RAWALPINDI MEDICAL UNIVERSITY RAWALPINDI

Department of Biochemistry

Biochemistry Self-Directed Learning (SDL) Curriculum

First Year MBBS
Second Year MBBS

2025

First Year MBBS

1. FOUNDATION MODULE

Biochemistry Self Directed Learning (SDL)		
Topics Of SDL	Learning Objectives	Learning resources
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
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)
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)

2. MSK-I MODULE

Topics	LearningObjective	References
Hypercalcemia	• Discuss causes of Hypercalcemia • Explain Biochemical Basis • Describe effects of Hypercalcemia	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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

Topics Of SDL	Learning Objectives	Learning resources
Disorder related to collagen synthesis	• Describe structure of collagen • Explain synthesis of collagen • Explain disorder related to collagen	• Text Book of Lippincott 8th Edition (chapter 02) • https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/gonad-function • Use digital library • https://www.ncbi.nlm.nih.gov/books/NBK29/
Clinical Aspect of elastin	• Describe structure of elastin • Describe disorder related to elastic	• Text Book of Lippincott 8th Edition (chapter 02) • https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/gonad-functionn • Use digital library • https://www.ncbi.nlm.nih.gov/books/NBK29/
Applied aspect of function of protein	• Describe functions of protein and their importance	• Text Book of Lippincott 8th Edition (chapter 02) • https://www.youtube.com/watch?v=VXWyWzbigrg • Use digital library • https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3243375/
Protein misfolding disorder	• Discuss folding of technique • Interpret clinical aspects of protein misfolding	• Text Book of Lippincott 8th Edition (chapter 02) • https://www.sciencedirect.com/topics/medicine-and-dentistry/purine-metabolism-disorder • https://www.youtube.com/watch?v=e2KFVvI8Akk • Use digital library • https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4215161/
Applied Aspect of protein denaturation	• Discuss denaturation of protein	• Text Book of Lippincott 8th Edition (chapter 02) • https://www.cliffsnotes.com/study-guides/biology/biochemistry-ii/purines-and-pyrimidines/pyrimidine-metabolism
Importance of various classes of protein	• Discuss importance of protein • Classify protein	• Text Book of Lippincott 8th Edition (chapter 02) • https://www.healio.com/hematology-oncology/learn-genomics/genomics-primer/regulation-of-gene-expression-in-eukaryotes
Applied Aspects of protein separation Techniques	• Describe techniques for separation of protein	• Text Book of Lippincott 8th Edition (chapter 02) • https://www.youtube.com/watch?v=J9jhg90A7Lw

