RAWALPINDI MEDICAL UNIVERSITY RAWALPINDI

DEPARTMENT OF Biochemistry

Curriculum of Learning Management System (LMS)
First Year MBBS
Second Year MBBS

2025

Vision

The Learning Management System (LMS) for books is designed to create a seamless and efficient learning environment that prioritizes essential concepts while providing balanced coverage of less critical topics. The LMS aims to prepare students effectively for upcoming examinations by offering structured and focused content.

Benefits of the LMS:

1. **Continuous Connectivity:**

   The LMS ensures that students remain engaged with their studies and maintain communication with the department, even during unforeseen disruptions, such as road blockages or other uncertainties.

2. **Comprehensive Coverage:**

   It provides a platform for students to address less critical topics at their own pace, ensuring a well-rounded understanding of the subject matter.

3. **Time Efficiency:**

   By streamlining the teaching and learning process, the LMS saves time for both faculty and students, allowing for more productive and focused educational experiences.

4. **Dynamic Improvements:**

   Regular updates by the IT department will address flaws and enhance the system's functionality, ensuring it meets the evolving needs of users.

5. **Accessibility:**

   Students must have proper internet connectivity at home to maximize the benefits of the LMS, enabling uninterrupted access to educational resources.

This LMS will serve as a bridge between traditional teaching methods and modern digital learning, fostering a robust and adaptive educational ecosystem.

Contents

Introduction: 4

1. Course Creation & Management: 4
2. User Management: 4
3. Assessment & Testing: 4
4. Reporting & Analytics: 4
5. Communication Tools: 4
6. Scalability & Flexibility: 4
7. Mobile Access: 4

Implementation of LMS: 5

TOS for LMS Department of Physiology: 6

Module wise Learning Objectives: 7

First Year MBBS: **Error! Bookmark not defined.**

1. Foundation Module: 7
2. MSK 1 MODULE 7
3. MSK II MODULE 11
4. BLOOD MODULE 15
5. CVS MODULE 20
6. Respiratory Module 23

Second Year MBBS: 29

1. GIT Module: 29
2. Renal module: 31
3. Reproduction Module: **Error! Bookmark not defined.**
4. CNS Module: **Error! Bookmark not defined.**
5. Special Senses: 31
6. Endocrinology Module: 37

Introduction:

A **Learning Management System (LMS)** is a software application or platform used to deliver, manage, and track educational content and training programs. It helps organizations, institutions, or businesses deliver learning experiences to learners in an organized, scalable, and accessible way.

1. **Course Creation & Management:**

   - Allows instructors or administrators to create and organize courses, modules, lessons, and assessments.
   - Supports multimedia content such as videos, quizzes, PDFs, and presentations.

2. **User Management:**

   - Facilitates the creation of user profiles for learners, instructors, and administrators.
   - Allows tracking of individual progress, achievements, and performance.

3. **Assessment & Testing:**

   - Includes features for creating and administering quizzes, assignments, and exams.
   - Provides automated grading and feedback to learners.

4. **Reporting & Analytics:**

   - Tracks learner performance, course completion rates, and engagement levels.
   - Provides insights to instructors and administrators for informed decision-making.

5. **Communication Tools:**

   - Integrates discussion boards, chat features, and email to facilitate communication between learners and instructors.
   - Supports notifications and announcements.

6. **Scalability & Flexibility:**

   - Can accommodate a growing number of learners or users.
   - Supports a variety of learning styles, including synchronous (live) and asynchronous (self-paced) learning.

7. **Mobile Access:**

   - Many LMS platforms are mobile-friendly or offer mobile apps to support learning on the go.

Implementation

To ensure the effective implementation of the Learning Management System (LMS), the following steps will be undertaken:

1. **Infrastructure Setup:**

   The LMS will be hosted on a well-equipped platform capable of handling multiple users simultaneously, ensuring reliability and performance during peak usage times.

2. **IT Department Support:**

   A dedicated IT department will be responsible for managing the system, providing technical support, and ensuring smooth operation.

3. **User Credentials:**

   Unique IDs and passwords will be issued to each student by the IT department, granting secure access to the LMS. Students will be guided on how to use the platform effectively.

4. **Exam Scheduling:**

   Dates and times for exams will be pre-set within the LMS, allowing students to prepare accordingly. The scheduling system will ensure timely availability of test materials and instructions.

5. **Automated Notifications:**

   Automated messages will be sent to students to inform them of upcoming exams, deadlines, or important updates. These notifications will ensure students remain informed and prepared.

6. **Test Notices:**

   Detailed test notices, including exam guidelines, formats, and schedules, will be shared with students through the LMS to ensure clarity and readiness.

This structured implementation plan will enable the LMS to function effectively, fostering a productive and organized learning environment for both students and faculty.

TOS

Two types of exams are conducted.

1. Formative
2. Summative

During module exam, minimum 2 ONLINE formative assessments are conducted in the evening.

At the end of block, a On Campus Summative assessment is conducted, comprises of component of both modules.

Single best answer with Scenario based Questions

Table 1: Distribution of MCQs in Formative & Summative Assessments on LMS:

Sr. #.	Type of exam	Type of Assessment	No of MCQs
1.	Mid module	Formative	30
2.	End of module	Formative	30
3.	block	Summative	30

Table 2: Implementation of Calgary Model of Categorization of Questions for LMS assessments:

Sr. No	**Type of Assessment**	**Calgary Model**		
		Must Know	Should Know	Nice to Know
1.	Formative	70%		30%
2.	Summative	100%		----------

Module wise Learning Objectives:

