Highlighted on Page No. 4, 16 to 23.

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC
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COMPETENCY BASED MEDICAL EDUCATION

(CBME)

(with effect from 2019-2020 Batches)

Curriculum for

First M.B.B.S

Human Biochemistry

Amended upto AC-41/2021, Dated 27/08/2021

Amended History

1. Approved as per BOM 57/2019 [Resolution no. 3.1.1.13], Dated 26/4/2019
2. Amended upto BOM 62/2020 [Resolution No. 3.2.1.3.i]; Dated 16/09/2020.
3. Amended upto BOM 63/2021 [Resolution No. 4.1.1.2.ii, Resolution No. 4.4.1.5, Resolution No. 4.4.1.6]; Dated 17/02/2021.
4. Amended upto AC-41/2021, [Resolution No. 4.1], [Resolution No. 4.2] [Resolution No. 4.3], [Resolution No. 4.4], [Resolution No. 4.7], [Resolution No. 4.8], [Resolution No. 4.9], [Resolution No. 4.10]; Dated 27/08/2021.

Resolution No. 4.4 of AC-41/2021: Resolved to include “MGMIHS Graduate Attributes” in 1st MBBS Anatomy Physiology and Biochemistry syllabi and cover them in the foundation course, Journals & logbooks, with effect from the batch admitted in 2021-22 onwards

Annexure-23 of AC-41-2021

MGM INSTITUTE OF HEALTH SCIENCES, NAVI MUMBAI

GRADUATE ATTRIBUTES

A student graduating from MGM Institute of Health Sciences, Navi Mumbai, should attain the following attributes:

1. Dynamic professionalism
2. Exemplary leadership
3. Effective communication skills
4. Scholarly attitude
5. Element of critical thinking
6. Enthusiasm for research
7. Social commitment
8. Global competencies

Dynamic professionalism:

Abide by professional codes of conduct, demonstrate high personal standards of behaviour, be considerate, trustworthy and honest, act with integrity. Apply effective strategies to maintain their own physical, psychological, social and spiritual well-being. Should be able to apply profession-specific knowledge, clinical skills and professional attitudes in implementation of evidence-based protocols for optimal outcome.

Exemplary leadership:

Focuses on the qualities required to effectively manage a career, as a practitioner or academician , work effectively within a system aiming at quality improvement ,fostering a spirit of team-building.

Effective communication skills:

Communicates effectively and humanely with all stakeholders, their families, colleagues, through a variety of means , gathers and conveys information respectfully , in a culturally acceptable and dignified manner.

Scholarly attitude:

Demonstrates a lifelong commitment to reflective learning, strives to maintain professional competence. Committed to learn, disseminate, apply and translate knowledge

Element of critical thinking:

Will develop a habit of inquiry, use the knowledge gained for dealing with complex situations foster an ambience conducive for effective learning with constructive criticism, exercise critical judgement in evaluating sources of information.

Enthusiasm for research:

Develop intellectual curiosity and embark upon opportunities to develop research capabilities. Imbibe the basic principles of research methodology and engage in ethical research.

Social commitment:

Inculcate values of self-awareness, empathy, mutual respect. Understand our obligation to society and foster an ability to work in a diverse cultural setting. Understand how one's actions can enhance the well-being of others.

Global competencies:

Team- building, communication, self-management, collaborative working, openness and respect for a range of perspectives.

Annexure – C– III

Distribution of Teaching Hours for First MBBS Biochemistry as per CBME curriculum

Sr.No.	Name of Topic Theory		Hours
1	Distribution of Theory Lectures based on new MCI Competency based Syllabus UG (including Horizontal & Vertical Integration)		**80**
2	Distribution of Practical hours based on new MCI Competency based UG curriculum Practical Skills assessment	**34**	**150**
3	Distribution of Practical hours based on new MCI Competency based UG curriculum: Observation of Use of Equipments / Techniques in Biochemistry Practical	**36**	
4	Distribution of Practical hours based on new MCI Competency based UG curriculum: Name of Topic for Clinicobiochemical correlation- basis & rational of tests in various conditions	**16**	
5	PBL/ Tutorial/ Small Group discussion/revision practicals/ integrated teaching	**64**	
6	SDL		**20**
	Total		**250**

Final Distribution of Total Teaching Hours

Subject- Biochemistry	**Hours**
Lectures	80 hrs
Small Group Teaching/Tutorials/Integrated learning/Practical hours	150 hrs
Self directed learning hours	20 hrs
Total hours	**250 hrs**
Early Clinical Exposure	30 hrs

Theory Syllabus I MBBS Batch 2020-2021 (As per CBME)