4. BLOOD & IMMUNITY MODULE

Topics Of SDL	Learning Objectives	Learning resources
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)	Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 03, page 25-28) https://doi.org/10.1016/j.bcmd.2017.10.006 https://www.youtube.com/watch?v=Qv-KExGKAYw Use digital library https://chemed.chem.purdue.edu/genchem/topicreview/bp/1biochem/blood3.html Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 03, page 33-34) https://pubmed.ncbi.nlm.nih.gov/34200315/ ,https://www.youtube.com/@DrAishwaryaKelkar Use digital library https://www.ucsfhealth.org/medical-tests/hemoglobin-electrophoresis#:~:text=Many%20different%20types%20of%20hemoglobin,have%20small%20amounts%20of%20HbF
Hemoglobinopathies	• Define Hemoglobinopathies • Enlist types of Hemoglobinopathies • Discuss familial Counselling • Elaborate Preventive Measures	Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 03, page 35-39) https://pubmed.ncbi.nlm.nih.gov/30193516/ https://youtu.be/34u1sOLrgV0 Use digital library https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3163784/
AIDS	• Define AIDS • Pathogenesis and Biochemical Basis of AIDS • Prevalence and Prevention	Mushtaq volume II, 7th edition (chapter 11 page – 333-338) https://pubmed.ncbi.nlm.nih.gov/3277764/ https://www.who.int/news-room/fact-sheets/detail/hiv-aids#:~:text=Acquired%20immunodeficiency%20syndrome%20(AIDS)%20is,tuberculosis%2C%20infections%20and%20some%20cancers. https://www.cdc.gov/hiv/basics/whatishiv.html , Use digital library
Clinical Aspects 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	Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 21, page 284-285) https://pubmed.ncbi.nlm.nih.gov/14765767/ https://www.youtube.com/watch?v=gIACp5js4MU https://my.clevelandclinic.org/health/diseases/15367-adult-jaundice
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	Harpers Illustrated biochemistry 32nd edition (Chapter 49, page 590-592) https://www.youtube.com/watch?v=xMSEl1ad0z8 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3053509/ https://pubmed.ncbi.nlm.nih.gov/9971870/ Use digital library
Vitamin K	• Clinical aspects of Vitamin K	Harpers Illustrated Biochemistry 32nd Edition CHAPTER 44 Micronutrients: Vitamins & Minerals Page (540-542) https://pmc.ncbi.nlm.nih.gov/articles/PMC8907489/ https://www.mdpi.com/2076-3921/10/4/566
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.	Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 28, page 378-379) https://pubmed.ncbi.nlm.nih.gov/29777755/ https://www.cdc.gov/ncbddd/folicacid/about.html https://www.cdc.gov/ncbddd/folicacid/about.html#:~:text=When%20the%20baby%20is%20developing,the%20early%20brain%20and%20spine. Use digital library
Vitamin B12	• Recall Sources of Vitamin B12 • Describe biochemical role of vitamin B12 • Discuss Deficiency effects of B12/Clinical Disorders Related to Vitamin B12	Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 28, page 379-381) https://pubmed.ncbi.nlm.nih.gov/25824066/ https://ods.od.nih.gov/factsheets/VitaminB12-HealthProfessional/ https://www.youtube.com/watch?v=j-2xHmcKkcy Use digital library

5. CVS MODULE

Topic	Learning Objectives At the end of lecture students should be able to	References
Clinical importance of carbohydrates	• Define & classify • Explain Pathophysiology & clinical features	• Textbook of Lippincott 8th Edition Chapter No.7 pg 92,93 • Text Book of Harper 32 S T Edition chap No. 15 pg 141, 142 ,144 ,147 • https://youtu.be/0N-LS97tTdU
Clinical importance of lipids	• Understand the definition, causes, and basic pathophysiology. • Identify key clinical features and the role of biochemical testing in its diagnosis.	• Textbook of Harper 32 S T Edtion Chapter No.21 pg 196 • https://youtu.be/tL8z5iEqHkU
Obesity Ear Wax Impaction	• Understand the basic pathophysiology, types, and clinical features. • Identify symptoms and describe the basic methods of removal and prevention.	• Textbook of Lippincott 8th Eidtion Chapter No.15 pg 196 -199 • https://youtu.be/-vNVG7XJpVE
Hypoglycemia	• Understand the definition, causes, and basic pathophysiology	• Text Book of Harper 32 S T Edition chap No.15 pg 142, 145 • https://youtu.be/dSPvc8lSWdc
Clinical Importance of homopolysachhrides	• Describe the pathophysiology, types, and genetic basis	• Text book of Harper 32 S T Edition Chap No.15 pg 145, 156 • https://youtu.be/0N-LS97tTdU
Hypercholestremia	• Describe the pathophysiology, types, and Biochemical Basis	• Textbook of Lippincott 8th Eidtion Chapter No. 21 pg 199-202 • https://youtu.be/3Ig5PQsuiDI
Applied Biochemistry of Heteropolysachrides	• Explain the clinical features ,pathophysiology & Biochemical Basis.	• Textbook of Lippincott 8th Eidtion Chapter No. 17 pg 236 • Text Book of Lehninger 7th Edition chap No. 10.3 pg 375,376 • https://youtu.be/9UhUEK-1Xh4
Clinical Role of prostaglandins	• Understand the definition, causes, and basic pathophysiology	• Textbook of Lippincott 8th Eidtion Chapter No. 14 pg 173-175 • Text Book of Harper 32 S T Edition Chap No.15 pg 147 ,148 • https://youtu.be/lkuZa9DDU8Y