First Year MBBS

1. Foundation Module:

Topic	Learning Objectives At the End of Lecture Students Should Be Able To	Calgary Gauge
Cell and cell organelles	• Explain composition of normal cell • Describe methods to separate different organelles of cell • Describe structure, functions and marker enzymes of ER & Golgi apparatus • Describe structure, functions and marker enzymes of lysosome, peroxisome & ribosome • Describe structure, functions and marker enzymes of mitochondria and Nucleus • Illustrate the clinical conditions and congenital defects of cell organelles	Should Know Must Know Should Know Should Know Should Know Must Know
Cell membrane	• Explain composition of cell membrane • Understand fluid mosaic model • Describe functions performed by each component	Should Know Should Know Should Know
Functions of cell membranes	• Discuss functions & importance of cell membrane	Should Know
Transport across cell membrane	• Explain transport of various substances by active and passive transport, diffusion, phagocytosis, endocytosis and exocytosis • Correlate the clinical disorders with defective transport across cell membrane	Should Know Must Know
Osmosis, osmotic pressure and oncotic pressure	• Define osmosis and osmotic pressure. • Discuss biochemical application of osmotic and oncotic pressure and methods to measure them. • Correlate oncotic pressure with clinical scenarios	Should Know Should Know Should Know
Phenomenon of viscosity, surface tension, emulsification and adsorption	• Define phenomenon of viscosity, surface tension, emulsification and adsorption • Explain Biochemical applications and methods to measure them	Should Know Should Know
Donnan equilibrium, adsorption and ion exchange resins	• Define Donnan equilibrium, adsorption and ion exchange resins. • Describe their effects on tissue fluids and biochemical importance	Should Know Should Know

Water and pH	• Define pH, Pka, body buffer • Discuss water distribution in the body • Understand dehydration and overhydration	Should Know Should Know Should Know
Enzymes Introduction	• Define Enzymes. • Explain general functions of enzymes. • Differentiate between coenzyme and cofactors	Should Know Should Know Must Know
Mechanism of enzyme action	• Describe different mechanisms of enzyme action.	Should Know
Classification of enzymes	• Discuss different classes of Enzymes	Should Know
Properties of Enzymes	• Elaborate the Properties of Enzymes such as specificity for substrate and stereo specificity.	Should Know
Factors affecting Enzyme action	• Discuss different factors which increase or decrease the activity of enzymes	Should Know
Enzyme inhibitors	• Describe enzyme inhibitors and how the activity of the regulatory enzymes can be modulated for benefit of body	Should Know
Enzyme Regulation	• Explain enzyme regulation	Must Know
Diagnostic role of Enzymes	• Interpret the role of measuring activity of different enzymes in the diagnosis and prognosis of different diseases • Interpret the role of Enzyme as medicine and their effects on body.	Must Know Nice to know
Nucleic acids chemistry	• Explain structure and biological importance of DNA, types of DNA • Differentiate between DNA &RNA • Explain structure, types and functions of RNA	Should Know Should Know Should Know
Replication	• Describe mechanism of replication of prokaryotes & Eukaryotes	Should Know
Transcription	• Describe mechanism of Transcription of prokaryotes & Eukaryotes	Should Know
Translation	• Discuss genetic code • Describe mechanism of Translation in prokaryotes & Eukaryotes • Illustrate mechanism of action of antibiotics at different stages of translation	Must Know Should Know Should Know

DNA damage & Repair	• Describe mechanism of DNA damage & Repair • Apply knowledge of DNA repair mechanisms in related clinical cases	Must Know Nice to Know
Mutations	• Describe different types of mutations with examples	Should Know
PCR and Recombinant DNA technology	• Define PCR • Explain mechanism and indications of PCR • Discuss Recombinant DNA technology	Should Know Should Know Must Know
Cancer	• Explain biochemical basis of cancer	Must Know
Cell and cell organelles	• Explain composition of normal cell • Describe methods to separate different organelles of cell • Describe structure, functions and marker enzymes of ER & Golgi apparatus • Describe structure, functions and marker enzymes of lysosome, peroxisome & ribosome • Describe structure, functions and marker enzymes of mitochondria and Nucleus • Illustrate the clinical conditions and congenital defects of cell organelles	❖ Essentials of medical Biochemistry. Mushtaq Ahmad Vol – I 9th edition (chapter 1, page 3)
Cell membrane Transport across cell membrane	• Explain composition of cell membrane • Understand fluid mosaic model • Describe functions performed by each component • Explain transport of various substances by active and passive transport, diffusion, phagocytosis, endocytosis and exocytosis • Correlate the clinical disorders with defective transport across cell membrane	❖ Harper's illustrated biochemistry 32nd edition (chapter 40 page - 460) ❖ Harper's illustrated biochemistry 32nd edition (Chapter 40 page 467)
Physichemical Aspects Osmosis, osmotic pressure and oncotic pressure	• Define osmosis and osmotic pressure. • Discuss biochemical application of osmotic and oncotic pressure and methods to measure them. • Correlate oncotic pressure with clinical scenarios	❖ Essentials of medical Biochemistry. Mushtaq Ahmad Vol – I 9th edition (Chapter 02 page 46)
Phenomenon of viscosity, surface tension.	• Define phenomenon of viscosity, surface tension. • Explain Biochemical applications and methods to measure them.	❖ Essentials of medical Biochemistry. Mushtaq Ahmad Vol – I 9th edition (Chapter 02 page 52, 55)

Nucleic Acid Chemistry	• Define Donnan equilibrium, adsorption and ion exchange resins. • Describe their effects on tissue fluids and biochemical importance	○ ❖ Essentials of medical Biochemistry. Mushtaq Ahmad Vol – I 9th edition (Chapter 02 page 50)
Cancer	• • Explain biochemical basis of cancer	❖ Essentials of medical Biochemistry. Mushtaq Ahmad Vol – I 9th edition (Chapter 6 page 168)
Diagnostics Role of Enzyme	• Interpret the role of Enzyme in diagnosis and their effects on body.	❖ Essentials of medical Biochemistry. Mushtaq Ahmad Vol – I 9th edition (Chapter 06 page 169) ❖ Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 05 page 69)
Transcription	• Describe mechanism of Transcription of prokaryotes & Eukaryotes	❖ Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 30 page 459)

2. MSK 1 MODULE

Topic	Learning Objectives At the End of Lecture Students Should Be Able To	Calgary Gauge
Minerals classification and Introduction. Calcium Phosphate	• Classify Minerals • State Daily Requirements of Calcium in different conditions	Should Know
	• Discuss Types & Sources of Calcium phosphate	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Biochemical Role of Calcium & Phosphate	• Discuss causes of Hypercalcemia & Hypocalcemia • Describe effects of Hypercalcemia & Hypocalcemia • State Daily Requirements of Phosphate • Discuss Biochemical functions of Phosphate	Must Know Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Fluoride, Magnesium, Sulphur	• Elaborate Biochemical functions of Fluoride, Sulphur & Magnesium • Describe Deficiency Effects	Should Know Must Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics Understand the curative and preventive health care measures	Nice to know
Iodine, Copper, Zinc, Selenium, Manganese	• Recall sources & daily requirements • Discuss their biochemical functions • Describe Deficiency Effects	Should Know Must know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know