Theory: 80 hours

Topics For Theory Lectureswith Teaching Hours &Competencies

Sr. No.	Topics	Competency No	Hours
1.	Molecular & functional organization of cell & subcellular components	BI 1.1	1
2.	Chemistry & Metabolism of Carbohydrates.	BI 3.1 to BI 3.10	9
3.	Chemistry & Metabolism of Proteins.	BI 5.1 to BI 5.5	9
4.	Chemistry & Metabolism of Lipids.	BI 4.1 to BI 4.7	9
5.	Chemistry & Metabolism of Nucleo proteins & cell cycle	BI 7.1	4
6.	Enzymes.	BI 2.1 to BI 2.7	5
7.	Biological oxidation.	BI 6.6	2
8.	Chemistry & Metabolism Hb.	BI 5.2, BI 6.11	4
9.	Integration of metabolism and starvation metabolism	BI 6.1	2
10.	Mechanism of hormones action.	BI 6.5 , BI 13.5	1
11.	Vitamins (Fat & Water soluble)	BI 6.5	5
12.	Nutrition	BI 8.1 to BI 8.5	3
13.	Molecular Biology	BI 7.1 to BI 7.7,BI 9.3	6
14.	Biochemistry of cancer.	BI 10.1 to BI 10.2	2
15.	Immunology	BI 10.3 to BI 10.5	3
16.	Oxidative stress & antioxidants	BI 7.6 to BI 7.7	2
17.	Kidney function tests, Thyroid function tests,Liver function tests, Adrenal function tests	BI 6.13 to BI 6.15	4
18.	Mineral Metabolism.	BI 6.9 to BI 6.10	4
19.	Water and Electrolyte Balance.	BI 6.7	2
20.	Acid base balance	BI 6.7 to 6.8	2
21.	ECM	BI 9.1 to 9.2	1
22.	Detoxification mechanisms, Role of xenobiotics in disease	BI7.5	1
23.	*Biochemical Laboratory Biomarkers alterations in patients of Covid 19		1

Practical Syllabus with Teaching Hours & Competencies

1. **Total Number of Practical hours including LCDS , Small group discussion, including tutorials and integrated teaching, revision practicals : 150 hours.**

List of Practicals, LCDs,Small group discussions etc.

First MBBS Practical Topics Total hours :34

SR NO	Name of Topic for Practical Skills assessment	Competency No.	Teaching method
1	Perform urine analysis to estimate and determine normal Constituents	11.4	DOAP
2	Perform urine analysis to estimate and determine abnormal Constituents	11.4,11.20	DOAP
3	Demonstrate the estimation of blood glucose	11.21	DOAP
4	Demonstrate the estimation of blood urea	11.21	DOAP
5	Demonstrate the estimation of serum creatinine and creatinine clearance	11.7,11.21	DOAP
6	Demonstrate estimation of serum proteins, albumin and A:G ratio	11.8,11.21,11.22	DOAP
7	Demonstrate the estimation of serum total cholesterol and HDLcholesterol	11.9	PRACTICAL
8	Demonstrate the estimation of triglycerides	11.10	PRACTICAL
9	Demonstrate estimation of calcium .	11.11	PRACTICAL
10	Demonstrate estimation of phosphorus .	11.11	PRACTICAL
11	Demonstrate estimation of Uric acid .	11.17	PRACTICAL
12	Demonstrate the estimation of serum bilirubin	11.12	PRACTICAL
13	Demonstrate the estimation of SGOT and SGPT	2.2,11.13	PRACTICAL
14	Demonstrate the estimation of alkaline phosphatase	11.14	PRACTICAL
15	C.S.F. Analysis	**11.15**	PRACTICAL

List of Lecture cum Demonstrations

C	Lecture cum Demonstrations		
SR NO	Name of Topic for Observation of Use of Equipments/ Techniques in Biochemistry Practical	Competency No.	Teaching method
1	Introduction to Biochemistry Laboratory Blood collection and anticoagulants	11.19	LCD
2	Common Laboratory instruments	B.I 11.16,11.19	LCD
3	First aid in Laboratory and Lab hazards	B.I. 11.1	LCD
4	Colorimetry	B.I 11.6	LCD
5	Autoanalyser	B.I B.I. 11.16	LCD
6	Spectrophotometry	B.I B.I.11.18	
7	pH meter	B.I 11.16	LCD
8	Paper chromatography of amino acid ,TLC	B.I. 11.5,11.16	LCD
9	Protein electrophoresis , PAGE	B.I. 11.16	LCD
10	Electrolyte analysis by ISE and Flammephotometry	B.I. 11.16	LCD
11	ABG analyzer	B.I. 11.16	LCD
12	ELISA	B.I. 11.16	LCD
13	Immunodiffusion	B.I. 11.16	LCD
14	Quality control	B.I. 11.16	LCD
15	DNA isolation from blood/ tissue	B.I. 11.16	LCD
16	GTT	B.I. 3.10	LCD
17	Advantages and disadvantages of use of fats in food	B.I.11.24	LCD
18	Calculate energy contents of different food items , identify food items with high and low glycemic index	11.23	LCD

Total Hours :36 Hours

List of SGDs - Basis and rational of tests in various conditions

Sr no	Name of Topic for Clinicobiochemical correlation – basis and rational of tests in various conditions	Competency No.	Teaching method
1	Diabetes mellitus	B.I.11.17	Small Group Discussion
2	Dyslipidemia, Myocardial infarction	B.I.11.17	Small Group Discussion
3	Renal failure,- proteinuria,- nephrotic syndrome	B.I.11.17	Small Group Discussion
4	Jaundice,- liver diseases	B.I.11.17	Small Group Discussion
5	Oedema , pancreatitis	B.I.11.17	Small Group Discussion
6	Disorders of acid- base balance	B.I.11.17	Small Group Discussion
7	Thyroid disorders	B.I.11.17	Small Group Discussion
8	Gout	B.I.11.17	Small Group Discussion

