RAWALPINDI MEDICAL UNIVERSITY RAWALPINDI

Department of Biochemistry

Biochemistry AV-OSPE Curriculum

First Year MBBS
Second Year MBBS

2025

1. Foundation Module:

Topic	Learning Objectives At the End Of Lecture Students Should Be Able To	Learning Domain	Calgary Guage	Learning Resources
Cell organelles				
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	C2 C2 C2 C2 C2 C3	Should know	Textbook of Lippincott 8 Edition https://youtube./apfESSx3g50?feature=shared
Cell membrane and transport across cell membrane				
Cell membrane	• Explain composition of cell membrane • Understand fluid mosaic model • Describe functions performed by each component	C2 C2 C2	Should know	Textbook of Lippincott 8 Edition https://youtube./ik9AcBcohA?feature=shared
Functions of cell membranes	• Discuss functions & importance of cell membrane	C2	Should know	Textbook of Lippincott 8 Edition
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	C2 C3	Should know	Textbook of Lippincott 8 Edition https://youtube./AE6s2xxdGoE?feature=shared
Physicochemical properties of cell				
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	C1 C2 C3	Should know	Textbook of Lippincott 8 Edition
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	C1 C2	Should know	Textbook of Lippincott 8 Edition
Donnan equilibrium, adsorption and ion exchange resins	• Define Donnan equilibrium, adsorption and ion exchange resins. • Describe their effects on tissue fluids and biochemical importance	C1 C2	Should know	Textbook of Lippincott 8 Edition https://youtube./qy8dk5iS1f0?feature=shared

Water and pH	• Define pH, Pka, body buffer • Discuss water distribution in the body • Understand dehydration and overhydration	C1 C2 C3	Should know	Textbook of Lippincott 8 Edition
Enzymes				
Enzymes Introduction	• Define Enzymes. • Explain general functions of enzymes. • Differentiate between coenzyme and cofactors	C1 C2 C2	Should know	Textbook of Lippincott 8 Edition
Mechanism of enzyme action	• Describe different mechanisms of enzyme action.	C2	Should know	Textbook of Lippincott 8 Edition https://youtube./EiMBsgNZh-M?feature=shared
Classification of enzymes	• Discuss different classes of Enzymes	C2	Should know	Textbook of Lippincott 8 Edition
Properties of Enzymes	• Elaborate the Properties of Enzymes such as specificity for substrate and stereo specificity.	C2	Should know	Textbook of Lippincott 8 Edition
Factors affecting Enzyme action	• Discuss different factors which increase or decrease the activity of enzymes	C2	Should know	Textbook of Lippincott 8 Edition https://youtube./EiMBsgNZh-M?feature=shared
Enzyme inhibitors	• Describe enzyme inhibitors and how the activity of the regulatory enzymes can be modulated for benefit of body	C2	Should know	Textbook of Lippincott 8 Edition
Enzyme Regulation	• Explain enzyme regulation	C2	Should know	Textbook of Lippincott 8 Edition
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.	C3 C3	Should know	Textbook of Lippincott 8 Edition https://youtube./EiMBsgNZh-M?feature=shared
Genetics & Cancer				
Nucleic acids chemistry	• Explain structure and biological importance of DNA, types of DNA • Differentiate between DNA &RNA • Explain structure, types and functions of RNA	C2 C2 C2	Should know	Textbook of Lippincott 8 Edition
Replication	• Describe mechanism of replication of prokaryotes & Eukaryotes	C2	Should know	Textbook of Lippincott 8 Edition
Transcription	• Describe mechanism of Transcription of prokaryotes & Eukaryotes	C2	Should know	Textbook of Lippincott 8 Edition https://youtube./EiMBsgNZh-M?feature=shared
Translation	• Discuss genetic code • Describe mechanism of Translation in prokaryotes & Eukaryotes • Illustrate mechanism of action of antibiotics at different stages of translation	C2 C2 C3	Should know	Textbook of Lippincott 8 Edition

DNA damage & Repair	• Describe mechanism of DNA damage & Repair • Apply knowledge of DNA repair mechanisms in related clinical cases	C2 C3	Should know	Textbook of Lippincott 8 Edition https://youtube./EiMBsgNZh-M?feature=shared
Mutations	• Describe different types of mutations with examples	C2	Should know	Textbook of Lippincott 8 Edition
PCR and Recombinant DNA technology	• Define PCR • Explain mechanism and indications of PCR • Discuss Recombinant DNA technology	C1 C2 C2	Should know	Textbook of Lippincott 8 Edition
Cancer	• Explain biochemical basis of cancer	C2	Should know	Textbook of Lippincott 8 Edition https://youtube./EiMBsgNZh-M?feature=shared