6. RESPIRATORY MODULE

Topic	Learning Objectives At the end of the lecture students should be able to	Learning Resources
Inhibitors of ETC	• Understand the concept of inhibitors and uncouplers, • Discuss the inhibitors of specific respiratory complexes, and inhibitors of ATP synthesis	• Lippincott's Biochemistry 8th Edition Chapter 6 • Harper's Illustrated Reviews of Biochemistry , Edition 32, Chapter 13. • https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000002BI/P000982/M017769/ET/1495006230E-Text-Moduel19InhibitorsofETC.pdf
Role of Kidneys in pH regulation	• Overview the Normal pH regulation • Explain how Kidneys regulate pH during Acid Base Imbalance.	• Lippincott's Biochemistry 8th Edition Chapter 1 • https://www.youtube.com/watch?v=99qSZZY0UKk • https://pmc.ncbi.nlm.nih.gov/articles/PMC9338915/
Uncouplers	• Explain the overall significance of Uncouplers in Mitochondrial Respiration. • Role of Uncouplers in Thermogenesis.	• Harper's Illustrated Reviews of Biochemistry , Edition 32, Chapter 13. (page 124-128) • https://pubmed.ncbi.nlm.nih.gov/11502224/ • https://www.sciencedirect.com/science/article/pii/S1550413105001671
Vitamin Pyridoxine related disorders	• Discuss Vitamin B_6, used as a dietary supplement • Describe its deficiency and related clinical disorders	• Lippincott's Biochemistry 8th Edition Chapter 28 (Pg 428-429) • Harper's Illustrated Reviews of Biochemistry , Edition 32, Chapter 44. (page 536, 543) • https://www.youtube.com/watch?v=sAyZBZurCmw • https://ods.od.nih.gov/factsheets/VitaminB6-HealthProfessional/
Xenobiotics	• Define xenobiotics • Discuss its metabolism and its role in environment • Clinical Aspects of Xenobiotics	• Harper's Illustrated Reviews of Biochemistry, Edition 32, Chapter 47. (page 536, 543) • https://www.sciencedirect.com/topics/medicine-and-dentistry/xenobiotic-metabolism

Second Year MBBS

1. GIT MODULE

Topics of SDL	Learning Objectives Students Should Be Able To	References
Carbohydrate Metabolism & Glycolysis	• Understand stages of metabolism • Explain transport of glucose across cell memebrane • Describe steps of glycolysis • Discuss regulation of committed steps • Explain energy calculation in anaerobic and aerobic conditions Understand pyruvate kinase deficiency	• Reference Book: Lippincott's Illustrated reviews of Biochemistry 8th Edition Chapter#8, Page 100.
TCA Cycle & Gluconeogenesis	• Describe steps of TCA cycle • Discuss substrates, steps and regulation of gluconeogenesis	• Reference Book: Lippincott's Illustrated reviews of Biochemistry 8th Edition Chapter#9, Page 120. • Reference Book: Lippincott's Illustrated reviews of Biochemistry 8th Edition Chapter#10, Page 128.
Glycogen metabolism	• Explain synthesis and breakdown of glycogen • Discuss glycogen storage diseases	• Reference Book: Lippincott's Illustrated reviews of Biochemistry 8th Edition • Chapter#11, Page 137.
Individual Sugars	• Descibe the metabolism of individual sugar • Explain related clinal disorder	• Essentials of Medical Biochemistry Book by Mushtaq Ahmed Edition 9th Volume#1, Chapter#7, Page 186 • ✞ Reference Book: Lippincott's Illustrated reviews of Biochemistry 8th Edition Chapter#19, Page 276, 77.
Digestion of Lipids by Pancreatic Enzymes	• Explain the digestion and absorption of lipids • Discuss the role of pancreatic enzymes in lipid	