Vitamins & Their Classification Vitamin A and E	• Classify Vitamins & Water-Soluble Vitamins • Enlist Sources of Vitamin A & E • Describe Biochemical functions of Vitamin A & E • Describe Deficiency Effects of Vitamin A & E • Explain Toxic Effects of Vitamin A	Should Know Should Know Must Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Vitamin D	• Enlist Sources of Vit.D • Explain Steps of activation of Vit.D in the body • Describe Biochemical functions of Vit.D • Explain Deficiency effects of Vit.D • Explain Toxic effects of Vit.D	Should Know Must Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Vitamin C	• Enlist Sources of Vit.C • Describe Biochemical functions of Vit.C • Explain Deficiency effects of Vit.C • Explain Toxic effects of Vit.C	Should Know Should Know Must know Must know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Niacin & Thiamine	• Enlist Sources • Describe Biochemical functions • Explain Deficiency effects	Should Know Must Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Classification & Structure of Amino Acids	• Classification & Structure of Amino Acids & Isomerism of Amino Acids	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library	Nice to know

	• Practice principles of bioethics • Understand the curative and preventive health care measures	

Hypercalcemia	• Discuss causes of Hypercalcemia • Explain Biochemical Basis • Describe effects of Hypercalcemia	Must Know	• Textbook of Lippincott 8th Edition Chapter # 29 page#466-467 • Textbook of Harper 32nd Edition Chapter # 44 page# 540 • https://www.ncbi.nlm.nih.gov/books/NBK218735 • https://youtu.be/34FTvJZCrt4
Hypocalcemia	• Discuss causes of Hypocalcemia • Describe effects of Hypocalcemia • State Daily Requirements of Phosphate Discuss Biochemical functions of Calcium	Must Know	• Textbook of Lippincott 8th Edition Chapter # 29 page #466-467 • https://www.ncbi.nlm.nih.gov/books/NBK279023/ • https://youtu.be/qAeWKCXDniw
Clinical Role of Fluoride, Magnesium, Sulphur	• Elaborate Biochemical Basis • Enlist Sources of Fluoride, Sulphur. • Describe causes of deficiency	Must Know	• Textbook of Lippincott 8th Edition Chapter # 29 page #468 • https://www.ncbi.nlm.nih.gov/ • https://youtu.be/PTOJNdtuXro
Wilson's Disease	• Recall sources & daily requirements of Copper • Discuss their biochemical functions of Copper • Describe Deficiency Effects	Should Know Must Know	• Textbook of Lippincott 8th Edition Chapter # 29 page #449-454 • https://youtu.be/1i9fSQSvYI0 • https://pubmed.ncbi.nlm.nih.gov/
Applied Biochemistry of Vitamin A and E	• Classify Fat- & Water-Soluble Vitamins • Enlist Sources of Vitamin A & E • Describe Deficiency Effects of Vitamin A & E • Explain Toxic Effects of Vitamin A	Should Know Must Know	• Textbook of Lippincott 8th Edition Chapter # 28 page #423,432-436,441,444 • Textbook of Harper 32nd Edition Chapter # 44 page# 528-529 • https://byjus.com/chemistry • https://youtu.be/7ZFr9xiAt94
Rickets	• Enlist Sources of Vit.D • Describe Biochemical functions of Vit.D • Explain Deficiency effects of Vit.D • Explain Toxic effects of Vit.D	Should Know Must Know	• Textbook of Lippincott 8th Edition Chapter # 28 page # 437-440 • Textbook of Harper 32nd Edition Chapter # 44 page# 530-532 • https://byjus.com/chemistry • https://youtu.be/6xhE5e16X0c

Deficiency Manifestation of Vitamin A	• Explain Deficiency effects of vitamin A	Must Know	• Textbook of Lippincott 8th Edition Chapter # 28 Page #435,439 • Textbook of Harper 32nd Edition Chapter # 44 page# 530-532 • https://www.ncbi.nlm.nih.gov/ • shttps://youtu.be/ZCINiQX-mxU
Deficiency manifestation of Thiamine	• Explain Deficiency effects	Must Know	• Textbook of Lippincott 8th Edition Chapter # 28 Page #429,430 • Textbook of Harper 32nd Edition Chapter # 44 page# 534 • https://www.ncbi.nlm.nih.gov/ • https://youtu.be/WAkXS8lgoA0
Deficiency manifestation of Niacin	• Describe Biochemical functions Niacin a • Explain deficiency effects of Niacin	Should Know Must Know	• Textbook of Lippincott 8th Edition Chapter # 28and 1 Page #1-5 &429-431 • Textbook of Harper 32nd Edition Chapter # 44 page# 534-535 • https://microbenotes.com/ • https://youtu.be/9pwBUTIcxHk

3. MSK II MODULE

Topic	Learning Objectives At the end of lecture students should be able to	Calgery Model
Properties of amino acids& Important peptides	• Describe amphoteric properties of amino acids • Discuss Post transitional amino acids and location of amino acids in proteins • Explain Important peptides	Should Know Should Know Should Know
Proteins	• Discuss Importance of proteins • Classify proteins • Describe Functions of proteins	Should Know Should Know Should Know
Primary structure of proteins	• Describe Primary structure of protein • Discuss Peptide bond	Should Know Should Know
Secondary structure of proteins	• Enlist Types of secondary structure. • Describe Secondary structure of proteins. • Elaborate Significance of secondary structure	Should Know Should Know Should Know
Tertiary and quaternary structure	• Describe Tertiary and quaternary structure of proteins • Understand the forces stabilizing protein structure	Should Know Should Know
Protein folding And denaturation	• Discuss Folding of proteins • Describe protein misfolding • Interpret the clinical cases related to protein misfolding • Discuss denaturation of proteins	Should Know Should Know Should Know Should Know
Collagen and Elastin	• Describe structure of collagen and elastin • Discuss differences between collagen and elastin • Explain Synthesis of collagen • Enlist Factor regulating and helping in strengthening of collagen • Interpret defects of collagen synthesis and elastin	Should Know Should Know Should Know Should Know Should Know
Techniques for separation of proteins	• Describe Techniques for separation of proteins	Should Know

