Syllabus for

HUMAN BIOCHEMISTRY

INDEX

BROAD CURRICULUM AS PER MCI GUIDELINES (BIOCHEMISTRY)

Biochemistry including medical physics and Molecular Biology.

i) GOAL

The broad goal of the teaching of undergraduate students' biochemistry is to make them understand the scientific basis of the life processes at the molecular level and to orient them towards the application of the knowledge acquired in solving clinical problems.

ii) OBJECTIVES

a) KNOWLEDGE

At the end of the course, the student should be able to:

(1) Describe the molecular and functional organization of a cell and list its sub cellular components;

(2) Delineate structure, function and inter-relationships biomolecules and consequences of deviation from normal;

(3) Summarize the fundamental aspects of enzymology and clinical application wherein regulation of enzymatic activity is altered;

(4) Describe digestion and assimilation of nutrients and consequences of malnutrition;

(5) Integrate the various aspects of metabolism and their regulatory pathways;

(6) Explain the biochemical basis of inherited disorders with their associated sequelae;

(7) Describe mechanisms involved in maintenance of body fluid and pH homeostasis;

(8) Outline the molecular mechanisms of gene expression and regulation, the principles of genetic engineering and their application in medicine;

(9) Summarize the molecular concepts of body defence and their application in medicine;

(10) Outline the biochemical basis of environmental health hazards, biochemical basis of cancer and carcinogenesis;

(11) Familiarize with the principles of various conventional and specialized laboratory investigations and instrumentation analysis and interpretation of a given data;

(12) The ability to suggest experiments to support theoretical concepts and clinical diagnosis.

b) SKILLS:

At the end of the course, the student should be able to:

(1) Make use of conventional techniques/instruments to perform biochemical analysis relevant to clinical screening and diagnosis;

(2) Analyze and interpret investigative data;

(3) Demonstrate the skills of solving scientific and clinical problems and decision making;

iii) INTEGRATION

The knowledge acquired in biochemistry should help the students to integrate molecular events with structure and function of the human body in health and disease.

DETAILS OF SYLLABUS FOR HUMAN BIOCHEMISTRY.

Structural formulae are not obligatory.

Must know:

1. **Chemistry of carbohydrates:** classification and biochemical importance, chemistry and functions of monosaccharides(excluding isomerism), disaccharides and polysaccharides including Glycosaminoglycans (mucopolysaccharides).

2. **Chemistry of Lipids:** classification and biological importance of triacylglycerol, phospholipids, glycolipids, fatty acids (PUFA), prostaglandin, steroids and lipoproteins.

3. **Chemistry 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, Plasma proteins-functions, clinical significance of various fractions, methods of separation (only principle).

4. **Enzymes :** General nature, classification of enzymes, specificity and mode of action of enzymes, factors affecting enzyme activity. Enzyme inhibitions (Kinetic not required).Clinical importance (Diagnostic, therapeutic and as a Laboratory reagent) of enzymes and isoenzymes.
5. **Biological oxidation:** General concept of oxidation and reduction. Role of enzymes and co-enzymes. Electron transport chain. Substrate level and Oxidative phosphorylation, Role of uncouplers and inhibitors.

6. **Haemoglobin:** Chemistry and functions of haemoglobin . Types of normal and abnormal hemoglobins.(HbS, M,Thalassemia). Haemoglobin derivatives.

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

8. **Nutrition:** Balance diet for normal adult, Quality of dietary protein, SDA, protein energy malnutrition (Kwashiorkor and Marasmus).

9. **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,Uric acid pathway

(significance only). Metabolism of Galactose and Galactosemia. Blood sugar level and its regulation, oral GTT and glycosuria, Biochemistry of diabetes mellitus.

10. **Protein Metabolism:** Biochemical aspects of digestion and absorption of proteins. Fate of amino acid in the body (Deamination, Transmination, Transdeamination,Decarboxylation), Fates of ammonia (Urea cycle, glutamine formation), Metabolism of aromatic and sulphur containing amino acids and their inborn errors. Metabolism of Glycine.

11. **Lipid Metabolism:** Biochemical aspects of digestion and absorption of Lipids. Beta oxidation, biosynthesis of saturated fatty acids only, cholesterol biosynthesis, transport (role of HDL & LDL) Excretion, Ketogenesis, Ketolysis and Ketosis. Adipose tissue metabolism, Lipolysis and re-esterification, fatty liver and atherosclerosis.

12. **Chemistry and Metabolism of purines:**, 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, Gout, Lesch- Nyhan Syndrome

13. Metabolic interrelationship of carbohydrates, lipids and proteins metabolism.

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

15. **Chemistry of nucleic acids:** structure and function of DNA and RNA, Genetic code, DNA Replication, Transcription, Translation, chain initiation, chain elongation , chain termination, Inhibitors of protein biosynthesis.

16. Molecular Mechanism of gene expression and regulation 1) Lacoperon model, Mutations.

17. **Mineral Metabolism :** Study of (i) Calcium and phosphorous (ii) sodium, potassium & chloride; (iii) magnesium, copper & iodine; (iv) Iron, (v) manganese, selenium, zinc & fluoride. Their importance in body in brief.

18. Water and electrolyte balance and imbalance.

19. Acid base balance and imbalance.

20. **Haemoglobin Metabolism :** Synthesis and break down of haemoglobin, porphyria (in brief), Fate of bilirubin, different types of Jaundice.

21. **Function tests:** (i) Liver function tests, (ii) Kidney function tests & (iii) Thyroid function tests.

22. **Detoxication mechanisms:** (Bio- transformation) oxidation, reduction, conjugation, hydrolysis.

Desirable to know:

1. Introduction of Biochemistry as a basic science for the study of medicine, It's importance in clinical practice.
2. Molecular and functional organization of a cell and its sub cellular components.
3. **Genetic engineering :** Recombinant DNA , Restriction endonuclease, Chimeric molecule, and Gene library. Applications of recombinant DNA technology in relation to medicine.

4. **Molecular concept of body defence and their applications:** i) Immunoglobulins- structure & functions, ii) Free radicals, enzymatic and non-enzymatic antioxidants.

5. **Radioisotopes :** Uses of radioisotopes (therapeutic, diagnostic) and hazards.

6. Metabolic changes during starvation.

Nice to know:

1. **Environmental Biochemistry:** Definition, chemical stress, air & water pollution.
2. **Biochemistry of cancer** : carcinogens, and outline mechanism of carcinogenesis.

TOPICS OF THE LECTURES AND APPROXIMATE NUMBER OF LECTURES, HUMAN BIOCHEMISTRY - FIRST PHASE- M.B.B.S.

Lectures.

1. Introduction to Biochemistry, Cell structure and function. 1
2. Chemistry of Carbohydrates. 4
3. Chemistry of Proteins. 4
4. Chemistry of Lipids. 4
5. Chemistry of Nucleo proteins. 2
6. Enzymes. 6

7. Biological oxidation. 2
8. Chemistry and functions of Haemoglobin; abnormal haemoglobin. 2
9. Carbohydrate Metabolism. 6
10. Protein Metabolism. 6
11. Lipid Metabolism. 6
12. Integration of metabolism and metabolic changes during starvation. 2
13. Mechanism of hormones action. 1
14. Vitamins (Fat & Water soluble) 6
15. Nutrition. 2
16. Purines and Pyrimidine metabolism. 2
17. Chemistry and functions of Nucleic acids.; Protein biosynthesis, Gene expression,mutations. 5
18. Genetic engineering and it applications. 2
19. Biochemistry of cancer. 1
20. Radioisotopes. 1
21. Haemoglobin metabolism, liver function tests,Detoxification mechanisms. 3
22. Kidney function tests,Thyroid function tests 2
23. Mineral Metabolism. 4
24. Water and Electrolyte Balance. 2
25. Acid base balance, 2
26. Environmental Biochemistry. 1
27. Molecular concept of body defence. 2

BOOKS RECOMMENDED:

TEXT BOOKS ;

1. Medical Biochemistry - U.Satyanarayan.
2. Biochemistry for Medical students by D.M.Vasudevan & Shree Kumari.
3. Medical Biochemistry by M.N. Chatterjea and Rana Shinde.
4. Text Book of Medical Biochemistry by Ramakrishnan, Prasannan & Rajan.
5. Medical Biochemistry by Debajyoti Das.
6. Biochemistry by A.C.Deb.

REFERENCE BOOKS:

1. Biochemistry by Pankaja Naik
2. Harper's Biochemistry.
3. Medical Biochemistry by N.V.Bhagwan.
4. Biochemistry by L.Stryer.
5. Biochemistry by Orten & Neuhans.

LIST OF BIOCHEMISTRY BOOKS FOR IST MBBS (UNDERGRADUATE COURSES)

A.TEXT BOOKS

Sr.No.	Name of the Book	Name of the Author
1	Medical Biochemistry	U.Satanarayan
2	Biochemistry for Medical students	D.M.Vasudevan & Shree Kumari
3	Medical Biochemistry	Pankaja Naik
4	Medical Biochemistry	R.C.Gupta
5	Medical Biochemistry	Harbn's Lal
6	Medical Biochemistry	M.N.Chatterjea & Rana Shinde
7	Medical Biochemistry	Debajyoti Das
8	Biochemistry	A.C.Deb

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

RULES & REGULATIONS OF EXAMINATION FOR THE SUBJECTS OF FIRST MBBS COURSE AT CONSTITUENT COLLEGES OF MGM UNIVERSITY OF HEALTH SCIENCES, NAVI MUMBAI
(Approved vide BOM – 04/2007 Resolution No. 4 and amended vide BOM-07/2008 Resolution No. 3.2)

1. THEORY EXAMINATION IN ANATOMY

1.1. There shall be two papers in preliminary/university examination in the Anatomy The course content shall be distributed as per given below:

1.2. **ANATOMY PAPER-I**- shall includes gross anatomy, systemic histology and systemic embryology of the region Superior extremity, head face, neck and neuro Anatomy.

1.3. **ANATOMY PAPER –II:** shall includes the gross anatomy, systemic histology and systemic '1 embryology of the region Thorax, Abdomen, Pelvix, interior extremity , General histology, General embryology, general anatomy & genetics.

2. PRACTICAL EXAM. PATTERN:

2.1. Total Marks for Orals (Viva)	20 marks
2.1.1. i) Axial Skeleton	10 marks
2.1.2. ii) Appendicular skeleton	5 marks
2.1.3. iii)Embryology models	5 marks

3. DISTRIBUTION OF PRACTICAL MARKS

3.1. Soft parts dissected body, organs, viscera, brain Histology	20 marks
3.2. spotting	6 marks
3.3.one slide for discussion	4 marks
3.4.Radiology	5 marks
3.5.Surface anatomy	5 marks

4. THEORY EXAMINATION IN PHYSIOLOGY

4.1. There shall be two papers in preliminary/university examination in the physiology The course content shall be distributed as per given below:

4.2. **Physiology Paper I**: Cell membrane and transport systems across the cell membrane, Homeostasis, Cardiovascular, Blood, Respiratory, Endocrines, Reproduction, Acclimatization to hypoxia, , Exercise physiology

4.3. **Physiology Paper II :** Nerve and Muscle Physiology, Gastrointestinal, Excretory and Temperature regulation, C.N.S. and special senses.

5. PATTERN OF VIVA VOCE AND PRACTICAL EXAMINATION :-

There shall be separate batches of students for viva and Practicals.

5.1. Viva examination(orals) Total marks 20

5.2. Practical examination Total marks 40 3 Exercises :

5.3. Clinical examination Total 20 marks

Four sub questions each of 5 marks,

5.3.1. C.V.S. 5
5.3.2. R.S. 5
5.3.3. C.N.S. 5
5.3.4. Abdomen & Special senses 5
5.4. Haematology 10
5.5. Short exercise 10
Sub questions having 2 marks each
5.5.1. Calculations,
5.5.2. Interpretation of graphs,
5.5.3. Charts,
5.5.4. Data analysis and interpretation
5.5.5. Photographs on-endocrine disorders,
5.5.6. Neurological disorder,

6. Topics to be asked as applied questions in theory.
6.1. Erythroblastosis foetalis
6.2. Haemophilia, purpura
6.3. Myasthenia gravis
6.4. Peptic ulcer
6.5. Oedema
6.6. Jaundice and anaemia – due to mismatched transfusion
6.7. Myxoedema
6.8. Cretinism
6.9. Hyperthyroidism
6.10. Tetany
6.11. Acromegaly, Gigantism
6.12. Respiratory distress syndrome
6.13. Parkinsonism
6.14. Asthma

7. **THEORY EXAMINATION IN BIOCHEMISTRY**
7.1. There will be TWO papers, each of two and half hours duration. Each paper will be of 50 marks with one compulsory question on applied biochemistry.

7.2. **BIOCHEMISTRY PAPER –I**
7.2.1. Molecular and functional organization of a cell and its sub-cellular components.
7.2.2. Chemistry of enzymes and their clinical applications.
7.2.3. Chemistry and metabolism of proteins and related disorders.
7.2.4. Chemistry and metabolism of purines and pyrimidines and related disorders.
7.2.5. Chemistry and functions of DNA and RNA , Genetic code ; Protein biosynthesis &.regulation (Lac-operon)
7.2.6. The principles of genetic engineering and their applications in medicine.
7.2.7. Chemistry and Metabolism of haemoglobin.
7.2.8. Biological oxidation.

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7.2.9. Molecular concept of body defence and their applications in medicine.
7.2.10. Vitamins and Nutrition.

7.3. BIOCHEMISTYR PAPER - II.

7.3.1. Chemistry and metabolism of carbohydrates and related disorders.
7.3.2. Chemistry and metabolism of lipids and related disorders.
7.3.3. Mineral metabolism: Water and electrolyte balance & imbalance.
7.3.4. Acid base balance and imbalance.
7.3.5. Integration of various aspects of metabolism and their regulatory pathways. Starvation metabolism.
7.3.6. Mechanism of hormone action.
7.3.7. Environmental biochemistry.
7.3.8. Liver function tests, Kidney function tests, Thyroid function tests.
7.3.9. Detoxification mechanisms.
7.3.10. Biochemical basis of cancer and carcinogenesis.
7.3.11. Radioisotopes.
7.3.12. Investigation techniques: (LCD-Topics) Colorimeter, Electrophoresis, Chromatography & Flame photometer.

8. PRACTICAL :

Practical examination in Biochemistry will be of TWO hours duration Exercise

8.1.1. Group A
Q.1.: One quantitative experiment 20 marks
(15 marks for expt. & 5 marks for table viva)

8.1.2. Group B
Q.2.: One qualitative/ quantitative experiment 15 marks
(10 marks for expt. & 5 marks for table viva)

8.1.3. Group C
Q.3. Spot identification 5 marks.

Group A :
Blood sugar, Blood urea; Serum total protein, Albumin and A/G ratio, Alanine amino transaminase(SGPT), Aspartate amino transaminase(SGOT) , Alkaline phosphatase, Serum amylase, Serum total bilirubin, Serum uric acid, Serum calcium,

Group B :
Creatinine in urine, Serum cholesterol, Serum phosphorus, CSF protein & sugar , Tests for monosaccharides (Ben edict, Barfoed,Selivanoff, Nylander, rapid furfural) , Tests for disaccharides, Colour reactions of proteins, Precipitation reactions of proteins, Normal Organic constituents of urine, Abnormal constituents of urine.

Group C :
Identification of slide under microscope,

Use of reagent.
Significance of test.
Use of Instrument /Appliances.
Identification of Hb - derivative.
Identification of GTT , Electrophoretogram and chromatogram.

Candidate will be allowed to use flow chart for quantitative exercise.

9. INTERNAL ASSESSMENT:

9.1. Internal assessment shall be based on the overall performance of the students during examinations during the course of the study in First MBBS.

9.2. Weightage for the internal assessment shall be 20% of the total marks in each subject.

9.3. The Students must secure a minimum of 35% of the total marks assigned for internal assessment in the subject in order to be eligible to appear in final university examination in that subject.

9.4. There shall be one terminal examination on conclusion of 1st semester and one preliminary examination, 6 weeks prior to commencement of university examination.

9.5. The First terminal examination will include one theory paper of 60 marks & practical of 40 marks and viva 20 marks. Preliminary examination shall have Theory 100 marks (2 papers of 50 marks each), Viva 20 marks & Practicals of 40 marks.

9.6. **Computation of Internal Assessment**- Internal assessment shall be computed out of 40 marks (20 marks in theory and 20 marks in practical) on overall performance in class test / internal examination conducted by the department, seminars, presentation, project work, field work, laboratory journal and attendance etc.

9.7. **Distribution of 20 marks in theory shall be as follows :-**

9.7.1 5 marks for attendance as per the following guidelines :-
Below 75% - 0
Upto 75% - 2.5
Above 75% - Proportionately higher marks at pro-rate basis.

9.7.2 & 5 marks for seminars, presentations, participation in academic activity assignments other than routine lectures etc.

9.7.3 10 marks for academic performance in theory in 1st term or prelim exam – average of both to be listed.

9.7.4 Marks in decimal computed in 9.7.1, 9.7.2 and 9.7.3 should be converted into whole number at the end.

9.8. **Distribution of 20 marks in praetical shall be as follows :-**

9.8.1 5 marks for attendance as per the following guidelines :-
Below 75% - 0
Upto 75% - 2.5
Above 75% - Proportionately higher marks at pro-rate basis.

9.8.2 5 marks for laboratory journal & assignments.

9.8.3 10 marks for academic performance in practical in 1st term & prelim exam – average of both.

9.8.4 Marks in decimal computed in 9.8.1, 9.8.2 and 9.8.3 should be converted into whole number at the end.

9.9. The Internal Assessment mark in practical shall be equal 20% of the total marks secured by in practical examination, project and laboratory journals.

9.10. Internal assessment shall be submitted by the Head of the department through Dean of the Constituents Colleges one week before commencement of University theory examination.

10. UNIVERSITY EXAMINATION:

10.1. There shall be one main university examination in a year at the end of second semester in the subjects of Anatomy, Physiology and Biochemistry.

11. CRITERIA FOR PASSING:

11.1. Students shall be declared pass in first professional of MBBS only if he/she obtain 50% aggregate in theory together with orals, 35% aggregate internal assessment and 50% in practicals separately in each subject for all the subjects of preclinical, provided he/she gets 50% of total marks in theory and practical and internal assessment.

11.2. However he/she will be exempted to appear again in the subject if he/she obtain 50% aggregate in theory together with orals and 50% in practicals and 50% in theory and practical and internal assessment taken together in each

12. Supplementary Examination:

12.1. Supplementary examination shall be conducted within six weeks from the date of declaration of results of first professional examination so as to allow the students who pass in supplementary examination may join the same batch in MBBS Course of phase-II. Unsuccessful students in the supplementary examination shall have to appear again in subsequent year.

13. DURATION OF EACH PAPER : 2 Hours & 30 minutes

13.1. Section A – M.C.Q. : 30 Minutes

13.2. Section B and Section C : 2 Hours

14. PATTERN OF QUESTION PAPER: There will be three sections in

14.1. Terminal Examination:

14.1.1. **Section A** – Comprising of MCQ

Q. No. 1: Multiple Choice Questions 10 Marks

(20 Question of 0.5 marks each to be solved in 30 minutes)

14.1.2. **Section B** – Comprising of short question

Q. No. 2: Write in Brief 30 Marks

(Any six out of seven of 5 marks each)

Q. No. 3 : Write shorts notes 20 Marks

(Any two out of three of 5 marks each)

14.1.3. **Section C** – Comprising of short and long question
Q.No.4 writes long answer
(Any two out of three of 10 marks each) 20 Marks

14.2. UNIVERSITY EXAMINATION / PRELIMINARY EXAMINATION:

There shall be two papers in each subjects

14.2.1. **Section A** – Comprising of MCQ
Q. No. 1: Multiple Choice Questions 10 Marks
(20 Question of 0.5 marks each to be solved in 30 minutes)

14.2.2. **Section B** – Comprising of short question
Q. No. 2: Write in Brief 20 Marks
(Any four out of five of 5 marks each)

14.2.3. **Section C** – Comprising of short and long question
Q. No. 3 : Write Answers in Details 20 Marks
(Any two out of three of 10 marks each)

15. DISTRIBUTION OF MARKS FOR SUBJECTS OF PRECLINICAL PHASE:

SN	Subject	Theory /Oral / Practical/ Internal Assessment	Maximum marks in each part of the subject	Minimum marks required to pass in each head of the subject
1	**ANATOMY**	Theory-I	50	60
		Theory-II	50	
		Oral	20	
		Internal Assessment	20	-
		Practical	40	20
		Internal	20	-
		Grand Total	**200**	**100**
1	**PHYSIOLOGY**	Theory-I	50	60
		Theory-II	50	
		Oral	20	
		Internal Assessment	20	-
		Practical	40	20
		Internal	20	-
		Grand Total	**200**	**100**
3	**BIOCHEMISTRY**	Theory-I	50	60
		Theory-II	50	
		Oral	20	
		Internal Assessment	20	-

		Practical	40	20
		Internal	20	-
		Grand Total	**200**	**100**

16. RE-VALUATION:

16.1. There shall be no provision of re-valuation of answer sheets, candidates shall be permitted to apply for recounting of theory papers within 7 days from the date of declaration of results.