2. RENAL MODULE

Topics Of SDL	Learning Objectives	Learning resources
Phenylalanine and Tyrosine	• Clinical disorders related to Phenylalanine and tyrosine metabolism	• Lippincott Biochemistry 8th edition (chapter 19 page - 271) • https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3854183/
Ammonia	• Discuss Related inherited disorders	• Harper's illustrated biochemistry 32nd edition (Chapter 40 page 477) • https://link.springer.com/article/10.1007/BF00998474
Arginine & Branched Chain Amino Acid Metabolism	• Explain Metabolism of branched chain amino acids • Discuss related inherited disorders	• Harper's illustrated biochemistry 32nd edition (Chapter 40 page 477) • https://link.springer.com/article/10.1007/BF00998474
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	• Lippincott Biochemistry 8th edition (chapter 01 page – 20-24) • Harper's illustrated biochemistry 32nd edition (Chapter 02 , Water and pH, page 11-13) • https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/acid-base-balance
Hypo and Hypernatremia	• Describe Daily requirements, sources and functions of sodium • Explain causes and effects of hyponatremia & hypernatremia	• Essentials of medical Biochemistry. Mushtaq Ahmad Vol – I 9th edition (Chapter 02 page 46) • https://www.sciencedirect.com/topics/medicine-and-dentistry/sodium-metabolism
Hypo and Hyperkalemia	• Describe Daily requirements, sources and functions of potassium. • Explain causes and effects of hypokalemia & hyperkalemia	• Essentials of medical Biochemistry. Mushtaq Ahmad Vol – I 9th edition (Chapter 02 page 47) • https://www.sciencedirect.com/topics/medicine-and-dentistry/potassium-metabolism

3. REPRODUCTION MODULE

Topics Of SDL	Learning Objectives	Learning resources
Applied aspect of Male gonadal hormones	• Biochemical basis of Clinical Fearures • Causes of hyersection & Hyposecretion • Treatment	• Text Book of Harper,32 edition (chapter 41 page – 487-488) • https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/gonad-function • https://www.youtube.com/watch?v=A5u_TY1A0t8 • Use digital library • https://www.ncbi.nlm.nih.gov/books/NBK29/
Clinical aspects Female gonadal hormones	• Biochemical basis of Clinical Fearures • Causes of hypersection & Hyposecretion • Treatment	• Text Book of Harper,32 edition (chapter 41 page – 487-488) • https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/gonad-functionn • https://www.youtube.com/watch?v=A5u_TY1A0t8 • Use digital library • https://www.ncbi.nlm.nih.gov/books/NBK29/
Applied aspect of nucleic acid and purine synthesis	• Role of Deficient enzymes • Clinical Features • Investigation	• Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 22, page 292-295) • https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/purine-synthesis • https://www.youtube.com/watch?v=VXWyWzbigrg • Use digital library • https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3243375/
Purine catabolism Related disorder	• Explain purine catabolism • Discuss related disorder	• Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 22, page 298-301) • https://www.sciencedirect.com/topics/medicine-and-dentistry/purine-metabolism-disorder • https://www.youtube.com/watch?v=e2KFVvI8Akk • Use digital library • https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4215161/
Clinical role Pyrimidine metabolism	• Explain Pyrimidine catabolism and related disorders	• Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 22, page 302-304) • https://www.cliffsnotes.com/study-guides/biology/biochemistry-ii/purines-and-pyrimidines/pyrimidine-metabolism • https://www.youtube.com/watch?v=n7Uec8Jtr4E • Use digital library • https://www.ncbi.nlm.nih.gov/pmc/articles/PMC378357/
Applied aspect of Regulation of gene expression	• Explain the regulation of gene expression • Related clinical disorders	• Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 22, page 465-477) • https://www.healio.com/hematology-oncology/learn-genomics/genomics-primer/regulation-of-gene-expression-in-eukaryotes • https://www.youtube.com/watch?v=J9jhg90A7Lw • Use digital library • https://www.nature.com/scitable/topicpage/regulation-of-transcription-and-gene-expression-in-1086/