Definition and Biological importance of lipids.	●Define lipids	Should Know
	●Classify lipids ●Describe Biomedical significance of lipids	Should Know
	● Apply the strategic use of artificial intelligence in healthcare ● Use HEC digital library ● Practice principles of bioethics ●Understand the curative and preventive health care measures	Nice to know
Fatty acids	●Classify fatty acids	Should Know
	●Describe physical and chemical properties of fatty acids	Should Know
	● Apply the strategic use of artificial intelligence in healthcare ● Use HEC digital library ● Practice principles of bioethics ●Understand the curative and preventive health care measures	Nice to know
Simple lipids	● Elaborate Structure and physical properties of Triglycerides	Should Know
	●Discuss Chemical properties of Triglycerides ●Clinical significance	Should Know Must Know
	● Apply the strategic use of artificial intelligence in healthcare ● Use HEC digital library ● Practice principles of bioethics ● Understand the curative and preventive health care measures	Nice to know
Compound lipids (Phospholipids, glycolipids, lipoproteins)	● Classify compound lipids ● Discuss structure and functions of compound lipids ● Interpret the clinical role of compound lipids	Should Know
	● Apply the strategic use of artificial intelligence in healthcare ● Use HEC digital library ● Practice principles of bioethics ● Understand the curative and preventive health care measures	Nice to know
Derived lipids	● Describe derived lipids	Should Know
	● Apply the strategic use of artificial intelligence in healthcare ● Use HEC digital library ● Practice principles of bioethics ● Understand the curative and preventive health care measures	Nice to know

Cholesterol	● Describe Structure and physical properties of Cholesterol ● Discuss Chemical properties and functions ● Interpret clinical findings of hypercholesterolemia	Should Know Must Know
	● Apply the strategic use of artificial intelligence in healthcare ● Use HEC digital library ● Practice principles of bioethics ● Understand the curative and preventive health care measures	Nice to know
Prostaglandins	● Classify Prostaglandins ● Describe functions and clinical significance of Prostaglandins. ● Interpret the role of drugs in prostaglandin synthesis	Should Know
	● Apply the strategic use of artificial intelligence in healthcare ● Use HEC digital library ● Practice principles of bioethics ● Understand the curative and preventive health care measures	Nice to know
Introduction and classification of carbohydrates	● Classify carbohydrates ● Explain different types of carbohydrates ● Clinical significance	Should Know Must Know
	● Apply the strategic use of artificial intelligence in healthcare ● Use HEC digital library ● Practice principles of bioethics ● Understand the curative and preventive health care measures	Nice to know
Isomerism, optical activity and mutarotation	●Discuss Different properties of carbohydrates (Isomerism, optical activity and mutarotation)	Should Know
	● Apply the strategic use of artificial intelligence in healthcare ● Use HEC digital library ● Practice principles of bioethics ●Understand the curative and preventive health care measures	Nice to know
Monosaccharide	● Classify monosaccharide ● Describe chemical properties of monosaccharide ● Interpret the clinical role of sorbitol, mannitol and cardiac glycosides	Should Know Must Know
	● Apply the strategic use of artificial intelligence in healthcare ● Use HEC digital library ● Practice principles of bioethics ● Understand the curative and preventive health care measures	Nice to know
	● Describe Structure and functions of Individual sugars	Should Know

Disaccharides	● Apply the strategic use of artificial intelligence in healthcare ● Use HEC digital library ● Practice principles of bioethics ● Understand the curative and preventive health care measures	Nice to know
Homopolyssacharides	●Explain Structure, physical and chemical properties of homopolyssacharide and their biological importance.	Should Know
	● Apply the strategic use of artificial intelligence in healthcare ● Use HEC digital library ● Practice principles of bioethics ●Understand the curative and preventive health care measures	Nice to know
Heteropolysaccharides	● Explain Structure, physical and chemical properties of heteropolysaccharides and their biological importance. ● Apply the role of heteropolysaccharides in clinical cases	Should Know Must Know
	● Apply the strategic use of artificial intelligence in healthcare ● Use HEC digital library ● Practice principles of bioethics ● Understand the curative and preventive health care measures	Nice to know

Clinical importance of carbohydrates	● Define & classify ● Explain Pathophysiology & clinical features	Must Know
Clinical importance of lipids	● Understand the definition, causes, and basic pathophysiology. ● Identify key clinical features and the role of biochemical testing in its diagnosis.	Must Know
Obesity Ear Wax Impaction	● Understand the basic pathophysiology, types, and clinical features. ● Identify symptoms and describe the basic methods of removal and prevention.	Must Know

Hypoglycemia	● Understand the definition, causes, and basic pathophysiology	Must Know
Clinical Importance of homopolysachhrides	● Describe the pathophysiology, types, and genetic basis	Must Know
Hypercholestremia	● Describe the pathophysiology, types, and Biochemical Basis	Must Know
Applied Biochemistry of Heteropolysachrides	● Explain the clinical features ,pathophysiology & Biochemical Basis.	Must Know
Clinical Role of prostaglandins	● Understand the definition, causes, and basic pathophysiology	Must Know

4. BLOOD MODULE

Topics	At the end of lecture students should be able to	Calgary Category
Hemoglobin and Myoglobin	• Describe Structure of hemoglobin and Myoglobin • Describe structure of myoglobin. • Discuss Biochemical roles of hemoglobin and myoglobin. • Enlist various types of Hemoglobin. • Describe Importance of heme and globin components • Interpret importance of HbA1c in diagnosis of Diabetes	Should Know Should Know Should Know Should Know Should Know Nice to know
Abnormalities in Hemoglobin.	• Elaborate congenital abnormalities in structure of Hemoglobin. • Enlist Structural defects of hemoglobin • Discuss Preventive measures.	Should Know Should Know Nice to Know
Heme synthesis	☐ Biochemical Pathway of Heme Synthesis ☐ Regulation of Heme Synthesis ☐ Heme Degradation and Its Clinical Implications • Pharmacological and Toxicological Effects on Heme Synthesis	Should Know Must Know Must/Nice to Know Nice to Know
Breakdown of hemoglobin	• Elaborate steps in the breakdown of hemoglobin. • Describe Steps in synthesis of Bilirubin	Should Know Should Know
Plasma proteins	• Describe plasma proteins. • Discuss Biochemical role of various plasma proteins. • Recall normal levels of plasma proteins • Illustrate Role of A/G ratio.	Should Know Should Know Should Know Should Know
Acute phase proteins & Albumin	• Enlist various proteins raise in inflammation. • Describe Role of albumin. • Discuss Role of C- reactive protein.	Must Know Should Know Must Know
Haptoglobin	• Describe Structure of Haptoglobin. • Discuss biochemical Role of Haptoglobin.	Should Know Should Know
Ferritin, transferrin and hemosiderin	• Describe biochemical role of ferritin, transferrin and hemosiderin. • Describe Hemosiderosis.	Should Know Must Know