2. MSK 1 MODULE

Topic	Learning Objectives At the End of Lecture Students Should Be Able To	Learning Domain	Calgary Guage	Learning Resources
Calcium	• Classify Minerals • State Daily Requirements of Calcium in different conditions	C1 C2	Should Know	• Textbook of Lippincott 8th Edition https://youtu.be/tGTGUlVr0E8
	• Discuss Types & Sources of Calcium phosphate • Deficiency Disorders	C2 C2	Should Know Must know	
Copper	• Recall sources & daily requirements • Discuss their biochemical functions • Describe Deficiency Effects	C1 C2	Should Know Must know	• Textbook of Lippincott 8th Edition page # 449 https://youtu.be/T1o3mleNPZ4
Fluoride	• Elaborate Biochemical functions of Fluoride • Describe Deficiency Effects	C2 C1	Should Know Must Know	• Textbook of Lippincott 8th Edition page 455 https://www.youtube.com/shorts/wERoNwIq6nA?feature=share
Iodine	• Recall sources & daily requirements • Discuss their biochemical functions • Describe Deficiency Effects	C1 C2	Should Know Must know	• Textbook of Lippincott 8th Edition Page #452-453 • https://youtu.be/Ra_vr4swv5I
Vitamin A	• Enlist Sources of Vitamin A • Describe Biochemical functions of Vitamin A • Describe Deficiency Effects of Vitamin A • Explain Toxic Effects of Vitamin A	C2 C1	Should Know Should Know Must Know	• Textbook of Lippincott 8th Edition page # 435 https://youtu.be/Qsp7CEeOwCs
Rickets	• 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	C1 C2	Should Know Must Know	• Textbook of Lippincott 8th Edition page #439 https://youtu.be/HMYSys-T3Rs
	• Apply the strategic use of artificial intelligence in healthcare	C3	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	C1 C2 C2	Should Know Must know	• Textbook of Lippincott 8th Edition page# 428 https://youtu.be/DFt5XbxMqvI
Niacin	• Enlist Sources • Describe Biochemical functions • Explain Deficiency effects	C1 C2	Should Know Must Know	• Textbook of Lippincott 8th Edition page# 430 https://www.youtube.com/shorts/Kc5yXTWUvtQ?feature=share
Vitamin D	• Enlist Sources of Vit.D • Explain Steps of activation of Vit.D in the body • Describe Biochemical functions of Vit.D	C1	Should Know	Textbook of Lippincott 8th Edition page# 437 https://youtu.be/kVniUEIOpMM
Biomedical Ethics	• Principle of Biomedical Ethics • Clinical Ethics • Research Ethics	C2	Must Know	https://youtu.be/9zJoq7nq1Fc

3. MSK II MODULE

Topic	Learning Objectives At the end of lecture students should be able to	Calgery Model	Learning Domain	Learning Resources
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	C2 C2 C2	
Proteins	• Discuss Importance of proteins • Classify proteins • Describe Functions of proteins	Should Know Should Know Should Know	C1 C2 C2	Text book of Lippincot 8 Edition
Primary structure of proteins	• Describe Primary structure of protein • Discuss Peptide bond	Should Know Should Know	C2 C2	Text book of Lippincot 8 Edition
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	C1 C2 C2	Text book of Lippincot 8 Edition
Tertiary and quaternary structure	• Describe Tertiary and quaternary structure of proteins • Understand the forces stabilizing protein structure	Should Know Should Know	C2 C2	Text book of Lippincot 8 Edition
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	C2 C2 C3 C2	Text book of Lippincot 8 Edition
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	C2 C2 C2 C1 C3	Text book of Lippincot 8 Edition
Techniques for separation of proteins	• Describe Techniques for separation of proteins	Should Know	C2	Text book of Lippincot 8 Edition

Definition and Biological importance of lipids.	• Define lipids	Should Know	C1	
	• Classify lipids • Describe Biomedical significance of lipids	Should Know	C2 C2	Textbook of Lippincott 8th Eidtion
	• 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	C3	
Fatty acids	• Classify fatty acids	Should Know	C1	Textbook of Lippincott 8th Eidtion
	• Describe physical and chemical properties of fatty acids	Should Know	C2	
	• 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	C3	
Simple lipids	• Elaborate Structure and physical properties of Triglycerides	Should Know	C2	Textbook of Lippincott 8th Eidtion
	• Discuss Chemical properties of Triglycerides • Clinical significance	Should Know Must Know	C2 C3	
	• 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	C3	
Compound lipids (Phospholipids, glycolipids, lipoproteins)	• Classify compound lipids • Discuss structure and functions of compound lipids • Interpret the clinical role of compound lipids	Should Know	C2 C2 C3	Textbook of Lippincott 8th Eidtion
	• 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	C3	
Derived lipids	• Describe derived lipids	Should Know	C2	Textbook of Lippincott 8th Eidtion
	• 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	C3	
Cholesterol	• Describe Structure and physical properties of Cholesterol • Discuss Chemical properties and functions • Interpret clinical findings of hypercholesterolemia	Should Know Must Know	C2 C2 C3	Textbook of Lippincott 8th Eidtion
	• 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	C3	

Prostaglandins	• Classify Prostaglandins • Describe functions and clinical significance of Prostaglandins. • Interpret the role of drugs in prostaglandin synthesis	Should Know	C2 C2 C3	Textbook of Lippincott 8th Eidtion
	• 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	C3	
Introduction and classification of carbohydrates	• Classify carbohydrates • Explain different types of carbohydrates • Clinical significance	Should Know Must Know	C2 C2 C3	Textbook of Lippincott 8th Eidtion
	• 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	C3	
Isomerism, optical activity and mutarotation	• Discuss Different properties of carbohydrates (Isomerism, optical activity and mutarotation)	Should Know	C2	Textbook of Lippincott 8th Eidtion
	• 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	C3	
Monosaccharide	• Classify monosaccharide • Describe chemical properties of monosaccharide • Interpret the clinical role of sorbitol, mannitol and cardiac glycosides	Should Know Must Know	C2 C2 C3	Textbook of Lippincott 8th Eidtion
	• 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	C3	
Disaccharides	• Describe Structure and functions of Individual sugars	Should Know	C2	
	• 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	C3	Textbook of Lippincott 8th Eidtion
Homopolyssacharides	• Explain Structure, physical and chemical properties of homopolyssacharide and their biological importance.	Should Know	C2	Textbook of Lippincott 8th Eidtion
	• 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	C3	

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	C2 C3	Textbook of Lippincott 8th Eidtion
	• 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	C3	
Clinical importance of carbohydrates	• Define & classify • Explain Pathophysiology & clinical features	Must Know	C2	
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	C2	
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	C3	
Hypoglycemia	• Understand the definition, causes, and basic pathophysiology	Must Know	C3	
Clinical Importance of homopolysachhrides	• Describe the pathophysiology, types, and genetic basis	Must Know	C2	
Hypercholestremia	• Describe the pathophysiology, types, and Biochemical Basis	Must Know	C2	
Applied Biochemistry of Heteropolysachrides	• Explain the clinical features, pathophysiology & Biochemical Basis.	Must Know	C3	
Clinical Role of prostaglandins	• Understand the definition, causes, and basic pathophysiology	Must Know	C2	

