



Sri Guru Ram Das University of Health Sciences, Sri Amritsar

Department of Biochemistry

Theory Paper A		Theory Paper B	
Topics	Marks Distribution	Topics	Marks Distribution
Basic Biochemistry	05	Molecular Biology	35
Enzyme	10	Nucleotide Chemistry and Metabolism	10
Chemistry and Metabolism of carbohydrates	20	Minerals, Water and Electrolytes Balance	15
Chemistry and Metabolism of Lipids	18	Acid base Balance	10
Chemistry and Metabolism of Proteins and immunology Heme metabolism	22	Organ function test and Hormones	10
Integration of Metabolism & biological oxidation	05	Extracellular Matrix	05
Vitamin and Nutrition	10	Oncogenesis, tumor markers and HIV	05
Antioxidants and Oxidative stress	05	Xenobiotics and AI	05
Aetcom 1.1	05	Aetcom 1.1	05
Total	100	Total	100

Number	COMPETENCY The student should be able to	Predominant Domain K/S/A/C	Level K/KH/S H/P	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Number required to certify P
BIOCHEMISTRY (Topics = 14, Competencies = 84)							
Topic 1: Basic Biochemistry		Number of competencies:(01)			Number of competencies that require certification:(NIL)		
BC1.1	Describe the molecular and functional organization of a cell and its sub-cellular components and composition and functions of Biological membranes.	K	KH	Y	LGT, SGT / SDL	Written assessment/ Viva voce	
Topic 2: Enzyme		Number of competencies:(05)			Number of competencies that require certification:(NIL)		
BC2.1	Explain fundamental concepts of enzyme, isoenzyme and coenzyme. Enumerate the main classes of IUBMB nomenclature.	K	KH	Y	LGT, SGT	Written assessment / Viva voce	
BC2.2	Describe and explain the basic principles of enzyme activity	K	KH	Y	LGT, SGT	Written assessment / Viva voce	
BC2.3	Describe and discuss enzyme Inhibition and role of enzymes or drugs as Inhibitors, and enzymes as therapeutic agents.	K	KH	Y	LGT, Casediscussion SGT	Written assessment / Viva voce	
BC2.4	Describe and discuss the clinical utility of various serum enzymes in laboratory and their use as markers of various pathological conditions.	K	KH	Y	LGT, SGT, Flipped class room	Written assessment / Viva voce	
BC2.5	Interpret laboratory results of enzymes in various disorders.	K	KH	Y	SGT, DOAPs, Case Studies	Written assessment/ Viva voce/ Case studies, OSPE	
Topic 3: Chemistry and Metabolism of Carbohydrates		Number of competencies:(06)			Number of competencies that require certification:(NIL)		

Number	COMPETENCY The student should be able to	Predominant Domain K/S/A/C	Level K/KH/S H/P	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Number required to certify P
BC3.1	Discuss and differentiate monosaccharides, di-saccharides and polysaccharides with examples, their importance as energy fuel, structural element, and storage molecule in human body.	K	KH	Y	LGT, SGT	Written/Viva voce	
BC3.2	Describe the digestion, absorption and transport of carbohydrates from food along with its disorders.	K	KH	Y	LGT, SGT, SDL	Written/Viva-voce	
BC3.3	Define and briefly describe the pathways of carbohydrate metabolism and their regulation (glycolysis, gluconeogenesis, TCA, and significance of glycogen metabolism and HMP shunt), with associated disorders.	K	KH	Y	LGT, SGT, Flipped class room	Written/Viva voce	
BC3.4	Describe and discuss the regulation, functions and integration of minor Carbohydrate Metabolism pathway briefly along with associated diseases /disorders.	K	KH	Y	LGT, SGT	Written/Viva-voce	
BC3.5	Discuss the mechanism and significance of blood glucose regulation (Glucose homeostasis) in health and disease. Describe the types, Biochemical changes, complications and laboratory investigations related to diabetes & other carbohydrate metal disorders.	K	KH	Y	LGT, SGT, Flipped class room	Written/Viva voce	
BC3.6	Interpret the results of analytes associated with metabolism of carbohydrates and other laboratory investigations related to disorders of carbohydrate metabolism.	K	KH	Y	LGT, SGT Case Studies / SDL, Flipped class room	Written/ Viva voce/ Case Studies /OSPE	
Topic 4 : Chemistry and Metabolism of Lipids		Number of competencies: (08)			Number of competencies that require certification:(NIL)		
BC4.1	Describe and discuss main classes of lipids and their functions.	K	KH	Y	LGT, SGT /SDL	Written/Viva voce	
BC4.2	Describe the digestion and absorption of dietary lipids and its (associated disorders.	K	KH	Y	LGT, SGT /SDL	Written /Viva voce	
BC4.3	Describe and discuss the fatty acid oxidation, metabolism of ketone bodies along with their clinical significance.	K	KH	Y	LGT, SGT	Written /Viva voce	