TOTAL HOURS : 16

*	Common questions on AETCOM modules - Biochemistry
1	Enumerate and briefly describe the roles of IMG (physician) as per MCI.
2	Describe the role of a physician in health care system
3	Physician role and responsibility to society and community that he serves.
4	Essentials elements of communication skill
5	Barriers of communication.
6	Methods of communication
7	Effective listening
8	Non verbal communication

*** Resolution No. 4.1 of AC-41/2021 : Resolved to continue the same AETCOM questions and their distribution for Anotomy, Physiology & Biochemistry as per syllabus in 2019-20, for subsequent batches.**

***Resolution No. 4.2 of AC-41/2021: Resolved to add the subtopics mentioned for Paper 1 and Paper 2 topics under topic heads in 1st MBBS (CBME) Syllabus for Biochemistry [ANNEXURE-21]**

Paper wise distribution of Theory topics:

Structural formulae are not obligatory.

Paper- I (100 marks) 3 hours duration

1. Cell.
2. Enzyme.
3. Chemistry and metabolism of proteins.
4. Chemistry and metabolism of purines and pyrimidines and related disorders, Cell cycle.
5. Molecular biology: Genetic code, Replication, Transcription, Translation, Regulation of gene expression, Recombinant DNA technology, PCR, DNA repair, gene mutation, Protein sorting & targeting.
6. Chemistry and Metabolism of haemoglobin.
7. Biological oxidation.
8. Immunology, Concept of vaccine development
9. Vitamins
10. Nutrition
11. Biochemical laboratory, Biomarkers alteration in patients of COVID-19

PAPER - II (100 marks) 3 hours duration

1. Chemistry and metabolism of carbohydrates.
2. Chemistry and metabolism of lipids.
3. Mineral metabolism: Water and electrolyte balance & imbalance.
4. Acid base balance and imbalance.
5. Integration of various aspects of metabolism and their regulatory pathways. Starvation metabolism.
6. Mechanism of hormone action.
7. Liver function tests, Kidney function tests, Thyroid function tests, Adrenal function tests.
8. Detoxification mechanisms, Role of xenobiotics in disease
9. Biochemical basis of cancer and carcinogenesis, Apoptosis
10. Oxidative stress & Antioxidants in health & diseases.

11. ECM

Paper wise distribution of Theory subtopics

Paper- I (100 marks) 3 hours duration

1. **Cell:** Molecular and functional organization of a cell and its sub-cellular components**.**

2. **Enzymes:**
   General nature, classification & IUBMB nomenclature of enzymes, alloenzyme, coenzyme & co-factors. Specificity and mode of action of enzymes. Basic principles of enzyme activity, factors affecting enzyme activity, Enzyme inhibition (Kinetic not required), Enzyme inhibitors as poisons and drugs, therapeutic enzymes, Clinical utility of enzymes & isoenzymes. Enzymes in lab investigations, Enzymes based assay.

3. **Chemistry and metabolism of proteins :**
   General nature of amino acids, various ways of classification of amino acids, biologically important peptides, classification, properties and biological importance of proteins. Structural organization of proteins, structure-function relationships in relevant areas eg, hemoglobin and selected hemoglobinopathies. Plasma proteins-functions, clinical significance of various fractions, methods of separation (only principle).
   Protein Metabolism:
   Biochemical aspects of digestion and absorption of proteins. Fate of amino acid in the body (Deamination, Transamination, Transdeamination, Transmethylation, Decarboxylation), Fates of ammonia (Urea cycle, glutamine formation), Metabolism of aromatic and sulphur containing amino acids and their inborn errors. Metabolism of Glycine & Serine common disorders associated with protein metabolism. Interpretation of laboratory results of analytes associated with metabolism of proteins.

4. **Chemistry and metabolism of purines and pyrimidines and related disorders.**
   Nucleosides, Nucleotides. Biologically important free nucleotides, Biosynthesis of purines (sources of ring & regulatory steps only, conversion of IMP to GMP & AMP) and salvage pathway, Biosynthesis of pyrimidines, Breakdown of purines and pyrimidines, Common disorders associated with Nucleotide metabolism. Interpretation of laboratory results of analytes associated with Gout, Lesch- Nyhan Syndrome .

5. **Molecular biology :**
   Chemistry of nucleic acids**:** structure and function of DNA and RNA, Genetic code, DNA Replication & repair of DNA, Transcription, Translation, chain initiation, chain elongation , chain termination, Inhibitors of protein biosynthesis, Cell cycle, Gene Mutation, basic mechanism of gene expression & regulation. Lac- operon model.
   Molecular Technologies: The principles of genetic engineering and their applications in medicine. Protein sorting & targeting. Recombinant DNA technology and PCR, their role in diagnosis and treatment of diseases with genetic basis, Restriction endonuclease, Chimeric molecule, and Gene library.

