

C-7: MOLECULAR BIOLOGY (THEORY)
SEMESTER –III
HMBCR3072T

TOTAL HOURS:52

CREDITS: 4

Module 1

Marks 20

Unit 1 Structures of DNA and RNA / Genetic Material

No. of Hours: 10

DNA Structure: Miescher to Watson and Crick- historic perspective, DNA structure, Salient features of double helix, Types of DNA, Types of genetic material, denaturation and renaturation, cot curves. DNA topology – linking number, topoisomerases; Organization of DNA Prokaryotes, RNA Structure, kinetoblast DNA

Unit 2 Replication of DNA (Prokaryotes and Eukaryotes)

No. of Hours: 10

Bidirectional and unidirectional replication, semi- conservative, semi- discontinuous replication
Mechanism of DNA replication: Enzymes and proteins involved in DNA replication –DNA polymerases, DNA ligase, primase, telomerase – for replication of linear ends; Various models of DNA replication including rolling circle, D- loop (mitochondrial), Θ (theta) mode of replication and other accessory protein

Module 2

Marks 30

Unit 3 Transcription in Prokaryotes and comparison with Eukaryotes

No. of Hours: 8

Transcription: Definition, difference from replication, promoter - concept and strength of promoter

RNA Polymerase and the transcription unit, Transcription in Eukaryotes: RNA polymerases, general Transcription factors

Unit 4 Post-Transcriptional Processing (outlines only)

No. of Hours: 8

Split genes, concept of introns and exons, RNA splicing, spliceosome machinery, concept of alternative splicing, Polyadenylation and capping, Processing of rRNA, RNA interference: si RNA, miRNA and its significance

Unit 5 Translation (Prokaryotes and comparison with Eukaryotes)

No. of Hours: 8

Translational machinery, Charging of tRNA, aminoacyl tRNA synthetases, Mechanisms of initiation,

elongation and termination of polypeptides in both prokaryotes and eukaryotes, Fidelity of translation,

Inhibitors of protein synthesis in prokaryotes and eukaryote

Unit 6 Regulation of gene Expression in Prokaryotes**No. of Hours: 8**

Principles of transcriptional regulation, regulation at initiation with examples from *lac* and *trp* operons, Sporulation in *Bacillus*, Yeast mating type switching ,

C-7: MOLECULAR BIOLOGY**(PRACTICAL)****HMBCR3072P****TOTAL HOURS: 39****CREDITS: 2**

1. Study of different types of DNA and RNA using micrographs and model / schematic representations
2. Study of semi-conservative replication of DNA through micrographs / schematic representations
3. Isolation of genomic DNA from *E. coli*
4. Estimation of salmon sperm / calf thymus DNA using colorimeter (diphenylamine reagent) or UV spectrophotometer (A260 measurement)
5. Estimation of RNA using colorimeter (orcinol reagent) or UV spectrophotometer (A260 measurement)
6. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
7. Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS-PAGE).

SUGGESTED READINGS

1. Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R (2008) Molecular Biology of the Gene, 6th edition, Cold Spring Harbour Lab. Press, Pearson Publication
2. Becker WM, Kleinsmith LJ, Hardin J and Bertoni GP (2009) The World of the Cell, 7th edition, Pearson Benjamin Cummings Publishing, San Francisco
3. De Robertis EDP and De Robertis EMF (2006) Cell and Molecular Biology, 8th edition. Lippincott Williams and Wilkins, Philadelphia
4. Karp G (2010) Cell and Molecular Biology: Concepts and Experiments, 6th edition, John Wiley & Sons. Inc.
5. Sambrook J and Russell DW. (2001). Molecular Cloning: A Laboratory Manual. 4th Edition, Cold Spring Harbour Laboratory press.
6. Krebs J, Goldstein E, Kilpatrick S (2013). Lewin's Essential Genes, 3rd Ed., Jones and Bartlett Learning
7. Gardner EJ, Simmons MJ, Snustad DP (2008). Principles of Genetics. 8th Ed. Wiley-India
8. David Friefilder
9. Weaver