4. CNS MODULE

Topics Of SDL	Learning Objectives	Learning resources
Chylomicron metabolism	• Describe synthesis of chylomicron, its breakdown and factors affecting it	• Lippincott Biochemistry Chapter, 18 page 253 • https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/gonad-function • Use digital library • https://www.ncbi.nlm.nih.gov/books/NBK29/
HDL & LDL metabolism	• Explain composition functions and clinical significance of LDL & HDL • Illustrate mechanism of revise cholesterol synthesis	• Lippincott Biochemistry Chapter, 18 page 253 • https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/gonad-functionn • Use digital library • https://www.ncbi.nlm.nih.gov/books/NBK29/
Fatty acid oxidation	• Describe steps enzymes energy calculation of Beta oxidation of saturated fatty acid	• Lippincott Biochemistry Chapter, 16 page 213 • https://www.youtube.com/watch?v=VXWyWzbigrg • Use digital library • https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3243375/
Synthesis & interconversion of ketone Bodies, Regulation of Ketogenesis, Ketolysis	• Describe synthesis and breakdown of ketone bodies and related disorders	• Lippincott Biochemistry Chapter, 27 page 411 • https://www.sciencedirect.com/topics/medicine-and-dentistry/purine-metabolism-disorder • https://www.youtube.com/watch?v=e2KFVvI8Akk • Use digital library • https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4215161/
Synthesis of Cholestrol and its regulation	• Describe steps regulation and related disorders of cholesterol synthesis	• Lippincott Biochemistry Chapter, 18 page 244 • https://www.cliffsnotes.com/study-guides/biology/biochemistry-ii/purines-and-pyrimidines/pyrimidine-metabolism

5. SPECIAL SENSES MODULE

Topics Of SDL	Learning Objectives	Learning resources
Neurotransmitter	• Explain synthesis & functions of neurotransmitters • Discuss related clinical disorders	Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 13, 21 page 166 & 317 - 319) Use digital library https://www.khanacademy.org/science/biology/humanbiology/neuron-nervous-system/a/neurotransmitters-theirreceptors https://youtu.be/LOHKVp8hn7o https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=neurotransmitters&oq=Neurotransmitter#:~:text=Axelrod%C2%A0%2D%20Scientific%20American%2C%201974%20%2D%20JSTOR
Receptors	• Define receptors • Classify Receptors	Text book of Biochemistry Lehninger 8th edition (Chapter 12, page 439- 440) Use digital library https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4817805/ https://www.sinobiological.com/research/receptors/what-arereceptors#:~:text=Receptors%20are%20proteins%2C%20usually%20cell,cells%2C%20monocytes%20and%20stem%20cells. https://youtu.be/vjFes5I07c0
G - Proteins	• Explain the structure and function of G proteins	Harper's Illustrated Biochemistry 32th edition (Chapter 42, page 503 – 505) Use digital library https://youtu.be/GHwMJnxaiys https://www.britannica.com/science/G-protein-coupled-receptor https://www.nature.com/scitable/topicpage/gpcr-14047471/
Role of Vitamin A in Vision	Explain the role of vitamin A in vision Discuss related clinical abnormalities	Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 28, page 433-434) Use digital library https://www.bing.com/search?pglt=41&q=role+of+vitamin+a+in+vision&cvid=dddf1e33ab0a45318ddff31539f0445a&aqs=edge.2.69i57j0l8.11403j0j1&FORM=ANSPA1&PC=U531#:~:text=https%3A//pubmed.ncbi.nlm.nih.gov/27830507 https://www.bing.com/search?pglt=41&q=role+of+vitamin+a+in+vision&cvid=dddf1e33ab0a45318ddff31539f0445a&aqs=edge.2.69i57j0l8.11403j0j1&FORM=ANSPA1&PC=U531#:~:text=Vision%20%E2%80%93%20Introduction%20to%20%E2%80%A6-, ,https%3A//mtsu.pressbooks.pub/.../8f%2Dvision%2Dvitamin s,-Web , https://youtu.be/wo7i9bFs4Bw
Second Messenger System	Describe different types of second messengers	Lippincott Illustrated reviews of biochemistry 8th edition (Chapter 8, page 103- 105) Harper's Illustrated Biochemistry 32th edition (Chapter 42, page 506 – 509) Use digital library https://www.britannica.com/ https://youtu.be/PzA5Z3DXfrQ