6. **Chemistry and Metabolism of hemoglobin.**

Chemistry and functions of hemoglobin. Major types of hemoglobin and its derivatives found in the body and their physiological/ pathological relevance (HbS, M, Thalassemia). Haemoglobin Metabolism: Synthesis and break down of hemoglobin, porphyria (in brief), Fate of bilirubin, different types of Jaundice

7. **Biological oxidation.**
   General concept of oxidation and reduction. Role of enzymes and co-enzymes in generation of ATP. Electron transport chain. Substrate level and Oxidative phosphorylation, Role of uncouplers and inhibitors.

8. **Immunology.**
   Cellular and humoral components of the immune system & types and structure of antibody, Innate and adaptive immune responses, self/non-self-recognition and the central role of T-helper cells in immune responses, Antigens and concepts involved in vaccine development

9. **Vitamins**
   General nature, classification, sources, active forms and metabolic role, deficiency manifestations, daily requirement and hypervitaminosis.

10. **Nutrition:**
    Nutritional Importance of commonly used items of food (fruits and vegetables. (Macro-molecules & its importance) and explain importance of dietary fiber,Balance diet for normal adult, Quality of dietary protein, SDA, protein energy malnutrition (Kwashiorkor and Marasmus), Dietary advice for optimal health in childhood and adult, in disease conditions like diabetes mellitus, coronary artery disease and in pregnancy, Causes (including dietary habits), effects and health risks associated with being overweight/ obesity

PAPER - II (100 marks) 3 hours duration

1. **Chemistry and metabolism of carbohydrates**:
   Chemistry of carbohydrates: Classification and biochemical importance, chemistry and functions of monosaccharides (excluding isomerism), disaccharides and polysaccharides including Glycosaminoglycans (mucopolysaccharides).
   Carbohydrate Metabolism: Biochemical aspects of digestion and absorption of carbohydrates. Synthesis and break down of glycogen, Glycolysis, Rapoport Lumbering cycle, Citric acid cycle, Gluconeogenesis, HMP shunt pathway and its biological significance, Uronic acid pathway (significance only). Metabolism of Galactose and Galactosemia. Mechanism & significance of blood glucose regulation in health & disease ,oral GTT and glycosuria, fructose metabolism & disorders Biochemistry of diabetes mellitus. Interpretation of laboratory results of analytes associated with metabolism of carbohydrates. Common poisons that inhibit crucial enzymes of carbohydrate metabolism.

2. **Chemistry and metabolism of lipids.**
   Chemistry of Lipids: classification and biological importance of triacyl glycerol, phospholipids, spingolipids, glycolipids, fatty acids , prostaglandin- therapeutic uses of prostaglandins and inhibitors of eicosanoid synthesis. steroids and lipoproteins- Structure and functions of lipoproteins
   Lipid Metabolism: Biochemical aspects of digestion and absorption of Lipids. Beta oxidation, biosynthesis of saturated fatty acids only, cholesterol biosynthesis, Lipoprotein metabolism, Regulation of lipoprotein metabolism & associated disorders, Ketogenesis,

Ketolysis and Ketosis. Fatty liver and atherosclerosis, Interpretation of laboratory results of analytes associated with metabolism of lipids.

3. **Mineral Metabolism:**
   Study of (i) Calcium and phosphorous (ii) sodium, potassium & chloride; (iii) magnesium, copper & iodine; (iv) Iron, (v) manganese, selenium, zinc & fluoride. Sources, RDA & functions of various minerals in the body, their metabolism and homeostasis. Disorders associated with mineral metabolism
   .
4. **Acid base balance and imbalance :** Maintenance of normal pH, mechanism of blood pH-buffer system, respiratory mechanism, renal mechanism. Disorders of Acid base balance. Interpretation of results of Arterial Blood Gas (ABG) analysis in various disorders.

5. **Water and electrolyte balance and imbalance**
   Water distribution & regulation of water. Electrolyte distribution & regulation. Disorders of water & electrolytes.

6. **Integration of various aspects of metabolism and their regulatory pathways.**
   Metabolic interrelationship of carbohydrates, lipids and proteins metabolism

7. **Starvation metabolism.**
   Metabolic processes & Biochemical changes that take place in specific organs in the body in the fed and fasting state

8. **Mechanism of hormone action.**
   Hormones: General characteristics and Mechanism of hormone action. cAMP the second messenger, phosphotidyl inositol /calcium system as second messenger

9. **Organ Function Tests:** Functions of the kidney, liver, thyroid and adrenal glands. Associated abnormalities of kidney, liver, thyroid and adrenal glands.Tests that are commonly done in clinical practice to assess the functions of these organs (Liver function tests, Kidney function tests, Thyroid function tests, Adrenal function tests.)

10. **Detoxification mechanisms**
    (Bio- transformation) oxidation, reduction, conjugation, hydrolysis. Role of xenobiotics in disease

11. **Biochemical basis of cancer and carcinogenesis**
    Cancer initiation, promotion, oncogenes & oncogene activation. Causes of Cancer, carcinogens,p53& apoptosis. Biochemical changes in cancerous cells. Various biochemical tumor markers and the biochemical basis of cancer therapy.