Number	COMPETENCY The student should be able to	Predominant Domain K/S/A/C	Level K/KH/S H/P	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Number required to certify P
BC4.4	Describe metabolism of Triglycerides and cholesterol metabolism along with its regulation and clinical significance.	K	KH	Y	LGT, SGT	Written /Viva voce	
BC4.5	Describe the metabolism of lipoproteins with brief overview of lipoprotein structure, their interrelations & relations with atherosclerosis.	K	KH	Y	LGT, SGT	Written /Viva voce	
BC4.6	Discuss Biological role and therapeutic applications of Eicosanoids and their Inhibitors.	K	KH	Y	LGT, SGT, Flipped class room	Written /Viva voce	
BC4.7	Describe Fatty liver, cholelithiasis and obesity.	K	KH	Y	LGT, SGT, Case Studies/Scenarios/SDL	Written /Viva voce	
BC4.8	Interpret laboratory results of analytes associated with metabolism of lipids	K	KH	Y	LGT, SGT, case studies, Flipped class room	Written/Viva voce/ case studies/OSPE	
Topic 5: Chemistry & Metabolism of Proteins and Immunology		Number of competencies:(09)			Number of competencies that require certification:(NIL)		
BC5.1	Discuss briefly structure of amino acids and classify amino acids on the basis of Nutritional and Metabolic significance.	K	KH	Y	LGT, SGT/SDL	Written / Viva voce	
BC5.2	Discuss classification of proteins, structural organization, functions and clinical aspects.	K	KH	Y	LGT, SGT	Written / Viva voce	
BC5.3	Describe the digestion and absorption of dietary proteins	K	KH	Y	LGT, SGT / SDL	Written / Viva voce	
BC5.4	Describe plasma proteins and their functions and brief overview of normal and abnormal electrophoretic pattern of serum proteins, acute phase proteins.	K	KH	Y	LGT, SGT	Written / Viva voce	
BC5.5	Describe the structure, functions and disorders of Immunoglobulins with brief description of cellular and humoral Immunity.	K	KH	Y	LGT, SGT	Written / Viva voce	

Number	COMPETENCY The student should be able to	Predominant Domain K/S/A/C	Level K/KH/S H/P	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Number required to certify P
BC 5.6	Describe the formation, transport, detoxification of Ammonia, Ammonia toxicity and its clinical significance.	K	KH	Y	LGT, SGT	Written / Viva voce	
BC 5.7	Describe the specialized products formed from the amino acids Glycine, Phenylalanine, Tyrosine, Tryptophan, and Methionine, branched chain amino acids and Arginine and the inborn errors associated with them. Discuss new-born screening.	K/S	KH/SH	Y	LGT, SGT	Written / Viva voce	
BC5.8	Describe the structure and functions of haem in the body and describe the processes involved in its metabolism with emphasis on jaundice and describe porphyrin metabolism.	K	KH	Y	LGT, SGT	Written / Viva voce	
BC5.9	Describe the major types of Hemoglobin and its types, derivatives & variants found in the body and their physiological / pathological relevance	K	KH	Y	LGT, SGT	Written / Viva voce	
Topic 6: Extracellular Matrix		Number of competencies: (03)			Number of competencies that require certification: (NIL)		
BC6.1	Enumerate the functions and components of the extracellular matrix (ECM).	K	KH	Y	LGT, SGT	Written/Viva voce	
BC6.2	Discuss the involvement of ECM components in health and disease.	K	KH	Y	LGT, SGT	Written/Viva voce	
BC6.3	Describe protein targeting & sorting along with its associated disorders.	K	KH	N	LGT, SGT	Written/Viva voce	
Topic 7: Integration of Metabolism and Biological Oxidation		Number of competencies: (02)			Number of competencies that require certification: (NIL)		
BC7.1	Describe the integration of various metabolic processes in the body (Carbohydrate, Lipid, and Protein).	K	KH	Y	LGT, SGT	Written/viva voce	
BC7.2	Describe the Biochemical processes involved in generation of energy in cells.	K	KH	Y	LGT, SGT	Written/Viva voce	
Topic 8: Vitamins and Nutrition		Number of competencies: (06)			Number of competencies that require certification: (NIL)		

Number	COMPETENCY The student should be able to	Predominant Domain K/S/A/C	Level K/KH/S H/P	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Number required to certify P
BC8.1	Describe the Biochemical role of vitamins in the body and explain the manifestations of their deficiency	K	KH	Y	LGT, SGT	Written/Viva voce	
BC8.2	Discuss the importance of various dietary components and explain importance of dietary fibre.	K	KH	Y	LGT, SGT, SDL	Written/Viva voce	
BC8.3	Describe the types and causes of protein energy malnutrition and its effects.	K	KH	Y	LGT, SGT	Written/Viva voce	
BC8.4	Provide dietary advice for optimal health in childhood and adult in disease conditions like diabetes mellitus, coronary artery disease and in pregnancy.	K/S/C	KH	Y	LGT, SGT / role play	Written/Viva voce	
BC8.5	Describe the causes (including dietary habits), effects and health risks associated with being overweight/ obese / metabolic syndrome	K	KH	Y	LGT, SGT	Written/Viva voce	
BC8.6	Summarize the nutritional importance of commonly used items of food including fruits and vegetables (macro-molecules & its importance).	K	KH	Y	LGT, SGT, Home assignment	Written/Viva voce	
Topic 9: Minerals, electrolytes, Water and Acid base balance		Number of competencies: (03)		Number of competencies that require certification: (NIL)			
BC9.1	Describe the dietary sources, absorption, transport, and metabolism, Biochemical functions of Iron, Calcium and copper with its associated clinical disorders.	K	KH	Y	LGT, SGT, Home Assignment, Flipped class room	Written/Viva voce	
BC9.2	Discuss Magnesium, Zinc and Phosphorus along with its clinical significance and discuss the functions of trace elements	K	KH	Y	LGT, SGT, Home Assignment. / SDL	Written/Viva voce	
BC9.3	Describe the processes involved in maintenance of normal pH, water & electrolyte balance of body fluids and the derangements associated with them	K	KH	Y	LGT, SGT / SDL	Written/Viva voce	