4. BLOOD MODULE

Topics	Learning Objectives	Learning domain	Calgary Guage	Learning resources
Structure of hemoglobin and myoglobin	• Describe Structure of hemoglobin • Describe structure of myoglobin. • Discuss Biochemical roles of hemoglobin and myoglobin.	C2	Should know	• Lippincott Illustrated reviews of biochemistry 8th edition • https://doi.org/10.1016/j.bcmd.2017.10.006
Types of Hemoglobin	• Enlist various types of Hemoglobin. • Describe Importance of heme and globin components • Interpret importance of HbA1c in diagnosis of Diabetes	LC2	Should know	• Lippincott Illustrated reviews of biochemistry 8th edition • https://pubmed.ncbi.nlm.nih.gov/34200315/ •
Oxygen dissociation curve.	• Discuss Importance of oxygen dissociation curve. • Enlist various factors affecting the curve. •	C2 C3	• Should know	• Lippincott Illustrated reviews of biochemistry 8th edition • https://pubmed.ncbi.nlm.nih.gov/2650756/ •
Hemoglobinopathies	• Discuss hemoglobinopathies. • Enlist Types of thalassemia. • Discuss Familial counseling. • Elaborate Preventive measures.	C2 C3 C2	• Should know	• Lippincott Illustrated reviews of biochemistry 8th edition • https://pubmed.ncbi.nlm.nih.gov/30193516/
Heme synthesis	• Describe enzymatic regulation of heme synthesis	• C2	• Should know	• Lippincott Illustrated reviews of biochemistry 8th edition • https://www.sciencedirect.com/science/article/pii/S0891584999002233 •
Porphyria	• Discuss various types of porphyria	• C2	• Should know	• Lippincott Illustrated reviews of biochemistry 8th edition • https://pubmed.ncbi.nlm.nih.gov/20226990/ •
Breakdown of hemoglobin	• Elaborate steps in the breakdown of hemoglobin. • Describe Steps in synthesis of Bilirubin • Recall Normal level of S. Bilirubin.	• C2	• Should know	• Lippincott Illustrated reviews of biochemistry 8th edition • https://www.sciencedirect.com/science/article/pii/S0891584999002233 •
Jaundice	• Define jaundice. • Recall normal level of Bilirubin. • Enlist types of Jaundice. • Describe Biochemical tests to distinguish various types of jaundice. • Describe Physiological Jaundice	• C2 C3	• Should know	• Lippincott Illustrated reviews of biochemistry 8th edition (• https://pubmed.ncbi.nlm.nih.gov/14765767/ • https://www.youtube.com/watch?v=gIACp5js4MU •

Plasma proteins	• Describe plasma proteins. • Discuss Biochemical role of various plasma proteins. • Recall normal levels of plasma proteins • Illustrate Role of A/G ratio.	• C2 C3	• Should know	• Harpers Illustrated biochemistry 30th edition • http://ib.bioninja.com.au/options/option-d-human-physiology/d3-functions-of-the-liver/plasma-proteins.html
Acute phase proteins & Albumin	• Describe Role of albumin. • Discuss Role of C- reactive protein.	C2 C3 C2	• Should know	• Harpers Illustrated biochemistry 30th edition • https://www.youtube.com/watch?v=xMSEl1ad0z8 •
Haptoglobin and transferrin	• Describe Structure of Haptoglobin and transferrin. • Discuss biochemical Role of Haptoglobin and transferrin.	C2 C3	• Should know	• Harpers Illustrated biochemistry 30th edition (• https://pubmed.ncbi.nlm.nih.gov/23016887/ •
Ferritin and hemosiderin	• Describe biochemical role of ferritin and hemosiderin. • Describe Hemosiderosis.	C2	• Should know	• Harpers Illustrated biochemistry 30th edition • http://www.vivo.colostate.edu/hbooks/pathphys/topics/ferritin.html
Ceruloplasmin.	• Describe biochemical role of ceruloplasmin. • Discuss Wilson's disease.	C2 C3	• Should know	• Harpers Illustrated biochemistry 30th edition • https://pubmed.ncbi.nlm.nih.gov/12055353/
Antiproteases and amyloidosis	• Describe biochemical role of antiproteases and amyloidosis.	C2 C3	• Should know	• Harpers Illustrated biochemistry 30th edition • https://pubmed.ncbi.nlm.nih.gov/31986086/
Immunoglobulins	• Describe Structure of Immunoglobulin. • Discuss biochemical role of various Immunoglobulin. • Elaborate Class switching.	C2 C3	• Should know	• Harpers Illustrated biochemistry 30th edition) • https://pubmed.ncbi.nlm.nih.gov/4188929/
AIDs	• Define AIDs • Describe Immunological defects in AIDs. • Discuss various preventive measures.	C2 C3	• Should know	• Mushtaq volume II, 7th edition • https://pubmed.ncbi.nlm.nih.gov/3277764/
Folic acid.	• Recall Sources of folic acid. • Discuss deficiency effects of folic acid • Describe biochemical role of folic acid. • Recall Recommended Dietary allowance.	C2 C3	• Should know	• Lippincott Illustrated reviews of biochemistry 8th edition () • https://pubmed.ncbi.nlm.nih.gov/29777755/
Vitamin B12	• Recall Sources of Vitamin B12 • Describe biochemical role of vitamin B12 • Discuss Deficiency effects of B12	C2 C3	• Should know	• Lippincott Illustrated reviews of biochemistry 8th edition • https://pubmed.ncbi.nlm.nih.gov/25824066/