12. **Oxidative stress & Antioxidants in health & diseases.**
    Anti-oxidant defense systems in the body, Role of oxidative stress in the pathogenesis of conditions such as cancer, complications of diabetes mellitus and atherosclerosis.

13. **ECM**
    Functions and components of the extracellular matrix (ECM). Role of ECM components in health and disease.

MGMIHS
1st year MBBS. CBME
Format for Internal assessment examinations

Sr. No.	Exam	Theory	Practical
1.	Internal assessment examinations	200	100
2.	Preliminary examination	200	100
Total		**400**	**200**

- Preliminary examination pattern will be as per University examination
- Respective colleges/ departments will conduct internal assessment examinations andmaintain records of the same.

I MBBS (Anatomy, Physiology & Biochemistry)

Time – 3 hrs. Preliminary / University examination

(* Applicable from 2020-21 Batch onwards)

Each subject – 2 papers (I / II) – 100 X 2 = **Total 200 Marks**

Each paper –

- **Section A** – MCQ – 20 X 1 mark = **20 Marks**
  - **10% MCQ i.e. 2 in each paper must be clinical based**

- **Section B** -

Q1. **Answer any 5 out of 6 (BAQ)** **(5X3 marks =15 marks)**

Q2. **Answer any 3 out of 4 (SAQ)** **(3X5 marks =15 marks)**

- 1 SAQ will be clinical application based
- **1 SAQ will be from AETCOM modules (in Paper I)**

Q3. **Answer any 1 out of 2(LAQ)** **(1X10 marks =10marks)**

- LAQ should be structured (With defined marks distribution)

- **Section C** –

Q1. **Answer any 5 out of 6 (BAQ)** **(5X3 marks =15marks)**

Q2. **Answer any 3 out of 4 (SAQ)** **(3X5 marks =15 marks)**

Q3. **Answer any 1 out of 2 (LAQ)** **(1X10 marks =10marks)**

- LAQ should be structured (With defined marks distribution)

PRACTICAL EXAM PATTERN

(Formative Assessment)

Pattern	**Marks**
Q1- Long Quantitative Experiment	15
Q2- Urine Analysis	15
Q3- Spoting	10
Q4- Viva	10
Total	**50**

(Summative Assessment)

***Pattern of Preliminary/University Examination Biochemistry Practical: Total100 marks**

Pattern	Marks
Q.A Long quantitative experiments	30
Q.B Urine Analysis	20
Spotting Q.C Quality Control Q.D .Interpretation of laboratory reports Q.E Interpretation of special techniques	25
Q.F communication Skill	05
Q.G Viva	20
Total	100

Resolution No. 4.8 of AC-41/2021: Resolved to approve the change in the pattern of Internal Assessment calculation, to be implemented from current batch of Ist MBBS (CBME) (i.e. AY- 2020-21) onwards

Annexure-27C of AC-41-2021

MGM Medical College, Navi Mumbai & Aurangabad

1st year MBBS CBME

INTERNAL ASSESSMENT CALCULATION

Sr. No.	Criteria	Theory	Practical
1.	*All internal assessment examinations including preliminary examination	50	50
2.	Day to Day assessment		
	➢ Day to Day assessment (PBL/ TBL/ Seminar/ MCQ test etc)	30	
	➢ Day to Day assessment (Viva/ Spotters/ OSPE / OSVE etc)		30
3.	Logbooks (Foundation Course, AETCOM, Competency logbook, SDL – each 5 marks)	20	
	Journals + ECE Logbook		20
Total		**100**	**100**

FORMAT FOR INTERNAL ASSESSMENT EXAMINATIONS

Sr. No.	Exam	Theory	Practical
1.	Internal assessment examinations (Midterm + Terminal)	200 (100 + 100)	100 (50 + 50)
2.	Preliminary examination	200	100
3.	Additional examination forstudents who have missed any of 3 internal assessment exams or are not qualifying	200	100

***Internal assessment examinations marks conversion to internal assessment marks -**
Student's internal assessment examinations scores [Midterm, Terminal, Preliminary and additional (where applicable)] will be converted to 50 marks eachfor theory and practical internal assessment.

***Resolution No. 4.7 of AC-41/2021:** Resolved to approve the distribution of the MCQs marks system/topic wise for Theory Paper I & II of 1st MBBS (CBME) Physiology and Biochemistry, effect from the batch admitted in 2020-21 onwards

Annexure-26B of AC-41-2021

MGMIHS

I MBBS CBME Biochemistry

MCQs Mark Distribution for University Theory Examination

Biochemistry Paper-I **Total marks 20**

Sr. No.	Topic	MCQs (20)
1	Cell	01
2	Enzymes	03
3	Chemistry and metabolism of proteins	02
4	Chemistry and metabolism of purines and pyrimidines and related disorders.	02
5	Molecular Biology	05
6	Chemistry and Metabolism of hemoglobin.	02
7	Biological oxidation.	01
8	Immunology	01
9	Vitamins	02
10	Nutrition	01
11	Biochemical laboratory, Biomarkers alteration in patients of COVID-19	00