Number	COMPETENCY The student should be able to	Predominant Domain K/S/A/C	Level K/KH/S H/P	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Number required to certify P
Topic 10: Molecular Biology		Number of competencies:(07)		Number of competencies that require certification:(NIL)			
BC10.1	Describe nucleotides and nucleic acids and their clinical significance.	K	KH	Y	LGT, SGT	Written/Viva voce	
BC10.2	Describe briefly synthesis of purines in the body with special stress on salvage pathway.	K	KH	N	LGT, SGT /SDL	Written/Viva voce	
BC10.3	Describe the degradation of purines and its significance with associated disorders.	K	KH	Y	LGT, SGT	Written/Viva voce	
BC10.4	Describe in brief the major steps involved in Replication, Transcription, and translation.	K	KH	Y	LGT, SGT	Written/Viva voce	
BC 10.5	Describe the types of DNA repair, gene mutations and associated disorders.	K	KH	Y	LGT, SGT	Written/Viva voce	
BC10.6	Describe basic mechanism of regulation of gene expression	K	KH	Y	LGT, SGT /SDL	Written/Viva voce	
BC10.7	Describe applications of molecular technologies like recombinant DNA technology and PCR in the diagnosis and treatment of diseases. Briefly discuss microarray, FISH, CRISPR	K	KH	Y	LGT, SGT, Flipped class room	Written/Viva voce	
Topic 11: Organ Function tests and Hormones		Number of competencies:(02)		Number of competencies that require certification:(NIL)			
BC 11.1	Describe the function tests of kidney, liver, thyroid and adrenal glands and their clinical significance. Interpret the function tests report.	K,S	KH/SH	Y	LGT, SGT, Case studies /SDL	Written/Viva voce/Case studies/OSPE	

Number	COMPETENCY The student should be able to	Predominant Domain K/S/A/C	Level K/KH/S H/P	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Number required to certify P
BC11.2	Enumerate the hormones and markers related to reproduction and reproductive health and their clinical interpretation (For e.g. LH, FSH, Prolactin, beta-HCG, Estrogen Progesterone, testosterone and AMH). Discuss importance of prenatal screening.	K	KH	Y	LGT, SGT / SDL, Flipped class room	Written/Viva voce/Direct observation/ OSPE	
Topic 12: Xenobiotic, oxidative stress and antioxidants		Number of competencies:(03)		Number of competencies that require certification:(NIL)			
BC12.1	Describe the role of xenobiotics in disease in health and disease	K	KH	Y	LGT, SGT	Written/Viva voce	
BC12.2	Describe the anti-oxidant defense systems in the body.	K	KH	Y	LGT, SGT	Written/Viva voce	
BC12.3	Describe the role of oxidative stress in the pathogenesis of conditions such as cancer, complications of diabetes mellitus and atherosclerosis	K	KH	Y	LGT, SGT / SDL	Written/Viva voce	
Topic 13: Miscellaneous		Number of competencies:(05)		Number of competencies that require certification:(NIL)			
BC 13.1	Describe oncogenesis, oncogenes & its activation with focus on p53 & apoptosis.	K	KH	Y	LGT, SGT	Written/Viva voce	
BC 13.2	Describe various Biochemical tumor markers and the Biochemical basis of cancer therapy.	K	KH	Y	LGT, SGT	Written/Viva voce	
BC13.3	Discuss briefly on HIV and Biochemical changes in AIDS.	K	KH	N	LGT, SGT	Written/Viva voce	
BC13.4	Discuss metabolism of alcohol with Biochemical changes and effects of chronic alcoholism.	K	KH	Y	LGT, SGT, SDL	Written/Viva voce	
BC13.5	Describe the role of Artificial Intelligence in clinical Biochemistry laboratory practices.	K	KH	N	LGT, SGT / SDL	Written/ Viva voce Logbook Record	

