 MARKS**

1. Urinary calculi
  - Formation
  - Types
  - Detection
2. Detection of urinary calculi
  - Detection methods
  - Principle
  - Procedure
3. Biliary calculi
  - Types
  - Clinical significance

4. Clearance tests

- Define
- Types
- Principle
- Importance

5. Urea clearance

- Define
- Method
- Principle
- Normal range

6. Creatinine clearance

- Define
- Method
- Principle
- Normal range

7. Analysis of biliary calculi

- Write definition
- Clinical significance
- Lab test

## **IMMUNOLOGICAL METHODS**

### **SHORT NOTES 5 MARKS**

1. Immunodiffusions

- Define
- Types
- Applications

2. RIA

- Principle
- Types

- Procedure
- Application

### 3. ELISA

- Principle
- Types
- Procedure
- Application

### 4. FIA

- Principle
- Types
- Procedure
- Application

### 5. Receptor assay

- Principle
- Types
- Procedure
- Application

### 6. Antigen-antibody reactions

- Principle
- Types
- Procedure
- Application

### **ANSWER BRIEFLY 3 Marks**

1. Immunodiffusion
2. Antigen antibody reaction
3. Immunofixation