Biochemistry Paper-II **Total marks 20**

Sr. No.	Topic	MCQs
1	Chemistry and metabolism of carbohydrates	02
2	Chemistry and metabolism of lipids	02
3	Mineral metabolism	02
4	Acid base balance and imbalance.	02
5	Water and electrolyte balance & imbalance.	01
6	Integration of various aspects of metabolism and their regulatory pathways.	01
7	Starvation metabolism	01
8	Mechanism of hormone action.	01
9	Organ Function Tests	03
10	Detoxification mechanisms.	01
11	Biochemical basis of cancer and carcinogenesis.	02
12	Oxidative stress and Antioxidants in Health and Disease	01
13	Extracellular Matrix	01

MGMIHS

I MBBS CBME

UNIVERSITY EXAMINATION PATTERN

I MBBS – BIOCHEMISTRY

Part of exam	Marks
Theory Paper I	100 Marks
Theory Paper II	100 Marks
Practical	100 Marks
Total	**300 Marks**

INTERNAL ASSESSMENT CALCULATION

Sr. No.	Criteria	Theory	Practical
1.	*All internal assessment examinations including preliminary examination	50	50
2.	Day to Day assessment		
	➢ Day to Day assessment (PBL/ TBL/ Seminar/ MCQ test etc)	30	
	➢ Day to Day assessment (Viva/ Spotters/ OSPE / OSVE etc)		30
3.	Logbooks (Foundation Course, AETCOM, Competency logbook, SDL – each 5 marks)	20	
	Journals + ECE Logbook		20
Total		**100**	**100**

FORMAT FOR INTERNAL ASSESSMENT EXAMINATIONS

Sr. No.	Exam	Theory	Practical
1.	Internal assessment examinations (Midterm + Terminal)	200 (100 + 100)	100 (50 + 50)
2.	Preliminary examination	200	100
3.	Additional Exam • For students missing any of the three Internal Assessment exams / not qualifying for University Exam. • Marks to be computed as per the missed Exam / low score exam for non qualifying students.	200	100

Total	**400**	**200**

***Internal assessment examinations marks conversion to internal assessment marks -**

Theory – Total 400 marks will be converted to 50

Practical – Total 200 marks will be converted to 50

BLUEPRINT OF UNIVERSITY QUESTION PAPER

I.THEORY EXAMINATION PATTERN

1. 1. Theory Question Paper Pattern:

Two papers each of 3 hours duration and carrying 100 marks each.

1.2. Marks distribution for each paper:

Type of question	Numbers X Marks	Total marks
Multiple Choice Questions	20 X 1	20
Long Answer Questions (LAQ)	2 X 10	20
Short Answer Questions (SAQ)	6 X 5	30
Brief Answer Questions (BAQ)	10 X 3	30
Total		**100**

Each Paper is divided into 3 sections:
Section A: MCQ 20 marks
Section B: 40 marks: BAQ 5/6 x 3= 15; SAQ 3/4 x 5= 15; LAQ 1/2 x 10 = 10
Section C: 40 marks: BAQ 5/6 x 3= 15; SAQ 3/4 x 5= 15; LAQ 1/2 x 10 = 10

1.3. Paper I & Paper II Contents

1.3.a. Paper I

- Cell
- Enzyme.
- Chemistry and metabolism of proteins.
- Chemistry and metabolism of purines and pyrimidines and related disorders
- Molecular biology
- Chemistry and Metabolism of hemoglobin.
- Biological oxidation.
- Immunology, Concept of vaccine development
- Vitamins
- Nutrition
- Biochemical laboratory, Biomarkers alteration in patients of COVID-19
- AETCOM – 1 SAQ (Module – 1.4)

1.3.b. Paper II

- Chemistry and metabolism of carbohydrates.
- Chemistry and metabolism of lipids.
- Mineral metabolism: Water and electrolyte balance & imbalance.
- Acid base balance and imbalance.
- Integration of various aspects of metabolism and their regulatory pathways.
- Starvation metabolism.
- Mechanism of hormone action.
- Liver function tests, Kidney function tests, Thyroid function tests, Adrenal function tests.
- Detoxification mechanisms, Role of xenobiotics in disease
- Biochemical basis of cancer and carcinogenesis, Apoptosis

- Oxidative stress & Antioxidants in health & diseases.
- ECM

1.4. Note to exam paper setters (Ref.: GMER 2019- Assessment)

1.4.A Multiple Choice Questions (MCQs) (20X1=20 Marks)		
• 10 % of MCQ marks should be from clinically based questions (Any 2)		
1.4. B Brief Answer Questions (BAQs) (10X3=30 Marks)		
Various Levels of Cognitive Domain must be considered as follows:		
Level of cognitive domain	**Number of questions**	**Marks**
Knowledge	3	3X3=9
Comprehension	3	3X3=9
Application	2	2X3=6
Analysis	2	2X3=6
Synthesis	1	1X3=3
Evaluation	1	1X3=3
1.4. C Short Answer Questions (SAQs) (6X5=30 Marks)		
1 SAQ will be clinical application based (In section B)		
1 SAQ will be from AETCOM modules (In Paper I)		
Various Levels of Cognitive Domain must be considered as follows:		
Level of cognitive domain	**Number of questions**	**Marks**
Knowledge	2	2X5=10
Comprehension	2	2X5=10
Application	1	1X5=5
Analysis	1	1X5=5
Synthesis	1	1X5=5
Evaluation	1	1X5=5
1.4.D Long Answer Question (LAQ) (2X10=20 Marks)		
• Long Answer Questions (LAQ) in both Papers I & II must be structured, covering various levels of cognitive domain.		