Iron	• Recall Sources of iron. • Describe Transport and absorption of iron. • Discuss hyper and hypo functions of iron.	C2 C3	• Should know	• Lippincott Illustrated reviews of biochemistry 8th edition • https://pubmed.ncbi.nlm.nih.gov/34373750/ • https://www.youtube.com/watch?v=vSkb0kDacjs

5. CVS MODULE

Topic	Learning Objectives	Learning Domain	Calgary Category	Learning Resources
Carbohydrates	Define and classify. Explain the types Discuss Properties (Isomerism, optical activity, mutarotation) Discuss the Clinical Significance.	C1 C1 C2 C3	Should Know Should Know Should Know Must Know	https://www.youtube.com/watch?v=miA9K6Gj0Pw • Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) • Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) • Google Images • Audiovisual Websites
Lipids	Define and classify. Explain the types Discuss the Clinical Significance.	C1 C1 C2	Should Know Should Know Must Know	https://www.youtube.com/watch?v=7jx3kRVmfXw • Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) • Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) • Google Images Audiovisual Websites
Monosaccharides and Disaccharides	Classify Describe the Chemical properties Explain Structure and Functions of Individual sugars Interpret the clinical role of sorbitol, mannitol and cardiac glycosides	C2 C1 C2	 Should Know Should know Must Know	https://www.youtube.com/watch?v=5H8SKas45Rk • Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) • Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) • Google Images Audiovisual Websites
Polysaccharides (Homopolysaccharides and Heteropolysaccharides)	Explain the Biochemical Structure, Physical and Chemical Properties Discuss the Biomedical Importance Apply the role in Clinical cases	C1 C2 C3	Should Know Must Know Nice to Know	https://www.youtube.com/watch?v=NMcvPefNzt4 https://www.youtube.com/watch?v=ugZEEwICTKc • Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) • Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) • Google Images Audiovisual Websites
Fatty Acids and Cholesterol	Define and classify. Explain the types Discuss the Clinical Significance. Discuss Related Clinical Disorders	C1 C1 C2 C3	Should Know Should Know Must Know Nice to Know	**https://www.youtube.com/watch?v=brs2nMubr84** **https://www.youtube.com/watch?v=bx99qQoHk5I** • Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) • Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) • Google Images Audiovisual Websites
Simple Lipids	Explain the Biochemical Structure, Types, physical properties and functions.	C1	Should Know	https://www.youtube.com/watch?v=7jx3kRVmfXw • Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) • Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images)

				• Google Images Audiovisual Websites
Compound Lipids	Explain the Biochemical Structure, Types, physical properties and functions. Interpret Clinical Role	C1 C3	Should know Nice to know	https://www.youtube.com/watch?v=v4critxBJ7c • Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) • Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) • Google Images Audiovisual Websites
Prostaglandins	Explain the Biochemical Structure, Types, physical properties and functions. Interpret Clinical Role of drugs in PG synthesis.	C1 C2	Should Know Must Know	https://www.youtube.com/watch?v=KgVXqlwjDYk • Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) • Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) • Google Images Audiovisual Websites
Biomedical Ethics	• Introduction to Biomedical Ethics • Foundational Ethical Theories and Principles • Informed Consent • Confidentiality and Privacy • Ethical Decision-Making in Clinical Practice • End-of-Life Care and Euthanasia • Human Experimentation and Research Ethics • Ethical Issues in Genetics and Biotechnology • Resource Allocation and Healthcare Access • Cultural and Religious Considerations in Biomedical Ethics • Professionalism and Ethical Responsibilities of Healthcare Providers • Legal and Policy Aspects of Biomedical Ethics • Emerging Ethical Challenges in Medicine and Healthcare	C3	Nice to Know	https://www.youtube.com/watch?v=axX9xDKPny4 • Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) • Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) • Google Images Audiovisual Websites

6. Respiratory Module

Topic	Learning Objectives At the end of lecture students should be able to	Learning Domain	Calgary Gage	Learning Resources
PH And PKA	• Define of pH and pKa • Elaborate Henderson Hasselbalch equation. • Describe Measurement of pH by equation.	C1 C2 C2	Must Know Should Know Should Know	Lippincott Illustrated Reviews Biochemistry, Eighth Edition Chapter 1, Page 6, 7 Google Images Audiovisual Websites https://www.sciencedirect.com/science/article/abs/pii/S037851732300203X
Body buffers	• Define buffers. • Discuss Mechanism of various buffers in maintenance of blood pH.	C1 C2	Must Know Must Know	Lippincott Illustrated Reviews Biochemistry, Eighth Edition Chapter 1, Page 7-11 Google Images Audiovisual Websites https://pubmed.ncbi.nlm.nih.gov/38752284/
Electron transportchain	• Describe Components/ complexes of electron transport chain. • Enlist Enzymes and Co-enzymes of each component. • Enlist Inhibitors of these complexes.	C2 C1 C1	Must Know Must Know Should know	Lippincott Illustrated Reviews Biochemistry, Eighth Edition Chap 6, Pg 80-85 Google Images Audiovisual Websites https://www.ncbi.nlm.nih.gov/books/NBK526105/
Mechanisms of energy generation inthe body.	• Discuss various mechanisms of energy generation in the body. • Discuss Oxidative phosphorylation. • Describe uncouplers of ETC.	C2 C2 C2	Must Know Must Know Should know	Lippincott Illustrated Reviews Biochemistry, Eighth Edition Chap 6, Pg 77-88 Google Images Audiovisual Websites https://www.frontiersin.org/journals/molecular-biosciences/articles/10.3389/fmolb.2024.1402910/full
Energy change.	• Define the terms: ○ Free energy change. ○ Standard free energy. • Describe various sources of electrons.	C1 C2	Must Know Should know	Lippincott Illustrated Reviews Biochemistry, Eighth Edition Chap 6, Pg 77-80 Google Images Audiovisual Websites https://www.researchgate.net/publication/221750020_Balanced_Biochemical_Reactions_A_New_Approach_to_Unify_Chemical_and_Biochemical_Thermodynamics
Vitamins B5, B7	• Define Vitamins • Discuss the distribution, daily requirement and deficiency ofvitamins • Clinical indication of vitamins	C1 C2 C3	Must Know Must Know Should know	Lippincott Illustrated Reviews Biochemistry, Eighth Edition Chap 28, Pg 431, 432 Google Images Audiovisual Websites https://www.ncbi.nlm.nih.gov/books/NBK538510/
Xenobiotics	• Define xenobiotics • Discuss its metabolism and its role in environment	C1 C2	Must Know Should know	Harper's Illustrated Biochemistry, 32nd Edition, pg 556 – 559 Google Images Audiovisual Websites https://www.sciencedirect.com/science/article/abs/pii/B9780323