Topics	At the end of lecture students should be able to	Calgary Category
Ceruloplasmin.	• Describe biochemical role of ceruloplasmin. • Discuss Wilson's disease.	Should Know Must Know/Nice to know
Immunoglobulins	• Describe Structure of Immunoglobulin. • Discuss biochemical role of various Immunoglobulin. • Elaborate Class switching.	Should Know Should Know Must Know
Hb and Oxygen Dissociation Curve	• Explain the structure, types and biomedical role of hemoglobin • Describe oxygen dissociation curve and its significance.	Should Know Should Know
Iron	• Describe sources, structure, Biochemical role of Iron • Discuss related diseases of iron.	Should Know Must Know
Thalassemia	• Apply basic knowledge of subject to clinically interpret the disorder.	Must Know
Heme Degradation and Jaundice	• Apply basic knowledge of subject to clinically interpret the related disorders.	Must Know
Clinical Disorders Related to Heme Synthesis	• Enlist various types of Hemoglobin. • Describe Importance of heme and globin components. • Discuss Disorders Affecting Heme Synthesis and their impact on quality of life. (Porphyria)	Should Know Should Know Must Know
Hemoglobinopathies	• Define Hemoglobinopathies • Enlist types of Hemoglobinopathies • Discuss familial Counselling • Elaborate Preventive Measures	Should Know Should Know Nice to Know Nice to Know
AIDS	• Define AIDS • Pathogenesis and Biochemical Basis of AIDS • Prevalence and Prevention	Must Know Must Know Nice to know
Clinical Aspect of Heme Degradation (Jaundice)	• Define jaundice. • Recall normal level of Bilirubin. • Enlist types of Jaundice. • Describe Biochemical tests to distinguish various types of jaundice. • Describe Physiological Jaundice	Must Know Should Know Must Know Should Know Must Know

Topics	At the end of lecture students should be able to	Calgary Category
Acute phase proteins & Albumin related diseases	• Describe Role of albumin. • Describe Protein raise in response to inflammation. • Discuss Role of C- reactive protein. • Albumin Related Clinical Disorders	Should Know Must Know Must Know Must Know
Vitamin K	• Clinical aspects of Vitamin K	Must Know
Folic acid.	• Recall Sources of folic acid. • Discuss deficiency effects of folic acid/ Clinical Disorders related to Folic Acid • Describe biochemical role of folic acid. • Recall Recommended Dietary allowance.	Should know Must know/Nice to know Should Know Must Know
Vitamin B12	• Recall Sources of Vitamin B12 • Describe biochemical role of vitamin B12 • Discuss Deficiency effects of B12/Clinical Disorders Related to Vitamin B12	Should know Should know Must know/Nice to know

5. CVS MODULE

Topic	Learning Objectives At the end of lecture students should be able to	Calgary Guage
Definition and Biological importance of lipids.	• Define lipids	Should Know
	• Classify lipids • Describe Biomedical significance of lipids	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Fatty acids	• Classify fatty acids	Should Know
	• Describe physical and chemical properties of fatty acids	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Simple lipids	• Elaborate Structure and physical properties of Triglycerides	Should Know
	• Discuss Chemical properties of Triglycerides • Clinical significance	Should Know Must Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Compound lipids (Phospholipids, glycolipids, lipoproteins)	• Classify compound lipids • Discuss structure and functions of compound lipids • Interpret the clinical role of compound lipids	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Derived lipids	• Describe derived lipids	Should Know
	• Apply the strategic use of artificial intelligence in healthcare	Nice to know

	• Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	
Cholesterol	• Describe Structure and physical properties of Cholesterol • Discuss Chemical properties and functions • Interpret clinical findings of hypercholesterolemia	Should Know Must Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Prostaglandins	• Classify Prostaglandins • Describe functions and clinical significance of Prostaglandins. • Interpret the role of drugs in prostaglandin synthesis	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Introduction and classification of carbohydrates	• Classify carbohydrates • Explain different types of carbohydrates • Clinical significance	Should Know Must Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Isomerism, optical activity and mutarotation	• Discuss Different properties of carbohydrates (Isomerism, optical activity and mutarotation)	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Monosaccharide	• Classify monosaccharide • Describe chemical properties of monosaccharide • Interpret the clinical role of sorbitol, mannitol and cardiac glycosides	Should Know Must Know

	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Disaccharides	• Describe Structure and functions of Individual sugars	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Homopolyssacharides	• Explain Structure, physical and chemical properties of homopolyssacharide and their biological importance.	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Heteropolysaccharides	• Explain Structure, physical and chemical properties of heteropolysaccharides and their biological importance. • Apply the role of heteropolysaccharides in clinical cases	Should Know Must Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Clinical importance of carbohydrates	• Define & classify • Explain Pathophysiology & clinical features	Must Know
Clinical importance of lipids	• Understand the definition, causes, and basic pathophysiology. • Identify key clinical features and the role of biochemical testing in its diagnosis.	Must Know
Obesity Ear Wax Impaction	• Understand the basic pathophysiology, types, and clinical features. • Identify symptoms and describe the basic methods of removal and prevention.	Must Know
Hypoglycemia	• Understand the definition, causes, and basic pathophysiology	Must Know