Number	COMPETENCY The student should be able to	Predominant Domain K/S/A/C	Level K/KH/S H/P	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Number required to certify P
Topic 14: Biochemical Laboratory test / Practical Number of competencies: (24) Number of competencies that require certification : (11)							
14.1	Describe commonly used laboratory apparatus equipments, good / safe laboratory practice, Biomedical hazards & waste management.	K	KH	Y	LGT, SGT	Written/ Viva voce/ Direct observation	
BC14.2	Describe estimation of pH by pH meter or ABG analyser and interpretation of results with paper case scenarios.	K	KH	Y	LGT, SGT / Case discussion	Written/ Viva voce Direct observation/ OSPE	
BC14.3	Describe the physical properties, chemical constituents of normal urine and abnormal constituents of urine and Perform urine analysis to determine normal and abnormal constituents (including dipsticks method demonstration).	K,S	KH/P	Y	LGT, Small group Discussion / DOAP	Written/ Viva voce / DOAP	2
BC14.4	Identify abnormal constituents in urine, interpret the findings and correlate these with pathological states and prepare a urine report.	S	P	Y	DOAPs	Skill assessment / OSPE	1
BC14.5	Describe screening of urine for inborn errors & describe the use of paper chromatography	K	KH	Y	LGT, SGT	Written/ Viva voce/ Direct observation/ OSPE	
BC14.6	Describe the principles of Colorimetry & Spectrophotometry.	K	KH	Y	LGT, SGT	Written / Viva voce / Direct observation	
BC14.7	Perform estimation of glucose by manual / semi-automated analyzer method and demonstrate glucometer usage. and interpretation of results with clinical scenarios.	S	P	Y	DOAPs	Skill Assessment OSPE	1
BC14.8	Perform estimation of urea and calculate BUN and interpretation of results in clinical scenarios.	S	P	Y	DOAPs	Skill Assessment OSPE	1

Number	COMPETENCY The student should be able to	Predominant Domain K/S/A/C	Level K/KH/S H/P	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Number required to certify P
BC14.9	Perform the estimation of serum creatinine and calculate creatinine clearance.	S	P	Y	DOAP	Skill Assessment OSPE	1
BC14.10	Perform estimation of uric acid in serum and interpretation of results with clinical scenarios.	S	P	Y	DOAPs	Skill Assessment OSPE	1
BC14.11	Perform estimation of serum proteins, albumin and A:G ratio	S	P	Y	DOAPs	Skill Assessment OSPE	1
BC14.12	Perform the estimation of serum total cholesterol	S	P	Y	DOAPs	Skill Assessment OSPE	1
BC14.13	Perform the estimation of serum Bilirubin by manual / semi-automated analyzer method.	S	P	Y	DOAP	Skills assessment / OSPE	1
BC14.14	Describe estimation of calcium and phosphorus and interpretation of results.	K	KH	Y	LGT, SGT, Demonstration	Written / Viva voce	
BC14.15	Describe the estimation Triglycerides, HDL and calculation of LDL and interpretation of results with clinical scenarios.	K	KH	Y	LGT, SGT	Written / Viva voce / OSPE (LDL Calculate)	
BC14.16	Describe the estimation of SGOT (AST) / SGPT (ALT) / Alkaline Phosphatase and interpretation of results with clinical scenarios.	K	KH	Y	LGT, SGT	Written/ Viva voce	
BC14.17	Describe briefly various body fluids & discuss the composition of CSF.	K	KH	Y	LGT, SGT	Written/ Viva voce	
BC14.18	Observe use of commonly used equipments/techniques in Biochemistry laboratory including: •pH meter •Paper chromatography of amino acid •Protein electrophoresis	K	KH	Y	Demonstration (SGT) & Lab Visit	Written/ Viva voce / Direct observation	

Number	COMPETENCY The student should be able to	Predominant Domain K/S/A/C	Level K/KH/S H/P	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Number required to certify P
	<ul style="list-style-type: none"> • TLC, PAGE • Electrolyte analysis by ISE • ABG analyzer • ELISA • Immunodiffusion • Autoanalyser • DNA isolation from blood/ tissue 						
BC14.19	<p>Explain the basis and rationale of Biochemical tests done and interpretation of laboratory results in the following conditions:</p> <ul style="list-style-type: none"> - Diabetes mellitus, - Obesity, - dyslipidaemia, - Fatty liver - myocardial infarction, - Renal failure, - Gout, - Nephrotic syndrome, - Jaundice, - Liver diseases, pancreatitis, disorders of acid- base balance, - Thyroid disorders, - Genetic disorders - Nutritional disorders - Vitamin deficiency disorders, - Disorders of Mineral metabolism, - Disorders of electrolyte metabolism. 	K	KH	Y	LGT/ Clinical case studies discussion (SGT)	Written/ Viva voce / OSPE / Case studies interpretation	
BC14.20	Describe & Identify Pre-Analytical (especially order of draw, tourniquet technique), Analytical, Post Analytical errors.	S	SH	Y	LGT, SGT DOAP(clinical lab), Skill lab	Written/ Viva voce/ OSPE/ Direct observation/ OSPE	

Number	COMPETENCY The student should be able to	Predominant Domain K/S/A/C	Level K/KH/S H/P	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Number required to certify P
BC14.21	Describe Quality control and identify basic L J charts in Clinical biochemistry lab.	S	SH	Y	LGT / SGT / DOAP (clinical lab)	Written/ Viva voce/ OSPE/ Direct observation/ OSPE	1
BC14.22	Describe performance of OGTT, Glucose Challenge Test and HbA1c and interpretation of results with clinical scenarios.	K	KH	Y	LGT, SGT	Written/ Viva voce/ OSPE /Direct observation/ Case studies interpretation.	
BC14.23	Calculate energy content of different food items, identify food items with high and low glycaemic index and explain the importance of these in the diet.	K	KH	Y	LGT, SGT	Written/ Viva voce	
BC 14.24	Observe, Interpret and discuss the baseline, diagnostic, prognostic, and discharge investigations of clinical biochemistry.	K,A,S,C	SH	Y	ECE-SGT(Bedside/ Ward visit/ Medical record department)	Logbook, reflections	

Department of Biochemistry

Guidelines for question paper as per the Medical Council of India, Competency Based Undergraduate Curriculum for Indian Medical Graduate.