Place: CBD Belapur
Date: 29.09.2008.

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MGM MEDICAL COLLEGE ,AURANGABAD
HORIZONTAL INTEGRATION 1ST M.B.B.S. TEACHING

TIME	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9 TO 10 A.M.	ANATOMY INTRODUCTION TO ANATOMY	PHYSIOLOGY EXTERNAL ENVIRONMENT LIFE PROCESS	BIOCHEMISTRY BIOCHEMICAL COMPOSITION OF CELL	PHYSIOLOGY HOMEOSTASIS	BIOCHEMISTRY CARBOHYDRATES	ANATOMY CONNECTIVE TISSUE (TISSUES OF BODY)
10 TO 11 A.M.	BIOCHEMISTRY INRODUCTION TO BIOCHEMISTRY	ANATOMY CELL	PHYSIOLOGY INTERNAL ENVIROMNMENT (BODY FLUIDS)	ANATOMY TERMINOLOGY	PHYSIOLOGY CONTROL SYSTEM BIOFEEDBACK	PHYSIOLOGY TRANSPORT ACROSS CELL MEMBRANE I
11 TO 01P.M.	PHYSIOLOGY INTRODUCTION BIOCHEMISTRY INTRODUCTION	PHYSIOLOGY PHYSICAL EXAM. BIOCHEMISTRY INTRODUCTION TO LAB	PHYSIOLOGY PHYSICAL EXAM. BIOCHEMISTRY PRACTICAL LAB	PHYSIOLOGY MICROSCOPE COLLECTION OF BLOOD BIOCHEMISTRY BIODATA WRITING	PHYSIOLOGY MICROSCOPE COLLECTION OF BLOOD BIOCHEMISTRY BIODATA WRITING	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD INTRODUCTION TO SUP. EXT. AND PECTORAL REGION DISSECTION GENERAL INRODUCTION	LECT MAMMARY GLAND DISSECTION GENERAL INRODUCTION	LCD CLAVICLE DISSECTION PECTORAL REGION I	LCD AXILLA DISSECTION PECTORAL REGION II	LECT AXILLARY ARTERY AND AXILLARY NERVE DISSECTION PECTORAL REGION III	LCD SCAPULA DISSECTION AXILLA I

ANNEXURE – 28

Received from Dean, MGM MC, Aurangabad on 15/4/2015 (AC meeting)

BOM-40/2015

MGM MEDICAL COLLEGE ,AURANGABAD
HORIZONTAL INTEGRATION 1ST M.B.B.S. TEACHING

TIME	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9 TO 10 A.M.	ANATOMY BONES AND CARTILAGE	PHYSIOLOGY COMPOSITION AND FUNCTIONS OF BLOOD	BIOCHEMISTRY PROTEIN I	PHYSIOLOGY PLASMA PROTEINS	*HOLIDAY*	ANATOMY HISTOLOGY INTRODUCTION
10 TO 11 A.M.	BIOCHEMISTRY CHEMISTRY OF CARBOHYDRATES II	ANATOMY MUSCLE	PHYSIOLOGY TRANSPORT ACROSS CELL MEMBRANE II	ANATOMY GENERAL CNS	*HOLIDAY*	PHYSIOLOGY ERYTHROCYTES FUNCTIONS
11 TO 01P.M.	PHYSIOLOGY MICROSCOPE COLLECTION OF BLOOD BIOCHEMISTRY TASTE ON MONOSACCHARIDE I	PHYSIOLOGY MICROSCOPE COLLECTION OF BLOOD. BIOCHEMISTRY TASTE ON MONOSACCHARIDE I	PHYSIOLOGY TUTORIAL (GEN. PHSIOLOGY) BIOCHEMISTRY	PHYSIOLOGY STUDY OF NEUBAUER'S CHAMBER AND PCV BIOCHEMISTRY TASTE ON MONOSACCHARIDE I	*HOLIDAY*	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD BACK DISSECTION AXILLA II	LECT BRACHIAL PLEXUS DISSECTION BRACHIAL PLEXUS	LCD SCAPULAR REGION DISSECTION BACK AND SUBSCAPULAR REGION I	LCD HUMERUS DISSECTION BACK AND SUBSCAPULAR REGION II	*HOLIDAY*	LCD FRONT AND BACK OF ARM DISSECTION BACK AND SUBSCAPULAR REGION III

MGM MEDICAL COLLEGE ,AURANGABAD
HORIZONTAL INTEGRATION 1ST M.B.B.S. TEACHING

TIME	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9 TO 10 A.M.	ANATOMY HISTOLOGY OF MUSCLE	PHYSIOLOGY MEMBRANE POTENTIAL RMP	BIOCHEMISTRY CHEMISTRY OF HAEMOGLOBIN I	PHYSIOLOGY ACTION POTENTIAL	BIOCHEMISTRY CHEMISTRY OF HAEMOGLOBIN II	ANATOMY HISTOLOGY OF NERVOUS TISSUE
10 TO 11 A.M.	BIOCHEMISTRY PROTEIN II	ANATOMY JOINT I	PHYSIOLOGY ERYTHROPOIESIS . FACTORS EFFECTING	ANATOMY JOINT II	PHYSIOLOGY HB FUNCTIONS ANAEMIA	PHYSIOLOGY NEURON AND CLASSIFICATION OF NERVES
11 TO 01P.M.	PHYSIOLOGY STUDY OF NEUBAUER'S CHAMBER AND PCV BIOCHEMISTRY TASTE ON MONOSACCHARIDE II	PHYSIOLOGY STUDY OF NEUBAUER'S CHAMBER AND PCV BIOCHEMISTRY TASTE ON TRISACCHARIDE I	PHYSIOLOGY TUTORIAL (GEN. PHYSIOLOGY) BIOCHEMISTRY	PHYSIOLOGY STUDY OF NEUBAUER'S CHAMBER AND PCV BIOCHEMISTRY TASTE ON TRISACCHARIDE I	PHYSIOLOGY R.B.C. COUNT AND ESR BIOCHEMISTRY TASTE ON TRISACCHARIDE II	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD RADIUS DISSECTION HISTO FRONT OF ARM I	LECT DERMATOMES AND VENOUS DRAINAGE DISSECTION HISTO FRONT OF ARM II	LCD FRONT OF FORE ARM (SUPERFICIAL) DISSECTION HISTO BACK OF ARM I	LCD ULNA DISSECTION BACK OF ARM II	LECT CUBITAL FOSSA AND ELBOW JOINT DISSECTION SHOULDER JOINT I	LCD WRIST AND PALM I DISSECTION SHOULDER JOINT II

MGM MEDICAL COLLEGE ,AURANGABAD
HORIZONTAL INTEGRATION 1ST M.B.B.S. TEACHING

TIME	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9 TO 10 A.M.	ANATOMY GEN. CARDIOVASCULAR SYSTEM	PHYSIOLOGY LEUCOCYTES LEUCOPOIESIS	BIOCHEMISTRY CARBOHYDRATE IV	PHYSIOLOGY FUNCTIONS OF WBC AND MONOCYTE MACROPHAGE	BIOCHEMISTRY PROTEIN III	ANATOMY HISTOLOGY EPITHELIUM
10 TO 11 A.M.	BIOCHEMISTRY CARBOHYDRATE III	ANATOMY GEN. LYMPHATIC SYSTEM	PHYSIOLOGY PROPERTIES OF NERVE	ANATOMY INTEGUMENTARY SYSTEM	PHYSIOLOGY PROPERTIES OF NERVE II	PHYSIOLOGY IMMUNITY
11 TO 01P.M.	PHYSIOLOGY R.B.C. COUNT AND ESR BIOCHEMISTRY TASTE ON TRISACCHARIDE II	PHYSIOLOGY R.B.C. COUNT AND ESR BIOCHEMISTRY TEST ON POLYSACCHRIDE I	PHYSIOLOGY TUTORIAL/ LCD BLOOD AND RBC	PHYSIOLOGY R.B.C. COUNT AND ESR BIOCHEMISTRY TEST ON POLYSACCHRIDE I	PHYSIOLOGY RBC AND HB BIOCHEMISTRY TEST ON POLYSACCHRIDE II	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD WRIST AND PALM II DISSECTION HISTO CUBITAL FOSSA	LECT SHOULDER JOINT DISSECTION HISTO FRONT OF FOREARM I	LCD BONES OF HAND DISSECTION HISTO FRONT OF FOREARM II	LCD BACK OF FOREARM AND HAND DISSECTION PALM I	LECT RADIOULNAR JT. DISSECTION PALM II	LCD ELBOW AND WRIST JT DISSECTION BACK OF FOREARM I

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TIME	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9 TO 10 A.M.	ANATOMY HISTOLOGY GLANDULAR EPITHELIUM	PHYSIOLOGY NUROMUSCULAR JUNCTION	HOLIDAY	PHYSIOLOGY BLOOD GROUPS	BIOCHEMISTRY PROTEIN V	ANATOMY HISTOLOGY OF BONE AND CARTILAGE
10 TO 11 A.M.	BIOCHEMISTRY PROTEIN IV	ANATOMY GENERAL EMBRYOLOGY I	HOLIDAY	ANATOMY GENERAL EMBRYOLOGY II	PHYSIOLOGY MUSCLE CLASS. AND STRUCTURE	PHYSIOLOGY RH INCOMPATIBILITY BOOD TRANSFUSION
11 TO 01P.M.	PHYSIOLOGY RBS AND HB BIOCHEMISTRY TEST ON POLYSAECHRIDE II	PHYSIOLOGY RBS AND HB BIOCHEMISTRY TUTORIAL ON CARBOHYDRATE	HOLIDAY	PHYSIOLOGY RBS AND HB BIOCHEMISTRY TUTORIAL ON CARBOHYDRATE	PHYSIOLOGY TLC AND BLOOD GR. BIOCHEMISTRY COLOUR REACTION OF PROTEIN I	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD RADIAL NERVE DISSECTION HISTO BACK OF FOREARM II	LECT MEDIAN AND ULNAR NERVE DISSECTION HISTO DISSECTION OF JTS	HOLIDAY	LCD X-RAYS AND LIVING ANAT.	LECT PALMER SPACES AND 1ST METACARPAL JT. DISSECTION HISTO SEMINAR	LCD INTRODUCTION OF THORAX DISSECTION INT. TO THORAX

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9 TO 10 A.M.	ANATOMY HISTOLOGY OF CONNECTIVE TISSUE	PHYSIOLOGY SARCOTUBULAR SYSTEM & EXCITATION	BIOCHEMISTRY LIPID II	PHYSIOLOGY MOLECULAR BASIS OF MUSCLE CONTRACTION	BIOCHEMISTRY LIPID III	ANATOMY HISTOLOGY OF BONE II
10 TO 11 A.M.	BIOCHEMISTRY LIPID I	ANATOMY GENRAL EMBRYOLOGY III	PHYSIOLOGY COAGULATION OF BLOOD	ANATOMY GENERAL EMBRYOLOGY IV	PHYSIOLOGY ANTICOGULATION INTRAVASCULAR CLOT FORMATION	PHYSIOLOGY PROPERTIES OF SKELETAL MUSCLE
11 TO 01P.M.	PHYSIOLOGY TLC AND BLOOD GR. BIOCHEMISTRY COLOUR REACTION OF PROTEIN I	PHYSIOLOGY TLC AND BLOOD GR. BIOCHEMISTRY COLOUR REACTION OF PROTEIN II	PHYSIOLOGY TUTORIAL	PHYSIOLOGY TLC AND BLOOD GR. BIOCHEMISTRY COLOUR REACTION OF PROTEIN II	PHYSIOLOGY DLC & BLOOD INDICES BIOCHEMISTRY PRECIPITATION REACTION OF PROTEIN I	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD INTERCOSTAL SPACE DISSECTION HISTO INTERCOSTAL SPACE I	LECT INTERCOSTAL SPACE DISSECTION HISTO INTERCOSTAL SPACE II	LCD THORACIC VERTEBRAE AND STERNUM DISSECTION HISTO INTERCOSTAL SPACE III	LCD PLEURA DISSECTION PLEURA I	LECT MEDIASTIMUM DISSECTION PLURA II	LCD LUNGS DISSECTION LUNGS I

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9 TO 10 A.M.	ANATOMY HISTOLOGY VASCULAR SYSTEM	PHYSIOLOGY PROPERTIES OF SKELETAL MUSCLE	BIOCHEMISTRY ENZYME I	PHYSIOLOGY INTRODUCTION TO CVS	BIOCHEMISTRY ENZYME II	ANATOMY HISTOLOGY OF RESPIRATORY SYSTEM
10 TO 11 A.M.	BIOCHEMISTRY LIPID IV	ANATOMY GENERAL EMBRYOLOGY V	PHYSIOLOGY SMOOTH MUSCLE	ANATOMY GENERAL EMBRYOLOGY VI	PHYSIOLOGY INTRODUCTION OF RESPIRATORY SYSTEM	PHYSIOLOGY PROPERTIES OF CARDIAC MUSCLE I
11 TO 01P.M.	PHYSIOLOGY DLC & BLOOD INDICES BIOCHEMISTRY PRECIPITATION REACTION OF PROTEIN I	PHYSIOLOGY DLC & BLOOD INDICES BIOCHEMISTRY COLOUR REACTION OF PROTEIN II	PHYSIOLOGY TUTORIAL	PHYSIOLOGY DLC & BLOOD INDICES BIOCHEMISTRY COLOUR REACTION OF PROTEIN II	PHYSIOLOGY DLC AND BTCT BIOCHEMISTRY LCD PH METER	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD PERICARDIUM & EXT. FEATURE OF HEART DISSECTION HISTO ANT. MEDIASTINUM I	LECT MECH. OF RESPIRATOTION AND JT. OF THORAX DISSECTION HISTO ANT. MEDIASTINUM II	LCD RIGHT ATRIUM & RIGHT VENTRICLE, PULMONARY TRUCK DISSECTION HISTO MIDDLE MEDIA. I	LCD LF. ATRIUM & VENTRICAL ASC. AORTA DISSECTION MIDDLE MEDIA. II	LECT BRONCHO PULMONARY SEG. DISSECTION HEART I	LCD SUPERIOR VENA CAVA, TRACHEA VAGI DISSECTION HEART II

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9 TO 10 A.M.	ANATOMY HISTOLOGY LYMPHOID I	PHYSIOLOGY MECHANICS OF RESPIRATION	BIOCHEMISTRY ENZYME IV	PHYSIOLOGY ATMOSPHERIC AIR & DEAD SPACE AIR.	BIOCHEMISTRY VITAMINS I	ANATOMY HISTOLOGY LYMPHOID II
10 TO 11 A.M.	BIOCHEMISTRY ENZYME III	ANATOMY GENERAL EMBRYOLOGY VII	PHYSIOLOGY PROPERTIES OF CARDIAC MUSCLE	ANATOMY GENERAL EMBRYOLOGY VIII	PHYSIOLOGY JUNCTIONAL TISSUES OF HEART	PHYSIOLOGY LUNG VOLUMES AND CAPACITIES
11 TO 01P.M.	PHYSIOLOGY DLC AND BTCT BIOCHEMISTRY LCD PH METER	PHYSIOLOGY DLC AND BTCT BIOCHEMISTRY TUTORIAL ON HAEMATOLOGY	PHYSIOLOGY TUTORIAL	PHYSIOLOGY DLC AND BTCT BIOCHEMISTRY TUTORIAL ON HAEMATOLOGY	PHYSIOLOGY INTRODUCTION TO EXPT. PHYSIOLOGY BIOCHEMISTRY TEST ON BILESALT AND PIGMENT	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD ESOPHAGUS/ DES AORTA/ THORACIC DUCT DISSECTION HISTO HEART III	LECT RIGHT ATRIUM DISSECTION HISTO SUPERIOR MEDIA.	LCD AZYGOS SYSTEM DISSECTION HISTO POST. MEDIA.	LCD X-RAYS AND LIVING	LECT. BLOOD SUPPLY OF HEART. DISSECTION/ SEMINAR	LCD INTRODUCTION AND ANTERIOR COMP. OF THIGH DISSECTION INTRODUCTION

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9 TO 10 A.M.	ANATOMY HISTOLOGY GIT I	PHYSIOLOGY ORIGIN AND SPREAD OF CARDIAC IMPULSE	BIOCHEMISTRY VITAMIN III	HOLIDAY	BIOCHEMISTRY VITAMIN IV	ANATOMY HISTOLOGY GIT II
10 TO 11 A.M.	BIOCHEMISTRY VITAMIN II	ANATOMY GENERAL EMBRYOLOGY IX	PHYSIOLOGY ALVEOLAR VENTILATION	HOLIDAY	PHYSIOLOGY E.C.G.	PHYSIOLOGY TRANSPORT OF OXYGEN
11 TO 01P.M.	PHYSIOLOGY INT. TO EXP. PHYSIOLOGY BIOCHEMISTRY TEST ON BILE SALT AND PIG.	PHYSIOLOGY EFFECT OF GRADED STIMULUS AND SMC & NORMAL ECG BIOCHEMISTRY TEST ON BILE	PHYSIOLOGY TUTORIAL	HOLIDAY	PHYSIOLOGY EFFECT OF GRADED STIMULUS AND SMC & NORMAL ECG BIOCHEMISTRY TEST ON BILE	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD HIP BONE DISSECTION HISTO FRONT OF THIGH	LECT FEMORAL TRINGLE DISSECTION HISTO FEMORAL TRINGLE	LCD ADD. COMPARTMENT OF THIGH DISSECTION HISTO FEMORAL	HOLIDAY	LECT ADDUCTOR CANAL DISSECTION MEDIAL SIDE OF THIGH I	LCD FEMUR AND PATELLA DISSECTION MEDIAL SIDE OF THIGH I

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9 TO 10 A.M.	ANATOMY HISTOLOGY GIT III	PHYSIOLOGY NERVE SUPPLY OF HEART AND HEART RATE	BIOCHEMISTRY VITAMIN VI	HOLIDAY	BIOCHEMISTRY VITAMIN VII	ANATOMY HISTOLOGY GIT IV
10 TO 11 A.M.	BIOCHEMISTRY VITAMIN V	ANATOMY GENERAL EMBRYOLOGY X	PHYSIOLOGY TRANSPORT OF CARBOHYDRATES	HOLIDAY	PHYSIOLOGY CARDIAC CYCLE I	PHYSIOLOGY CARDIAC CYCLE II
11 TO 01P.M.	PHYSIOLOGY EFFECT OF GRADED STIMULUS AND SMC & NORMAL ECG BIOCHEMISTRY TUTORIAL ON PROTEIN	PHYSIOLOGY EFFECT OF GRADED STIMULUS AND SMC & NORMAL ECG BIOCHEMISTRY TUTORIAL ON PROTEIN	PHYSIOLOGY TUTORIAL	HOLIDAY	PHYSIOLOGY EFFECT OF LOAD ON SKELETAL MUSCLE & PROPTERTIES ON CARDIAC MUSCLE BIOCHEMISTRY LCD CALORIMETRY	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD GLUTEAL REGION I DISSECTION HISTO GLUTEAL REGION I	LECT GLUTEAL REGION DISSECTION HISTO GLUTEAL REGION II	LCD GLUTEAL REGION II DISSECTION HISTO GLUTEAL REGION III	HOLIDAY	LCD TIBIA DISSECTION POPLITEAL FOSSA I	LCD POPLITEAL REGION DISSECTION POPLITEAL FOSSA II

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9 TO 10 A.M.	ANATOMY HISTOLOGY GIT V	PHYSIOLOGY NERVOUS REGULATION OF RESPIRATION	BIOCHEMISTRY BIOLOGICAL OXIDATION I	PHYSIOLOGY CARDIAC OUTPUT II	BIOCHEMISTRY BIOLOGICAL OXIDATION II	ANATOMY HISTOLOGY RESPIRATORY SYSTEM
10 TO 11 A.M.	BIOCHEMISTRY VITAMIN VIII	ANATOMY GENERAL EMBRYOLOGY XI	PHYSIOLOGY CARDIAC OUTPUT I	ANATOMY EMBRYOLOGY PHARYNGEAL POUCHES & ARCHES	PHYSIOLOGY CHEMICAL REGULATION OF RESPIRATION	PHYSIOLOGY HAEMADYNAMIC OF CIRCULATION
11 TO 01P.M.	PHYSIOLOGY EFFECT OF LOAD ON SKELETAL MUSCLE & PROPTERTIES ON CARDIAC MUSCLE BIOCHEMISTRY LCD COLORIMETER	PHYSIOLOGY EFFECT OF LOAD ON SKELETAL MUSCLE & PROPTERTIES ON CARDIAC MUSCLE BIOCHEMISTRY ESTIMATION OF BLOOD SUGAR	PHYSIOLOGY TUTORIAL	PHYSIOLOGY EFFECT OF LOAD ON SKELETAL MUSCLE & PROPTERTIES ON CARDIAC MUSCLE BIOCHEMISTRY ESTIMATION OF BLOOD SUGAR	PHYSIOLOGY GENESIS OF TETANUS AND PROPERTIES OF CARDIAC MUSCLE BIOCHEMISTRY ESTIMATION OF BLOOD SUGAR	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD BACK OF THIGH DISSECTION HISTO BACK OF THIGH I	LECT POPLITAL FOSSA DISSECTION HISTO BACK OF THIGH II	LCD HIP JOINT DISSECTION HISTO HIP JOINT I	LCD TARSALS & METATARSALS DISSECTION HIP JOINT II	LECT HIP JOINT DISSECTION FRONT OF LEG & DORSUM OF FOOT I	LCD FRONT OF LEG & DORSUM OF FOOT DISSECTION FRONT OF LEG & DORSUM OF FOOT II

