

Competency Based Questions and Answers in **Biochemistry** for First MBBS Professional Examination

Salient Features

- Questions and MCQs Prepared as per MCI Guidelines
- Content Written and Arranged as per the MCI's Competency-Based Curriculum
- Included are Long Essays, Short Essays and Short Notes
- Types of MCQs are Case-Based, Picture-Based and Matching Options, etc.
- Questions are Based on Knows, Knows How Components
- Copious Flowcharts, Tables and Line Diagrams are included
- Text is Given in Simple and Easy to Remember Points.



has been founded and developed by a team of passionate doctors and entrepreneurs to bring out a series of high-quality study companions for the MBBS students as per the latest MCI syllabus. This is being the first venture among them. The Academy is also involved in preparing and delivering the content for upcoming NEXT. It encourages young doctors who have outstanding teaching and writing skills to collaborate in this unique project.



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Competency Based Questions and Answers in **Biochemistry** for First MBBS Professional Examination

SUSHRUTHA Academy



Competency Based Questions and Answers in **Biochemistry**

for First MBBS Professional Examination


Compiled and designed as per Competency Based Undergraduate Curriculum for the Indian Medical Graduate prescribed by Medical Council of India

- 36 Long Essays
- 159 Short Essays
- 175 Short Notes
- 600 MCQs

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**Sushrutha Academy
Bengaluru**



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to

Ancient Gurus of Bharat



Preface

“Assessment drives learning”

The purpose of assessment is not just to assess learning but also assist learning. The new CBME curriculum proposed by the Medical Council of India (MCI) calls for an outcome-based teaching-learning approach and transition from just acquisition of knowledge to application and practice of knowledge. Assessments need to be designed to suit the newer teaching-learning methods and to assess if the required competency has been achieved or not.

The purpose of bringing out this book is to introduce the I MBBS students to the new format of questions that are most likely to be asked during the internal assessment and the university examination and also equip them to face these examinations without fear. Students can use this book for self-assessment of learning, preparing for internal assessment and university examination.

The book has been compiled by group of teachers who have undergone MCI recognized training in revised basic medical education technologies and advanced course in medical education. The questions in this book have been arranged according to competencies as listed in the MCI curriculum document. Various types of questions including structured long essays, modified essays, short answers, and multiple choice questions are added. These questions have been framed according to the guidelines set by the MCI with appropriate use of verbs at each level of Bloom's taxonomy of cognitive domain. The questions not only assess recall but also higher levels of learning.

We would like to acknowledge all the people who are involved in the publishing of this book especially Shri SK Jain (Chairman), Shri Varun Jain (Director), Mr YN Arjuna (Vice President—Publishing, Editorial and Publicity), Mrs Ritu Chawla (General Manager) and Mrs Jassi of CBS Publishers & Distributors, for their all-time support.

We hereby wish all the readers of the book all the best in their endeavors.

Happy reading!

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Contents

<i>Preface</i>	<i>vii</i>
<i>Details of the Number of Questions and MCQs included as per the Competency</i>	<i>xi</i>
1. Basic Biochemistry	1
2. Enzyme	6
3. Chemistry and Metabolism of Carbohydrates	32
4. Chemistry and Metabolism of Lipids	58
5. Chemistry and Metabolism of Proteins	86
6. Metabolism and Homeostasis	115
7. Molecular Biology	164
8. Nutrition	199
9. Extracellular Matrix	207
10. Oncogenesis and Immunity	210
11. Biochemical Laboratory Test	221

Multiple Choice Questions

1. Basic Biochemistry	237–238
2. Enzyme	239–249
3. Chemistry and Metabolism of Carbohydrates	250–261
4. Chemistry and Metabolism of Lipids	261–269
5. Chemistry and Metabolism of Proteins	270–276
6. Metabolism and Homeostasis	276–301
7. Molecular Biology	302–311
8. Nutrition	312–317
9. Extracellular Matrix	318–322
10. Oncogenesis and Immunity	322–330
11. Biochemical Laboratory Test	330–355