Theory paper should include questions from core competencies and not from Non Core Competency

BLUEPRINT OF THEORY PAPER

Sr. No.	Type	Explanation	Topics	Distribution of marks as per weightage
1.	MCQ		10 MCQs for Paper A 10 MCQs for Paper B	2 X 10 = 20 2 X 10 = 20
2.	Long essay question	1. The question should pose a Clinical/ Practical problem to the students and require them to apply knowledge and integrate it with disciplines. Avoid giving one liners as questions. 2. Avoid giving one liners as questions. 3. The question stem should be structured and marking distribution should be provided. 4. Use action verbs from higher domains as given in this document.	Paper A (One Question) 1. Structured Question from core competencies in Paper A Paper B (Two Questions) 1. Structured Question from core competencies in Paper B	1 X 10= 10 1 X 10= 10
3.	Reasoning Questions	These provide excellent opportunities for testing integration, clinical reasoning and analytic ability of the student.	Paper A (5 Questions) From Core Competencies of all topics as per competency based undergraduate curriculum for the Indian Medical Graduate, VOLUME 1	5 X 3 = 15

			<p>Paper B (5 Questions) From Core Competencies of all topics as per competency based undergraduate curriculum for the Indian Medical Graduate, VOLUME 1</p>	5 X 3 = 15
4.	Short Notes (Applied Questions)	Questions on applied aspect From six integrated modules.	<p>Paper A (4 Questions) From Core Competencies as per competency based undergraduate curriculum for the Indian Medical Graduate, VOLUME 1</p> <p>Paper B (4 Questions) From Core Competencies as per competency based undergraduate curriculum for the Indian Medical Graduate, VOLUME 1</p>	4 X 5 = 20 4 X 5 = 20
5.	Short Notes	These provide opportunity to sample a wider content, albeit in a short time. The questions should be task oriented rather than 'Write a short note on xxx'. Preferably use verbs (as per List attached) in framing questions and structure them as far as possible	<p>Paper A (3 Questions) From Core Competencies as per competency based undergraduate curriculum for the Indian Medical Graduate, VOLUME 1</p> <p>Paper B (3 Questions) From Core Competencies as per competency based undergraduate curriculum for the Indian Medical Graduate, VOLUME 1</p>	3 X 5 = 15 3 X 5 = 15

6.	Short notes + AETCOM module	<p>These provide opportunity to sample a wider content, albeit in a short time. The questions should be task oriented rather than 'Write a short note on xxx'.</p> <p>Preferably use verbs (as per List attached) in framing questions and structure them as far as possible</p>	<p>Paper A (3 Questions + AETCOM module)</p> <p>Paper B (3 Questions + AETCOM module)</p>	<p>4 x 5 = 20</p> <p>4 x 5 = 20</p>
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Total Marks 200(Paper A- 100 marks, Paper B-100 marks)

Blueprinting in knowledge domain

(Representative example only. Actual figures may vary with the subject and phase)

Level	Topic A	Topic B	Topic C	Topic D	Total
Knowledge	1	2	1	1	5 (20%)
Comprehension	1	1	1	2	5(20%)
Application	2	1	1	1	5 (20%)
Analysis	1	1	2	2	6(24%)
Synthesis		1		1	2 (8%)
Evaluation	1		1		2 (8%)
Total	6 (24%)	6 (24%)	6 (24%)	7 (28%)	25 (100%)

Verbs in various levels in Knowledge domain (Bloom's taxonomy)

Level	Suggested Verbs
Knowledge	Define, Describe, Draw, Find, Enumerate, Cite, Name, Identify, List, label, Match, Sequence, Write, State
Comprehension	Discuss, Conclude, Articulate, Associate, Estimate, Rearrange, Demonstrate understanding, Explain, Generalise, Identify, Illustrate, Interpret, Review, Summarise
Application	Apply, Choose, Compute, Modify, Solve, Prepare, Produce, Select, Show, Transfer, Use
Analysis	Analyse, Characterise, Classify, Compare, Contrast, Debate, Diagram, Differentiate, Distinguish, Relate, Categorise
Synthesis	Compose, Construct, Create, Verify, Determine, Design, Develop, Integrate, Organise, Plan, Produce, Propose, rewrite
Evaluation	Appraise, Assess, Conclude, Critic, Decide, Evaluate, judge, Justify, Predict, Prioritise, Prove, Rank

The question part of the MCQ (item) is called STEM; correct answer is called the KEY and the rest of the options are called DISTRACTORS.