				951203000075
Body Buffers	• Define buffers. • Discuss Mechanism of various buffers in maintenance of blood PH.	C1 C2	Must Know Must Know	Lippincott Illustrated Reviews Biochemistry, Eighth Edition Chap 1, Pg 6-12 Google Images Audiovisual Websites https://www.researchgate.net/publication/368402312_The_Role_of_Buffers_in_Establishing_a_Balance_of_Homeostasis_and_Maintaining_Health
HH equation	• Define of pH and pKa • Elaborate Henderson Hasselbalch equation. • Describe Measurement of pH by equation.	C1 C2 C2	Must Know Must Know Should know	Lippincott Illustrated Reviews Biochemistry, Eighth Edition Chap 1, Pg 6-7 Google Images Audiovisual Websites https://www.researchgate.net/publication/231265409_The_Henderson-Hasselbalch_Equation_Its_History_and_Limitations
Role of ChemicalBuffers in pH regulation	• Define chemical buffers. • Discuss Mechanism of various chemical buffers in maintenance of blood pH. • Elaborate the carbonic acid-bicarbonate buffer system	C1 C2 C2	Must Know Must Know Should know	Lippincott Illustrated Reviews Biochemistry, Eighth Edition Chap 1, Pg 6-12 Google Images Audiovisual Websites https://www.ncbi.nlm.nih.gov/books/NBK507807/
pH meter and physiological buffers in pH regulation	• Measure the pH of solution in Pharmaceutical, Chemical, and Biotechnology Industry • Elaborate the Bicarbonate and Phosphate system of Buffers and Intracellular and Extracellular proteins	C2 C1	Should know Must Know	Lippincott Illustrated Reviews Biochemistry, Eighth Edition Chap 1, Pg 5-11 Google Images Audiovisual Websites https://www.mdpi.com/1424-8220/24/17/5751
Vitamin Pyridoxine	• Discuss Vitamin B6, used as a Dietary Supplement • Describe its Deficiency and related Clinical Disorders	C2 C2	Must Know Should know	Lippincott Illustrated Reviews Biochemistry, Eighth Edition Chap 28, Pg 428 Google Images Audiovisual Websites https://www.ncbi.nlm.nih.gov/books/NBK557436/

Second Year MBBS:

1. GIT Module:

Topic	Learning Objectives At the End of Assessment Students Should be able to	Learning Domain	Calgary Gauge	Learning Resources
Glycolysis	• Steps of Glycolysis • Regulation of the Committed Steps • Energy calculation in Anaerobic Glycolysis	C2 C2 C2	Should know	Lippincott Illustrated reviews of biochemistry 8th edition https://youtu.be/LiR0AlwDK7E?si=lAWdJUTlGwETfMWy
Glycogenolysis	• Explain synthesis and breakdown of glycogen • Discuss glycogen storage diseases	C2	Should know	Text Book of Harper,32 edition https://youtube.com/shorts/AIftX1xZsaA?si=mI_1nO1a6-No3HZU
Gluconeogenesis	• Understand the synthesis of glucose from non-carbohydrate sources and their pathways	C2 C2 C2	Should know	Text Book of Harper,32 edition https://youtu.be/u-WXvNPxqvM?si=uwZGTKG4xFT_FLpw
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	C2 C3	Should know	Lippincott Illustrated reviews of biochemistry 8th edition https://youtu.be/u-WXvNPxqvM?si=uwZGTKG4xFT_FLpw
Malnutrition	• Define and explain different forms of malnutrition	C2	Nice to know	Lippincott Illustrated reviews of biochemistry 8th edition https://youtu.be/vtW5ESe7ypI?si=77O5qZdRrGykNM4P
Bile and Pancreatic Juice	• Describe composition, function, formation of bile and related disorders • Describe composition, function and formation of pancreatic juice and related disorder	C2 C2	Should know	Text Book of Harper,32 edition https://youtu.be/ajK0Zo2qjrY?si=1txFZg-LIdDa5DBg
Jaundice and LFTs	• Describe different enzymes involved in LFTs	C2 C2	Nice to know	Text Book of Harper,32 edition https://youtu.be/GpqK45W96uU?si=0xKVJ9BCKMYtJPTm
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	C2 C3	Must know	Text Book of Harper,32 edition https://youtu.be/u-WXvNPxqvM?si=uwZGTKG4xFT_FLpw
Glycogen storage diseases	• Describe the sign and symptoms and deficient enzymes of glycogen storage diseases	C3	Nice to know	Text Book of Harper,32 edition https://youtu.be/ND1yWmJejEg?si=30hanUMCCmvr9mcy
Biomedical ethics	• Explain biomedical ethics	C2		https://youtu.be/w9Uf2NCN5gc?si=ZvgGsQUgRKZxdVNq