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9 TO 10 A.M.	ANATOMY HISTOLOGY OF URINARY SYSTEM	PHYSIOLOGY HYPOXIA ACCLIMATIZATION AT HIGH ALTTITUDE	BIOCHEMISTRY CARBOHYDRATE METABOLISM I	PHYSIOLOGY ARTERIAL BLOOD PRESSURE	BIOCHEMISTRY CARBOHYDRATE METABOLISM II	ANATOMY SOLE OF FOOT
10 TO 11 A.M.	BIOCHEMISTRY BIOLOGICAL OXIDATION III	ANATOMY EMBRYOLOGY RESPIRATORY SYSTEM	PHYSIOLOGY VENOUS CIRCULATION	ANATOMY EMBRYOLOGY GIT I	PHYSIOLOGY ABNORMALITY OF RESPIRATION	PHYSIOLOGY REGULATION OF BLOOD PRESSURE I
11 TO 01P.M.	PHYSIOLOGY GENESIS OF TETANUS AND PROPERTIES OF CARDIAC MUSCLE II BIOCHEMISTRY ESTIMATION OF BLOOD SUGAR	PHYSIOLOGY GENESIS OF TETANUS AND PROPERTIES OF CARDIAC MUSCLE II BIOCHEMISTRY TUTORIAL ON LIPID CHEMISTRY	PHYSIOLOGY TUTORIAL	PHYSIOLOGY GENESIS OF TETANUS AND PROPERTIES OF CARDIAC MUSCLE II BIOCHEMISTRY TUTORIAL ON LIPID CHEMISTRY	PHYSIOLOGY BIOCHEMISTRY REVISION PRACTICLE	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD FIBULA AND LAT. COMP. OF LEG DISSECTION HISTO LAT. SIDE OF LEG I	LECT CUTANEOUS NERVES & VENOUS DRAINAGE & LYMPH DISSECTION HISTO LAT. SIDE OF LEG II	LCD BACK OF LEG DISSECTION HISTO MEDIAL SIDE OF LEG	LCD SOLE I DISSECTION BACK OF LEG I	LECT KNEE JOINT DISSECTION BACK OF LEG II	LCD SOLE II AND JT. OF FOOT DISSECTION SOLE I

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9 TO 10 A.M.	ANATOMY HISTOLOGY SKIN, SCALP & NAIL	PHYSIOLOGY PULMONARY FUNCTION TEST	BIOCHEMISTRY CARBOHYDRATE METABOLISM IV	PHYSIOLOGY CAPILLARY CIRCULATION	BIOCHEMISTRY CARBOHYDRATE METABOLISM V	ANATOMY INGUANAL CANAL
10 TO 11 A.M.	BIOCHEMISTRY CARBOHYDRATE METABOLISM III	ANATOMY EMBRYOLOGY GIT II	PHYSIOLOGY REGULATION OF BLOOD PRESSURE II	ANATOMY EMBRYOLOGY GIT III	PHYSIOLOGY LYMPH	PHYSIOLOGY EDEMA FORMATION
11 TO 01P.M.	PHYSIOLOGY REVISION BIOCHEMISTRY REVISION	PHYSIOLOGY FATIGUE, VAGAL ESCAPE BIOCHEMISTRY ESTIMATION OF TOTAL PROTEIN	PHYSIOLOGY TUTORIAL	PHYSIOLOGY FATIGUE, VAGAL ESCAPE BIOCHEMISTRY ESTIMATION OF TOTAL PROTEIN	PHYSIOLOGY FATIGUE, VAGAL ESCAPE BIOCHEMISTRY ESTIMATION OF TOTAL PROTEIN	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD TIBIOFEBULAR & ANKLE JT DISSECTION HISTO SOLE II	LECT ARCHES OF FOOT, MECH OF WALKING DISSECTION HISTO SOLE III	LCD X-RAYS AND LIVING OF INF. EXT.	LCD INTRODUCTION TO ABDOMEN DISSECTION HISTO INTRODUCTION	LCD ANTERIOR ABD. I DISSECTION ANTERIOR ABD. I	LCD ANTERIOR ABD II DISSECTION ANTERIOR ABD. II

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9 TO 10 A.M.	ANATOMY HISTOLOGY MALE GENITAL SYS. I	PHYSIOLOGY INTRODUCTION TO EXCRETORY SYSTEM	BIOCHEMISTRY CARBOHYDRATE METABOLISM VII	PHYSIOLOGY RENAL CIRCULATION & AUTOREGULATION OF RENAL BLOOD FLOW	BIOCHEMISTRY CARBOHYDRATE METABOLISM VIII	ANATOMY LECT STOMACH
10 TO 11 A.M.	BIOCHEMISTRY CARBOHYDRATE METABOLISM VI	ANATOMY EMBRYOLOGY GIT IV	PHYSIOLOGY PULMONARY CIRCULATION	ANATOMY EMBRYOLOGY GIT V	PHYSIOLOGY CORONARY CIRCULATION	PHYSIOLOGY GFR
11 TO 01P.M.	PHYSIOLOGY FATIGUE, VAGAL ESCAPE BIOCHEMISTRY ESTIMATION OF TOTAL PROTEIN	PHYSIOLOGY INTRODUCTION TO CLINICAL EXAM. EFFECTS OF DRUGS ON HEART BIOCHEMISTRY SEMINAR ON VITAMIN	PHYSIOLOGY TUTORIAL	PHYSIOLOGY INTRODUCTION TO CLINICAL EXAM. EFFECTS OF DRUGS ON HEART BIOCHEMISTRY SEMINAR ON VITAMIN	PHYSIOLOGY INTRODUCTION TO CLINICAL EXAM. EFFECTS OF DRUGS ON HEART BIOCHEMISTRY SEMINAR ON VITAMIN	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD MALE EXT. GENITAL ORGAN DISSECTION HISTO MALE GENITAL ORGAN	LECT TESTIES DISSECTION HISTO TESTIES	LCD PERITONEUM I DISSECTION HISTO PERITONEAL CAVITY I	LCD PERITONEUM II DISSECTION PERITONEAL CAVITY I	LECT PERITONEUM DISSECTION GRATER AND LESSER OMENTUM	LCD STOMACH & COELIAC TRUNK DISSECTION STOMACH & COELIAC TRUNK

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9 TO 10 A.M.	ANATOMY MALE GENITAL ORGAN II	PHYSIOLOGY CEREBRAL AND HEPATIC CIRCULATION	BIOCHEMISTRY PROTEIN METABOLISM II	PHYSIOLOGY CARDIO RESPIRATORY CHANGES DURING EXCERCISE	BIOCHEMISTRY PROTIEN META. III	ANATOMY LECT PANCREAS
10 TO 11 A.M.	BIOCHEMISTRY PROTEIN META. I	ANATOMY EMBRYOLOGY GIT VI	PHYSIOLOGY TUBULAR FUNCTION	ANATOMY EMBRYOLOGY GIT VII	PHYSIOLOGY MECHANISM OF CONCENTRATION OF URINE	PHYSIOLOGY CIRCULATORY SHOCK I
11 TO 01P.M.	PHYSIOLOGY INTRODUCTION TO CLINICAL EXAM. EFFECTS OF DRUGS ON HEART BIOCHEMISTRY SEMINAR ON VITAMIN	PHYSIOLOGY ARTERIAL PULSE AND EFFECT OF IONS ON HEART BIOCHEMISTRY ESTIMATION OF BLOOD UREA	PHYSIOLOGY TUTORIAL	PHYSIOLOGY ARTERIAL PULSE AND EFFECT OF IONS ON HEART BIOCHEMISTRY ESTIMATION OF BLOOD UREA	PHYSIOLOGY ARTERIAL PULSE AND EFFECT OF IONS ON HEART BIOCHEMISTRY ESTIMATION OF BLOOD UREA	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD DUODENUM DISSECTION HISTO DUODENUM	LECT DUODENUM DISSECTION HISTO MESENTRY	LCD SMALL INTESTINE & SUP. MESENTRIC ARTERY DISSECTION HISTO SMALL INTESTINE	LCD LARGE INTESTINE AND INF. MESENTRIC ARTERY DISSECTION COECUM & APPENDIX	LECT COECUM & APPENDIX DISSECTION LARGE INTESTINE	LCD PANCREASE DISSECTION PANCREASE

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9 TO 10 A.M.	ANATOMY HISTOLOGY FEMALE GENTIAL TRACT I	PHYSIOLOGY RENAL HANDLING OF WATER & ELECTROLYTES	BIOCHEMISTRY PROTEIN META. V	PHYSIOLOGY ACIDIFICATION OF URINE	BIOCHEMISTRY PROTEIN META. VI	ANATOMY LECT. KIDNEY
10 TO 11 A.M.	BIOCHEMISTRY PROTEIN META. IV	ANATOMY EMBRYOLOGY URINARY SYST. I	PHYSIOLOGY CIRCUALTORY SHOCK II	ANATOMY EMBRYOLOGY URINARY SYST. II	PHYSIOLOGY MITURATION Mituration	PHYSIOLOGY RENAL FUNCTION TESTS.
11 TO 01P.M.	PHYSIOLOGY ARTERIAL PULSE AND EFFECT OF IONS ON HEART BIOCHEMISTRY ESTIMATION OF BLOOD UREA	PHYSIOLOGY RECORDING OF BLOOD PRESSURE & STETHOGRAPHY BIOCHEMISTRY LCD ON CHROMATOGRAPHY	PHYSIOLOGY TUTORIAL	PHYSIOLOGY RECORDING OF BLOOD PRESSURE & STETHOGRAPHY BIOCHEMISTRY LCD ON CHROMATOGRAPHY	PHYSIOLOGY RECORDING OF BLOOD PRESSURE & STETHOGRAPHY BIOCHEMISTRY ESTIMATION OF SERUM BILIRUBIN	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD LIVER DISSECTION HISTO LIVER	LECT EXTRA HEPATIC BILLIARY APP. DISSECTION HISTO GALL BLADDER	LCD SPLEEN DISSECTION HISTO SPLEEN	LCD KIDNEY DISSECTION KIDNEY, URETER, SUPRARENAL	LECT AUTONOMIC NERVOUS SYSTEM DISSECTION KIDNEY, URETER, SUPRARENAL	LCD SUPRARENAL AND URETERS DISSECTION POST. WALL

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9 TO 10 A.M.	ANATOMY HISTOLOGY FEMALE REPRODUCTIVE SYSTEM II	PHYSIOLOGY BODY TEMP. REGULATION I	BIOCHEMISTRY PROTEIN META VIII	PHYSIOLOGY BODY TEMP. REGULATION III	BIOCHEMISTRY ACID BASE BALANCE I	ANATOMY LECT URINARY BLADDER
10 TO 11 A.M.	BIOCHEMISTRY PROTEIN META VII	ANATOMY EMBRYOLOGY URINARY SYSTEM III	PHYSIOLOGY BODY TEMP. REGULATION II	ANATOMY EMBRYOLOGY URINARY SYSTEM IV	PHYSIOLOGY INTRODUCTION TO ENDOCRINOLOGY	PHYSIOLOGY INTRODUCTION TO GIT
11 TO 01P.M.	PHYSIOLOGY RECORDING OF BLOOD PRESSURE & STETHOGRAPHY BIOCHEMISTRY ESTIMATION OF SERUM BILIRUBIN	PHYSIOLOGY BLOOD PRESSURE II & CLINICAL EXAMINATION OF CVS BIOCHEMISTRY ESTIMATION OF SERUM BILIRUBIN	PHYSIOLOGY TUTORIAL	PHYSIOLOGY BLOOD PRESSURE II & CLINICAL EXAMINATION OF CVS BIOCHEMISTRY ESTIMATION OF SERUM BILIRUBIN	PHYSIOLOGY BLOOD PRESSURE II & CLINICAL EXAMINATION OF CVS BIOCHEMISTRY TUTORIAL ON ENZYMES	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD PERINEUM & ANAL TRINGLE DISSECTION HISTO PERINEUM & ANAL TRINGLE	LECT ISCHIORECTAL FOSSA DISSECTION HISTO ISCHIORECTAL FOSSA I	LCD BONY PELVIS DISSECTION HISTO ISCHIORECTAL FOSSA II	LCD UROGENITAL TRINGLE DISSECTION UROGENITAL TRINGLE I	LECT PERINEAL POUCHES DISSECTION UROGENITAL TRINGLE II	LCD URINARY BLADDER DISSECTION URINARY BLADDER

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9 TO 10 A.M.	ANATOMY HISTOLOGY OF ENDOCRINES I	PHYSIOLOGY ANTERIOR PITUTARY	BIOCHEMISTRY LIPID META I	PHYSIOLOGY PITUTARY II	BIOCHEMISTRY LIPID META II	ANATOMY LECT PROSTATE & PELVIC DIA.
10 TO 11 A.M.	BIOCHEMISTRY ACID BASE BALANCE II	ANATOMY EMBRYOLOGY MALE GENITAL I	PHYSIOLOGY SALIVARY SECRETION	ANATOMY EMBRYOLOGY MALE GENITAL II	PHYSIOLOGY DEGLUTATION	PHYSIOLOGY THYROID I
11 TO 01P.M.	PHYSIOLOGY BLOOD PRESSURE II & CLINICAL EXAMINATION OF CVS BIOCHEMISTRY TUTORIAL ON ENZYMES	PHYSIOLOGY ECG & CLINICAL EXAMINATION OF RS BIOCHEMISTRY ESTIMATION OF ALK. PHOSPHATASE	PHYSIOLOGY TUTORIAL	PHYSIOLOGY ECG & CLINICAL EXAMINATION OF RS BIOCHEMISTRY ESTIMATION OF ALK. PHOSPHATASE	PHYSIOLOGY ECG & CLINICAL EXAMINATION OF RS BIOCHEMISTRY ESTIMATION OF ALK. PHOSPHATASE	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD UTERUS DISSECTION HISTO UTERUS	LECT UTERUS DISSECTION HISTO OVARY AND F. TUBE	LCD OVARY AND F. TUBE DISSECTION HISTO OVARY AND F. TUBE	LCD RECTUM & ANAL CANAL DISSECTION RECTUM & ANAL CANAL I	LECT RECTUM & ANAL CANAL DISSECTION RECTUM & ANAL CANAL II	LCD PROSTATE DISSECTION PROSTATE

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9 TO 10 A.M.	ANATOMY HISTOLOGY OF ENDOCRINES II	PHYSIOLOGY GASTRIC SECRETIONS I	BIOCHEMISTRY LIPID META IV	HOLIDAY	BIOCHEMISTRY LIPID META V	ANATOMY LECT (INTEGRATED) CORSS SECTIONAL ANAT.
10 TO 11 A.M.	BIOCHEMISTRY LIPID MRTA III	ANATOMY EMBRYOLOGY FEMALE REPRODUCTIVE I	PHYSIOLOGY THYROID II	HOLIDAY	PHYSIOLOGY GASTRIC SECRETIONS II	PHYSIOLOGY PANCREATIC SECRETION
11 TO 01P.M.	PHYSIOLOGY ECG & CLINICAL EXAMINATION OF RS BIOCHEMISTRY ESTIMATION OF ALK. PHOSPHATASE	PHYSIOLOGY ARTIFICIAL RESPIRATION & SPIROMETRY BIOCHEMISTRY TEST ON CARBOHYDRATE METABOLITES	PHYSIOLOGY TUTORIAL	HOLIDAY	PHYSIOLOGY ARTIFICIAL RESPIRATION & SPIROMETRY BIOCHEMISTRY TEST ON CARBOHYDRATE METABOLITES	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD DIA. AND MUSCLES OF POST. ABD. WALL DISSECTION HISTO DIAPHRAGM	LECT NERVES, VESSLES & LYMPH OF POST ABD. WALL DISSECTION HISTO POST. ABD WALL & PELVIS	LCD X-RAYS & LIVING HISTOLOGY PRACT.	HOLIDAY	REVISION	REVISION

MGM MEDICAL COLLEGE ,AURANGABAD
HORIZONTAL INTEGRATION 1ST M.B.B.S. TEACHING

TIME	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9 TO 10 A.M.	ANATOMY SEMINAR	PHYSIOLOGY GASTRIC MOTILITY	BIOCHEMISTRY LIPID META VII	PHYSIOLOGY ADERNAL GLAND I	BIOCHEMISTRY MECHANISM OF HORMONE ACTION	ANATOMY EMBRYOLOGY HEART II
10 TO 11 A.M.	BIOCHEMISTRY	ANATOMY EMBRYOLOGY FEMALE REPRODUCTIVE II	PHYSIOLOGY PARATHYROID	ANATOMY EMBRYOLOGY HEART I	PHYSIOLOGY ADERNAL GLAND II	PHYSIOLOGY
11 TO 01P.M.	PHYSIOLOGY ARTIFICIAL RESPIRATION & SPIROMETRY BIOCHEMISTRY ESTIMATION OF SGOT & SGPT	PHYSIOLOGY ARTIFICIAL RESPIRATION & SPIROMETRY BIOCHEMISTRY ESTIMATION OF SGOT & SGPT	PHYSIOLOGY TUTORIAL	PHYSIOLOGY CARDIAC EFFIENCY BIOCHEMISTRY ESTIMATION OF SGOT & SGPT	PHYSIOLOGY CARDIAC EFFIENCY BIOCHEMISTRY ESTIMATION OF SGOT & SGPT	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	REVISION	REVISION	REVISION	REVISION	REVISION	REVISION

MGM MEDICAL COLLEGE ,AURANGABAD
HORIZONTAL INTEGRATION 1ST M.B.B.S. TEACHING
FIRST TERM EXAMINATION

TIME	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9 TO 10 A.M.	THEORY ANATOMY	THEORY PHYSIOLOGY	THEORY BIOCHEMISTRY	TERMINAL PRACTICLE	TERMINAL PRACTICLE	TERMINAL PRACTICLE
10 TO 11 A.M.						
11 TO 01P.M.						
01 TO 02 P.M.						
02 TO 05 P.M.						

MGM MEDICAL COLLEGE ,AURANGABAD
HORIZONTAL INTEGRATION 1ST M.B.B.S. TEACHING

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9 TO 10 A.M.	ANATOMY INTRODUCTION TO ANATOMY	PHYSIOLOGY	BIOCHEMISTRY	PHYSIOLOGY	BIOCHEMISTRY	ANATOMY
10 TO 11 A.M.	BIOCHEMISTRY	ANATOMY	PHYSIOLOGY	ANATOMY	PHYSIOLOGY	PHYSIOLOGY
11 TO 01P.M.	PHYSIOLOGY BIOCHEMISTRY	PHYSIOLOGY BIOCHEMISTRY	PHYSIOLOGY BIOCHEMISTRY	PHYSIOLOGY BIOCHEMISTRY	PHYSIOLOGY BIOCHEMISTRY	P.S.M.
01 TO 02 P.M.	LUNCH					
02 TO 05 P.M.	LCD DISSECTION	LCD DISSECTION	LCD DISSECTION	LCD DISSECTION	LCD DISSECTION	LCD DISSECTION

BOM-38/2014

A-3(B)

MGM/MC/Biochem/2014/581

Date-10/01/2014

To

The Registrar,
MGMIHS, Kamothe,
Navi Mumbai

MGM University of Health Sciences
INWARD NO. 928
DATE: 10-1-14
REF: DIPN

Reference: Acad. 15/2014 dated 01.01.2014 received on 09.01.2014

Subject: Topics for Horizontal and Vertical Integration for 1st MBBS

Dear Sir,

It was decided in the BOS that as of now Vertical Integration is not feasible at the 1st MBBS level, but it can be done at higher level (II & III MBBS) as per current MCI Curriculum. Therefore I am not submitting the topics of Vertical Integrated Teaching.

