

SEMESTER V**ZY5B08U CORE COURSE 8****BIOCHEMISTRY, PHYSIOLOGY AND ENDOCRINOLOGY**

54 hrs

Credits 3

Objectives:

1. This course will provide students with a deep knowledge in biochemistry, physiology and endocrinology.
2. Defining and explaining the basic principles of biochemistry useful for biological studies for illustrating different kinds of food, their structure, function and metabolism.
3. Explaining various aspects of physiological activities of animals with special reference to humans.
4. Students will acquire a broad understanding of the hormonal regulation of physiological processes in invertebrates and vertebrates.
5. By the end of the course, students should be familiar with hormonal regulation of physiological systems in several invertebrate and vertebrate systems.
6. This also will provide a basic understanding of the experimental methods and designs that can be used for further study and research.
7. The achievement of above objectives along with periodic class discussions of current events in science, will benefit students in their further studies in the biological/physiological sciences and health-related fields, and will contribute to the critical societal goal of a scientifically literate citizenry.

Part I. BIOCHEMISTRY**18 Hours****Module 1 - GENERAL BIOCHEMISTRY, BIOELEMENTS AND BIOMOLECULES****4 hrs**

Carbohydrates, protein and lipids – structure of basic compounds, classifications with examples and its biological importance.

Core Readings

Harper's Illustrated Biochemistry, 27th Ed, Mc Graw Hill

Module -2 METABOLISM**9 hrs**

Carbohydrate metabolism- Glycolysis, glycogenolysis, gluconeogenesis, glycolysis –citric acid cycle, ATP synthesis, Hexose, monophosphate shunt

Lipid metabolism- Biosynthesis and oxidation of fatty acids- Beta oxidation, Physiologically important compounds synthesized from cholesterol.

Protein metabolism- Deamination, transamination, transmethylation, decarboxylation, ornithine cycle.

Core Readings

Harper's Illustrated Biochemistry, 27th Ed, Mc Graw Hill

Module 3- ENZYMES**4 hrs**

Chemical nature of enzymes, mechanism of enzyme action, factors influencing enzyme action (temperature, pH, enzyme concentration, substrate concentration), enzyme activation, enzyme inhibition, allosteric enzyme, isoenzymes, co-enzyme.

Core Readings

Harper's Illustrated Biochemistry, 27th Ed, Mc Graw Hill

Part II. HUMAN PHYSIOLOGY**26 Hrs****Module 4- NUTRITION****5 hrs**

Nutrients,classification,RDA,Balanced diet.

Antioxidants and functions, Mineral metabolism,Role of Ca,Fe,Na,K,andP.

Role of vitamins

Food adulteration, Defects of modern food habits (importance of fibers in food), weight control, nutrition during pregnancy, breast feeding, anorexia, acidity and

ulcers, flatulence, fasting and its significance, malfunctions of gastro intestinal tract.

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp.718-833

Prosser & Brown 2006 : Comparative Animal Physiology

Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Module 5 -RESPIRATION

5 hrs

Gas transport, Factors affecting transport of respiratory gases through blood, oxy-hemoglobin curve, Bohr effect, reverse Bohr effect, Haldane effect, neural (voluntary and automatic) and chemical control (mention the role of carotid and aortic bodies) of respiration, smoking and its physiological effects, carbon monoxide poisoning, oxygen toxicity, nitrogen narcosis, dysbarism, oxygen therapy, artificial respiration, respiratory disorders –hypoxia, hypocapnia, hypercapnia, asphyxia.

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp432-509 Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Module 6–CIRCULATION

4 hrs

Cerebral circulation, blood brain barrier and cerebrospinal fluid, Haemo dynamic principles, formation and fate of blood cells, Blood composition ,blood clotting mechanism – intrinsic and extrinsic pathways, clotting factors, anticoagulants, blood transfusion (safety and security problems), mention haemostasis, haemolysis, jaundice, thrombosis, ESR.

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp.144-262, 382-429, 711-715.

Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Module 7 –EXCRETION

4 hrs

Urea cycle (in detail), renal handling of individual substances eg. glucose, sodium, urea, water, factors affecting GFR, concept of plasma clearance, acid base balance and homeostasis, kidney disorders – acute renal failure, chronic renal failure-glomerular nephritis, pyelonephritis, nephrotic syndrome and kidney stones.