Steps in writing:

1. Select the specific learning objectives which you want to test.
2. Write the stem, it should be self-explanatory and complete, avoid using terms like (NOT, EXPECT, NEVER, ALWAYS, SOMETIMES) in the stem, if the terms are being used they should be in UPPERCASE and **bold** letter.
3. Write unambiguous and unarguably the correct answer to the stem.
4. Select the most plausible alternatives and arrange them in the form of options.
5. Avoid window dressing of the stem. This means adding superfluous and unnecessary words which confuses the student.
6. Abbreviations should be avoided.
7. Options should be grammatically parallel to the key, and should be parallel and have the same relation to the stem.
8. When writing options, avoid duplications or making options all inclusive, e 1-6, 6-10 etc.
9. The options should be arranged in rank order, eg. 256, 266, 280, 290 and not 290, 266, 280, 256.
10. "All the above" and "None of the above" should be avoided as an option.

Distribution of Marks: - BIOCHEMISTRY

Papers		Maximum Marks	Minimum Passing Marks
Theory (Summative Assessment) (100 +100=200 Marks)	Theory Paper I(Sample paper Attached)	100	Mandatory to get 40% marks separately in theory and in practical and with minimum 50% in aggregate for theory plus practical.
	Theory paper II(Sample paper Attached)	100	
Practical * (Summative Assessment) (60 + 40= 100 Marks) 1. Practical/clinical examinations will be conducted in the laboratories and /or hospital wards. The objective will be to assess proficiency and skills to conduct experiments, interpret data and form logical conclusion.) 2. Viva/oral examination should assess approach to patient management, emergencies, attitudinal, ethical and professional values. Candidate's skill in interpretation of common investigative data, X-rays, identification of specimens, ECG, etc. is to be also assessed.	1. Lab Investigation & Interpretation (Case history to be given and students should perform the following based on the case as directed by the examiners) a. Qualitative Analysis a) Perform urine analysis to estimate and determine normal and abnormal constituents(any three parameter) b) Discussion b. Quantitative Analysis a) Estimation of Blood Glucose, Blood Urea, serum Creatinine, Serum Total Protein and Serum Albumin, Uric acid b) Principle and clinical applications of any one of the following serum : total cholesterol , TGL, HDL-C, Calcium, phosphorous, Bilirubin, SGOT , SGPT, ALP c) Discussion	20	
	2. OSPE/Spotters including Oral Viva Examination a. Performance station b. Non Performance station	20	
	3. Oral Viva examination of : (should focus on the application and interpretation) Lab equipment's, Chart, Graphs, Topic covered in ECE & Photographs etc	40	
Internal Assessment (Not added to the marks of the university examinations and should be shown separately in the grade card)	Theory	100	
	Practical	100	

During practical examinations assessment tools are not limited to above mentioned methods; you can use other methods also to improve authenticity. Please refer to competency based assessment module for UG medical education for more examples of methods. Also includes topics covered in ECE.

Formative & Internal Assessment: - Internal assessment shall be based on day-to-day assessment. Efforts should be made to use multiple tools even for a given competency to improve validity and reliability of assessment.

It shall relate to different ways in which learners participate in learning process which is day to day recorded in record book and log book in the form of :-

- a) Assignments,
- b) Preparation for seminar,
- c) Clinical case presentation,
- d) Preparation of clinical case for discussion,
- e) Clinical case study/problem solving exercise participation in project for health care in the community,
- f) Proficiency in carrying out a practical or a skill in small research project etc.

Regular periodic examination shall be conducted throughout the course as per following schedule:-

SRI GURU RAM DAS INSTITUTE OF MEDICAL SCIENCES & RESEARCH												
DEPARTMENT OF ANATOMY / PHYSIOLOGY/ BIOCHEMISTRY												
MBBS	Year/phase 1 st Prof. Phase-I						Session --					Cumulative percent of Theory & Practical
			Formative Assessment				Continuous Internal Assessment (Theory)					
S.No.	Roll No.	Name of Student	1st PCT Theory	2 nd PCT Theory	Prelims theory Paper I and II	Send up	Assignments	Seminars/ Class Test	Attendance (Theory)	Total	Percentage Theory (Minimum cut off 40%)	Theory + Practical=100+100=200 (Minimum cut off 50%)
			10	10	15	30	15	15	05	100		
1.												
2.												
3.												
4.												
5.												
6.												
7.												

SRI GURU RAM DAS INSTITUTE OF MEDICAL SCIENCES & RESEARCH											
DEPARTMENT OF ANATOMY / PHYSIOLOGY/ BIOCHEMISTRY											
MBBS	Year/phase 1st Prof. Phase-I						Session --				
			Formative Assessment			Continuous Internal Assessment (Practical)					
S.No.	Roll No.	Name of Student	1st PCT Practical	2nd PCT Practical	Send up	Log Book	AETCOM	Case Base Discussion / Viva/ Museum	Attendance (Practical)	Total	Percentage Practical (Minimum cut off 40%)
			10	10	15	30	15	15	05	100	
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											



Maximum Marks: 100

MBBS 1st Professional Examination

Time: 3 Hours

(Session Oct/Nov 2025)

Subject- Biochemistry (New Scheme)

Paper-A

- Note:**
1. Attempt all questions. Illustrate your answer with suitable diagrams where applicable.
 2. Question No. I (Multiple Choice Questions (1-10)) is to be attempted on OMR Sheet in first 15 minutes of the start of exam.
 3. Question No. II-VI are to be attempted on the main answer book. No supplementary sheet shall be provided.
 4. Students must write QP code in the space provided on OMR sheet as well as on the title page of the main answer book.