Details of the Number of Questions and MCQs included as per the Competency

S. No.	Competency No.	Competency Details	Long Essays	Short Essays	Short Notes	MCQs
1. Basic Biochemistry						
1.	BI 1.1	Describe the molecular and functional organization of a cell and its sub-cellular components	—	04	02	08
2. Enzyme						
2.	BI 2.1	Explain fundamental concepts of enzyme, isoenzyme, alloenzyme, coenzyme and co-factors. Enumerate the main classes of IUBMB nomenclature	03	05	05	08
3.	BI 2.2	Observe the estimation of SGOT and SGPT	—	02	02	13
4.	BI 11.13	Demonstrate the estimation of SGOT/SGPT	—	02	01	07
5.	BI 2.3	Describe and explain the basic principles of enzyme activity	—	02	01	07
6.	BI 2.4	Describe and discuss enzyme inhibitors as poisons and drugs and as therapeutic enzymes	01	02	01	06
7.	BI 2.5 BI 2.7	Describe and discuss the clinical utility of various serum enzymes as markers of pathological conditions Interpret laboratory results of enzymes activities and describe the clinical utility of various enzymes as markers of pathological conditions	01	02	04	10
7.	BI 2.6	Discuss use of enzymes in laboratory investigations (enzyme-based essays)	—	02	—	05
3. Chemistry and Metabolism of Carbohydrates						
8.	BI 3.1	Discuss and differentiate monosaccharides, di-saccharides and polysaccharides giving examples of main carbohydrates as energy fuel, structural element and storage in the human body	—	01	05	06
9.	BI 3.2 BI 3.3	Describe the processes involved in digestion and assimilation of carbohydrates and storage Describe and discuss the digestion and assimilation of carbohydrates from food	—	02	01	05

S. No.	Competency No.	Competency Details	Long Essays	Short Essays	Short Notes	MCQs
10.	BI 3.4	Define and differentiate the pathways of carbohydrate metabolism (glycolysis, gluconeogenesis, glycogen metabolism, HMP shunt)	04	06	03	05
11.	BI 3.5	Describe and discuss the regulation, functions and integration of carbohydrate along with associated diseases/disorders	—	—	01	09
12.	BI 3.6	Describe and discuss the concept of TCA cycle as an amphibolic pathway and its regulation	01	02	—	06
13.	BI 3.7 BI 3.8	Describe the common poisons that inhibit crucial enzymes of carbohydrate metabolism (e.g. fluoride, arsenate) Discuss and interpret laboratory results of analytes associated with metabolism of carbohydrates	—	02	—	13
14.	BI 3.9 BI 3.10	Discuss the mechanism and significance of blood glucose regulation in health and disease Interpret the results of blood glucose levels and other laboratory investigations related to disorders of carbohydrate metabolism	01	02	03	09
4. Chemistry and Metabolism of Lipids						
15.	BI 4.1	Describe and discuss main classes of lipids (essential/non-essential fatty acids, cholesterol and hormonal steroids, triglycerides, major phospholipids and sphingolipids) relevant to human system and their major functions	—	05	05	07
16.	BI 4.2	Describe the processes involved in digestion and absorption of dietary lipids and also the key features of their metabolism	01	10	—	05
17.	BI 4.3	Explain the regulation of lipoprotein metabolism and associated disorders	01	02	02	05
18.	BI 4.4	Describe the structure and functions of lipoproteins, their functions, interrelations and relations with atherosclerosis	—	07	02	06
19.	BI 4.5 BI 4.7	Interpret laboratory results of analytes associated with metabolism of lipids	02	03	01	08
20.	BI 4.6	Describe the therapeutic uses of prostaglandins and inhibitors of eicosanoid synthesis	—	01	01	05
5. Chemistry and Metabolism of Proteins						
21.	BI 5.1	Describe and discuss structural organization of proteins	—	02	07	11
22.	BI 5.2	Describe and discuss functions of proteins and structure—function relationships in relevant areas, e.g. hemoglobin and selected hemoglobinopathies	—	03	02	06