Following are the topics for Horizontal Integrated Teaching -

Sr. No.	Topics	Anatomy	Physiology	Biochemistry
1.	Diabetes Mellitus	Endocrine part of pancreas	Control of Insulin Secretion & Functions	Lab Diagnosis & GTT
2.	Endemic Goiter	Thyroid Gland	Formation & Regulation of T_3, T_4 & TSH	Iodine Metabolism & Function Tests
3.	Myocardial Infraction	Coronary Arteries	ECG	Cardiac Markers
4.	Fatty Liver	Liver Histology	Functions of liver – Transport of Fat from the liver	Lipotropic Factors
5.	Obstructive Jaundice	Hepato-Biliary Tree	Bile Juice, Entro-hepatic recirculation	Diagnostic Biochemical Markers
6.	Glomerular Filtration	Nephron	Physiology of Glomerular Filtration	Inulin & creatinine clearance test

Dr. A. D. Deepak
Chairperson BOS- Preclinical,
Dept of Biochemistry,
MGM Medical College,
Kamothe, NM

10/1/14

(Approved in BOM 38/2014, dated 28/11/2014, Resolution No. - 3.1)

BOM-23/2012, dated 30.03.12, Resolution No 4

Annexure - III

Mahatma Gandhi Mission's Institute of Health Sciences ,
Sector – 18 Kamothe, Navi Mumbai - 410 209

TOPICS FOR HORIZONTAL INTEGRATION IN I-MBBS

(Anatomy , Physiology , Biochemistry)

Sr. no	Month	Name of the Topic	Anatomy	Physiology	Biochemistry
1	1st &2nd week of August	Cell	Cell membrane organelles (1)	Function of cell membrane , cell organelles & transport across cell membrane (3)	Biochemical function carried out by organelles, fluid mosaic model ,transport (2)across cell membrane
2	3rd week of August	Nerve Muscle	Structure of muscle & Structure of Nerve(1)	Types of Muscles ,Molecular Structure of muscle,Classification of Nerve fibres (3)	–
3	3rd week of August	Blood	Overview of circulatory system (1) structure of bone(1)	Blood – composition & functions (1), Hemopoiesis(1)	structure of Hb Physiological functions of Hb Hb derivatives abnormal Hb(3) Plasma proteins(2) Immunochemistry (1)
4	Sept	Respiratory System	Organization of RS. Thoracic cage lungs, Pleura Tracheobronchial tree(2)	Respiratory System Organisation(1) Mech. Respiration(1) Muscle movements (1)	Phospholipids (1)
5	Sept	Cardio vascular system	Mediastinum, pericardium , Heart, Great vessels (2)	Cardio vascular system Organisation(1) Structure & function of Heart & blood vessels (1)	Lipoproteins (1)
6	Nov & Dec	Digestive system	Gross anatomy of GIT with microscopic structure & development -Liver & hepatobiliary apparatus Pancreas(5)	Digestive system(10) Liver& gallbladder bile entrahepatic circulation (2)	General idea of digestion & absorption of carbohydrates , proteins , lipids (1) LFT (1) Hb metabolism (2) Iron Metabolism(1)

7	Jan	Excretory system	Gross anatomy& development, Microanatomy of kidney, ureter bladder, ,urethra(4)	Excretory system(10)	RFT(1) Protein metabolism(7) water & electrolytes(1) Na+, K+ (1)
8	3rd week of Jan	Endocrine system	Demonstration of pituitary gland , thyroid , Pancreas& suprarenal (3)	Endocrine system(8)	Mechanism of Hormone action (1) TFT (1),Ca-P metabolism, (1) trace elements (1)
9	Feb	Reproductive system	Mammary gland Reproductive system- male & female with development, structure(9)	Reproductive system(7)	----
10	Feb – March	Special senses	Eye, Ear, Tongue, vestibular apparatus Nose Olfactory system (4)	Special senses(12)	--
11	March-April	Nervous system	Overview –spinal cord, Brain meninges, Autonomic nervous system(10)	Central Nervous system(20)	---

Prof & HOD
Anatomy

Prof & HOD
Physiology

22/3/12
Prof & HOD
Biochemistry

Approved in BOM ~~2005~~ 26/2012, Dated 27/09/2012

~~Item~~ Item No.-5

5. Resolved to include Lecture-cum-demonstration topic "Immunoassay Techniques" in the 1st MBBS, Biochemistry Journal.

Approved in BOM - 28/2013, Dated 25/03/2013

Resolved to include 'Lipoprotein metabolism' in place of 'Transport (role of HDL & LDL) in First MBBS – Biochemistry Theory Syllabus.

Approved in BOM - 38/2014, Dated 28/11/2014

Resolution No. 3.1(c): Resolved to include Lipid Profile as LCD topic in the Biochemistry curriculum of I[st] year MBBS course with effective from Academic Year 2015-16.

Approved in BOM - 40/2015, Dated 13/05/2015

Resolution No. - 3.1 (b)

Resolution No. 3.1(b): Resolved to incorporate LCD on immunoassay technique in UG practical syllabus of Biochemistry.

Approved in BOM 43/2015, Dated 05/11/2015
Resolution No. 3.1 (d)

Resolution No. 3.1(d): Resolved to accept the proposed pattern of redistribution of the marks in First MBBS – University Biochemistry Practical Examination **(Annexure-III)** for the batch of Students to be admitted in 1st MBBS from the academic year 2016-17 onwards.

Redistribution of the marks in First MBBS – University Biochemistry practical Examination as below :

1. Current Pattern of Biochemistry Practical Examination

Total Marks =40

Q.1 Long quantitative/ qualitative experiment 20 marks
Q.2 Short quantitative/ qualitative experiment 15 marks
Q.3 Spotting 5marks

2. Proposed Pattern of Biochemistry Practical Examination

Total Marks =40

Q.1 Long quantitative/ qualitative experiment 20 marks
Q.2 Short quantitative/ qualitative experiment 10 marks
Q.3 Spot- Clinical interpretation of the datas & applied Biochemistry (10 Marks)

For e.g.: 5 Spots of 2 marks each (10 Marks) or 2 case study questions of five marks each (10 Marks)

Case study: Which will be given based on various investigations taught in practical syllabus for example: Diabetic ketoacidosis, jaundice, Kidney diseases, and AMI, etc.

Following subquestions one mark each could be asked like

1. Which Tests can be done.
2. What is principle of test/ instrument.
3. Give names of reagents used in the test./ use of reagent.
4. What is normal range.
5. What is clinic biochemical correlation.

Approved in BOM-43/2015, dated 06/11/2015
Resolution No.-3.1(b)

Resolution No. 3.1(b): Resolved to include Early Clinical Exposure in the curriculum of First MBBS by way of video clipping, animations, visit to Wards wherever necessary **(Annexure-II)**) for the batch of Students to be admitted in 1st MBBS from the academic year 2016-17 onwards.

1. Introduction of early clinical exposure
   - For example –
     - Introduction to imaging techniques and correlation with anatomical structure in normal person.
     - Upper limb – Erb'spalsy,Klumke's paralysis,claw hand, wrist drop,
     - Lower limb – varicose veins, Trendelenburg's test for gluteus medius, Knee arthroscopy and replacement, foot drop
     - Thorax – pleural effusion, procedure of pleural or pericardial tap, diaphragmatic hernia, X-ray chest with introduction of terms such as CT scan, HRCT, Bronchoscopy. Introduction of echocardiography and valvular movements; Angiography.
     - Abdomen – renal calculi, Meckel's diverticulum, cholecystitis, Introduction to endoscopy of stomach and large intestine and duodenum, Peancreatic and gallstone removal with endoscopy.
     - Pelvis – interior of bladder by cystoscopy, ectopic pregnancy, haemorrhoids, Introduction of pelvic laprosopy.
     - Head, face, neck – facial palsy, parotitis, black eye in scalp injury
     - Neuro-anatomy – Huntington's chorea, hydrocephaly, procedure of lumbar puncture, Introduction of MRI and MRI angiography and tensor imaging.

O/C

MGM INSTITUTE OF HEALTH SCIENCES

(Deemed University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC
Sector -1, Kamothe, Navi Mumbai – 410 209.
Tel: 022-27432471 / 27432994, Fax: 022-27431092
Email: registrar@mgmuhs.com | Website: www.mgmuhs.com

MGM/01 -AC-19/2014/264

Dated: 04/11/2014

To

Dr. A.D. Deepak,
Prof. & Head, Dept. of Biochemistry,
Chairperson – BOS (Pre Clinical)
MGM Medical College, Navi Mumbai

Sub.: Model Question Paper- Reg.

Dear Sir,

As per the discussions in Academic Council Meeting (AC-19 / 2014) dated 31st October, 2014, you are hereby requested to prepare the Model Question Papers for Pre Clinical subjects, as per the MGMIHS and MCI norms, and submit the same to the Examination Section before 15th November, 2014, with intimation to the undersigned.

Thanking you,

Registrar

Registrar
MGM INSTITUTE OF HEALTH SCIENCES
(DEEMED UNIVERSITY u/s 3 of UGC Act, 1956)
KAMOTHE, NAVI MUMBAI

Mahatma Gandhi Mission

MEDICAL COLLEGE

DEPARTMENT OF BIOCHEMISTRY

PH No:- 022-27437809

Ref:- MGM/MED-C/BIOCHEM/690 Date:- 26-11-2014

To,
The Registrar,
MGM Institute of Health Sciences,
Kamothe, Navi Mumbai.

Reference:- Circular No. MGM/01-AC-19/2014/264 dated- 4-11-14

Sub:- Preparation Of Model Question Papers for Pre Clinical Subjects & Log Book.

Sir,

With reference to the above , I am sending the Model Question Paper for Biochemistry Department & log Book.

Thanking you,

Prof & Head
Dept. of Biochemistry

AR (Examin)

MGM Medical College, Navi Mumbai
Department of Biochemistry
University Examination
I-MBBS

Total Marks-50

Paper-I

Date: 30-05-2013

Time: 10.00 a.m. to 12.30 p.m.

SECTION – B

Q.2. Write in brief (Any Four out of Five) **(4 X 5 = 20)**

1. Schematic representation of Krebs- Henseleit cycle and mention its disorders
2. Molecular basis of Sickle cell anemia & give its clinical manifestations.
3. Define isoenzymes and give diagnostic use of any two Isoenzymes.
4. write a note on Lac-Operon model of gene expression.
5. A full term infant was observed to have a lack of pigmentation , blue eyes, white hair & confirmed as a case of albinism.
   a) Name the deficient pigment. (1 Mark)
   b) Name the enzyme responsible for the defect. (1 Mark)
   c) Write biochemical reaction catalysed by the enzyme. (1 Mark)
   d) Name the amino acid, from which the pigment is synthesized. (1 Mark)
   e) Management of the disease. (1 Mark)

SECTION – C

Q.3 Write in detail. (Any Two out of Three) **(2 X 10 = 20)**

1. Catabolism of Purine with related disorders.
2. Give an account of ETC (with diagramme) with sites of ATP formation, inhibitors. Add a note on uncouplers.
3. Write sources, RDA, biochemical functions and deficiency manifestations of vitamin A.

****

MGM Medical College, Navi Mumbai
Department Of Biochemistry
University Examination
I-MBBS

Total Marks-50

Paper-II

Date: 31-05-2013 Time: 10.00 a.m. to 12.30 p.m.

Section – B

Q. 2. Short answer questions (Any Four) **(4 x 5=20)**

1. Hormonal regulation of blood calcium level.
2. Detoxification by conjugation
3. Biochemical changes in starvation.
4. Diagnostic applications of radioisotopes.
5. A 65 year old male presented with acute chest pain, sweating & discomfort in Casualty . After the admission his blood was sent to Laboratory for investigations & findings are

Investigation	Patient	Normal
a) Serum cholesterol	350 mg/dl	150-220 mg/dl
b) S.G.O.T	55 IU / L	5-35 IU/ L
c) LDH	220 U / L	50-110 U/ L

a) What is most probable diagnosis. (1 Mark)
b) Which isoenzyme of LDH will you estimate to confirm above diagnosis. (1 Mark)
c) Name additional tests to be done to confirm your diagnosis. (1 Mark)
d) What is biochemical mechanism for the symptoms. (2 Marks)

Section – C

Q. 3. Write in detail (Any Two) **(2 x10=20)**

1. Describe formation and breakdown of ketone bodies. Add a note on ketosis.
2. Describe Krebs cycle, its regulation and energetics
3. Describe liver function tests .

****

Approved As per BoM 45/2016, Dated 28/04/2016
Resolution No. - 3.1 (b)

Resolution No. 3.1(b): Resolved to accept revised method to calculate internal assessment marks for Ist MBBS as given below from the academic year 2016 -17 onwards:

For Theory:

	Anatomy	Physiology	Biochemistry
1st Sem. & Prelim Exam.	15	15	15
Day to day assessment as per MCI norms	05	05	05
Total marks	20	20	20

For Practical:

	Anatomy	Physiology	Biochemistry
1st Sem. & Prelim Exam.	15	15	15
Day to day assessment as per MCI norms	05	05	05
Total marks	20	20	20

DEPARTMENT OF PHYSIOLOGY
MGM MEDICAL COLLEGE, KAMOTHE, NAVI MUMBAI

MGM/MED-C/PHY/2016/626 Date: 28.12.2016

To
The Registrar
MGM IHS,
Navi Mumbai

Subject: First MBBS Syllabus for Human Physiology, Human Anatomy & Human Biochemistry subjects.

Sir,

Please find herewith the First MBBS Syllabus for Human Physiology, Human Anatomy & Human Biochemistry syllabus, as submitted by HODs after due discussion sent by email registrar@mgmuhs.com & dyr@mgmuhs.com.

This is for your kind information and necessary action.

Thanking you.

Academic Council
25.12.16

Yours sincerely,

Dr. R. S. Inamdar
Chairman
Pre Clinical BOS
Professor & Head
Department of Physiology
MGM Medical College,
Kamothe, Navi Mumbai

MGM Institute Of Health Sciences
INWARD NO. 10099
DATE: 28/12/16
REF:

MGM INSTITUTE OF HEALTH SCIENCES
HUMAN BIOCHEMISTRY – Phase I M.B.B.S.

I) Goal:-

The broad goal of the teaching of undergraduate students in biochemistry is to make them understand the scientific basis of the life processes at the molecular level and to orient them towards the application of the knowledge acquired in solving clinical problems.

II) Objectives:-

a) Knowledge

At the end of the course, the student shall be able to:

1. Describe the molecular and functional organization of a cell and list its subcellular components;
2. Delineate structure, function and inter-relationships of biomolecules and consequences of deviation from normal;
3. Summarize the fundamental aspects of enzymology and clinical application wherein regulation of enzymatic activity is altered;
4. Describe digestion and assimilation of nutrients and consequences of malnutrition;
5. Integrate the various aspects of metabolism and their regulatory pathways;
6. Explain the biochemical basis of inherited disorders with their associated sequelae;
7. Describe mechanisms involved in maintenance of body fluid and pH homeostasis;
8. Outline the molecular mechanisms of gene expression and regulation, the principles of genetic engineering and their application in medicine.
9. Summarize the molecular concept of body defense and their applications in medicine;
10. Outline the biochemical basis of environmental health hazards, biochemical basis of cancer and carcinogenesis;

11. Familiarize with the principles of various conventional and specialized laboratory investigations and instrumentation analysis and interpretation of given data;
12. Suggest experiments to support theoretical concepts and clinical diagnosis;

b) SKILLS

At the end of the course, the student shall be able to :

1. Make use of conventional techniques / instruments to perform biochemical analysis relevant to clinical screening and diagnosis;
2. Analyze and interpret investigative data;
3. Demonstrate the skills of solving scientific and clinical problems and decision making.

c) INTEGRATION

The knowledge acquired in biochemistry shall help the students to integrate molecular events with structure and function of the human body in health and disease.

1. Total no. of teaching hours allotted to Human Biochemistry – 240 hrs.
2. **Theory examination**:

There will be TWO papers, each of two and half hours duration. Each paper will be of 50 marks with one compulsory question on applied biochemistry.

Paper wise distribution of theory topics:
Structural formulae are not obligatory.

Paper- I (50 marks) 2 ½ hours duration

1. Molecular and functional organization of a cell and its sub-cellular components.
2. Chemistry of enzymes and their clinical applications.
3. Chemistry and metabolism of proteins and related disorders.
4. Chemistry and metabolism of purines and pyrimidines and related disorders.
5. Chemistry and functions of DNA and RNA , Genetic code ; Protein biosynthesis &.regulation (Lac-operon)
6. The principles of genetic engineering and their applications in medicine.
7. Chemistry and Metabolism of haemoglobin.
8. Biological oxidation.
9. Molecular concept of body defense and their applications in medicine.
10. Vitamins and Nutrition.

PAPER - II (50 marks) 2 ½ hours duration

1. Chemistry and metabolism of carbohydrates and related disorders.
2. Chemistry and metabolism of lipids and related disorders.
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. Environmental biochemistry.
8. Liver function tests, Kidney function tests, Thyroid function tests.
9. Detoxification mechanisms.
10. Biochemical basis of cancer and carcinogenesis.
11. Radioisotopes.
12. Investigation techniques : (LCD-Topics) First Aid in Biochemistry laboratory, Colorimeter, Electrophoresis, Chromatography, Flame photometer, Lipid profile, Immunoassay techniques.

SYLLABUS FOR PRACTICAL

1. Tests for monosaccharides.
2. Tests for disaccharides & osazones
3. Color reactions of proteins.
4. Precipitation reactions of proteins.
5. Estimation of blood sugar.
6. Estimation of blood urea.
7. Estimation of i) Serum creatinine, ii) Creatinine in urine.
8. Determination of serum total protein, albumin and A/G ratio.
9. Estimation of total serum bilirubin.
10. Estimation of serum cholesterol.
11. Estimation of serum calcium.
12. Estimation of serum phosphorus (Inorganic)
13. Estimation of S.G.P.T. (ALT).
14. Estimation of S.G.O.T. (AST).
15. Estimation of serum alkaline phosphatase.
16. Estimation of serum amylase.
17. Urine; Physical characteristics and normal constituents (organic)
18. Urine report; Physical characteristics and abnormal constituents by Uristicks & Conventional methods.
19. C.S.F. - Sugar & Protein.
20. Serum uric acid.

PRACTICAL:

Practical examination in Biochemistry will be of TWO hours duration 40 marks

B) Exercise

Q.1.: One qualitative/quantitative experiment from group A/B
(15 marks for expt. & 5 marks for table viva) 20 marks

Q.2.: One qualitative/ quantitative experiment from group B. 10 marks
(7 marks for expt. & 3 marks for table viva)

Q.3.: Spot – Clinical interpretation of the datas & applied Biochemistry — 10 marks

Q.4.: Viva Examination (Oral) — 20 marks

Group A:

Blood sugar, Blood urea; Serum total protein, Albumin and A/G ratio, Alanine amino transaminase (SGPT), Aspartate amino transaminase (SGOT), Alkaline phosphatase, Serum amylase, Serum total bilirubin, Serum uric acid, Serum calcium, CSF sugar.

Group B:

Creatinine in urine, Serum cholesterol, Serum phosphorus, CSF protein, Tests for monosaccharides (Benedict, Barfoed, Selivanoff, Nylander, rapid furfural), Tests for disaccharides, Color reactions of proteins, Precipitation reactions of proteins, Normal organic constituents of urine, Abnormal constituents of urine, S. Creatinine.

Group C:

5 Spots of 2 marks each (10 Marks) or 2 case study questions of five marks each

a. **Spot / Five mark Case study** :
Which will be given based on various investigations taught in practical syllabus for example Diabetic ketoacidosis , jaundice, Kidney diseases, and AMI, etc.
Following sub-questions one mark each could be asked like

1. Which tests can be done?
2. What is principle of test/instrument?

3. Give names of reagents used in the test./ use of reagent.

4. What is normal range?

5. What is clinico-biochemical correlation.

Candidate will be allowed to use flow chart for quantitative exercise only.
There will be table viva on Q.1 & Q.2 exercise.

NATURE OF QUESTION PAPER - Theory

MCQ Section A will be given to the candidate at the beginning of the examination. After 30 minutes Section A will be collected. Paper containing Section B and Section C will then be handed over to the candidate. Section B and Section C is to be written in separate answer sheets.

SECTION -A

Q.No.1. Multiple choice questions (MCQs 20)

(30 minutes duration) 10 marks

SECTION -B

Q. No. 2.Write in brief (Any Four out of Five) 5 marks each 20 marks

(Two to be based on applied aspects)

SECTION-C

Q.No.3. Long question

Solve any Two out of Three 20 marks

APPOINTMENT OF EXAMINERS:

There shall be at least six examiners. Out of whom not less than 50% must be an external examiner. Of the six examiners, the senior most internal examiner will act as Chairman/Convener. The Chairman will make distribution of Practical & viva-voce, so that all examiners will examine each candidate.

Theory

Paper I.	50 marks
Paper II.	50 marks
	Total 100 marks

Theory – viva.	20 marks
	(Paper I & II – 10 marks each.)

Practical :

Q.1. Qualitative/Quantitative	20 marks
Q.2. Qualitative/Quantitative.	10 marks
Q.3. Spotting.	10 marks
	Total 40 marks

Internal assessment

Theory	20 marks
Practical	20 marks

	Total 40 marks

For Theory

	Biochemistry
1st Sem. & Prelim Exam	15
Day to day assessment as per MCI norms	05
Total marks	**20**

For Practical

	Biochemistry
1st Sem. & Prelim Exam	15
Day to day assessment as per MCI norms	05
Total marks	**20**

Standard of passing:

Head of passing And Standard of passing will be as under:

Head of passing	Standard of passing
A)Theory +Oral	50% Marks
B)Practical/Clinical	50% Marks
C) Internal Assessment	35% marks(for eligibility)

(Theory + Practical)

D) Aggregate of all the 50% marks

Above mentioned Heads of passing.