1.4.E Percentage of marks allotted to various levels of cognitive domains:

Level of cognitive domain	**Marks (Total = 76)**	**Percentage (%)**
1. Knowledge	19	25
2. Comprehension	19	25
3. Application	11	15
4. Analysis	11	15
5. Synthesis	8	11
6. Evaluation	8	10

1.4.F Verbs in various levels in Knowledge domain.

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

(Reference GMER-2019, Assessment Module Page no.17& Revised Bloom's Taxonomy by Anderson, L.W. et al in (2001))

1.5. Topic wise weightage of marks

Paper I

Sr. No.	Topic	MCQs (20)	LAQ/ SAQ/ BAQ
1	Cell	01	5
2	Enzymes	03	15
3	Chemistry and metabolism of proteins	02	20
4	Chemistry and metabolism of purines and pyrimidines and related disorders.	02	15
5	Molecular Biology	05	15
6	Chemistry and Metabolism of Hemoglobin.	02	10
7	Biological oxidation.	01	10
8	Immunology	01	5
9	Vitamins	02	15
10	Nutrition	01	6
11	Biochemical laboratory, Biomarkers alteration in patients of COVID-19	00	00

Paper II

Sr. No.	Topic	MCQs	LAQ/ SAQ/ BAQ
1	Chemistry and metabolism of carbohydrates	02	20
2	Chemistry and metabolism of lipids	02	20
3	Mineral metabolism	02	10
4	Acid base balance and imbalance.	02	10
5	Water and electrolyte balance & imbalance.	01	5
6	Integration of various aspects of metabolism and their regulatory pathways.	01	5
7	Starvation metabolism	01	9
8	Mechanism of hormone action.	01	5
9	Organ Function Tests	03	10
10	Detoxification mechanisms.	01	5
11	Biochemical basis of cancer and carcinogenesis.	02	7
12	Oxidative stress and Antioxidants in Health and Disease	01	5
13	Extracellular Matrix	01	5

2. PRACTICAL EXAMINATION PATTERN

2.1. Total Practical Marks 100 marks

Pattern	Marks
Q. A long Quantitative Experiment	30
Q. B Urine Analysis	20
Spotting Q. C Quality Control Q. D Interpretation of Laboratory results Q. E Interpretation of special Techniques	25
Q. F communication skills	5
Q.G Viva (Paper I & Paper II)	20
Total	100

Eligibility to appear for university exams	
Internal Assessment (Theory + Practical)	50% [combined Theory and Practical] [Theory - minimum 40% Practical- minimum 40%]
Criteria for pass in university exams	
Theory	50% Aggregate (Paper I + Paper II) [Each Paper minimum 40%]
Practical	50%

Model Question Paper For University Theory Exam

Department Of Biochemistry

Annexure No 29C of AC-41/2021

Resolution No. 4.10 of AC-41/2021
effective from 2021-22 onwards and to be revised
as per question paper blue printing format
as per 4.9 of AC-41/2021 in next BOS

Ist MBBS CBME

Paper-I

Section B

Q.1 Answer any 5 out of 6 (SAQ) **5 x 3 = 15 Marks**

a) Causes and clinical features of Pellagra
b) Structure and functions of Mitochondria
c) Write any six biologically important peptides with functions
d) Inhibitors of translation
e) Enlist the specialized products formed from tyrosine
f) Enzyme pattern in myocardial infarction

Q.2 Answer any 3 out of 4 (BAQ) **3 x 5 = 15 Marks**

a) Role of a physician in health care system
b) Lac Operon concept of gene expression
c) Cell mediated immunity
d) A ten year old boy from rural area was brought to OPD for complaints of diminished vision in dim light. His cornea was ulcerated and there were white patches on conjunctiva.
   I) Name vitamin deficient (1 Mark)
   II) Give its RDA (1 Mark)
   III) Explain it's biochemical role (3 Mark)

Q.3 Answer any 1 out of 2 (LAQ) **1 x 10 = 10 Marks**

a) Describe the pathway for biosynthesis of urea from ammonia. Add a note on metabolic disorders of urea cycle. (6 +4= 10 Marks)
b) Describe various complexes of Electron Transport Chain. State sites of ATP synthesis. Add a note on inhibitors and uncouplers. (5 +2 + 3= 10 Marks)

Section C

Q.1 Answer any 5 out of 6 (SAQ) **5 x 3 = 15 Marks**

a) Functions of plasma proteins
b) Denaturation
c) Coenzymes-definition and any 3 biochemical reactions
d) Genetic code
e) Purine salvage pathway
f) Role of fibers in diet