2. Renal module:

Topic	Learning Objectives At The End Of Lecture Students Should Be Able To	Learning Domain	Calgary Guage	Learning resources
Introduction to protein metabolism	• Understand protein turn-over, amino acid pool and entry of amino acid into cell	C2	Should know	Textbook of Lippincott 8 Edition https://pubmed.ncbi.nlm.nih.gov/25824066/
Nitrogen balance	• Describe positive and negative nitrogen balance	C2	Should know	Textbook of Lippincott 8 Edition https://pubmed.ncbi.nlm.nih.gov/34373750/ https://www.youtube.com/watch?v=vSkb0kDacjs
General reactions of amino acids	• Discuss reactions of amino acids • Interpret the clinical importance of transaminases	C2 C3	Should know	Textbook of Lippincott 8 Edition
Metabolism of ammonia	• Explain sources of NH_3 formation and its transport • Discuss causes and effects of Hyperammonemia • Explain mechanism of ammonia toxicity	C2 C3 C2	Should know	Textbook of Lippincott 8 Edition https://pubmed.ncbi.nlm.nih.gov/29777755/
Urea cycle	• Describe the location, steps and regulation of Urea cycle	C2	Should know	Textbook of Lippincott 8 Edition https://pubmed.ncbi.nlm.nih.gov/31986086/
Disorders of urea cycle	• Describe Disorders of the urea cycle	C2	Should know	Textbook of Lippincott 8 Edition https://pubmed.ncbi.nlm.nih.gov/4188929/
Metabolism of glycine	• Explain Glycine metabolism and related disease	C2	Should know	Textbook of Lippincott 8 Edition https://pubmed.ncbi.nlm.nih.gov/23016887/
Metabolism of phenyl alanine and tyrosine	• Explain Phenyl alanine & tyrosine metabolism • Discuss related inherited disorders	C2 C3	Should know	Textbook of Lippincott 8 Edition http://www.vivo.colostate.edu/hbooks/pathphys/topics/ferritin.html
Metabolism of Tryptophan	• Explain Tryptophan metabolism • Discuss related inherited disorders	C2 C3	Should know	Textbook of Lippincott 8 Edition https://www.youtube.com/watch?v=xMSEl1ad0z8
Metabolism of methionine	• Describe metabolism of sulpher containing amino acids • Discuss related disorders	C2 C3	Should know	Textbook of Lippincott 8 Edition https://pubmed.ncbi.nlm.nih.gov/14765767/ https://www.youtube.com/watch?v=gIACp5js4MU
Metabolism of branched chain amino acids	• Explain Metabolism of branched chain amino acids • Discuss related inherited disorders	C2 C3	Should know	Textbook of Lippincott 8 Edition
Metabolism of polyamines	• Discuss Synthesis of polyamines and their clinical significance	C2	Should know	Textbook of Lippincott 8 Edition https://pubmed.ncbi.nlm.nih.gov/20226990/

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	C2 C3 C2	Should know	Textbook of Lippincott 8 Edition https://www.sciencedirect.com/science/article/pii/S0891584999002233
Water	• Explain Distribution of water in different compartments of body • Interpret Dehydration & over hydration	C2 C3	Should know	Textbook of Lippincott 8 Edition https://pubmed.ncbi.nlm.nih.gov/30193516/
Electrolytes Sodium (Na)	• Describe Daily requirements, sources and functions of sodium • Explain causes and effects of hyponatremia & hypernatremia	C2 C3	Should know	Textbook of Lippincott 8 Edition
Potassium	• Describe Daily requirements, sources and functions of potassium • Explain causes and effects of hypokalemia & hyperkalemia	C2 C3	Should know	Textbook of Lippincott 8 Edition https://pubmed.ncbi.nlm.nih.gov/30193516/
Chloride (Cl) & Bicarbonate (HCO_3)	• Describe Daily requirements, sources, functions & their deficiency and toxic effects on body	C2	Should know	Textbook of Lippincott 8 Edition https://www.sciencedirect.com/science/article/pii/S0891584999002233

3. Reproduction

Topic	Learning Objectives At the End of Assessment Students Should be able to	Learning Domain	Calgary Guage	Learning Resources
Digestion of Nucleic Acid	**Identify Enzymes:** Describe the key enzymes involved in nucleic acid digestion, including DNase and RNase. **Mechanism of Digestion:** Explain the step-by-step process of DNA and RNA digestion in the gastrointestinal tract.	C2 C2 C2	Should know	Lippincott Illustrated reviews of biochemistry 8th edition https://youtu.be/A9KUAJFRIus?si=VhHCO_srlxhEPVOI
GOUT	**Definition and Pathophysiology:** Explain the pathophysiology of gout, including the role of hyperuricemia and urate crystal formation. **Etiology:** Identify the primary and secondary causes of hyperuricemia leading to gout.	C2	Should know	Text Book of Harper,32 edition https://youtu.be/SH_ceFaKLA8?si=NuacXQLFf7CK5UHq
GENE Therapy	**Definition and Concept:** Explain the basic concept and definition of gene therapy as a therapeutic approach. **Types of Gene Therapy:** Differentiate between somatic and germline gene therapy and their implications.	C2 C2 C2	Should know	Text Book of Harper,32 edition https://youtu.be/-N_DKD0ahtg?si=goEvkD5iDIOXGAoH
Arthrocentesis	● **Definition and Indications:** Define arthrocentesis and identify its indications, such as diagnosing and treating joint disorders. ● **Anatomy and Site Selection:** Understand the anatomy of major joints and appropriate sites for performing arthrocentesis.	C2 C3	Should know	Lippincott Illustrated reviews of biochemistry 8th edition https://youtu.be/ikXvLLlpoas?si=UsVfg8tERVeNw06N
GENE Expression	**Definition and Overview:** Define gene expression and explain its significance in cellular function and phenotype determination. **Stages of Gene Expression:** Describe the key stages of gene expression, including transcription, RNA processing, translation, and post-translational modifications.	C2	Nice to know	Lippincott Illustrated reviews of biochemistry 8th edition https://youtu.be/ikXvLLlpoas?si=UsVfg8tERVeNw06N
DNA to Protein Synthesis	● **DNA Structure and Function:** Understand the structure of DNA and its role as the genetic material encoding instructions for protein synthesis. ● **Transcription Process:** Describe the process of transcription, including the roles of RNA polymerase, promoters, and transcription factors in synthesizing mRNA from DNA.	C2 C2	Should know	Text Book of Harper,32 edition https://youtu.be/gG7uCskUOrA?si=T0SJ0EzjR7c-ieaz