Based on Medical Council of India Notification. 164

DETAILS OF SYLLABUS FOR HUMAN BIOCHEMISTRY

Structural formulae are not obligatory.

Must know:

1. **Chemistry of carbohydrates:** classification and biochemical importance, chemistry and functions of monosaccharides (excluding isomerism), disaccharides and polysaccharides including Glycosaminoglycans (mucopolysaccharides).

2. **Chemistry of Lipids:** classification and biological importance of triacyl glycerol, phospholipids, glycolipids, fatty acids (PUFA), prostaglandin, steroids and lipoproteins.

3. **Chemistry 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, Plasma proteins-functions, clinical significance of various fractions, methods of separation (only principle).

4. **Enzymes:** General nature, classification of enzymes, specificity and mode of action of enzymes, factors affecting enzyme activity. Enzyme inhibitions (Kinetic not required).Clinical importance (Diagnostic, therapeutic and as a Laboratory reagent) of enzymes and isoenzymes.

5. **Biological oxidation:** General concept of oxidation and reduction. Role of enzymes and co-enzymes. Electron transport chain. Substrate level and Oxidative phosphorylation, Role of uncouplers and inhibitors.

6. **Haemoglobin:** Chemistry and functions of haemoglobin . Types of normal and abnormal hemoglobins. (HbS, M, Thalassemia). Haemoglobin derivatives.

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

8. **Nutrition:** Balance diet for normal adult, Quality of dietary protein, SDA, protein energy malnutrition (Kwashiorkor and Marasmus).

9. **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. Blood sugar level and its regulation, oral GTT and glycosuria, Biochemistry of diabetes mellitus.

10. **Protein Metabolism:** Biochemical aspects of digestion and absorption of proteins. Fate of amino acid in the body (Deamination, Transmination, Transdeamination, Decarboxylation), Fates of ammonia (Urea cycle, glutamine formation), Metabolism of aromatic and sulphur containing amino acids and their inborn errors. Metabolism of Glycine.

11. **Lipid Metabolism:** Biochemical aspects of digestion and absorption of Lipids. Beta oxidation, biosynthesis of saturated fatty acids only, cholesterol biosynthesis, Lipoprotein metabolism, Ketogenesis, Ketolysis and Ketosis. Adipose tissue metabolism, Lipolysis and re-esterification, fatty liver and atherosclerosis.

12. **Chemistry and Metabolism of purines:** 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, Gout, Lesch- Nyhan Syndrome

13. Metabolic interrelationship of carbohydrates, lipids and proteins metabolism.

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

15. **Chemistry of nucleic acids:** structure and function of DNA and RNA, Genetic code, DNA Replication, Transcription, Translation, chain initiation, chain elongation , chain termination, Inhibitors of protein biosynthesis.

16. Molecular Mechanism of gene expression and regulation 1) Lac- operon model, Mutations.

17. **Mineral Metabolism:** Study of (i) Calcium and phosphorous (ii) sodium, potassium & chloride; (iii) magnesium, copper & iodine; (iv) Iron, (v) manganese, selenium, zinc & fluoride. Their importance in body in brief.

18. **Water and electrolyte** balance and imbalance.

19. **Acid base** balance and imbalance.

20. **Haemoglobin Metabolism:** Synthesis and break down of haemoglobin, porphyria (in brief), Fate of bilirubin, different types of Jaundice.

21. **Function tests:** (i) Liver function tests, (ii) Kidney function tests & (iii) Thyroid function tests.

22. **Detoxication mechanisms:** (Bio- transformation) oxidation, reduction, conjugation, hydrolysis.

Desirable to know:

23. Introduction of Biochemistry as a basic science for the study of medicine, It's importance in clinical practice.

24. Molecular and functional organization of a cell and its sub cellular components.

25. **Genetic engineering :** Recombinant DNA, Restriction endonuclease, Chimeric molecule, and Gene library. Applications of recombinant DNA technology in relation to medicine.

26. **Molecular concept of body defence and their applications:**

a) Immunoglobulins- structure & functions,
b) Free radicals, enzymatic and non-enzymatic antioxidants.

27. **Radioisotopes:** Uses of radioisotopes (therapeutic, diagnostic) and hazards.

28. Metabolic changes during starvation.

Nice to know:

29. **Environmental Biochemistry:** Definition, chemical stress, air & water pollution.

30. **Biochemistry of cancer:** carcinogens, and outline mechanism of carcinogenesis.

.....

Theory: 80 hours

TOPICS OF THE LECTURES AND APPROXIMATE NUMBER OF LECTURES, HUMAN BIOCHEMISTRY - FIRST PHASE- M.B.B.S.

Sr. No.	Topics	Hours
1.	Introduction to Biochemistry, Cell structure and function.	1
2.	Chemistry of Carbohydrates.	4
3.	Chemistry of Proteins.	4
4.	Chemistry of Lipids.	4
5.	Chemistry of Nucleo proteins.	2
6.	Enzymes.	6
7.	Biological oxidation.	2
8.	Chemistry and functions of Haemoglobin; abnormal haemoglobin.	2
9.	Carbohydrate Metabolism.	6
10.	Protein Metabolism.	6
11.	Lipid Metabolism.	6
12.	Integration of metabolism and metabolic changes during starvation.	2
13.	Mechanism of hormones action.	1
14.	Vitamins (Fat & Water soluble)	6
15.	Nutrition.	2

16.	Purines and Pyrimidine metabolism.	2
17.	Chemistry and functions of Nucleic acids.; Protein biosynthesis, Gene expression,mutations.	5
18.	Genetic engineering and it applications.	2
19.	Biochemistry of cancer.	1
20.	Radioisotopes.	1
21.	Haemoglobin metabolism, liver function tests,Detoxification mechanisms.	3
22.	Kidney function tests,Thyroid function tests	2
23.	Mineral Metabolism.	4
24.	Water and Electrolyte Balance.	2
25.	Acid base balance,	2
26.	Environmental Biochemistry.	1
27.	Molecular concept of body defence.	2

FIRST M.B.B.S. LECTURE CUM DEMONSTRATION DISTRIBUTION (HOURS)

Sr no.	NAME OF LCD TOPIC	HOURS
1.	First Aid in Biochemistry laboratory & Laboratory hazards.	02
2.	Colorimeter	02
3.	Chromatography	02
4.	Electrophoresis	02
5.	Flammephotometer	02

6.	Lipid profile and Cardiac Markers	02
7.	Immunoassay	02
	Total hours	**14**

FIRST M.B.B.S. PRACTICAL DISTRIBUTION (HOURS)

Sr no.	NAME OF PRACTICAL	HOURS
1	Tests on Monosacchrides	03
2	Tests on disaccharides	03
3	Colour reactions of Proteins	03
4	Precipitation reactions of Proteins	03
5	Normal constituents of urine	03
6	Abnormal constituents of urine	06
7	Estimation of Plasma sugar	03
8	Estimation of Blood Urea	03
9	Estimation of Serum Creatinine/ urinary Creatinine	03
10	Estimation of Serum uric acid.	03
11	Estimation of Serum inorganic phosphorus	03
12	Estimation of Serum Bilirubin	03
13	Estimation of Serum SGOT/SGPT	03
14	Estimation of Serum Alkaline phosphtase	03
15	Estimation of Serum Amylase	03
16	Determination of Serum total protein, albumin and A/G ratio.	03
17	Estimation of Serum calcium.	03
18	Estimation of C.S.F. sugar and C.S.F. Proteins	03

19	Estimation of Serum Cholesterol	03
20	Revision for qualitative experiments	03
21	Revision for quantitative experiments	03
	Total hours	**66**

FIRST M.B.B.S. TUTORIAL DISTRIBUTION (HOURS)

Sr no.	NAME OF TUTORIAL	HOURS
1.	Cell structure and function.	1
2.	Chemistry of Carbohydrates.	2
3.	Chemistry of Proteins.	2
4.	Chemistry of Lipids.	2
5.	Chemistry of Nucleo proteins.	1
6.	Enzymes.	2
7.	Biological oxidation.	2
8.	Chemistry and functions of Haemoglobin; abnormal haemoglobin.	2
9.	Carbohydrate Metabolism.	3
10.	Protein Metabolism.	2
11.	Lipid Metabolism.	2
12.	Vitamins (Fat & Water soluble)	4
13.	Nutrition.	1
14.	Purines and Pyrimidine metabolism.	1

15.	Molecular Biology	3
16.	Biochemistry of cancer.	1
17.	Radioisotopes.	1
18.	Haemoglobin metabolism, liver function tests,	2
19.	Detoxification mechanisms.	1
20.	Kidney function tests, Thyroid function tests	2
21.	Mineral Metabolism.	2
22.	Water and Electrolyte Balance.	1
23.	Acid base balance,	2
24.	Molecular concept of body defence.	2
	Total hours	**44**

Total 240 Hours Distribution

Sr. No.	Hours Distribution	No. of hours
1.	Theory Lectures	80
2.	LCDs	14
3.	Practical hours	66
4.	Tutorial hours	44
5.	Early clinical Biochemistry Exposure Visit to Central Clinical Laboratory	08

6.	Seminars	08
7.	Small group discussion on case studies /Problem based learning	20
	Total hours	**240**

LIST OF BOOKS RECOMMENDED FOR BIOCHEMISTRY-

A.TEXT BOOKS

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

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

University Examination
I-MBBS
Paper-I **Total Marks: 50**

Time: 10.00-12.30 pm

SECTION – A

Q.1- Multiple Choice questions **Marks-0.5 x 20 = 10**

1. Nuclear membrane is in continuous connection with
   a) SER b) RER c) Golgi apparatus d) Lysosomes
2. A discarboxylic amino acid among the following is
   a) Aspartate b) Lysine c) Arginine d) Tyrosine
3. All the following can be formed from tryptophan except
   a) Niacin b) Serotonin c) Melatonin d) Melanin
4. Non - competitive inhibitors
   a) Increase the Km b) Increase the Vmax
   c) Decrease the Km d) Decrease the Vmax
5. Enzymes accelerate the rate of reactions by
   a) Increasing equilibrium constant of reactions b) Increasing energy of activation
   c) Decreasing the energy of activation d) Decreasing the free energy of activation
6. PRPP is used for all the following except:
   a) De novo synthesis of purine nucleotides
   b) De novo synthesis of pyrimidine nucleotides
   c) Salvage of purine bases
   d) Salvage of pyrimidine bases
7. Amethopterin and aminoptrin decrease the synthesis of :
   a) TMP b) UMP c) CMP d) CTP
8. 7- Methyguanosine triphosphate cap is present at the
   a) 5-end of mRNA b) 3-end of mRNA c) 5-end of tRNA d) 3-end of tRNA
9. Hogness box is present in:
   a) Prokaryotic promoters b) Eukaryotic promoters c) Introns d) Exons

10. During replication, unwinding of double helix is initiated by:

a) dnaA protein b) dnaB protein c) dnaC protein d) Rep protein

11. The initiation site for transcription is recognized by :

a) α-Subunit of DNA-dependent RNA polymerase

b) β-Subunit of DNA-dependent RNA polymerase

c) Sigma factor d) Rho factor

12. A point mutation results from

a) Substitution of a base b) Insertion of a base

c) Deletion of a base d) Any of the above

13. Restriction endonucleases can recognize

a) Palindromic sequences b) Chimeric DNA

c) DNA -RNA hybrids d) Homopolymer sequences

14. 2, 3-Bisphosphoglycerate is attached to the following form of hemoglobin

a) T form b) R form c) Both a &b d) Neither a nor b

15. Protoporphyria is due to deficiency of

a) Protoporphyrinogen oxidase b) Coproporphyrinogen oxidase

c) Ferrochelatase d) Uroporphyrinogen decarboxylase

16. Enzyme responsible for respiratory burst is

a) NADPH oxidase b) Nitric oxide synthase c) Glutathione peroxidase d) Catalase

17. Niacin deficiency can occur in all the following conditions except :

a) Deficient leucine intake b) Isoniazed administration

c) Malignant carcinoid syndrome d) Hartnup disease

18. Ascorbic acid is required to synthesis all of the following except:

a) Collagen b) Bile acids c) Bile pigments d) Epinephrine

19. Specific dynamic action is more for

a) Carbohydrates b) Fats c) Proteins d) Mixed diet

20. Which of the following enzyme is used as an anti-cancer drug?

a) Alpha-1-antitrypsin b) Streptokinase c) Asparginase d) Papain

SECTION – B

Q.2. Short answer questions (Any Four out of Five) (4 X 5 = 20)

1. Write inhibitors and uncouplers of ETC and oxidative phosphorylation. State their site and mechanism of action
2. Competitive inhibition of enzymes with their importance in clinical medicine
3. Define BMR and describe various factors affecting it
4. Describe structure, functions and characteristics of different types of immunoglobulins
5. A 20 year old man came to the hospital with complaints of anorexia, nausea, and headache weakness, pain in abdomen, clay colored stools but dark urine. Laboratory data is as follows

Total bilirubin	-	10 mg%
Conjugated bilirubin	-	4 mg%
UnConjugated bilirubin	-	4 mg%
SGPT	-	120 IU/L
SGOT	-	70 IU/L
ALP	-	6 KA

a. Name the condition giving reasons (1 Mark)
b. What are the causes of this condition? (2 Mark)
c. Give the cause of clay stools & dark Urine (1 Mark)
d. Why SGPT is increased? (1 Mark)

SECTION – C

Q.3 Write in detail. (Any Two out of Three) (2 X 10 = 20)

1. Fate of ammonia and describe urea cycle with disorders
2. Describe in detail protein biosynthesis in prokaryotes with inhibitors
3. Write sources, RDA, biochemical functions and deficiency manifestations of vitamin D

****

University Examination
I-MBBS
Paper-II (SECTION A)

Total Marks: 50 **Time: - 10.00-12.30 pm**

Q1. Multiple choice questions **(0.5 x 20 =10 Marks**

1. A specific inhibitor for succinate dehydrogenase is

   a) Arsenite b) Malonate

   c) Citrate d) Fluoride

2. Transketolase activity is affected in

   a) Biotin deficiency b) Thiamine deficiency

   c) Pyridoxine deficiency d) Manganese deficiency

3. How many ATP molecules will be required for conversion of 2 molecules of lactic acid to glucose

   a) Two b) Four

   c) Six d) Eight

4. LCAT activity is associated with which of the lipoprotein complex

   a) VLDL b) HDL

   c) Chylomicrons d) VLDL

5. The free fatty acid in blood is

10. Normal range of creatinine clearance in an adult man is about

a) 54 -110 ml/min b) 85-125 ml/min

c) 115-135 ml/min d) 130-150ml/min

a) Stored in fat depots

b) Mainly bound to β- lipoproteins

c) Mainly bound to serum albumin

d) Metabolically most inactive

6. Zinc is a cofactor for

a) Acid Phosphatase b) Alkaline Phosphatase

c) Amylase d) Lipase

7. A rise in blood Calcium may indicate

a) Paget's disease b) Vitamin D deficiency

c) Hypervitaminosis D d) All of the above

8. Minimum excretory volume to eliminate waste products from the body in dehydration is

a) 200 - 400 ml b) 500 - 600 ml

c) 600 - 800 ml d) less than 200 ml

9. Diabetes insipidus results from :

a) Decreased insulin secretion b) Decreased ADH secretion

c) Decreased aldosterone secretion d) Unresponsiveness of osmoreceptors

11. High level of T3 and T4 and low TSH in serum indicates

a) Hyperthyrodism of pituitary origin b) Hypothyrodism of pituitary origin

c) Hyperthyrodism of thyroid origin d) Hypothyrodism of thyroid origin

12. The most penetrating rays are

a) α-rays b) β- rays

c) γ- rays d) X- rays

13. Atrial natriuretic peptide (ANP) is produced by the atrial wall in response to

a) Aldosterone b) Decreased BP

c) Kinins d) Increased intravascular volume

14. All of the following hormones use C-AMP as a second messenger except

a) FSH b) LH

c) Glucagon d) Estrogen

15. In starvation, all of the following enzyme activities are decreased except

a) Lipoprotein lipase b) Fatty acid synthetase

c) Acetyl CoA carboxylase d) Carnitine-palmitoyl transferase-I

16. Increased citric acid levels in the blood will stimulate which of the enzyme

a) Transketolase b) Enolase

c) Pyruvate carboxylase d) Acetyl CoA carboxylase

17. B-oxidation of odd-carbon fatty acid chain produces

a) Succinyl CoA b) Acetyl CoA

c) Propoonyl CoA d) Malonyl CoA

18. Carnitine is synthesised from

a) Lysine b) Serine

c) Choline d) Arginine

19 Rate limiting enzyme in cholesterol biosynthesis is

a) Mevalonate kinase b) Squalene synthetase

c) HMG CoA reductase d) HMG CoA synthetase

20 α-1 ,6- Glycosidic bond is not present in

a) Glycogen b) Dextrin

c) Amylose d) Amylopectin

Section: B

Q.2 Short Answer Questions (Any 4 out of 5) **(4 x 5= 20 Marks)**

1. Detoxification by conjugation
2. Diagnostic & therapeutic importance of radioisotopes
3. Cell membrane receptor mechanism of hormone action
4. Mechanism of Carcinogenesis
5. A 13 year old boy reported with jaundice, fatigue, muscle stiffness, tremors & behavioural changes. Examination revealed an enlarged liver & spleen , kayser-ring was noted
   a) What is the other probable diagnosis? **(1 Mark)**
   b) Which organs are affected? **(1 Mark)**
   c) What are the causes for the disease? **(2 Marks)**
   d) What is the treatment suggested **(1 Mark)**

Section: C

Q.3 Long Answer Questions (Any 2 out of 3) **(2 x 10= 20 Marks)**

1. Glycogen metabolism with significance & regulation.
2. Describe formation & breakdown of ketone bodies. Add note on Ketosis
3. Discuss the various mechanisms for regulation of acid base balance.

Resolution passed in BOM – 48/2017, dated 24/01/2017

Item No. 5.6: BOS (Preclinical) dated 20.09.2016

a) About **Internal assessment examination pattern Anatomy, Physiology and Biochemistry**.

Resolution No. 5.6(a): It was resolved to abide by the existing **Internal assessment examination pattern of Anatomy, Physiology and Biochemistry in 1st MBBS** with regards to distribution of marks and pattern in concurrence with rules of MCI & MGMIHS.

b) **Internal Assessment pattern – First MBBS**

Resolution No. 5.6(b): It was resolved that the actual modality to calculate day to day assessment component of internal assessment in MBBS subjects is to be decided by the respective department heads with keeping all the records for verification in future.

c) About inclusion of Bioethics in MBBS (UG) curriculum.

d) About inclusion of Bioethics in PG curriculum and research.

For both above items' following resolution was adopted

Resolution No. 5.6(c): It was resolved to send the material received by University from UNESCO chair, Bioethics to Dean Faculty (Aurangabad and Navi Mumbai) and Chairpersons of BOS for their perusal and appropriate inputs to be put forth in next BOS meeting for discussion. [Annexure-II & III of BOM-48/2017]

1st year - MBBS

Resolution No. 1.3.7.1 of BOM-51/2017: Resolved to continue the current Internal Assessment pattern for MBBS (i.e. 5 marks for Day-to-day assessment) for Pre and Para Clinical subjects (Anatomy, Physiology, Biochemistry, Microbiology, Pharmacology, Pathology and FMT).
For rest of the subjects, Internal Assessment is to be calculated from terminal/Post end exam marks and Prelims examination, with immediate effect.

MBBS, Biochemistry

Resolution No. 1.3.7.4 of BOM-51/2017: Approved to include "Lecture cum Demonstration" on Glucose Tolerance Test in the UG (MBBS) Syllabus of Biochemistry with effective from Academic year 2017-18.

1st MBBS
Biochemistry

Resolution No. 1.3.7.3 of BOM-51/2017: Approved to include Bioethics in First MBBS curriculum with three Lectures (1 hr each) per subject of Anatomy, Physiology and Biochemistry with topics: (with effective from Academic year 2017-18)

3) Biochemistry –

1) Prudency of investigations, Confidentiality of tests & results
2) Disposal of investigation material & integrity
3) Informed consent

1st MBBS - Biochemistry

Resolution No. 3.5.2 of BOM-52/2018: It was resolved to conduct Bioethics as lecture schedule in MBBS in Anatomy, Physiology, Biochemistry with topics & time table as mentioned below, with effect from batch admitted in 2017-18 onwards–

3) Biochemistry –

1) Prudency of investigations, Confidentiality of tests & results– (January)
2) Disposal of investigation material & integrity – (February)
3) Informed consent – (April)

I MBBS

Resolution No. 3.5.9 of BOM-52/2018:

a) BOM reiterated the earlier BOM resolution as mentioned below:

Resolution No. 1.3.7.5 of BOM-51/2017: It was resolved that

i) In all the subjects of all courses, MCQ weightage (Section A) shall be a maximum of 20% of the total marks in each paper.

ii) BOS will have to accordingly workout the changes in Section B & C weightage and put up in forthcoming BOS meeting.

iii) Further University Examination section must validate the MCQ Question Bank by Faculties before giving it to question paper-setter.

b) To be effective from:

(i) Ist MBBS - Batch appearing in University August/September 2018 examination onwards.