S. No.	Competency No.	Competency Details	Long Essays	Short Essays	Short Notes	MCQs
23.	BI 5.3	Describe the digestion and absorption of dietary proteins	—	02	02	05
24.	BI 5.4	Describe common disorders associated with protein metabolism	03	09	15	07
25.	BI 5.5	Interpret laboratory results of analytes associated with metabolism of proteins	01	03	01	05
6. Metabolism and Homeostasis						
26.	BI 6.1	Discuss the metabolic processes that take place in specific organs in the body in the fed and fasting states	—	04	—	08
27.	BI 6.2 BI 6.3	Describe and discuss the metabolic processes in which nucleotides are involved Describe the common disorders associated with nucleotide metabolism	01	03	—	14
28.	BI 6.4	Discuss the laboratory results of analytes associated with gout and Lesch-Nyhan syndrome	—	02	—	09
29.	BI 6.5	Describe the biochemical role of vitamins in the body and explain the manifestations of their deficiency	04	08	07	09
30.	BI 6.6	Describe the biochemical processes involved in generation of energy in cells	—	03	—	10
31.	BI 6.7	Describe the processes involved in maintenance of normal pH, water and electrolyte balance of body fluids and the derangements associated with these	—	04	06	07
32.	BI 6.8	Discuss and interpret results of Arterial blood gas (ABG) analysis in various disorders	01	02	02	08
33.	BI 6.9	Describe the functions of various minerals in the body, their metabolism and homeostasis	—	02	04	07
34.	BI 6.10	Enumerate and describe the disorders associated with mineral metabolism	01	02	—	05
35.	BI 6.11	Describe the functions of haem in the body and describe the processes involved in its metabolism and describe porphyrin metabolism	01	03	—	09
36.	BI 6.12	Describe the major types of hemoglobin and its derivatives found in the body and their physiological/pathological relevance	—	02	—	06
37.	BI 6.13	Describe the functions of the kidney, liver, thyroid and adrenal glands	—	03	—	05
38.	BI 6.14	Describe the tests that are commonly done in clinical practice to assess the functions of these organs (kidney, liver, thyroid and adrenal glands)	01	03	—	11
39.	BI 6.15	Describe the abnormalities of kidney, liver, thyroid and adrenal glands	01	01	01	06

S. No.	Competency No.	Competency Details	Long Essays	Short Essays	Short Notes	MCQs
7. Molecular Biology						
40.	BI 7.1	Describe the structure and functions of DNA and RNA and outline the cell cycle	—	03	05	08
41.	BI 7.2	Describe the processes involved in replication and repair of DNA and the transcription and translation mechanisms	03	04	14	08
42.	BI 7.3	Describe gene mutations and basic mechanism of regulation of gene expression	—	03	02	09
43.	BI 7.4	Describe applications of molecular technologies like recombinant DNA technology, PCR in the diagnosis and treatment of diseases with genetic basis	01	04	04	07
44.	BI 7.5	Describe the role of xenobiotics in disease	—	03	03	09
45.	BI 7.6	Describe the anti-oxidant defence systems in the body	—	01	03	08
46.	BI 7.7	Describe the role of oxidative stress in the pathogenesis of conditions such as cancer, complications of diabetes mellitus and atherosclerosis	—	—	02	05
8. Nutrition						
47.	BI 8.1	Discuss the importance of various dietary components and explain importance of dietary fibre	—	01	04	07
48.	BI 8.2	Describe the types and causes of protein energy malnutrition and its effects	—	01	01	06
49.	BI 8.3	Provide dietary advice for optimal health in childhood and adult, in disease conditions like diabetes mellitus, coronary artery disease and in pregnancy	01	—	01	06
50.	BI 8.4	Describe the causes (including dietary habits), effects and health risks associated with being overweight/obesity	—	—	02	07
51.	BI 8.5	Summarize the nutritional importance of commonly used items of food including fruits and vegetables (macromolecules and its importance)	—	—	05	05
9. Extracellular Matrix						
52.	BI 9.1	List the functions and components of the extracellular matrix (ECM)	—	—	02	04
53.	BI 9.2	Discuss the involvement of ECM components in health and disease	—	03	—	08
54.	BI 9.3	Describe protein targeting and sorting along with its associated disorders	—	01	—	10
10. Oncogenesis and Immunity						
55.	BI 10.1	Describe the cancer initiation, promotion oncogenes and oncogene activation. Also focus on p53 and apoptosis	01	—	03	15