6. ENDOCRINOLOGY MODULE

Topics Of SDL	Learning Objectives	Learning resources
Classification & Mechanism of action of Endocrine Hormones	• Classify Endocrine Hormones • Discuss the Mechanism of action of various Endocrine Hormones	1. Harper's Illustrated Biochemistry 32nd edition, chapter 41, pages 482-484 2. Lippincott Illustrated Reviews, Biochemistry, 8th Edition, chapter 18, pages 265-266 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6761896/ https://www.youtube.com/watch?v=KSclrkk_Ako
Formation & Mechanism of action of Thyroid Hormone	• Elaborate the nature, formation, mechanism of action and related diseases of Thyroxin	• Harper's Illustrated Biochemistry 32nd edition, chapter 41, pages 492-493 and 498 • Lippincott Illustrated Reviews, Biochemistry, 8th Edition, chapter 29, pages 452-454 https://www.nature.com/articles/boneres201311 • https://www.youtube.com/watch?v=cDGmsR2ZILE
Synthesis & Mechanism of Action of Adrenocortical Hormones	• Describe synthesis, mechanism of action and functions of Aldosterone, Cortisol and Adrenal androgens • Describe mechanism of action and role of Adrenal Medullary Hormones • Discuss related clinical disorders	• Harper's Illustrated Biochemistry 32nd edition, chapter 41, pages 485-488, 491- 492, and 495-496, 498-499 • Lippincott Illustrated Reviews, Biochemistry, 8th Edition, chapter 18, pages 262-266 https://www.ncbi.nlm.nih.gov/books/NBK470339/ https://www.youtube.com/watch?v=JlI5N2N4d-k https://www.sciencedirect.com/topics/medicine-and-dentistry/adrenal-medulla • https://www.youtube.com/watch?v=afzWLmd72Rk • Use digital library
Synthesis & Mechanism of Action of Insulin & Glucagon	• Explain formation, mechanism of action and role of Insulin and Glucagon • Discuss related diseases	• Harper's Illustrated Biochemistry 32nd edition, chapter pages 493-494 • Lippincott Illustrated Reviews, Biochemistry, 8th Edition, chapter 23, pages 341-354 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6515536/ https://www.youtube.com/watch?v=1c6a0BNsyek • https://www.youtube.com/watch?v=-3J6QRMerQE
Glucose Tolerance Test Curves Hypoglycemia Diabetic Ketoacidosis & Hyperosmolar Hyperglycemic State Online Clinical Evaluation	• Normal & abnormal curves of glucose tolerance test and factors effecting it. • Interpretation of GTT curves for Diabetes Mellitus • Hypoglycemia, Hyperglycemia & Diabetic ketoacidosis	1. Harper's Illustrated Biochemistry 32nd edition, chapter pages 719-720, 136-138 & 469-470 2. Lippincott Illustrated Reviews, Biochemistry, 8th Edition, chapters 23 & 25, pages 350-354 & 375-387 https://www.ncbi.nlm.nih.gov/books/NBK532915/ https://www.youtube.com/watch?v=SRZlYdQWO3g https://www.ncbi.nlm.nih.gov/books/NBK279052/ https://www.youtube.com/watch?v=jCf7W1U4JKE https://www.ncbi.nlm.nih.gov/books/NBK534841/ • Use digital library