(ii) IInd MBBS - Batch appearing in University January 2019 examination onwards.

(iii) IIIrd MBBS (Part I) and IIIrd MBBS (Part II) - Batch appearing in University January 2019 examination onwards.

Resolution No. 3.5.11 of BOM-52/2018: Resolved to have Exam Schedule of Ist MBBS which is as follows :

1. Terminals 1st week of February 2018
2. Prelims – 1st week of July 2018
3. University Exam
   a) Theory – August 1st week 2018
   b) Practical – 3rd week of August 2018

1ST MBBS

Resolution No. 3.5.1 of BOM-52/2018: Resolved to have Internal Assessment for each subject in 1st (MBBS) as mentioned below, with effect from batch admitted in 2017-18 onwards:

Theory – 20 marks

1. 15 marks (Terminal & Prelim exam theory marks)
2. 5 marks (Departmental assessment)
    a. 3 marks (4 Periodical Theory tests)
    b. 2 marks (Seminars)

Practical – 20 marks

1. 15 marks (Terminal + Prelim Practical marks)
2. 5 marks (continuous departmental assessment)
    a. 3 marks (4 Periodical practical tests)
    b. 2 marks Journals

Note –There will be 4 periodical tests in each subject (Two per term) in theory & practicals of 30 marks each.

Resolution No. 3.5.8 of BOM-52/2018: It was resolved that 2 horizontal & 1 Vertical integration will be taken per term in 1st MBBS, with effect from batch admitted in 2017-18 onwards. **[Annexure-II A, II B, II C & II D]**

Annexure - II

Annexure - II

~~Annexure VII A~~

I MBBS -Horizontal Integration Topics of Anatomy ,Physiology and Biochemistry.

Sr. No.	Topics	Anatomy	Physiology	Biochemistry
1.	Diabetes Mellitus	Endocrine Part Of Pancreas	Control of Insulin Secretion & Functions	lab Diagnosis & GIT
2.	Endemic Goiter	Thyroid Gland	Formation & Regulation of T_3, T_4 & TSH	Iodine Metabolism & Function Tests
3.	Myocardial Infarction	Coronary Arteries	ECG	Cardiac Markers
4.	Jaundice	Hepato Biliary Tree	Fate of Haemoglobin Bile Enterohepatic circulation	Diagnostic tests for Jaundice.
5.	Glomerular Filtration	Nephron	Physiology of Glomerular Filtration	Inulin & Creatinine Clearance Test

*Note :

1. Two sessions of Horizontal integration will be conducted per term for 1st MBBS students.
2. This can be subject to change as per requirement and rotation in subsequent years.

Annexure VII B

Vertical Integration Topics of Anatomy

1. **Breast cancer**
   - Anatomy – Mammary Gland
   - Radiology – Mammography
   - Surgery – Diagnosis and treatment in reference to Anatomy

2. **Thyroid – Goitre**
   - Anatomy – Thyroid Gland
   - Medicine – Diagnosis with reference to Anatomy and Physiology
   - Surgery – Diagnosis and treatment in reference to Anatomy
   - Community Medicine – Epidemiology

3. **Tonsillitis**
   - Anatomy – Palatine Tonsil
   - ENT – Diagnosis and treatment in reference to Anatomy

4. **Fallopian tube – Ectopic Pregnancy**
   - Anatomy – Fallopian tube
   - OBGY – Diagnosis and treatment in reference to Anatomy
   - Community Medicine – Tubal ligation as method of contraception

5. **Tuberculosis**
   - Anatomy – Lungs
   - Pathology – Changes in lungs with reference to normal histology
   - Radiology – Findings in chest radiographs
   - Respiratory Medicine – Diagnosis and treatment in reference to Anatomy
   - Community Medicine – Epidemiology

*Note : As per the discussion in the meeting BOS Preclinical – 27/11/2017, we are submitting sample topics for vertical integration. This can be subject to change as per requirement and rotation in subsequent years

One session of vertical integration will be conducted per term for 1st MBBS students

Annexure for item no 8 in BOS Preclinical – 27/11/2017

PG Allied Posting

As per the discussion in the meeting BOS Preclinical – 27/11/2017, we are submitting final schedule of allied posting in MD Anatomy.

a. Pathology – 2 weeks
b. FMT – 2 weeks
c. Radiology – 4 weeks
d. Genetics – 2 weeks

NOTE : MD Student from Aurangabad campus can be deputed for genetics posting in Navi Mumbai campus.

Annexure VII C

Vertical Integration Topics of Physiology

1. Anaemia

- Physiology – Erythroposis & Regulation
- Pathology – Etiology, Classification
- Medicine – Treatment
- PSM - Epidemiology & Prevention

2. Diabetes Mellitus

- Physiology – Action of Insulin
- Medicine – Signs & Symptoms
- Pharmacology – Pharmacological & non pharmacological management

3. Errors of Refraction

- Physiology – Optics of eye
- Ophthalmology – errors of refraction and their correction

4. Pulmonary Function test

- Physiology – Pulmonary Functions
- Chest & TB – PFT & Interpretation

5. Gastric secretion

- Physiology – Physiology of Gastric Secretion
- Pathology – Pathophysiology of Peptic ulcer
- Surgery – Diagnosis, Complication & Treatment

Note : As per the discussion in the meeting BOS Preclinical – 27/11/2017, we are submitting sample topics for vertical integration. This can be subject to change as per requirement and rotation in subsequent years

One session of vertical integration will be conducted per term for 1st MBBS students

Annexure VII D

Topics for Vertical Integration of Biochemistry for I[st] Year MBBS.

1. **Thyroid**
   - Biochemistry- synthesis, regulation and mechanism of action of Thyroid hormones, Thyroid Function Tests
   - Pathology- etiology, pathophysiology, classification of Goitre
   - Medicine- signs & symptoms of hyperthyroidism and hypothyroidism, treatment
   - ENT- Surgical treatment

2. **Kidney**
   - Biochemistry- Renal Function Tests, Acid Base balance, Urine Analysis
   - Pathology- pathophysiology of Renal disorders
   - Medicine & Peadiatrics - Interpretation and differential diagnosis of Renal Function Tests, Arterial Blood Gas Analysis & Urine Analysis. Clinical Features of related disorders.

3. **Liver**
   - Biochemistry- Role in Metabolism & Detoxification , Liver Function Tests
   - Pathology- Pathophysiology of Jaundice liver cirrhosis, Alcoholic liver disease
   - Medicine- Interpretation and differential diagnosis of Liver Function Tests. Clinical Features of related disorders.

Prof. & Head

Department Of Biochemistry

Professor & Head,
Dept. of Biochemistry
M.G.M. Medical College,
Kamothe, Navi Mumbai-410209

Resolution No. 4.5.1.1 of BOM-55/2018: Resolved that from 2018-2019 batch onwards**:**

(i) Following should be deleted from the Ist MBBS Biochemistry practical syllabus:

- Tests for bile
- Tests for polysaccharides

(ii) Following topics needs to be grouped (Experiment no. -27, 28 & 29) as "Lipid profile" (lecture cum demonstration) in Biochemistry Journal

Existing Experiments	Proposed
27. Triglycerides Des Dynamic Extended stability with lipid clearing agent GPO - Trinder method, End point 28. HDL - Cholesterol Phosphotungstic Acid Method, End Point 29. Cholesterol Des Dynamic extended stability 89 Chod-Pap method, End point with lipid clearing agent	Lipid Profile

(iii) "Write up" of the following Lecture cum demonstration topics are approved which needs to be added in practical journal: [**Annexure-28-A,B,C,D]**

a) Enzyme immunoassay
b) Lipid profile
c) First Aid in Biochemistry laboratory & Laboratory Hazards
d) Blood collection and anticoagulants

(iv) Inclusion of the Case studies in Biochemistry Journal- A separate heading (D- Case Studies) should to be added in biochemistry Journal

(v) Therefore a new index of 1st MBBS Biochemistry journal is prepared & enclosed alongwith **[Annexure-29]**

Annexure – 1 – A

IMMUNOASSAY TECHNIQUE

Introduction:

Immunochemical techniques are usually employed to detect or quantitate the antigen or antibody. RIA and ELISA are to important immunoassay techniques used to measure hormones , drugs , tumour markers and antigens which occur in microquantities in biological sample.

Enzyme linked immunosorbent Assay

Introduction:

ELISA is based on the immunochemical principles of the antigen antibody reaction. The technique is commonly used to detect very small quantities of antigens or antibodies in biological sample. It is also employed for hormone estimations and to detect tumour markers and growth factors.

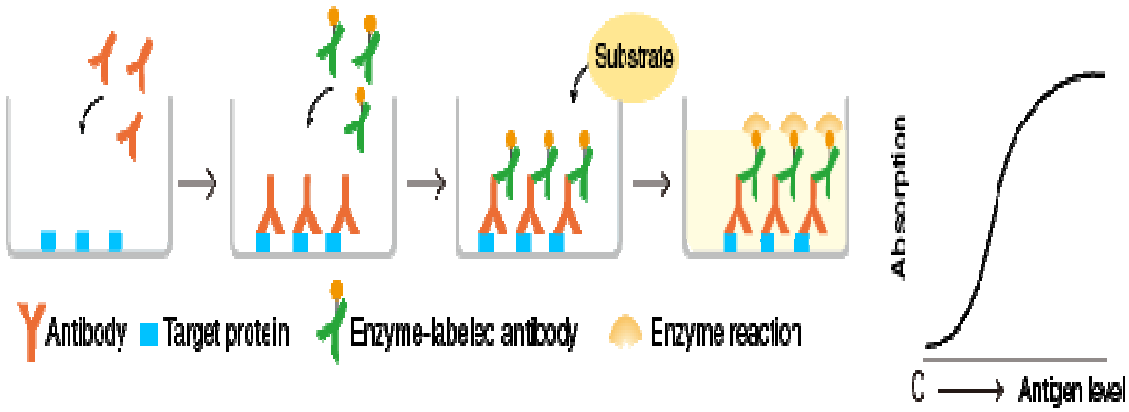
Types of ELISA :

1. Single antibody method (Competitive method)
2. Double Antibody Method (Sandwich Method)

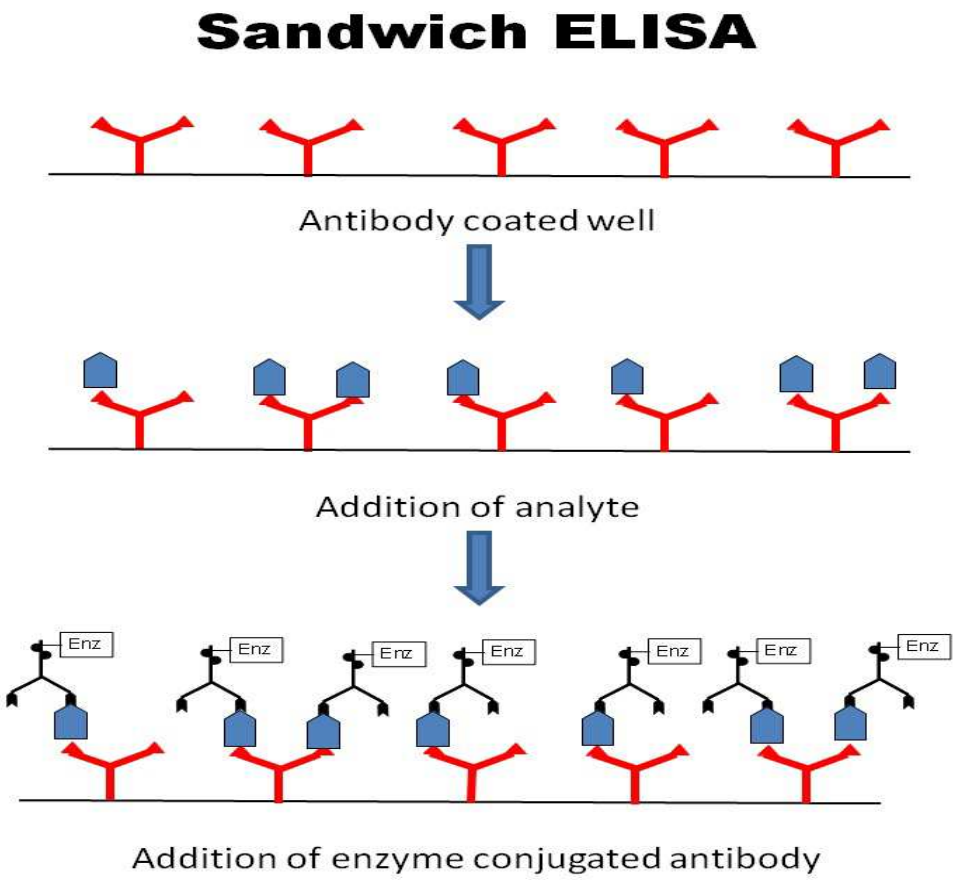
Single antibody method (Competitive method): In this technique, a known amount of enzyme labelled antigen and unknown amount of unlabelled antigen (in patient sample) mixture are allowed to react with specific antibody fixed on an inert solid.

There is competation between labeled antigen and unlabelled antigen for binding with limited number of antibodies available. Wells are washed after the incubation period. During washing the unbound antigen are washed off with buffer. After washing the unbound antibody- enzyme conjugate with buffer , the enzyme substrate is added and enzyme activity is measured.

The enzyme activity measured is directly proportional to amount of labelled antigen and inversely proportional to amount of the unlabelled antigen in test sample.



Double Antibody Method (Sandwich Method):): In this technique, the unknown antigen in the test sample is allowed to bind with specific antibody attached covalently to a solid support like a thin sheet polyvinyl chloride. Now a second antibody labeled with the enzyme is added. This antibody binds with the already bound antigen, forming an Antibody- antigen – antibody complex. The antigen is now in a state of being ‘ sandwiched’ between two antibodies. After washing off excess antibodies, the enzyme substrate is added. Enzyme activity is measured by measuring the product formed colorimetrically. The enzyme activity is directly proportional to amount of antigen present in the test sample. For each molecule of antigen that binds in the final complex , there will be thousands of product molecules produced which cause amplification. This amplification effect makes ELISA a highly sensitive immunoassay.



Materials used in ELISA

1. Solid phase: plastic tubes or micro titre plates
2. Enzymes
   - Horse radish peroxidase for which substrate is hydrogen peroxide
   - Alkaline phosphatase for which substrate is p nitrophenyl phosphate

Applications-

1. ELISA is used in clinical biochemistry laboratory to measurew hormones in the serum like thyroid hormone, insulin, reproductive hormone, pituitary hormones like FSH, LH, TSH
2. Used to measure tumor markers in serum like AFP, PSA, HCG, CEA, CA 125, etc
3. To study infectious diseases like detection opf bacterial toxins, viruses, hepatitis B surface antigens.
4. For the assay of antibodies in serum in infectious diseases including antiviral antibodies e. g. Epstein Barr virus, Rubella Virus
5. For the assay of auto antibodies e.g. anti DNA , ANA, antithyroglobulin.

RADIOIMMUNO ASSAY:

The estimation of compound occurring in biological fluids in extremely low concentrations can be done by this technique.

Principle: Radioimmuno assay is a combination of the principles of radioactivity of isotopes and immunological reactions of antigens and antibody. RIA method is based on the competition between unlabelled antigen in the sample / standard and radio labeled analyte/ antigen for the limited number of binding sites of the specific antibody. At the end of the incubation , the bound antibody and the free analyte/ antigen are separated . The concentration of analyte in sample is estimated by measuring the radioactivity of the bound fraction of samples and standards in the radioactive counters. As the concentration of unlabelled antigen increases , the levels of labeled antigen – antibody decreases.

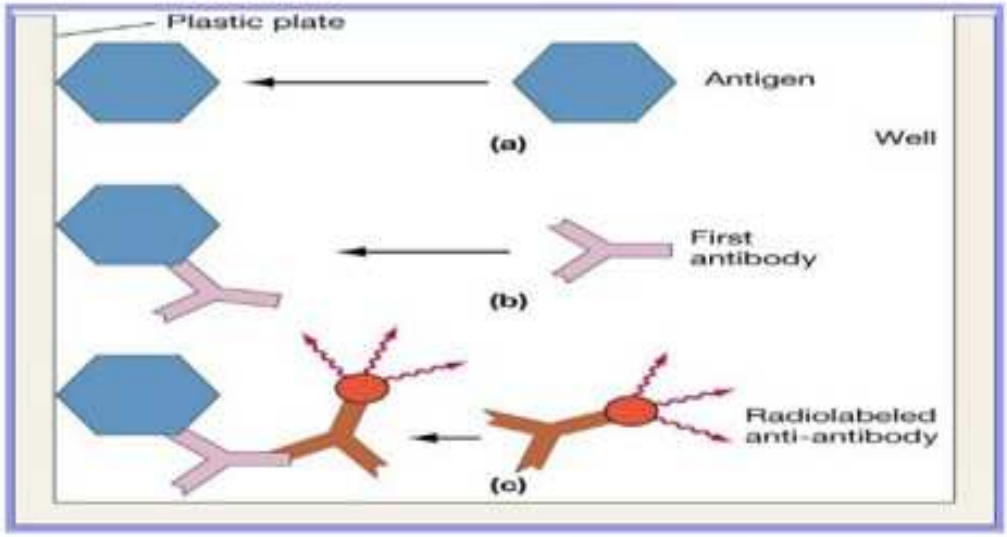
Applications: A large number of compounds which occur in minute concentration in biological fluid can be accurately quantitated.

1. Hormones such as thyroid profile (T3 T4 TSH), growth hormne , insulin, estradiol, FSH, LH , Prolactin etc can be accurately measured.
2. Tumor markers such as PSA, AFP, etc can be detected.
3. All vitamin levels can be measured.
4. Therapeautic monitoring of drugs can be done.

Limitations:

1. The reagents and equipments are expensive.
2. The shelf life of reagent is short hence can not be stored for long
3. The assay is of long duration.
4. Proper safty measurses must be taken while handling and disposing radio active materials to avoid radiological hazards

Radioimmunoassay (RIA)



Annexure – 1 – B

LIPID PROFILE

Lipid profile refers to a group of biochemical test done for estimating major plasma lipids to evaluate the risk of atherosclerosis. Hyperlipidemia, particularly hypercholesterolemia, is well known to cause atherosclerosis which may result in serious clinical disorders like myocardial infarction and cerebral strokes.

Cholesterol is transported in the blood by lipoproteins mainly HDL and LDL. Further, HDL plays an important role in the removal of cholesterol from tissues and LDL in its deposition into the tissues. Hence their cholesterol content is particularly helpful in predicting the risk of atherosclerosis.

BLOOD LIPID PROFILE

It includes estimation of the following

1. Total Cholesterol
2. HDL- Cholesterol (HDL-C)
3. LDL- Cholesterol (HDL-C)
4. Triglycerides
5. HDL/LDL Ratio

Cholesterol estimation has already been discussed. Here is a brief account of HDL-C and LDL-C in the overall context of lipid profile and its clinical importance.

TOTAL SERUM CHOLESTEROL

Enzymatic Method for Estimation of Cholesterol

Commercially available cholesterol reagents commonly combine all enzymes and other required components into a single reagent. The reagent usually is mixed with 3 µL to 10 µL aliquot of serum or plasma, incubated under controlled conditions for color development and absorbance is measured at about 500 nm. The reagents typically use a **bacterial cholesterol ester hydrolase** to hydrolyze cholesterol esters to cholesterol and fatty acids **(Figure 26.5**). The 3-OH group of cholesterol is then oxidized to a ketone derivative and H2O2 by cholesterol oxidase. H_2O_2 is then measured in a peroxidase catalyzed reaction that forms dye.

$$\text{Cholesterol ester} + H_2O \xrightarrow[\text{hydrolase}]{\text{Cholesterol ester}} \text{Cholesterol} + \text{Fatty acid}$$

$$\text{Cholesterol} + O_2 \xrightarrow[\text{hydrolase}]{\text{Cholesterol}} \text{Ketone derivative of cholesterol} + H_2O_2$$

$$\xrightarrow{\text{Peroxidase}}$$

H_2O_2+ Phenol + 4 –aminoantipyrine ⟶ Quinoneimine dye + 2 H_2O

NORMAL VALUES AND INTERPRETATION

Cholesterol Normal Value
< 200mg/dl- Desirable
200-239 mg/dl – Borderline
240 mg /dl- High risk

- The normal range for healthy young adults is less than 200 mg / dL.
- It may be lower in children
- The concentration increases with age.
- The concentration in the women is generally somewhat lower than in men up to the time of menopause but then increase and may exceed that in men of the same age.

