

**SARDAR PATEL UNIVERSITY**  
**Programme: MSc (Genetics)**  
**Semester: I**  
**Syllabus with effect from: June 2010**

<b>Paper Code:</b> PS01CGEN01	<b>Total Credits: 4</b>
<b>Title Of Paper:</b> Cell & Molecular Biology	

Unit	Description in detail	Weightage (%)
1	<p><b>Cells:</b> Unique characteristics of Cells. Structure and Organization of pro-and eukaryotic cells. An overview of cell cycle and cell divisions. <b>Nucleus:</b> Structure of the nuclear envelope, organization and regulation of nuclear pore complex. Transport across nuclear membrane, internal organization of the nucleus and nucleolus, the nucleus during mitosis. <b>Chloroplast and Mitochondria:</b> Similarities and dissimilarities, structural organization in relation to function, genome. <b>DNA structure:</b> Chemistry of DNA, Forces stabilizing DNA structure, Helix parameters, Forms of DNA (A, B, C, D, T, and Z), Watson –Crick and Hoogsteen base pairing, Physical properties of ds DNA (UV-Absorption spectra, Denaturation and Renaturation, Cot curves, DNA hybridization), Chemicals that react with DNA. <b>DNA topology:</b> DNA supercoiling, Supercoiled forms of DNA, Superhelical density, Biology of supercoiled DNA (Topological domains of DNA, DNA topoisomerases, Mechanisms of supercoiling in cells, Mechanism of action of Topoisomerase I and II, effect of supercoiling on structure of DNA and role of supercoiling in gene expression and DNA replication). <b>Organization of DNA into chromosomes:</b> Packaging of DNA and organization of chromosome in bacterial cells; Packaging of DNA in eukaryotic nucleosome and chromatin condensation, assembly of nucleosomes upon replication, Chromatin modification and genome expression. <b>DNA-protein Interactions:</b> General features, Interaction of Helix-turn Helix motif, B-sheet, Zn-DNA binding domains with DNA.</p>	25 %
2	<p><b>DNA replication:</b> Mechanism of DNA polymerase catalyzed synthesis of DNA, Overview of replication in prokaryotes, Types and function of eukaryotic DNA polymerases, initiation of replication in eukaryotes, role of telomerases in replication of eukaryotic chromosomes. Inhibitors of DNA replication (blocking precursor synthesis, nucleotide polymerization, altering DNA structure).</p>	25 %
3	<p><b>Transcription:</b> RNA polymerases, features of prokaryotic and eukaryotic promoters, assembly of transcription initiation complex in prokaryotes and eukaryotes and its regulation; synthesis and processing of prokaryotic and eukaryotic transcripts. Transport of RNA within eukaryotic cell.</p> <p><b>Synthesis and processing of proteome:</b> Structure and role of t-RNA in protein synthesis, ribosome structure, basic features of genetic code and its deciphering, translation (initiation, elongation and termination in detail in prokaryotes as well as eukaryotes), Posttranslational processing of proteins (protein folding, processing by proteolytic cleavage, processing by chemical modification, Inteins), Protein degradation.</p>	25 %
4	<p><b>Regulation of gene expression in prokaryotes and eukaryotes:</b> Operon Concept, positive and negative regulation. Examples of lac-, ara-, his- and trp operons, Antitermination, Global regulatory responses. Regulation of gene Expression in eukaryotes.</p>	25 %



### Basic Text & Reference Books:

- Cell Biology: organelle structure and function by David. E. Sadava, Jones and Bartlett Publishers, Boston, 1993. ISBN: 978-8123914084.
- Cell and Molecular Biology (1987), 8<sup>th</sup> Edn. De Robertis, E. D. P. and De Robertis, E. M. F. Jr., Lea & Febiger, USA (Indian Edition: B. I. Publications Pvt. Ltd. ISBN: 0-7817-3493-2.
- Genes IX: by Lewin, Benjamin., Jones & Bartlett Publishers, Boston., ISBN: 978-0-7637-5222-4.
- Molecular Biology of the Gene: by Watson, James D. et al., Pearson Education (low price edition), Fifth edition, ISBN: 81-7758-181-3.
- Genomes 3 by Brown, T. A. Garland Science, New York. ISBN: 0-8153-4138-5.
- Molecular Genetics of Bacteria, 3<sup>rd</sup> edition, by Snyder Larry & Champness Wendy, ASM Press, Washington, D.C. ISBN: 978-1-55581-399-4.
- Topic related recent review articles.