QP Code: MBN105A

Multiple Choice Questions (MCQs):

[10X2=20]

- I.
1. **A newborn develops jaundice and anemia shortly after birth. The mother is Rh-negative and the baby is Rh- positive. Antibodies from the mother attacked the baby's red blood cells. This is a type of**
 - a. Type I hypersensitivity
 - b. Type II hypersensitivity
 - c. Type III hypersensitivity
 - d. Type IV hypersensitivity
 2. **A patient with hypocalcemia is found to have elevated parathyroid hormone levels. Which enzyme is upregulated in the kidney due to PTH?**
 - a. 25-hydroxylase
 - b. 24-hydroxylase
 - c. 1-alpha hydroxylase
 - d. 21-hydroxylase
 3. **A patient is admitted with chest pain and diagnosed with myocardial infarction. Which serum enzyme is expected to be significantly elevated in this condition?**
 - a. GOT (AST)
 - b. GPT (ALT)
 - c. Alkaline phosphatase
 - d. Amylase
 4. **Bacterial synthesis of folic acid by the human intestinal flora is inhibited when sulphanilamide is administered. The type of inhibition brought about by sulphanilamide is:**
 - a. Allosteric Inhibition
 - b. Non-competitive inhibition
 - c. Competitive inhibition
 - d. Enzyme poisoning
 5. **High cholesterol diet fed animals exhibit a decrease in cholesterol synthesis by liver because cholesterol inhibits the enzyme:**
 - a. HMG CoA synthetase
 - b. HMG CoA Lyase
 - c. HMG CoA reductase
 - d. Squalene synthetase
 6. **In fasting beyond 3-4 days, largest amino acids released on muscle proteolysis are:**
 - a. Alanine and Glutamine
 - b. Serine and Threonine
 - c. Cysteine and Methionine
 - d. Leucine and Lysine
 7. **A mother brought her 20-day-old female infant to the hospital with a history of poor feeding, vomiting for 1 week, generalized convulsions and a peculiar burnt sugar smell from the body and urine. Increased Plasma & Urine Concentration of branched-chain amino acids & their keto acids is suggestive of which enzyme deficiency?**
 - a. Isovaleric CoA Dehydrogenase
 - b. Branched Chain Ketoacid Dehydrogenase
 - c. Fumaryl acetoacetate hydrolase
 - d. Phenylalanine hydroxylase

8. **Galactosemia is an inherited disorder of metabolism associated with the accumulation of galactose-1-P in the erythrocytes with increased galactose levels in plasma and excretion of galactose in urine. The enzyme responsible for causing galactosemia is:**
- Galactokinase
 - Galactose-1-P uridyl transferase
 - UDP-galactose-4-epimerase
 - UDPG pyro phosphorylase
9. **An individual with a Biotinidase deficiency was shown to produce fatty acids at a greatly reduced rate (in the absence of supplements) as compared to someone who did not have the deficiency. This is due to which of the following?**
- Low activity of citrate lyase
 - Reduced activity of acetyl transacylase
 - Defective acyl carrier protein
 - Reduced ability to form malonyl-CoA
10. **You prescribe ibuprofen to help reduce your patient's inflammation. Which of the following pathways is blocked as an anti-inflammatory mechanism of action of nonsteroidal anti-inflammatory drugs?**
- Prostaglandin synthesis
 - Thromboxane synthesis
 - Leukotriene synthesis
 - Arachidonic acid release from the membrane

II. **Define gluconeogenesis. Name the substrates for gluconeogenesis. Explain the pathway of gluconeogenesis. Add a note on its regulation.** [10]

III. **Reasoning Questions (Why):** [5X3=15]

- Explain why HbF has high affinity for oxygen than HbA
- Explain the formation & utilisation of Ketone bodies. How are they harmful when present in excess?
- Explain the role of rate limiting enzymes in regulation of Glycogenesis & Glycogenolysis.
- Justify why Vitamin D is considered to be a prohormone.
- Justify why orotic aciduria in hyperammonaemia Type II.

IV. **Write short notes (Applied questions) on:** [4X5=20]

- Describe Glucose tolerance test. Discuss its clinical significance?
- Define Km. Illustrate the role of Enzymes as Markers of Pancreatic diseases.
- Explain biochemical basis of Homocystinuria & Investigations done to diagnose it.
- Discuss reverse cholesterol transport.

V. **Explain briefly:** [3X5=15]

- Explain what is BMI? Give an account on its clinical Importance.
- Explain structure & functions of Bio membranes.
- Explain chemiosmotic theory of Oxidative Phosphorylation. Enumerate its inhibitors.

VI. **Write short notes on:** [4X5=20]

- Structural organization of proteins
- Fatty acid Synthase complex.
- Use of Vitamin E as antioxidant in preventing lipid peroxidation.
- Describe professional qualities and roles of a physician.