INCREASED CONCENTRATION

- The total concentration is increased in
  - Hypothyroidism
  - Uncontrolled diabetes mellitus
  - Nephrotic syndrome
  - Extrahepatic obstruction of the bile ducts
  - Various hyperlipidemias

- Long time elevated cholesterol concentration (more than 240 mg /dL) is a high –risk factor for the development of coronary artery disease.
- Lowering of plasma cholesterol concentration reduces the incidence of coronary heart diseases.
- National Cholesterol Education Program (NCEP) defined the levels of serum cholesterol believed to be desirable, tolerable or a high-risk factor for development of coronary artery disease. The report classifies total cholesterol concentration (Table 26.2) which is applicable to all individuals over 20 years of age and sex.

DECREASED CONCENTRATION: Hypocholesterolemia is usually present in :

- Hyperthyroidism
- Hepatocellular disease
- Certain genetic defects, e.g. abetalipoproteinemia

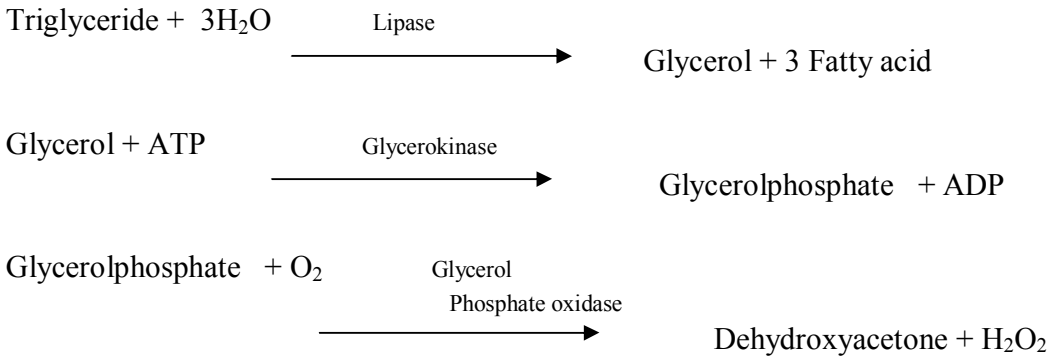
TRIGLYCERIDES (TGS)

TGs are major lipids as well as storage form of lipid in adipose tissue. Their primary function is to provide energy. The normal serum TG levels are from 50-160mg%, the mean being 120mg%. Higher TGs levels are seen in conditions like diabetes mellitus, nephritic syndrome, hypothyroidism, obesity etc. High TG levels alone without any other lipid abnormality are usually not associated with increased risk of atherosclerosis.

Enzymatic method for estimation of triglycerides(TG):

Single reagents that consist of all the required enzymes, cofactors and buffers generally are used.

The first step is the hydrolysis of triglycerides to glycerol and fatty acid by lipase. Glycerol is then oxidized to dihydroxyacetone and H2O2 by glycerophosphate oxidase enzyme. The H2O2 formed in the reaction subsequently is measured as described in enzymatic method for total serum cholesterol



NORMAL VALUES AND CLINICAL INTERPRETATION

Triglyceride Normal Value

< 150 mg /dl- Desirable

150-199 mg/dl- Borderline

200-499 mg/dl- High risk

The normal range of serum triglycerides is 40 to 145 mg / dL. Mean values rise slowly with age after three decade.

Values below the normal range are of little clinical significance.

Elevated concentration is often found in disturbance of lipid metabolism and in atherosclerosis and coronary artery disease. The serum triglyceride concentration is greatly elevated in hyperlipoproteinemia type I and V and moderately increased in type II b and III.

The cause of hyperlipoproteinemia is a genetic origin but hypertriglyceridemia occur commonly secondary to the following pathologic conditions:

- Hypothyroidism
- Nephrotic syndrome
- Alcoholism
- Obstructive liver diseases
- Acute pancreatitis
- Uncontrolled diabetes mellitus
- Glycogen storage disease (type I)

DECREASED CONCENTRATION:

The plasma triglyceride concentration is low in the rare disease, abetalipoproteinemia (absence of low density lipoproteins)

HDL CHOLESTEROL (HDL-C)

HDL or high density lipoprotein, also known as α-lipoprotein, is good for body. Its cholesterol content, contrary to the bad image of cholesterol is called good cholesterol. This is because HDL- removes cholesterol from peripheral tissues, esterifies it with the help of LCAT enzyme and Apo-A-I (coenzyme) and then transfers it ultimately to the liver through VLDL, LDL etc.

This helps in prevention of development of atherosclerosis.

Principle: LDL, VLDL and chylomicrons are prepecipitaed by polyanions in the presence of magnesium ions to leave HDL in solution. The supernatant containing HDL is used for cholesterol estimation by the same method as for total cholesterol.

NORMAL VALUES AND CLINICAL SIGNIFICANCE OF HDL CHOLESTEROL:

HDL Cholesterol Normal Value

60 mg /dl- Desirable

35- 45 mg/dl- Borderline

< 35 mg/dl- High risk

Serum level of HDL cholesterol for:

- Men is 30 to 60 mg / dL.
- For women 40 to 80 mg/dL which is 20 to 30% higher than men

Studies have indicated that when the HDL cholesterol value is lower than 55 mg/dL in men and lower than 55 mg / dL in women there is an increased risk for heart disease and the relative risk increases with lower HDL cholesterol concentrations.

Higher HDL cholesterol concentrations may be associated with decreased risk of coronary disease. Thus, HDL cholesterol levels are inversely related to the risk of cardiovascular disease. HDL cholesterol level above 60 mg/dL indicates very low risk for coronary artery disease (CAD). HDL below 35 mg/dL cholesterol increases the risk of CAD.

The ratio of total cholesterol to HDL cholesterol gives a more accurate and definite assessment of heart disease risk (Table 26.3)

Decreased levels are associated with stress, obesity, androgens, cigrarette smoking and diseases like diabetesmellitus, augments the risk of coronary artery disease . HDL cholesterol is very low in genetic disorder, **Tangier disease**

VLDL- CHOLESTEROL (VLDL-C)

Serum TGs level is also used to calculate VLDL- cholesterol indirectly. Direct separation of VLDL from serum is a very lengthy and difficult procedure requiring 18 hours of ultra centrifugation.

VLDL-C is approximately equal to $1/5^{th}$ of the serum TG level and is based on the normal TG and cholesterol ratio in VLDL. However, this should not be used if serum TG is more than 400mg% or if the patient has type III hyperlipoproteinemia, because in these conditions the VLDL composition changes.

LDL- CHOLESTEROL (LDL-C)

LDL is richest in cholesterol among all the lipoproteins. About 30% of the total LDL is taken up by peripheral tissues where it delivers its cholesterol. Hence in case of high LDL-C, there is an increased deposition of cholesterol in the tissues. This enhances the risk of atherosclerosis including coronary artery disease (CAD). LDL- cholesterol is thus very helpful in evaluating the risk of CAD.

The value of LDL cholesterol may be calculated, if the concentrations of total and HDL cholesterol and triglycerides are measured. In practice, LDL can be measured indirectly by use of Friedwald equation assuming that total cholesterol is composed primarily.
Total cholesterol = cholesterol in (VLDL+ LDL+HDL).
LDL cholesterol = Total cholesterol – (HDL cholesterol + 1/5 x Triglyceride (Tg))

The concentrations of all constituents should be expressed in the same units mg/dL or mg/L. 1/ 2022 x TG is used when LDL cholesterol is expressed in mmol/L. The factor 1 / 5 x TG is an estimate of the VLDL cholesterol concentration.

NORMAL VALUES AND CLINICAL INTERPRETATION

LDL Cholesterol Normal Value

60 - 130 mg /dl- Desirable

130-159 mg/dl- Borderline

160-189 mg/dl- High risk

The LDL cholesterol in women is somewhat lower than in men but increase after menopause

Low levels of LDL cholesterol lower the risk.

Values above 160 mg/dL indicate high risk.

Values between 130 and 160 mg/dL are in border line risk

Values below 130 mg/dL are safer side. (Table 26.2)

Thus , the risk of cardiovascular disease is correlated directly with a high concentration of LDL cholesterol. The highest correlations have been obtained as a risk factor by the ratio of LDL cholesterol to HDL cholesterol (Table 26.3)

FRIEDWALD EQUATION

According to this equation total serum cholesterol (TC) is equal to the sum of cholesterol contents of high, low and very low density lipoproteins.

TC= HDL- C + LDL-C + VLDLC
LDL- C= TC – (HDL-C + VLDL-C)
= TC –(HDL – C + TG/5)
(Since VLDL – C = 1/5 th TG)

HDL- AND LDL-C RATIO:

HDL-C: LDL-C Ratio is a good measure of the risk of atherosclerosis than either the LDL-C or HDL-C alone. Normal HDL-C: LDL-C Ratio is 2-2.5.
Once HDL-C and LDL-C are known the ratio of the HDL-C and LDL-C can be easily calculated. It is good predictor of atherosclerosis.
High ratio due to increase LDL-C or decrease HDL-C is considered a positive predictor of risk of atherosclerosis than the LDL-C or HDL-C alone

Cholesterol / HDL ratio Normal Value

4.0- Desirable

5.0- Borderline

6.0- High risk

Annexure – 1 – C

FIRST AID IN BIOCHEMISTRY LABORATORY & LABORATORY HAZARDS

A. CONTACT WITH CORROSIVE CHEMICALS AND REAGENTS

1. Wash the affected area with plenty of water
2. Seek medical help immediately
3. Acid splashes on skin- Bath the area with 5% sodium carbonate.
4. Alkali splashes on skin- Bath the area with 5% Acetic Acid.
5. Contact with phenol- Irrigate with polyethylene glycol mixed with water.

B. EYE ACCIDENTS

1.Most urgent ocular emergency
2. An alkali burns are more disasterous than acid burns
3.Wash eye with plenty of water
4.Seek medical help immediately
5.Rinse eyes in sterile saline

C. ACCIDENTAL SWALLOWING OF POISONOUS REAGENT

1. Spit it out immediately
2. Rinse mouth promptly with water
3. Induce vomiting by warm salt water

D. ACCIDENTAL SWALLOWING OF INFECTIOUS SPECIMEN

1. Spit it out immediately
2. Rinse mouth promptly with water
3. Wash mouth with dilute antiseptic lotion

E. CONTACT OF LIP AND TONGUE WITH CORROSIVE REAGENTS

1. Wash with plenty of water
2. Acids- wash with 2% sodium carbonate.
3. Alkali- wash with 5% acetic acid

F. INJURIES CAUSED BY BROKEN GLASS

1. Wash with disinfectant
2. Cover with gauze and adhesive tape

G. BLEEDING

1. Make the patient lie down
2. Stop bleeding by applying pressure
3. Clean area with antiseptic
4. Apply sterile gauze and bandages

H. ACCIDENTAL SWALLOWING OF CORROSIVE REAGENTS

1. Rinse with water
2. Take medical help
3. Acids- antidote is 5% soap solution,8% magnesium hydroxide
4. Alkalis- antidote is lemon juice /5% acetic acids

I. BURNS

1. Wash the affected area with plenty of water
2. Cover burnt area with sterile dressing
3. Seek medical help immediately

General Instructions to Students

DO'S

- ✓ Be Punctual
- ✓ Maintain silence
- ✓ Wear white apron
- ✓ Use teats for pipetting
- ✓ Avoid pipetting corrosive by mouth
- ✓ Handle biological fluids with great care to avoid infection
- ✓ Ensure safety while boiling fluids
- ✓ Turn off burners after use
- ✓ Waste to be thrown in dustbin
- ✓ Girls should tuck their hairs with pins
- ✓ Report any accident to the staff immediatey
- ✓ Report glassware breakage immediately

DONT'S

- Do not talk while pipetting
- Do not use paper to light burner
- Do not handle broken glass with bare hand
- Do not waste any reagent unnecessarily
- Do not throw filter paper or broken glassware into the wash basin
- Do not eat and drink in laboratory
- Do not keep cloth or books near burner

SAFTY SIGNS

CORROSIVE:-
DESTROYS LIVING TISSUES.
e. g.- Concentrated acids,
alkalies,
phenols.

TOXIC:-
CAN BE DANGEROUS
IF SWALLOWED ,
ABSORBED THROUGH SKIN,
INHALATION
e.g.-potassium cyanide,
ninhydrin

FLAMMABLE HAZARDS -
THEY SHOULD BE KEPT
AWAY FROM THE
AREA WHERE HEATING
PROCEDURES ARE CARRIED
OUT.
e.g.- carbon tetrachloride,
ether, chloroform,

OXIDISING
SUBSTANCES:-
MAY NOT BE FLAMMABLE
BUT MAY CAUSE A
FIRE WHEN BROUGHT
INTO CONTACT WITH
COMBUSTIBLE MATERIAL

EXPLOSIVES :-
MUST BE HANDLED WITH
EXTRTEME CARE
e.g. – dry picric acid

NOTE:- EXPLOSIONS CAN ALSO OCCUR FROM THE MIXTURE OF TWO COMPOUNDS WHICH IN THEMSELVES ARE HARMLESS. AN AWARENESS OF THIS IS NECESSORY TO AVOID A LABORATORY HAZARD.

Annexure – 1 – D

Blood Collection & anticoagulants

Blood Collection:

The procedure in which an operator bleeds a specific amount of blood of subject for a particular investigation can be termed as collection of blood.

Preparation of specimen collection material

Following material should be readily available in the specimen collection section-

- Disposable syringes and needles (of bore size 19, 20 and 21) or vacutainer systems.
- Disposable lancets.
- Gauze pads or adsorbent cotton
- Tourniquet
- 70% (V/V) ethanol (or isopropanol)
- Clean and dry wide mouth bottles (50 ml and 100 ml)
- Sterile wide mouth bottles(100 ml)
- Needle disposal system
- First Aid box

Table 1: Anticoagulated bulbs or tubes for blood collection

Color	Anticoagulant	USE
Red	-	For Serum
Lavender	EDTA (Na_2 or K_2)	Whole blood for CBC
Blue	Sodium citrate (liquid)	Whole blood for ESR And coagulation test
Green	Heparin	Plasma or Whole blood
Gray	Sodium fluoride	Plasma for blood glucose

Patient preparation

Following instructions are given to the patient:

1. The patient should be on balanced diet at least for 2 to 3 days prior to the test.
2. The day before sample collection, the patient should not drink intoxicating substance, esp. alcoholic drinks and eat tobacco.
3. It is necessary to find out if the patient is under any specific medication.
4. The patient should not undergo vigorous exercise prior to the test.
5. Patient should report to the laboratory after fasting for 12-16 hrs. Patient should not drink tea, coffee or any other drinks except one glassful of water.
6. Patient should basic information about venipuncture. (since patients cooperation is needed during blood collection)
7. For post –prandial blood collection, it is necessary for the patient to report to the laboratory, 15 mins before the scheduled blood collection time.
8. The patient must rest for at least 15 minutes before the blood collection.

Responsibilities of a phlebotomist

The Phlebotomist (the technician who collects blood) should be trained to-

- Approach the patient pleasantly and confidently.
- Obtain blood samples properly, quickly and without undue discomfort to the patient
- Details of drugs or local medicines taken by the patient before blood collection.
- Relevant clinical information regarding patient's conditions.

Laboratory request form

1. The laboratory request form should be dated and include a number to identify all paperwork and specimen associated with each patient.
2. The laboratory request form should provide the following information.

- Patient full name, sex and weight (if necessary)
- Identifications number
- List of required specific tests
- Urgent tests: Only those tests that are required for the immediate care
- Name of the physician ordering the test

Basic steps for drawing a blood specimen

- Ascertaining whether the patient has fasted. Some tests require the patient to fast. Such care is needed to ensure accurate results.
- Reassuring the patient.

The technician must gain patient's confidence and assure him, that, although the venipuncture will be slightly painful, it will be of short duration.

- Positioning the patient

a) The patient should be made to sit comfortably in a chair and should position his arm on a slanting armrest, extending the arm straight from the shoulder and it should not bend at the elbow.
b) If the patient wants to lie down , let the patient lie comfortably on the back. The patient should extend the arm straight from the shoulder. For support, a pillow may be placed under the arm.

Blood collection procedure

- Checking the paper works and tubes

  The tubes and bulbs should be checked for appropriate kinds and for paper labeling.

- Selecting vein site

  For most venipuncture procedures on adults, veins located in the arm are used. The median cubital vein is the one used for the patient. If the venipuncture of this vein is unsuccessful, one of the cephalic or basillic veins may be used. The blood, however, usually flows more slowly from these veins.

- Factors in site selection

1. Healed burn areas should be avoided.
2. Hematoma: specimens collected from a hema-toma area may cause erroneous test results.

- Following techniques are useful when encountering a patient with difficult veins:

1. Look for a blood drawing site.

2. Feel for a vein using the tip of the finger. Think of four things when feeling for a vein, bounce, direction of vein, size of needle, and depth.
3. Choose the vein that feels the fullest.
4. Try the other arm unless otherwise instructed.
5. Ask the patient to make a fist.
6. Apply a tourniquet briefly.
7. Massage the arm form wrist to elbow.

- Applying tourniquet

A tourniquet will increase venous filling, which makes the veins more prominent and easier to enter. For valid test results, the tourniquet should never be left on the arm for more than two minutes because a tourniquet prevents the blood from flowing freely and the balance of fluids and blood elements may get disrupted.

- Cleansing the area

Once the vein to be used has been located, the technician must cleanse the area thoroughly to prevent any contamination . Spirit or 70% ethanol is used for cleansing and the area is allowed to dry to prevent possible hemolysis of the blood specimen. If the skin is touched after it has been cleansed, the procedure must be repeated.

- Inspecting needles and syringes

The appropriate needle is attached to the syringe. The cover of the needle must not be removed until the technician is ready to draw blood. When ready for use, examine the needle especially the tip and check for any blockage by pressing the piston(The piston will not move freely, if needle is blocked).

- **Performing the venipuncture**

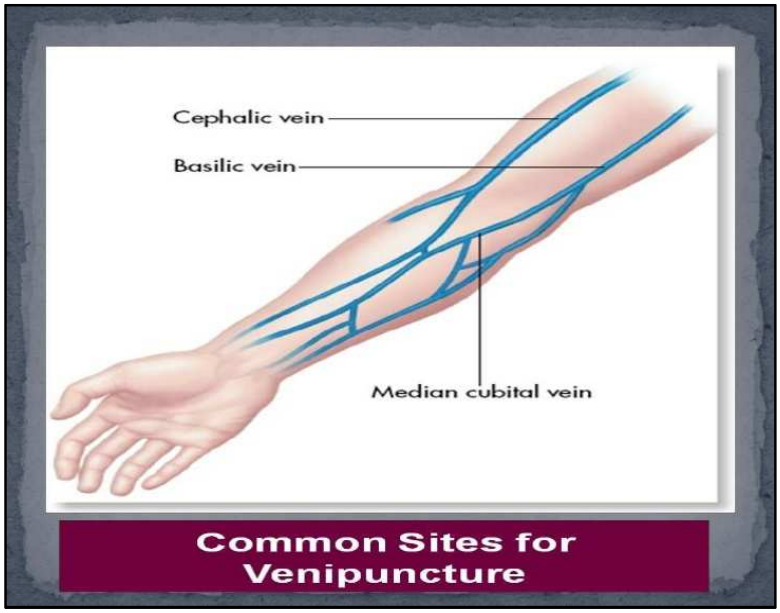
1. The patients arm is gripped tightly and thumb of another hand is used to draw skin taut.
2. The vein is penetrated (by positioning th needle at a 30^{o} to 40^{o} angle). Initially some resistance is encountered but once the point of the needle passes through the vein wall of resistance is felt.
3. After blood has been drawn, the patient would release the fist and the tourniquet is also released.

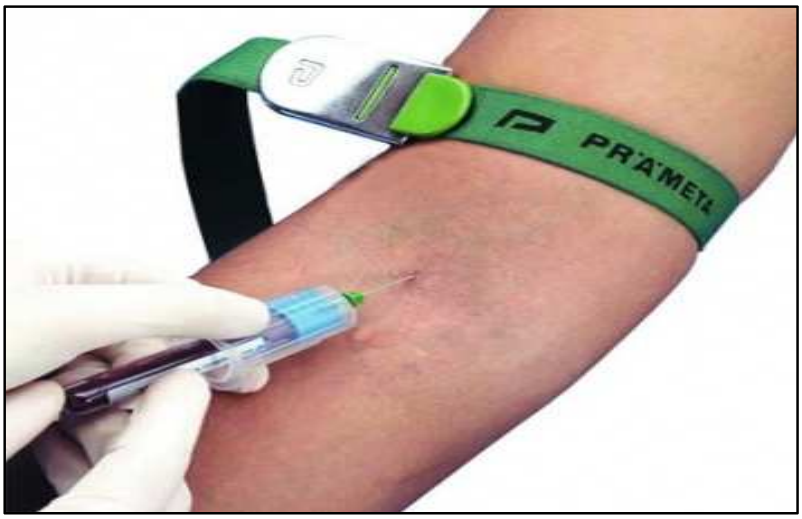
4. A cotton ball is held firmly over the venipuncture site as soon as the needle is removed. The patient may remove the cotton ball after 10-15 minutes, (if the patient continues to bleed, pressure is applied to the site with a gauze pad or cotton ball until the bleeding stops).
5. After removing the needle the collected blood is dispensed in the appropriate tubes or bulbs.
6. The blood in the anticoagulated bulbs is mixed carefully and blood collected in the tubes (or bulbs without anticoagulants) is kept at a room temperature (25^{o}c + - 5^{0}C) for the separation of serum for 30-45 minutes.
7. The tubes and bulbs should be covered with appropriate stoppers.
8. After venipuncture the needle should be removed from the syringe and disposed by using needle destroyer.
9. Dispose used cotton ball, gauze pads and distracted needle residue into a non-penetrable container (A specific waste disposal container).