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp.264-379

Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Module 8-MUSCLE PHYSIOLOGY

3hrs

Ultra structure of striated muscle.Mechanism of muscle contraction.Biochemistry of muscle contraction,isotonic and isometric contraction.

Electrical, chemical and morphological changes and ionic fluxes during contraction of striated muscle fibre, Cori cycle, electrophysiology of muscle, threshold and spike potentials, simple muscle twitch, whole muscle contraction, isotonic and isometric contraction, latent and refractory periods, summation, beneficial effect, superposition curve, tetanus, tonus, staircase phenomenon, fatigue, oxygen debt, rigor mortis.

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp.52-86

Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Module 9 –NEUROPHYSIOLOGY

3 hrs,

Synaptic transmission & properties of synapses, neurotransmitters, role of dopamine and serotonin. EEG, memory, short term and long term sleep, dream, Neural disorders- dyslexia, Parkinson's disease, epilepsy, Alzheimer's disease, schizophrenia.

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp.512-715

Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Module 10 -SPORTS PHYSIOLOGY**2hrs**

Muscular, Respiratory and cardiovascular changes during exercise, dope test, drug abuse.

Significance of exercise in body fitness. (Guyton pp 968-978)

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp.968-978

Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Part III ENDOCRINOLOGY**11 hrs****Module 11****5 hrs**

Hormones as messengers, classification and types of hormones. General principles of hormone action, Concept of hormone receptors, hormonal control of homeostasis.

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp.836-966

Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Module 12**6 hrs**

Secretion, Regulation, Functions and Disorders of hormones of Hypothalamus, Hypophysis, Pineal, Thyroid, Parathyroid, Thymus, Islets of Langerhans, Adrenal, Gonads, Placenta, Gastro intestinal hormones.

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp.836-966

Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Selected Further Readings**Human Physiology**

Best and Taylor: Physiological basis of Medical practice

Chakrabarti, Ghosh &: Human Physiology, the New Book Stall Schana.

Chatterjee C.C.: Human Physiology, Vol I & II Medical Allied Agency

Eckert & Randall : Animal Physiology, Mechanism and Adaptations , CBS publishers, New Delhi.

Ganong W F : Review of Medical Physiology, Mc Graw Hill, New Delhi.

Guyton : Text Book of Medical Physiology Saunders

Joshi : Nutrition and Dietetics , Tata Mc. Graw Hill

Knut Schmidt Nilesen 2007 Animal Physiology – Adaptation and environment.
Cambridge University press 5 th ed.

Mackenna & Callander : Illustrated Physiology, Churchill Livingstone

Powar Human Physiology

Prosser & Brown : Comparative Animal Physiology

Sarada Subramanyam & K. Madhavankutty : Textbook of human physiology, S.
Chand & Co Ltd, New Delhi.

Endocrinology

Barrington, E.J.W. General and Comparative Endocrinology, Oxford, Clarendon Press.

Bentley, P.J.Comparative Vertebrate Endocrinology, Cambridge University Press.

David O. Norris Vertebrate Endocrinology 3th Edition,

Gorbman ,A *et. al.* Comparative endocrinology, John Wiley & Sons.

Hadley, M.E. 2000. Endocrinology, 5th ed. Prentice Hall, Upper Saddle River, NJ.

Martin, C.R. Endocrine Physiology, Oxford University Press

Norris, D.O. 1997. Vertebrate Endocrinology, 3rd ed. Academic Press, Sand Diego, CA.

Williams, R.H. Textbook of Endocrinology, W.B. Saunders

Biochemistry

Ackerman E, Biophysical Science, Prentice Hall Inc.

Awapara J, Introduction to Biological chemistry, Prentice-Hall of India

Cohn E E and Stumpf P K, outlines of Biochemistry, Wiley Eastern

Foster, R.L. Nature of Enzymology

Garett and Grisham. Biochemistry.

Harper's Illustrated Biochemistry, 27th Ed, Mc Graw Hill

Lehninger, Biochemistry , Kalyani Publications

Lodish et. al. Molecular Cell Biology

Rangnatha Rao K, Text Book of Biochemistry, Prentice-Hall of India

Roy K N, A Text Book of Biophysics, New Central Book Agency

Stryer, Biochemistry, W.H Freeman and Co., Newyork

Voet, D. and J.G. Voet. Biochemistry. J. Wiley & Sons