Clinical Importance of homopolysachhrides	• Describe the pathophysiology, types, and genetic basis	Must Know
Hypercholestremia	• Describe the pathophysiology, types, and Biochemical Basis	Must Know
Applied Biochemistry of Heteropolysachrides	• Explain the clinical features ,pathophysiology & Biochemical Basis.	Must Know
Clinical Role of prostaglandins	• Understand the definition, causes, and basic pathophysiology	Must Know

6. Respiratory Module

Topic	Learning Objectives At the end of lecture students should be able to	Calgary Category
pH and pKA	• Define pH and pKa • Elaborate Henderson Hasselbach equation. • Describe Measurement of pH by equation.	Should Know Should Know Should Know
Body buffers	• Define buffers. • Discuss Mechanism of various buffers in maintenance of blood pH.	Should Know Should Know
Mechanisms of energy generation inthe body.	• Discuss various mechanisms of energy generation in the body. • Discuss Oxidative phosphorylation. • Describe uncouplers.	Should Know Should Know Must Know
Electron transportchain	• Enlist Components/ complexes of electron transport chain. • Describe Enzymes and Co-enzymes of each component. • Discuss and Enlist Inhibitors of these complexes.	Should Know Should Know Should Know
Vitamins Biotin and pantothenic acid	• Define Vitamins • Discuss the distribution, daily requirement and their deficiency. • Interpret Clinical indications	Should Know Should Know Nice to Know
Inhibitors Of ETC	☐ Identify major inhibitors of the electron transport chain and their target complexes. ☐ Explain the impact of ETC inhibition on ATP synthesis and cellular respiration. ☐ Discuss the physiological and pathological consequences of ETC inhibition. ☐ Highlight the clinical and experimental significance of ETC inhibitors.	Should know Should know Nice to Know Nice to know
Acid Base Imbalance/ Role of Kidneys in Acid Base Disorders	☐ Apply basic knowledge of the subject to interpret a clinical case. • Explain how the kidneys regulate acid-base balance by excreting hydrogen ions and reabsorbing bicarbonate. ☐ Identify the renal mechanisms involved in compensating for acidosis and alkalosis. ☐ Discuss the impact of renal dysfunction on acid-base homeostasis and associated disorders. ☐ Explore the diagnostic and therapeutic approaches for kidney-related acid-base imbalances.	Nice to Know Should know Should know Nice to Know Nice to know

Topic	Learning Objectives At the end of lecture students should be able to	Calgary Category
Role of Uncouplers in Thermogenesis	Explain how uncouplers generate heat by disrupting the mitochondrial proton gradient. Identify key uncoupling proteins and their role in thermogenesis. Discuss their significance in body temperature regulation and cold adaptation. Highlight clinical relevance in metabolic disorders and obesity management.	Must know Should know Should know Nice to Know
Disorders of Vitamin Pyridoxine	• Understand the role of pyridoxine (vitamin B6) in metabolism and its biochemical functions. • Identify clinical disorders caused by pyridoxine deficiency, including symptoms and risk factors. • Explore the implications of pyridoxine toxicity and its associated conditions. • Recognize the therapeutic applications of pyridoxine in managing related clinical disorders	Should know Must know Nice to Know Nice to know
Clinical Aspects of Xenobiotics	Define xenobiotics and their significance in clinical toxicology. Explain the mechanisms of xenobiotic metabolism, including phases I and II. Identify the clinical effects and potential toxicities associated with xenobiotics. Discuss the therapeutic and diagnostic implications of xenobiotic exposure in clinical practice.	Must know Should know Nice to Know Nice to know

Second Year MBBS:

1. GIT Module:

Topic	Learning Objectives At the End of Assessment Students Should be able to	Calgary Guage
Introduction to carbohydrate Metabolism	• Introduction and stages of Metabolism • Differentiation between Anabolism and Catabolism • Transport of glucose across the cell. (Glucose Transporters)	Should know
Metabolism of monosaccharide & Disaccharide (Fructose, Lactose, Galactose)	• Explain the Metabolism of Fructose, Lactose, Galactose and their related clinical Disorders	Should know
Glycolysis	• Steps of Glycolysis • Regulation of the Committed Steps • Energy calculation in Anaerobic Glycolysis	Should know
Fate of Pyruvate	• Fate of Pyruvate • Cori's Lactic Acid Cycle & Lactic Acidosis	Should know
Function of NADPH and deficiency of G6PD	• Describe hexose monophosphate pathway • Explain functions of NADPH with G6PD deficiency	Should know
Glycogen Metabolism	• Explain synthesis and breakdown of glycogen • Discuss glycogen storage diseases	Should know
Gastric Juice	• Explain composition, function, formation of gastric juice and related disorders • Peptic ulcer disease	Should know
Bile and Pancreatic Juice	• Describe composition, function, formation of bile and related disorders • Describe composition, function and formation of pancreatic juice and related disorder	Should know
GIT Hormones and Succus Entericus	• Understand the sources, functions, and regulation of gastrointestinal hormones. • Describe the composition, secretion, and role of succus entericus in digestion.	Must know
Nutrition	• Understand the roles of macronutrients and micronutrients in energy production and overall health. • Describe the consequences of nutrient deficiencies and excesses in the human body	Nice to know
Citric acid cycle	• Describe steps, regulations, energy calculations and significance of CAC • Deficiencies of coenzymes of pyruvate dehydrogenase complex	Should know
Digestion and Absorption of lipids, proteins and carbohydrates	• Explain the enzymatic processes involved in the digestion of lipids, proteins, and carbohydrates. • Describe the pathophysiology of related disorders	Must know
Pyruvate Kinase Deficiency	• Understand Role of Pyruvate Kinase • Discuss Pathogenesis of PK Deficiency	Should know

	• Understand Clinical Features of PK Deficiency	
Clinical disorders related to HMP Shunt	• Explain applied aspects and importance of HMP shunt • Discuss the role of NADPH in phagocytosis	Must know
Glycogen storage diseases	• Describe the sign and symptoms and deficient enzymes of glycogen storage diseases	Nice to know
Clinical aspects of Digestive Juices	• Understand the disorder of salivary glands • Discuss clinical aspects related to gastric and pancreatic juice • Understand the pathogenesis of gall stones	Must know
Clinical disorders related to digestion and absorption	• Explain disorders i.e. lactose intolerance, cystinuria, hartnup disorder, steatorrhea and cystic fibrosis	Nice to know