S. No.	Competency No.	Competency Details	Long Essays	Short Essays	Short Notes	MCQs
56.	BI 10.2	Describe various biochemical tumor markers and the biochemical basis of cancer therapy	01	03	02	06
57.	BI 10.3	Describe the cellular and humoral components of the immune system and describe the types and structure of antibody	—	02	02	07
58.	BI 10.4	Describe and discuss innate and adaptive immune responses, self/non-self recognition and the central role of T-helper cells in immune responses	—	01	—	06
59.	BI 10.5	Describe antigens and concepts involved in vaccine development	—	01	01	05
11. Biochemical Laboratory Test						
60.	BI 11.1	Describe commonly used laboratory apparatus and equipment, good safe laboratory practice and waste disposal	—	—	01	08
61.	BI 11.2	Describe the preparation of buffers and estimation of pH	—	—	01	04
62.	BI 11.3	Describe the chemical components of normal urine	—	—	01	06
63.	BI 11.4	Perform urine analysis to estimate and determine normal and abnormal constituents	—	—	03	08
64.	BI 11.5	Describe screening of urine for inborn errors and describe the use of paper chromatography	—	—	03	11
65.	BI 11.6	Describe the principles of colorimetry	—	—	01	05
66.	BI 11.7	Demonstrate the estimation of serum creatinine and creatinine clearance	—	—	01	07
67.	BI 11.8	Demonstrate estimation of serum proteins, albumin and A:G ratio	—	—	01	07
68.	BI 11.9	Demonstrate the estimation of serum total cholesterol and HDL cholesterol	—	—	01	06
69.	BI 11.10	Demonstrate the estimation of triglycerides	—	—	01	05
70.	BI 11.11	Demonstrate estimation of calcium and phosphorus	—	—	01	05
71.	BI 11.12	Demonstrate the estimation of serum bilirubin	—	—	01	05
72.	BI 11.14	Demonstrate the estimation of alkaline phosphatase	—	—	01	05
73.	BI 11.15	Describe and discuss the composition of CSF	—	—	02	12
74.	BI 11.16	Observe use of commonly used equipment/ techniques in biochemistry laboratory including: <ul style="list-style-type: none"> • pH meter • Paper chromatography of amino acid • Protein electrophoresis • TLC, PAGE • Electrolyte analysis by ISE • ABG analyzer • ELISA 	—	—	06	09

S. No.	Competency No.	Competency Details	Long Essays	Short Essays	Short Notes	MCQs
75.	BI 11.17	<ul style="list-style-type: none"> • Immunodiffusion • Autoanalyzer • Quality control • DNA isolation from blood/tissue Explain the basis and rationale of biochemical tests done in the following conditions: <ul style="list-style-type: none"> • Diabetes mellitus • Dyslipidemia • Myocardial infarction • Renal failure, gout • Proteinuria • Nephrotic syndrome • Edema • Jaundice • Liver diseases, pancreatitis, disorders of acid-base balance • Thyroid disorders 				12
76.	BI 11.18	Discuss the principles of spectrophotometry	—	—	01	04
77.	BI 11.19	Outline the basic principles involved in the functioning of instruments commonly used in a biochemistry laboratory and their applications				07
78.	BI 11.20	Identify abnormal constituents in urine, interpret the findings and correlate these with pathological states	—	—	01	07
	BI 11.21	Demonstrate estimation of glucose, creatinine, urea and total protein in serum	—	—	01	06
79.	BI 11.22	Calculate albumin:globulin (AG) ratio and creatinine clearance	—	—	02	05
80.	BI 11.23	Calculate energy content of different food items. Identify food items with high and low glycemic index and explain the importance of these in the diet	—	03	02	08
81.	BI 11.24	Enumerate advantages and/or disadvantages of use of unsaturated, saturated and and trans fats in food	—	02	01	08
Total Content			36	159	175	600