Estrogen	**Definition and Types:** Define estrogen and identify the three main types: estrone, estradiol, and estriol. **Synthesis and Secretion:** Explain the biosynthesis of estrogen, including its production in the ovaries, adrenal glands, and placenta.	C2 C2	Nice to know	Text Book of Harper,32 edition https://youtu.be/Mc5iK0AtGNc?si=_gtogOeQB7HY9yjV
Purine Degradation	**Overview of Purine Metabolism:** Understand the basic pathway of purine metabolism and the conversion of purines to their end products. **Purine Degradation Pathway:** Describe the steps of purine degradation, including the breakdown of AMP, GMP, and their conversion to uric acid.	C2 C3	Must know	Text Book of Harper,32 edition https://youtu.be/JnwjBTlywwk?si=Abixv22ZVqqNED-9
Testosterone	**Definition and Types:** Define testosterone and identify its primary forms, including free testosterone and testosterone bound to sex hormone-binding globulin (SHBG). **Synthesis and Secretion:** Describe the biosynthesis of testosterone in the testes, adrenal glands, and its precursor role in females.	C3	Nice to know	Text Book of Harper,32 edition https://youtu.be/djqqao2Uebo?si=J2a1jPdrZX72WJwr
Biomedical ethics	**Introduction to Biomedical Ethics:** Define biomedical ethics and explain its importance in guiding decision-making in medical practice and research. **Ethical Principles:** Describe the four primary ethical principles in biomedical ethics: autonomy, beneficence, nonmaleficence, and justice.	C2		https://youtu.be/qgefxRT80M0?si=0x4p3MENWota1Oon

4. CNS

Topic	Learning Objectives At the end of lecture students should be able to	Learning Domain	Calgary Guage	Learning Resources
Triglyceride Metabolism, Fatty acid transport	• Describe synthesis & breakdown of TAGs and factors affecting it • Explain entry of fatty acid into mitochondria (carnitine shuttle)	C2 C2	Must know Must know	• Lippincott Illustrated Reviews Biochemistry Eighth Edition Chapter 16 page 206- 212 • Use digital library • Google Images • Audiovisual Websites • https://pmc.ncbi.nlm.nih.gov/articles/PMC10998004/
Oxidation of fatty acids	• Describe steps, enzymes, energy calculations of β- oxidation of saturated fatty acid (Odd + Even) • Discuss other types of oxidations and related disorders	C2 C3	Must know Should know	• Lippincott Illustrated Reviews Biochemistry Eighth Edition Chapter 16 page 210- 216 • Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) pg 208,209 • Use digital library • Google Images • Audiovisual Websites • https://ninjanerd.org • https://www.ncbi.nlm.nih.gov/books/NBK556002/
Fatty acid synthesis	• Explain the steps, regulation and related diseases of fatty acid synthesis	C2	Must know	• Lippincott Illustrated Reviews Biochemistry Eighth Edition Chapter 16 page 203- 209 • Use digital library • Google Images • Audiovisual Websites • https://www.sciencedirect.com/science/article/pii/S266732582400373X
Cholesterol Synthesis and its regulation	• Describe the steps, regulation and related disorders of Cholesterol Synthesis	C2	Must know	• Lippincott Illustrated Reviews Biochemistry Eighth Edition Chapter 18 page 244- 249 • Use digital library • Google Images • Audiovisual Websites • https://youtu.be/y9zsDFdMvZY
Plasma Cholesterol level	• Recall normal Plasma Cholesterol level and factors controlling it • Discuss related clinical abnormalities including IHD	C2 C3	Must know Should know	• Lippincott Illustrated Reviews Biochemistry Eighth Edition Chapter 18 page 243, 253 • Use digital library • Google Images • Audiovisual Websites • https://www.ncbi.nlm.nih.gov/books/NBK513326/
Ketone bodies metabolism	• Explain the synthesis, Interconversion and breakdown of Ketone bodies. • Regulation of Ketogenesis, Ketolysis • Describe the Related Diseases (ketoacidosis)	C2 C2 C3	Must know Must know Should know	• Lippincott Illustrated Reviews Biochemistry Eighth Edition Chapter 16 page 216, 218 • Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) pg 207, 210, 211 • Use digital library

				• Google Images • Audiovisual Websites • https://youtu.be/GuSqOsm3QV8
Metabolism of Glycerophospholipid	Describe the steps of biosynthesis of Glycerophospholipids with its regulation and clinical significance	C2 C3	Must know Should know	• Lippincott Illustrated Reviews Biochemistry Eighth Edition Chapter 17 page 230 - 235 • Use digital library • Google Images • Audiovisual Websites • https://www.sciencedirect.com/science/article/abs/pii/S0304389424014493
Metabolism of Sphingophospholipids	Explain the steps of biosynthesis of sphingophospholipids with its regulation Clinical significance Respiratory Distress Syndrome	C2 C3 C3	Should know	• Lippincott Illustrated Reviews Biochemistry Eighth Edition Chapter 17 page 229 - 232 • Use digital library • Google Images • Audiovisual Websites • https://www.frontiersin.org/journals/endocrinology/articles/10.3389/fendo.2024.1400961/full
Introduction to Lipoproteins	Discuss the functions and roll of Lipoproteins & apolipoprotein	C2	Must know	• Lippincott Illustrated Reviews Biochemistry Eighth Edition Chapter 18 page 253 - 262 • Use digital library • Google Images • Audiovisual Websites • https://pubmed.ncbi.nlm.nih.gov/39465476/
Disorders of lipoprotein metabolism	• Classify and explain the disorders of lipoprotein metabolism. (hyper & hypo lipoproteinemia)	C3 C3	Must know	• Lippincott Illustrated Reviews Biochemistry Eighth Edition Chapter 18 page 253 - 262 • Use digital library • Google Images • Audiovisual Websites • https://www.mdpi.com/2072-6643/16/13/2156
Fatty Liver & Adipose Tissue	Interpret conditions leading to Fatty liver • Describe metabolism of adipose tissue & Brown fat	C3 C3	Should know	• Lippincott Illustrated Reviews Biochemistry Eighth Edition Chapter 18 page 261- 262 • Use digital library • Google Images • Audiovisual Websites • https://www.nature.com/articles/s41598-024-70481-9
Lipoprotein (VLDL, LDL)	Explain synthesis, functions & clinical significance of VLDL, LDL	C3	Must know	• Lippincott Illustrated Reviews Biochemistry Eighth Edition Chapter 18 page 256 – 262 • Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) • Use digital library • Google Images