Q.2 Answer any 3 out of 4 (BAQ) **3 x 5 = 15 Marks**

a) Sickel cell anemia
b) 42 years old male presented with complaints of severe pain in right toe and knee joint. Laboratory analysis revealed elevated serum Uric acid levels.
   I. Name the disease (1 Mark)
   II. Name metabolism affected (1 Mark)
   III. What is probable cause (2 Mark)
   IV. Name any two drugs used in treatment of above disease . (1 Mark)
c) Describe Wald's visual cycle
d) Applications of recombinant DNA technology

Q.3 Answer any 1 out of 2 (LAQ) **1 x 10 = 10 Marks**

a) Define enzyme inhibition. List various types of . enzyme inhibition . Describe competitive inhibition in detail with examples .(1 +2 + 7= 10 Marks)
b) Describe the sources, RDA, biochemical functions and deficiency manifestations of Vitamin B 12 . (1 +1 + 4 + 4= 10 Marks)

Model Question Paper For University Theory Exam

Department Of Biochemistry

Ist MBBS CBME

Paper-II

Section B

Q.1 Answer any 5 out of 6 (SAQ) **5 x 3 = 15 Marks**

a) Role of calcitonin in regulation of calcium homeostasis

b) Phase II reactions of detoxification

c) Causes and clinical features of Wilson's disease,

d) Structure and function of Elastin

e) Liver function tests based on detoxification and excretory function.

f) Write any three Glucose transporters with functions

Q.2 Answer any 3 out of 4 (BAQ) **3 x 5 = 15 Marks**

a) Metabolic interrelationship among adipose tissue, liver and extrahepatic tissue.

b)Explain briefly on storage and absorption iron from intestine.

c) What are the functional and therapeutic role of prostaglandins.

d) A patient was brought to the hospital in state of coma. Acetone could be smelled on his breath. His investigation revealed following findings- Physical findings showed dehydration. Blood sugar- 270 mg/ dL, urine Benedict's test- Positive, urine Rothera's test – Positive, Blood pH-0.75

I. What is probable diagnosis? (1 Mark)
II. What does Positive Rothera's test indicate ? (1 Mark)
III. Why is patient's Blood pH lower than normal ? (2 Marks)
IV. What possible treatment should the patient be given ? (1 Mark)

Q.3 Answer any 1 out of 2 (LAQ) **1 x 10 = 10 Marks**

a) Define gluconeogenesis. Describe how glucose is synthesized from alanine and add a note on its regulation. (2 +6 + 2= 10 Marks)

b)Discuss in detail the mechanism by which kidney maintains the blood pH. What is meant by metabolic acidosis and how it is compensated. (1 +6 + 3= 10 Marks)

Section C

Q.1 Answer any 5 out of 6 (SAQ) **5 x 3 = 15**

a) Regulation of cholesterol synthesis

b) Write the enzyme defect and clinical features of Galactosemia

c) Oncogenes in carcinogenesis

d) Biochemical changes within 48 hrs of starvation.

e) Mechanism of hormone action at nuclear level.

f) Enumerate thyroid function tests and normal values T3 and T4

Q.2 Answer any 3 out of 4 (BAQ) **3 x 5 = 15**

a) Discuss the regulation of glycogen metabolism

b) Function of phospholipids.

c) Name the ketone bodies. Describe the process of ketogenesis. List the condition that lead to ketoacidosis

d) Free radical scavenger mechanism.

Q.3 Answer any 1 out of 2 (LAQ) **1 x 10 = 10**

a) Name the site where beta oxidation of fatty acid occurs. Describe the steps involved in beta oxidation of fatty acids. Explain how much energy is released in beta oxidation of one molecule of palmitic acid. (1 +6 + 3= 10 Marks)

b)Define Kreb's cycle. Describe the reactions of Kreb's cycle. Add a note on its energetics and significance. (1 +6 + 1 + 2= 10 Marks)

Resolution No. 4.3 of AC-41/2021: Resolved to approve the booklist for 1st MBBS (CBME) Biochemistry with effect from the batch admitted in 2021-22 onwards

Annexure-22C of AC-41-2021

~~**Annexure – 5.3**~~

LIST OF BOOKS RECOMMENDED FOR I[st] MBBS CBME BIOCHEMISTRY-

A.TEXT BOOKS

Sr.No.	Name of the Book	Name of the Author
1	Biochemistry for Medical students	D M Vasudevan & Shree Kumari
2	Text Medical Biochemistry	U Satanarayan
3	Textbook of Biochemistry	M. Rafi
4	Medical Biochemistry	Pankaja Naik

B. REFERENCE BOOKS

Sr.No.	Name of the Book	Name of the Author
1	Harper's illustrated Biochemistry	Robert K Murray
2	Lipponcott's illustrated Reviews	Richard A Harvey
3	Biochemistry	Dinesh Puri
4	Biochemistry	Devlin
5	Biochemistry	Lubert .Stryer
6	Medical Biochemistry	N V Bhagwan
7	Text Book Of Biochemistry	Chaterjee, R. Shinde

Resolution No. 4.13 of AC-41/2021: Resolved to approve the two books - Communication skills & Early clinical Exposure, as reference books for Medical College Library and departments

1. Communication Skills in Clinical Practice - KR Sethuraman
2. Textbook of Early clinical Exposure Setting and Planning - Dr. Motilal C Tayade

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

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