

SEMESTER – IV
MOLECULAR BIOLOGY & HORMONES
THEORY

Programme: B.Sc.
Course Code: U20/BIC/DSC/401
Course Type: DSC – 4
No. of credits: 4

Max. Hours: 60
Hours per week: 4
Max. Marks: 100

Course Objective:

Illustrate mechanisms related to the molecular basis of life. To infer the molecular, biochemical and physiological effects of hormone on cells and tissues.

Course Outcomes:

- CO1:** Describe the different classes and chemical structures of hormones, glands, organs, tissues and cells that synthesize and secrete hormones, hormone precursors and associated compounds, synthesis and regulation.
- CO2:** Remember different steps in the central dogma of molecular biology, gene expression and emphasize the enzymes involved in the process.
- CO3:** Exhibit clear knowledge in most applicable technique of all the molecular works which includes PCR, Hybridization and blotting & sequencing techniques.
- CO4:** Learn the nature of signals, sorting, SRP Receptor in the targeting of proteins to the endoplasmic reticulum and to know that chaperones prevent faulty folding of other proteins.

MODULE I: ENDOCRINOLOGY**(15 Hrs)**

Organisation of endocrine system. Definition and Classification of Hormones on the basis of composition & mode of action. Outline of chemistry, physiological role and disorders of hormones of hypothalamus, pituitary, thyroid, adrenal, parathyroid, gonads, pancreas, and placenta.

Introduction to gastrointestinal hormones. Mechanism of hormone action – Signal transduction pathways for adrenaline, glucocorticoids and insulin.

MODULE II: REPLICATION & TRANSCRIPTION**(15 Hrs)**

General features of mechanism of DNA replication, models of DNA replication, Experimental evidence of semi conservative model - Meselson Stahl experiment. Replicosome. Properties of prokaryotic and eukaryotic DNA polymerases. Mechanism of transcription – RNA synthesis, RNA polymerase of prokaryotes.

Promoters, Initiation - sigma factors and their recognition sites. Elongation – role of core enzymes.

Termination – rho dependent and rho independent. RNA polymerase I, II III of eukaryotes. Inhibitors of transcription. Post transcriptionary modification – 5'α - amanitin.

Comparison of transcription in prokaryotes & eukaryotes.

MODULE III: PROTEIN SYNTHESIS & REGULATION OF GENE EXPRESSION**(15 Hrs)**

Translation machinery, mechanism of translation, polysomes, inhibitors of protein synthesis, Post translational modifications and their significance. Basic principles of protein sorting, Signal hypothesis & protein secretion. Regulation of gene expression – promoter, operator, repressor binding in DNA. Lac Operon - Control by negative and positive regulatory proteins, Regulation of transcription in eukaryotes.

MODULE IV: RECOMBINANT DNA TECHNOLOGY**(15 Hrs)**

Creation of a recombinant molecule – general outline. Restriction endonucleases – types, uses, Ligases, phosphatases, reverse transcriptase, polynucleotide kinases, terminal transferase, nucleases-S1 and RNAase H. Restriction mapping. Salient features of cloning vectors – plasmids, Ti plasmids, cosmids, lambda phage vectors & virus vectors, Insertion vectors, expression vectors, Shuttle vectors. Introduction of Recombinant DNA to host cells by various modes like transformation, transfection, microinjection, liposome, encapsulation etc. selection of transformed cells.

Sequencing of nucleic acids – Sanger's and Maxam – Gilbert methods.

Principles & Techniques of hybridization - Colony hybridization, NA Hybridization.

Blotting techniques – Southern, Northern and Western blotting techniques.

Polymerase chain reaction and its applications.

Reference Books:

1. Lodish: Molecular Cell Biology, 5th Edition (2003) Freeman, W. H. & Company.
ISBN- 13: 2900716743667.
2. Devlin : Textbook of Biochemistry with Clinical Correlations (2011),
T.M. John Wiley & Sons, Inc. (New York).
3. Campbell, Biochemistry (1995) 3rd Edition, Publisher: John Vondeling.
ISBN: 0-03-02-44-269.
4. P.K Gupta, Biotechnology and Genomics, Rastogi Publications. (2004)
ISBN: 81-7133-67-6-0.

MOLECULAR BIOLOGY & HORMONES**MODEL QUESTION PAPER****THEORY**

Course Code: U20/BIC/DSC/401
Credits: 4

Max Marks: 60
Time: 2 Hrs

SECTION – A**I. Answer the following****4 x 10 = 40 M**

1. Give an account of hormones involved in calcium metabolism
OR
2. Enumerate the mechanism involved in hormone action
3. Write about the different enzymes involved in DNA replication
OR
4. Explain the mechanism of transcription in prokaryotes
5. Explain the initiation process of protein synthesis in prokaryotes
OR
6. Explain diagrammatically the signal peptide hypothesis
7. Describe the principle, procedure and applications of southern blotting
OR
8. Explain in detail the sequencing of nucleic acids by Sanger's Dideoxy method.

SECTION – B**II. Answer any FOUR****4 x 5 = 20 M**

9. Classification of Hormones
10. Lac Operon
11. Post transcriptional modifications
12. Clover leaf model of tRNA
13. Western Blotting
14. Human Chorionic Gonadotropin