				• Audiovisual Websites • https://www.ncbi.nlm.nih.gov/books/NBK553193/
Chylomicron metabolism	Describe synthesis of chylomicron, its breakdown and factors affecting it	C2	Must know	• Lippincott Illustrated Reviews Biochemistry Eighth Edition Chapter 18 page 252 - 256 • Use digital library • Google Images • Audiovisual Websites https://www.ncbi.nlm.nih.gov/books/NBK305896/

5. Special Senses:

6. Topic	Learning Objectives	Learning Domain	Calgary Gauge	Learning Resources
Cell Communication & Signal Tranduction	Define receptors. Classify Receptors Types of Cell communivation	C1	Should Know	**https://youtu.be/pdYxaS6r6yg.**
Signal transduction G proteins	Explain the structure and function of G proteins	C2	Should Know	https://youtu.be/Glu_T6DQuLU
Second messenger system	Describe different types of second messengers	C2	Should Know	**https://youtu.be/yHItzSs2JGI**
Neurotransmitters	Explain synthesis & functions of neurotransmitters. Discuss related clinical disorders	C2 C3	Should Know Nice Know	https://youtu.be/p5zFgT4aofA https://youtu.be/OTz_2AJJh6o **https://youtu.be/FHNP4oPiAPE** **https://youtu.be/FHNP4oPiAPE**
Parkinson's Disease	Explain Biochemical Basis Explain Clinicicsl features	C3	Must Know	**https://youtu.be/0-t4RTQ0EsM**
Vibrio Cholera	Explain Biochemical Basis Explain Clinicicsl features	C2 C3	Should Know Must Know	https://youtu.be/jG1VNSCsP5Q
Biomedical Ethics	Explain Clinical Ethics	C2	Must Know	https://youtu.be/E4mtNrOLKgo

7. Endocrinology Module:

Topic	Learning Objectives	Learning Domain	Calgary Category	Learning Resources
Hormones	Define and classify. Explain the synthesis of different hormones Explain the MOA.	C1 C2 C2	Should Know Should Know Must Know	https://www.youtube.com/watch?v=v-hHIACJ9SE https://www.youtube.com/watch?v=yBVi0p3hmKQ Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) Google Images Audiovisual Websites
Thyroid	Explain the Synthesis, Biochemical Structure and MOA Discuss Related Clinical Disorders	C2 C3	Should Know	https://www.youtube.com/watch?v=1faCWw13kMw Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) Google Images Audiovisual Websites
Parathyroid and Calcitonin	Explain the Synthesis, Biochemical Structure and MOA Discuss Related Clinical Disorders	C2 C3	Should Know	https://www.youtube.com/watch?v=_1WgpVbpgeo Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) Google Images Audiovisual Websites
Adreno-cortical Hormones	Explain the Synthesis, Biochemical Structure and MOA Discuss Related Clinical Disorders	C2 C3	Must Know	https://www.youtube.com/watch?v=v-jUwEpIzkE Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) Google Images Audiovisual Websites
Adrenal Medullary Hormones	Explain the Synthesis, Biochemical Structure and MOA Discuss Related Clinical Disorders	C2 C3	Should Know Must Know	**https://www.youtube.com/watch?v=0YqRgObApF0&t=29s** Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) Google Images Audiovisual Websites
Insulin and Glucagon	Explain the Synthesis, Biochemical Structure and MOA Discuss Related Clinical Disorders	C2 C3		https://www.youtube.com/watch?v=KunJbPF9iSk https://www.youtube.com/watch?v=ZwGdW2YZ9W4 Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) Google Images Audiovisual Websites

Endocrine Imbalance	Physiology of the Endocrine System Common Endocrine Disorders Causes and Pathophysiology of Endocrine Imbalance Clinical Symptoms and Diagnosis Treatment and Management Strategies	C2 C2 C3 C3 C3	Must Know Must Know Nice to know Nice to know Nice to know	https://www.youtube.com/watch?v=NwBzGfKY_gE&t=113s Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) Google Images Audiovisual Websites
Biomedical Ethics	Introduction to Biomedical Ethics Foundational Ethical Theories and Principles Informed Consent Confidentiality and Privacy Ethical Decision-Making in Clinical Practice End-of-Life Care and Euthanasia Human Experimentation and Research Ethics Ethical Issues in Genetics and Biotechnology Resource Allocation and Healthcare Access Cultural and Religious Considerations in Biomedical Ethics Professionalism and Ethical Responsibilities of Healthcare Providers Legal and Policy Aspects of Biomedical Ethics Emerging Ethical Challenges in Medicine and Healthcare	C3	Nice to Know	https://www.youtube.com/watch?v=2sGoUYfb9h8 Lippincott illustrated Reviews of Biochemistry 8th Edition (Diagrams, tables, images) Harper's textbook of Biochemistry 32Nd edition (Diagrams, tables, images) Google Images Audiovisual Websites