- **Patient after care**

1. If bleeding from the puncture site continues for an unusually long time, elevate the area and apply a pressure dressing. Observe the patient closely. Check for anticoagulant and ASA (acetylsalicylic acid) type injection.
2. If the patient feels dizzy or faints, put the head down between the knees or have patient lie flat and breathe deeply. A cool towel may be applied to head or back of neck. If the patient remains unconscious, notify the physician immediately.
3. Hematomas can be prevented by-

- Use of proper technique
- Release of tourniquet before the needle is withdrawn
- Application of sufficient pressure over the puncture sites.
- Maintenance of extended extremity until the bleeding stops.


Cephalic vein
Basilic vein
Median cubital vein
Common Sites for Venipuncture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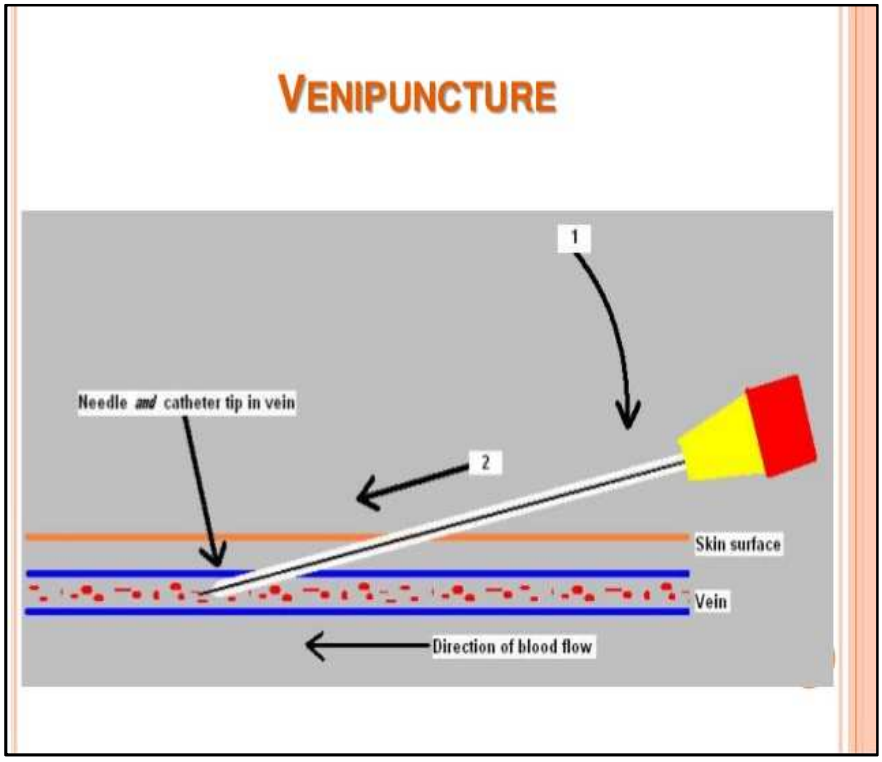


Specimen rejection criteria

1. Specimen improperly labeled.
2. Specimen improperly collected or preserved.
3. Specimen submitted without properly completed request form.
4. Specimen sample volume not sufficient for requirement of test protocol.
5. Patients not prepared properly for test requirements.
6. If separated serum or plasma is grossly hemolyzed.

Hemolysis of blood

Hemolysis means, the liberation of hemoglobin after red blood cells have ruptured. Due to hemolysis the serum or plasma assumes pink to red color. It is important to avoid hemolysis at every step during blood sampling, transportation and storage, because hemolysis causes specific or non specific change in measurements of a number of analyses . In venipuncture, hemolysis may occur by-

1. Using too small a needle
2. Forcing the blood through needle

3. Shaking the tube or bulb too vigorously after blood collection
4. Presence of excess of anticoagulant in the container (tube or bulb)
5. Centrifuging blood samples at high speed before completion of clotting
6. Freezing or thawing of blood
7. Using unclean tubes with residual detergent
8. Presence of water in the container(tube or bulb)

Chemical tests affected by hemolysis

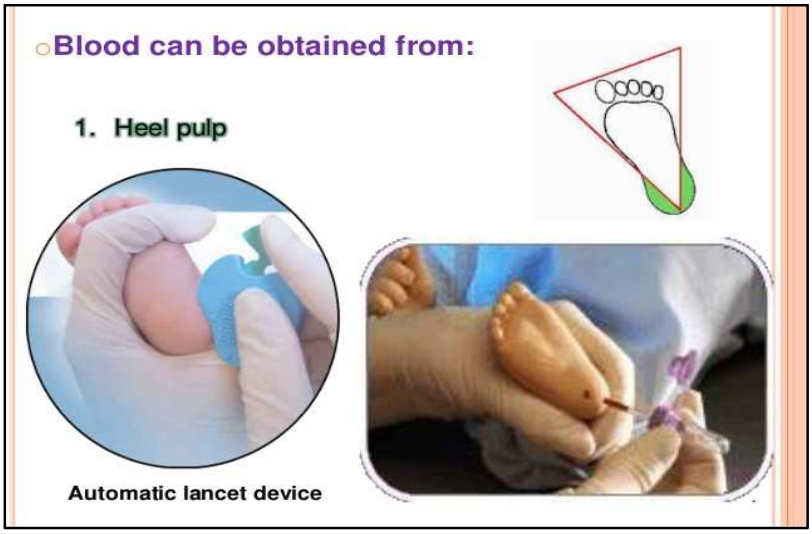
Following tests are specifically affected due to hemolysis of serum:

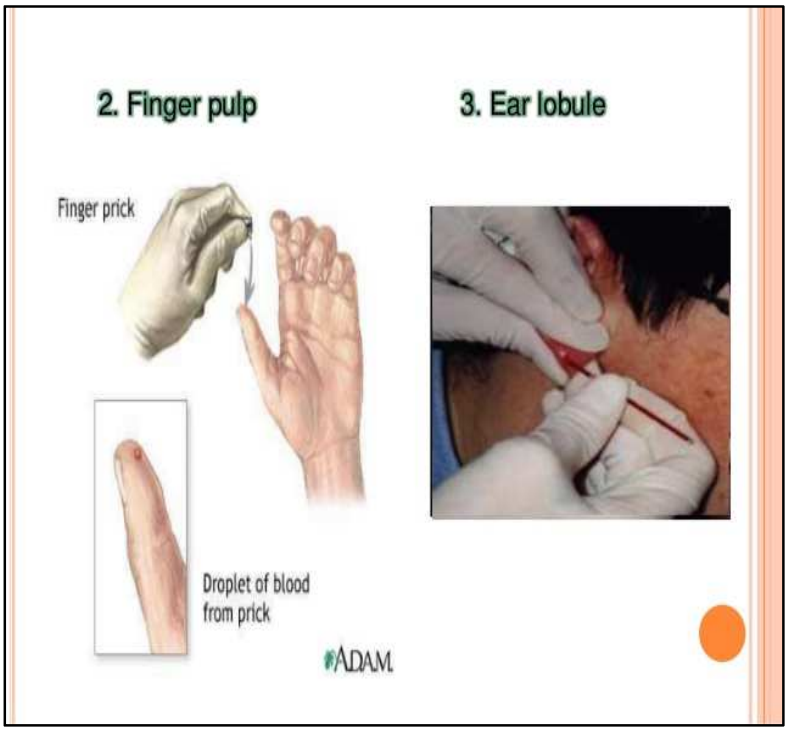
- Serum potassium
- Serum inorganic phosphorus
- Serum Glutamate Oxaloacetate Transaminase (SGOT)
- Serum Lactate Dehydrogenase (LDH)
- Serum acid Phosphatase

Skin puncture blood collection

If only a small volume of blood is required for a blood test, then it can be collected by skin puncture.

In an adult or grown child, blood may be obtained by puncturing the tip of finger or by piercing an earlobe. The skin of the palmar side of tip of the third or fourth finger of the non-writing hand should be first cleaned by using cotton or gauze pat saturated in 70 ethanol (or isopropanol). After evaporation of alcohol, when the skin is dry, a sharp stab is applied with a lancet. The depth of incision should be less than 2.5 mm to avoid contact with bone. The finger should be held in such a way that gravity assists the collection of blood on the fingertip.





Arterial puncture

For the determination of blood pH, PCO_2, PO_2 and bicarbonate, arterial blood is used. An arterial puncture requires considerable skill and is usually performed only by physicians or by specially trained nurses or technicians. The sites preferred for arterial puncture are the radial artery at the wrist, the bacterial artery in the elbow, and the femoral artery in the groin.

Tourniquet is not required for arterial puncture. Heparinized glass syringes are used (since plastic may be permeable to gases) with 18 or 20 gauge needles. Once an arterial puncture has been performed , firm pressure should be applied over the puncture site for at least 5 minutes to minimize bleeding. After collecting the blood for blood gas analysis, the nozzle of the syringe containing the blood should be sealed and the syringe is placed in ice for immediate transport to the clinical laboratory.

Deciding specimen types and anticoagulants

Serum is used for most of the clinical chemistry tests, since most the anticoagulants may interfere in the test. However, for the determination of blood gases, lactate and ammonia whole blood is used. For the determination of blood glucose, blood should be collected in tubes (or bulbs) containing fluoride anticoagulant. Plasma separated from this whole blood is then used for blood glucose determination. Fluoride prevents glycolysis of glucose.

Sodium fluroide

Sodium fluoride is an anticoagulants and prevents glycolysis by inhibiting the enzyme systems involved in glycolysis. It is used in combination of potassium oxalate. Usually one part of sodium fluoride and three parts of potassium oxalate are mixed to prepare anticoagulated powder and 8 mg of this powder is used to collect 2-3 ml of blood.

Heparin

It is available as sodium, potassium, lithium and ammonium salts. It causes interference with tests. It prevents coagulation of blood by acting as an antithrombin to prevent the transformation of prothrombin into thrombin and thus the formation of fibrin from fibrinogen. Most blood tubes are prepared with powdered 0.2 mg heparin for each ml of blood to be collected.

Ethylenediamine tetra-acetic acid (EDTA)

Since this anticoagulant preserves the cellular components well, it is used for hematological examinations. It is used as disodium or dipotassium salt. The dipotassium salt is preferred because it is more soluble compared to disodium salt.

EDTA prevents coagulation by binding calcium, which is essential for the clotting mechanism. It is effective at a final concentration of 1 to 2 mg/ml of blood.

Citrate

Sodium citrate solution, at a concentration o 3.4 or 3.8 g/dl in a ratio of 1 parts to 9 parts of blood is widely used for coagulation studies, since the effect is easily reversible by addition of CA (II) . It preserves labile procoagulants . Citrate prevents blood coagulation by chelating with calcium.

Oxalates

Sodium, potassium, ammonium and lithium oxalates inhibit blood coagulation by forming insoluble complexes with calcium ions. As mentioned earlier, potassium oxalate is used in combination with sodium fluoride for blood used for glucose determination.

Separation of serum

1. Collects 5 to 7 ml of blood in a tube, (which do not contain any anticoagulant).
2. Keep the tube in slanting position and allow the blood to clot at room temperature (25^{o}c + - 5^{0}C) . However, if blood is collected in a vacutainer tube(Which contains clot activating material), it should be kept in a vertical position at a room temperature (25^{o}c + - 5^{0}C) for 15-30 minutes.
3. After 15-30 minutes , loosen the clot slowly and by using a Pasteur pipette, transfer the separated serum into a centrifuge and centrifuge it at 1,500 RPM for 10 minutes.
4. Pale yellow colored serum is obtained above the packed red blood cells in the centrifuge tube.
5. Transfer it to a clean and dry test tube, by using a Pasteur pipette, label it and stopper appropriately and immediately store at 2-8^{O} C, till it used to perform a test.

Separation of plasma

1. Collect about 5 ml of blood in a specific anticoagulant containing tube or bulb.
2. Shake the tube (or bulb) gently to mix the anticoagulant with blood.
3. Centrifuge at 1,500 RPM for about 10 minutes. Pale yellow colored plasma will separate above the sedimented red blood cell pack.
4. Transfer the plasma to a clean and dry test tube, label appropriately and store at 2-8^{o} C till a test is performed on this specimen.

Difference in composition of plasma and serum (only components with significant differences are considered).

Quantity of blood collection

It depends on the number of tests to be performed on one patient. In each anticoagulant containing bulb , 2-3 ml blood is sufficient. Approximately 0.5 ml of plasma can be obtained from 2-3ml anticoagulated blood, by centrifugation. For about 1 ml of serum , 5-7 ml of blood should be collected in a tube, without anticoagulant.

Vacutainers

Vacutainers are used to collect blood by venipuncture. Or by finger prick method, instead of conventional syringes and needles.

Blood collection by using vacutainer

During the blood collection process, the rear cannula pushes through the rubber sleeve and punctures the rubber topper, allowing the vacuum in the tube to draw blood from the vein.

When one tube is withdrawn form the back of the needle, to collect blood in another container, the sleeves slide back into position and keep the blood from flowing out through the rear end of the cannula. When the last tube has been filled, the entire assembly is removed form the patients arm and the needle is disposed off using needle disposal system

Resolution No. 4.5.1.2 of BOM-55/2018: Resolved that the internal assessment for 1st M.B.B.S. will be calculated as per the table below from 2018-19 onwards. Further Departments should maintain record of Internal Assessment:

Theory: (20 Marks)

	I Terminal & Prelim	4 Periodicals	PBL	Seminar
Existing	15	3		2
Revised	10	5	5 PBL/Seminar/case studies/any other as per dept.	

Practical: 20 marks

	I Terminal & Prelim	4 Periodicals	OSPE	Journal
Existing	15	3		2
Revised	10	5	5 Journal/OSPE/any other method as per dept.	

Resolution No. 4.5.1.3 of BOM-55/2018: Resolved to accept specific mark distribution in MCQ (Section A) in 1st MBBS – Anatomy, Physiology & Biochemistry. To be implemented from 2018-19 onwards. **[Annexure-30-A,B,C]**

Annexure C - 30 - (A)

Annexure C – 1

SPECIFIC MARK DISTRIBUTION IN MCQ PAPER IN I MBBS ANATOMY

Paper I

Sr. No.	Topic	No. of Questions
1.	Upper Limb	4
2.	Thorax	4
3.	Systemic Histology	2
4.	Systemic Embryology	2
5.	Head, Face & Neck	4
6.	Neuroanatomy	4
Total		**20**

Paper II

Sr. No.	Topic	No. of Questions
1.	Lower Limb	4
2.	Abdomen	4
3.	Pelvis	4
4.	Systemic Histology	2
5.	Systemic Embryology	1
6.	General Histology	1
7.	General Embryology	2
8.	General Anatomy	1
9.	Genetics	1
Total		**20**

10 % of MCQ marks should be from clinically based questions

Annexure - 30 (B)

Annexure C – 2

SPECIFIC MARK DISTRIBUTION IN MCQ PAPER IN I MBBS PHYSIOLOGY

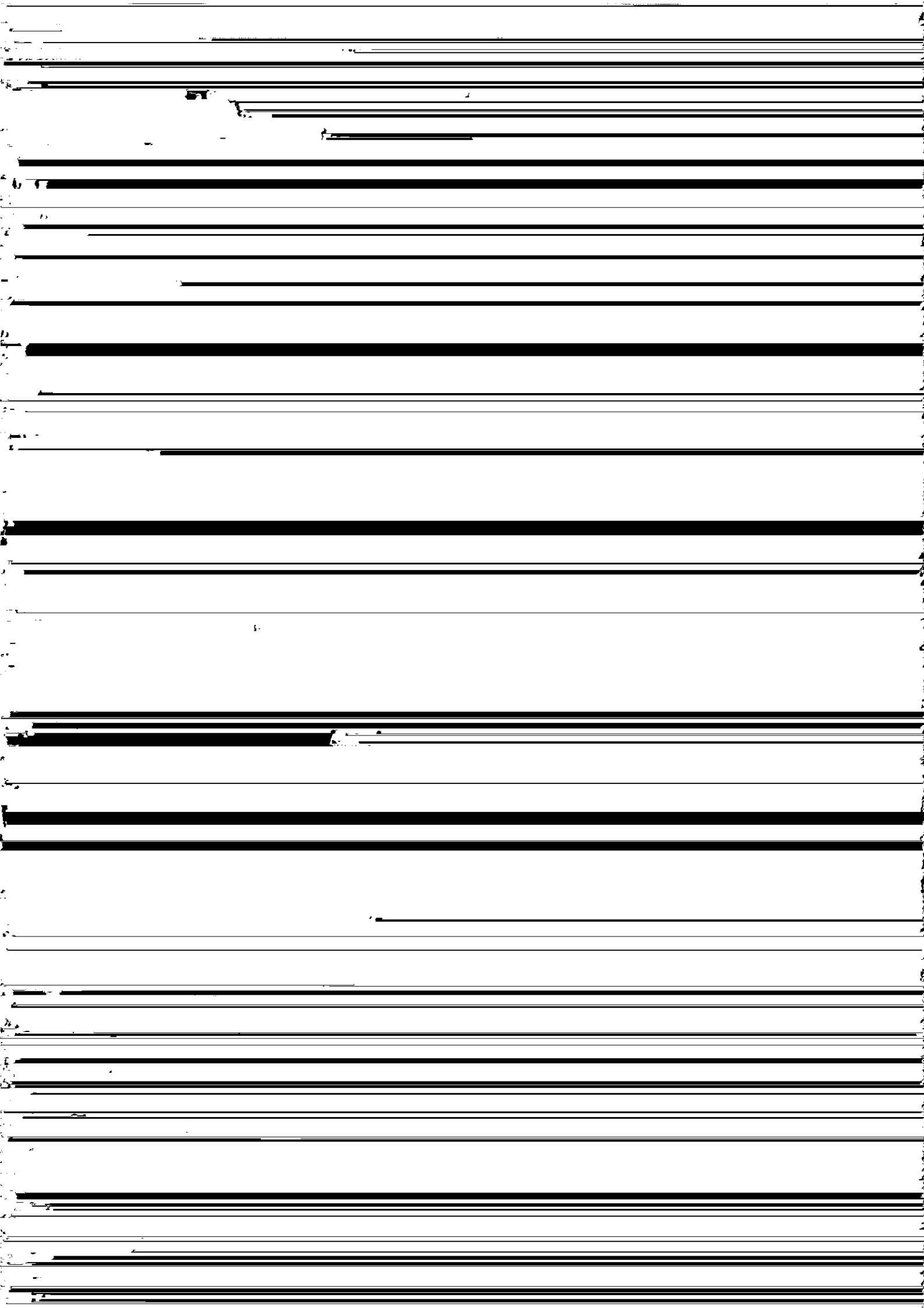
Paper I

Sr. No.	Topic	No. of Questions
7.	General physiology	2
8.	Cardiovascular System	4
9.	Respiratory System	4
10.	Blood	4
11.	Endocrine	4
12.	Reproduction	2
Total		**20**

Paper II

Sr. No.	Topic	No. of Questions
10.	Nerve-Muscle Physiology	3
11.	Digestive System	4
12.	Renal System	4
13.	CNS	6
14.	Special Sense	3
Total		**20**

10 % of MCQ marks should be from clinically based questions



Resolution No. 4.5.1.4 of BOM-55/2018: Resolved to include a lecture on 'Quality control' in Ist MBBS Biochemistry theory syllabus from 2018-2019 batch (under nice to know category) **[Annexure-31].** For inclusion of this topic in practical syllabus the item is referred back to BOS for lack of relevant write-up.

Annexure -31

I MBBS Biochemistry

DEPARTMENT OF BIOCHEMISTRY

As per BOS suggestion we are submitting herewith definitions which will be covered under covered under demonstration of Quality control methods in Clinical Biochemistry Laboratory.

Item No.10:- Demonstration of Quality control methods in Clinical Biochemistry Laboratory

1) Definition of Quality Control
2) Need of Quality Control
3) Quality Control Procedure
4) Quality Control material
5) Calibration
6) Calibration material
7) Precision
8) Accuracy
9) Pre analytical errors
10) Post analytical errors
11) External Quality Control

13/10/18

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