Maximum Marks: 100

MBBS 1st Professional Examination

Time: 3 Hours

(Session Oct/Nov 2025)

Subject- Biochemistry (New Scheme)

Paper-B

- Note:**
1. Attempt all questions. Illustrate your answer with suitable diagrams where applicable.
 2. Question No. I (Multiple Choice Questions (1-10)) is to be attempted on OMR Sheet in first 15 minutes of the start of exam.
 3. Question No. II-VI are to be attempted on the main answer book. No supplementary sheet shall be provided.
 4. Students must write QP code in the space provided on OMR sheet as well as on the title page of the main answer book.

QP Code: MBN106A

Multiple Choice Questions (MCQs):

[10X2=20]

- I. 1. **A researcher is studying cell migration and notices that inhibition of integrins prevents cells from adhering to the extracellular matrix. Which of the following best explains the role of integrins in ECM interaction?**
- a. They produce collagen fibers
 - b. They degrade basement membranes
 - c. They anchor cells to ECM by binding fibronectin and laminin
 - d. They transport calcium across the plasma membrane
2. **Which one of the following enzymes synthesizes primers in eukaryotic replication?**
- a. DNA polymerase α
 - b. DNA polymerase β
 - c. DNA polymerase γ
 - d. DNA polymerase δ
3. **One of the following is considered as the 'cap binding protein complex'.**
- a. eIF- 4A and eIF-4B
 - b. eIF-4F
 - c. GTP-bound eIF-2
 - d. eIF- 3
4. **Most laboratories measure both serum total calcium and serum albumin. If the albumin is diminished bound calcium falls, and total calcium level as a result will be low. Calculation of adjusted calcium will clarify the status. Adjusted calcium refers to:**
- a. Serum total calcium
 - b. Twice the value of serum unbound calcium
 - c. A calculated figure of serum total calcium if the albumin had been normal
 - d. A calculated figure of serum bound calcium if the albumin had been normal
5. **5. A 35-year-old man with narcotic overdose was admitted to the hospital in severe coma with respiratory depression. His blood sample showed: pH=7.22 (Normal Blood pH=7.35-7.45); HCO⁻³=25 mEq/L; pCO₂= 61 mm Hg (Normal pCO₂ level=35-45 mm Hg)**
- a. Metabolic acidosis
 - b. Respiratory acidosis
 - c. Metabolic alkalosis
 - d. Respiratory alkalosis
6. **The loss of DNA at the ends of chromosomes is prevented by the action of:**
- a. PCNA
 - b. Telomerase
 - c. DNA Ligase
 - d. DNA gyrase
7. **The enzyme that links amino acid to the tRNA is:**
- a. Peptidyl transferase
 - b. Telomerase
 - c. Aminoacyl- tRNA synthetize
 - d. Aminotransferase

8. In plasma, HCO_3^- is neutralized by Na^+ , and is present as NaHCO_3 ; NaHCO_3 is referred to as; 'AKALI RESERVE' of plasma. The normal range of plasma NaHCO_3 is:
- 16-18 mmol/L
 - 18-22 mmol/L
 - 20-24 mmol/L
 - 22-26 mmol/L
9. A 50-year-old woman is diagnosed with invasive breast carcinoma. The tumor cells are seen to breach the basement membrane. Which enzyme secreted by cancer cells facilitates this process?
- Elastase
 - Matrix metalloproteinase
 - Cathepsin D
 - Hyaluronidase
10. A 1-year-old female patient is lethargic, weak, and anemic. Her height and weight are low for her age. Her urine contains an elevated level of orotic acid. Activity of uridine monophosphate synthase is low. Administration of which of the following is most likely to alleviate her symptoms?
- Adenine
 - Guanine
 - Thymidine
 - Uridine

II. Describe the process of protein biosynthesis in prokaryotes. Enumerate various inhibitors of translation & discuss mechanism of action of any one. [10]

III. Reasoning Questions (Why): [5X3=15]

- Justify why iron is called a one-way element.
- Justify why collagen synthesis is impaired in Vitamin C deficiency.
- In the light of Operon model explain why glucose is preferentially utilized even in presence of lactose.
- What are Oncogenes? Discuss the mechanism of carcinogenesis by any 2 oncogenes protein produced.
- Give reason why high protein diet and intake of alcohol precipitates gouty attack

IV. Write short notes (Applied questions) on: [4X5=20]

- Summarize the role of PTH and calcitonin in Calcium Homeostasis.
- Discuss thyroid function tests and their clinical significance.
- What is Gene Therapy? Describe the role of viruses in Gene Therapy.
- Define the term RFLP & VNTR. Explain their role in DNA fingerprinting.

V. Explain briefly: [3X5=15]

- Describe principle & procedure of PCR. Give its applications in medicine.
- Compare and contrast metabolic alkalosis.
- Discuss role of AI in laboratory practice.

VI. Write short notes on: [4X5=20]

- Lesch-Nyhan Syndrome
- Regulation of water and electrolyte balance
- Biochemical role of oestrogens and progesterone during pregnancy.
- Describe and discuss the role of a physician in health care system.