

BACHELORS WITH BIOCHEMISTRY AS MAJOR
6th SEMESTER

BCH622J2: BIOCHEMISTRY _ MOLECULAR BIOLOGY

CREDITS: THEORY-4; PRACTICAL-2

THEORY (4 CREDITS: 60 HOURS)

OBJECTIVES /EXPECTED OUTCOMES:

Molecular biology deals with nucleic acids and proteins and how these molecules interact within the cell to promote proper growth, division, and development. It is a large and ever-changing discipline. This course will emphasize the molecular mechanisms of DNA replication, repair, protein synthesis etc. At the end of this course students should be able to demonstrate a clear understanding of the facts and basic concepts of molecular biology which are covered in lectures, including:

- *To provide with the core principles of molecular biology.*
- *To gain higher level thinking skills that is necessary for scientists.*
- *This course should excite about basic science and its applications.*

UNIT-1: STRUCTURE AND FUNCTIONS OF NUCLEIC ACIDS (15 HOURS)

The beginning of Molecular Biology: Chromatin arrangement, remodelling & nucleosome formation. C value paradox. Operons, pseudogene. Euchromatin & heterochromatin. Unique and repetitive DNA. SNPs & Their function.

DNA: A carrier of genetic information, Chemical structure of DNA and Base composition, biologically important nucleotides, Watson - Crick Model, Super coiled DNA, structure of different types of nucleic acids, hydrolysis of nucleic acids. Conformation of nucleic acids: A-, B-, Z-, DNA, Stability of nucleic acid structure

UNIT-2: DNA REPLICATION, REPAIR AND RECOMBINATION (15 HOURS)

DNA replication: Prokaryotic and Eukaryotic DNA replication; mechanism, Initiation, elongation, termination and regulation of replication, Different types of Polymerases. Uni and bi-directional replication. Maintaining the ends of Linear DNA molecule. Extra chromosomal replicons. DNA damage and repair mechanisms (Brief Discussion).

UNIT-3: RNA SYNTHESIS AND PROCESSING (15 HOURS)

Structure and function of RNA polymerases. Transportation in prokaryotes & eukaryotes (Transcription factors and machinery, formation of initiation complex, transcription activators and repressors), Capping, elongation and termination, RNA processing, RNA editing, splicing, polyadenylation, structure and function of different types of RNA.

UNIT-4: PROTEIN SYNTHESIS AND PROCESSING (15 HOURS)

Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination (Prokaryotes & Eukaryotes), Genetic code, Aminoacylation of tRNA, aminoacyl tRNA synthetase, translational proof-reading, translational inhibitors, posttranslational modification of proteins.

PRACTICALS (2 CREDITS: 60 HOURS)

1. Extraction of DNA from Blood.
2. Use of Primer calculator Software to design Primer for PCR.
3. Polymerase chain reaction (PCR Technique)
4. To learn the use of UCSC and NCBI data base.

BOOKS RECOMMENDED:

1. Lehninger Principles of Biochemistry by D. L. Nelson, M. M. Cox. 6th Edition. W. H. Freeman. 2012.
2. Molecular Biology by R.F. Weaver, 4th edition. McGraw Hill, USA. 2007.
3. Karp, G., Iwasa, J., & Marshall, W. (2020). Karp's Cell and Molecular Biology. John Wiley & Sons.
4. Gene IX by Benjamin Lewin. Jones and Bartlett Publishers. 2007.