2. Renal module:

Topic	Learning Objectives At The End Of Lecture Students Should Be Able To	Calgary Category
Introduction to protein metabolism	• Understand protein turn-over, amino acid pool and entry of amino acid into cell.	Should Know
Nitrogen balance	• Describe positive and negative nitrogen balance	Should Know
General reactions of amino acids	• Discuss reactions of amino acids • Interpret the clinical importance of transaminases	Should Know Must Know
Urea cycle And its disorders	• Describe the location, steps and regulation of Urea cycle • Describe Disorders of the urea cycle	Should Know Should know
Metabolism of glycine	• Explain Glycine metabolism and • related disease	Should Know
Metabolism of tyrosine	• Explain tyrosine metabolism • Discuss related inherited disorders	Should Know
Metabolism of Tryptophan	• Explain Tryptophan metabolism • Discuss related inherited disorders	Should Know Must Know
Metabolism of methionine	• Describe metabolism of sulfur containing amino acids • Discuss related disorders	Should Know Must Know
Metabolism of branched chain amino acids	• Explain Metabolism of branched chain amino acids • Discuss related inherited disorders	Should Know Must Know
Metabolism of polyamines	• Discuss Synthesis of polyamines and • their clinical significance	Should Know Must Know

Electrolytes Sodium (Na) Potassium Chloride (Cl) & Bicarbonate ($HCO_{3)}$	• Describe Daily requirements, sources and functions of sodium, potassium, Chloride and Bicarbonate • Explain Metabolism in Detail.	Should Know Should Know
Phenylalanine Metabolism	• Explain phenylalanine Metabolism in detail • Highlight the Disorders	Should Know Nice to Know
Ammonia	• Explain sources of NH_3 formation and its transport • Describe Metabolism • Discuss Ammonia Toxicity • interpret the related disorders	Must Know Must Know Must Know Nice to Know
Phenylalanine and Tyrosine	• Clinical disorders related to Phenylalanine and tyrosine metabolism	Must Know
Arginine & Branched Chain Amino Acid Metabolism	• Explain Metabolism of branched chain amino acids • Discuss related inherited disorders	Should Know Must Know
Clinical Aspects of Acid base imbalance	• Explain causes and compensation of metabolic and respiratory acid base disorders • Describe anion gap and its significance • Interpret different acid base disorders	Must Know Must Know Must Know
Hypo and Hypernatremia	• Describe Daily requirements, sources and functions of sodium • Explain causes and effects of hyponatremia & hypernatremia	Should Know Must Know / Nice to Know
Hypo and Hyperkalemia	• Describe Daily requirements, sources and functions of potassium. • Explain causes and effects of hypokalemia & hyperkalemia	Should know Must Know

3. CNS

Topic	At The End Of Lecture Students Should Be Able To	Calgary Model
Triglyceride Metabolism, Fatty acid transport	• Describe synthesis & breakdown of TAGs and factors affecting it	Should Know
	• Explain entry of fatty acid into mitochondria (carnitine shuttle)	Should Know
Oxidation of fatty acid	• Describe steps, enzymes, energy calculations of β- oxidation of saturated fatty acid (Odd + Even)	Should Know
Oxidation of fatty acid	• Discuss other types of oxidations and related disorders	Should Know
Fatty acid synthesis	• Explain the steps, regulation and related diseases of fatty acid synthesis	Should Know
Cholesterol Synthesis	• Describe the steps, regulation and related disorders of Cholesterol Synthesis	Should Know
Plasma Cholesterol level	• Recall normal Plasma Cholesterol level and factors controlling it	Should Know
Ketone bodies metabolism	• Explain the synthesis and breakdown of Ketone bodies with related diseases (ketoacidosis)	Should Know
Metabolism of Glycerophospholipid	• Describe the steps of biosynthesis of Glycerophospholipids with its regulation and clinical significance	Should Know
Metabolism of Sphingophospholipids	• Explain the steps of biosynthesis of sphingophospholipids with its regulation and clinical significance	Should Know
Introduction to Lipoproteins	• Discuss the functions and roll of Lipoproteins & apolipoprotein	Should Know
Definition and Biological importance of lipids.	• Define lipids	Should Know
	• Classify lipids • Describe Biomedical significance of lipids	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Fatty acids	• Classify fatty acids	Should Know
	• Describe physical and chemical properties of fatty acids	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library	Nice to know

	• Practice principles of bioethics • Understand the curative and preventive health care measures	
Simple lipids	• Elaborate Structure and physical properties of Triglycerides	Should Know
	• Discuss Chemical properties of Triglycerides • Clinical significance	Should Know Must Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Compound lipids (Phospholipids, glycolipids, lipoproteins)	• Classify compound lipids • Discuss structure and functions of compound lipids • Interpret the clinical role of compound lipids	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Derived lipids	• Describe derived lipids	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Cholesterol	• Describe Structure and physical properties of Cholesterol • Discuss Chemical properties and functions • Interpret clinical findings of hypercholesterolemia	Should Know Must Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Prostaglandins	• Classify Prostaglandins • Describe functions and clinical significance of Prostaglandins. • Interpret the role of drugs in prostaglandin synthesis	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know

Introduction and classification of carbohydrates	• Classify carbohydrates • Explain different types of carbohydrates • Clinical significance	Should Know Must Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Isomerism, optical activity and mutarotation	• Discuss Different properties of carbohydrates (Isomerism, optical activity and mutarotation)	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Monosaccharide	• Classify monosaccharide • Describe chemical properties of monosaccharide • Interpret the clinical role of sorbitol, mannitol and cardiac glycosides	Should Know Must Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Disaccharides	• Describe Structure and functions of Individual sugars	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Homopolyssacharides	• Explain Structure, physical and chemical properties of homopolyssacharide and their biological importance.	Should Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
Heteropolysaccharides	• Explain Structure, physical and chemical properties of heteropolysaccharides and their biological importance.	Should Know

	• Apply the role of heteropolysaccharides in clinical cases	Must Know
	• Apply the strategic use of artificial intelligence in healthcare • Use HEC digital library • Practice principles of bioethics • Understand the curative and preventive health care measures	Nice to know
LDL& HDL	• Explain the composition, functions and clinical significance of LDL& HDL	Should Know
	• Illustrate the mechanism of reverse cholesterol transport	Should Know
Disorders of lipoprotein metabolism	• Classify and explain the disorders of lipoprotein metabolism. • (hyper & hypo lipoproteinemia)	Should Know Should Know
Fatty Liver & Adipose Tissue	• Interpret conditions leading to Fatty liver	Should Know
	• Describe metabolism of adipose tissue & Brown fat	Should Know
Disorders of lipoprotein metabolism	• Classify and explain the disorders of lipoprotein metabolism. • (hyper & hypo lipoproteinemia)	Should Know Should Know
Clinical importance of carbohydrates	• Define & classify • Explain Pathophysiology & clinical features	Must Know
Clinical importance of lipids	• Understand the definition, causes, and basic pathophysiology. • Identify key clinical features and the role of biochemical testing in its diagnosis.	Must Know
Obesity Ear Wax Impaction	• Understand the basic pathophysiology, types, and clinical features. • Identify symptoms and describe the basic methods of removal and prevention.	Must Know
Hypoglycemia	• Understand the definition, causes, and basic pathophysiology	Must Know
Clinical Importance of homopolysachhrides	• Describe the pathophysiology, types, and genetic basis	Must Know
Hypercholestremia	• Describe the pathophysiology, types, and Biochemical Basis	Must Know
Applied Biochemistry of Heteropolysachrides	• Explain the clinical features ,pathophysiology & Biochemical Basis.	Must Know
Clinical Role of prostaglandins	• Understand the definition, causes, and basic pathophysiology	Must Know

4. Special Senses:

Topic	Learning Objectives At the End of Lecture Students Should Be Able To	Calgary Gauge
Receptors and their classification	• Define receptors. • Classify Receptors	Should Know Should Know
Signal transduction G proteins	• Explain the structure and function of G proteins	Must Know
Signal transduction Second messenger system	• Describe different types of second messengers	Must Know
Neurotransmitters	• Explain synthesis & functions of neurotransmitters. • Discuss related clinical disorders	Must Know Must Know
Role of vitamin A in vision	• Explain the role of vitamin A in vision. • Discuss related clinical abnormalities	Nice to Know Nice to Know
Receptors & G proteins	• Explain different types of receptors and G proteins	Should Know
Neurotransmitters	• Discuss synthesis, functions & clinical significance of neurotransmitters	Must Know

5. Endocrinology Module:

Topic	Learning Objectives At The End Of Lecture Students Should Be Able To	Calgery Category
Classification and mechanism of action of hormones	• Classify hormones • Explain the mechanism of action of hormones	Must Know Must Know
Thyroxin	• Describe nature, formation and mechanism of action of thyroxin • Discuss related clinical disorders	Must Know Should Know
Parathyroid and Calcitonin	• Discuss role of various hormones acting on calcium and phosphate metabolism • Discuss related clinical disorders	Must Know Should Know
Adrenal cortical hormones	• Describe synthesis, mechanism of action and functions of aldosterone, cortisol and adrenal androgens • Discuss related clinical disorders	Must Know Should Know
Adrenal medullary hormones	• Describe mechanism of action and role of adrenal medullary hormones • Discuss related diseases	Must Know Should Know
Insulin and glucagon	• Explain formation, mechanism of action and role of insulin and glucagon • Discuss related diseases	Must Know Must Know
Blood glucose regulation	• Describe regulation of normal plasma glucose level • Explain hypoglycemia	Must Know Should Know
Classification of endocrine hormones,	• Classify Endocrine hormones	Must Know
	• Disscus the mechanism of action of endocrine hormones	Must Know
Adrenocortical Hormones	• Elaborate formation, functions & related disorders of adrenocortical hormones	Must Know
Classification & Mechanism of action of Endocrine Hormones	• Classify Endocrine Hormones • Discuss the Mechanism of action of various Endocrine Hormones	Must Know Must Know
Formation & Mechanism of action of Thyroid Hormone	• Elaborate the nature, formation, mechanism of action and related diseases of Thyroxin	Must Know

Synthesis & Mechanism of Action of Adrenocortical Hormones	• Describe synthesis, mechanism of action and functions of Aldosterone, Cortisol and Adrenal androgens • Discuss related clinical disorders • Describe mechanism of action and role of Adrenal Medullary Hormones • Discuss related diseases	Must Know Should Know Must Know Should Know
Synthesis & Mechanism of Action of Insulin & Glucagon	• Explain formation, mechanism of action and role of Insulin and Glucagon • Discuss related diseases	Must Know Must Know
Glucose Tolerance Test Curves Hypoglycemia Diabetic Ketoacidosis & Hyperosmolar Hyperglycemic State	• Normal & abnormal curves of glucose tolerance test and factors effecting it. Interpretation of GTT curves for Diabetes Mellitus • Hypoglycemia, Hyperglycemia & Diabetic ketoacidosis	Must Know Should Know
Classification & Mechanism of action of Endocrine Hormones	• Classify Endocrine Hormones • Discuss the Mechanism of action of various Endocrine Hormones	Must Know Must Know
Formation & Mechanism of action of Thyroid Hormone	• Elaborate the nature, formation, mechanism of action and related diseases of Thyroxin	Must Know
Synthesis & Mechanism of Action of Adrenocortical Hormones	• Describe synthesis, mechanism of action and functions of Aldosterone, Cortisol and Adrenal androgens • Discuss related clinical disorders • Describe mechanism of action and role of Adrenal Medullary Hormones • Discuss related diseases	Must Know Should Know Must Know Should Know
Synthesis & Mechanism of Action of Insulin & Glucagon	• Explain formation, mechanism of action and role of Insulin and Glucagon • Discuss related diseases	Must Know Must Know
Glucose Tolerance Test Curves Hypoglycemia Diabetic Ketoacidosis & Hyperosmolar Hyperglycemic State	• Normal & abnormal curves of glucose tolerance test and factors effecting it. Interpretation of GTT curves for Diabetes Mellitus • Hypoglycemia, Hyperglycemia & Diabetic ketoacidosis	Must Know Should Know
Estimation of Blood Glucose	• Perform estimation of glucose by spectrophotometer & Glucometer.	Must Know
GTT	• Explain the procedure of practical, normal & abnormal curves of glucose and factors effecting it Interpret the result of GTT	Should Know