

236C3A Molecular Biology Theory Summary

Course Units

Unit 1: Provide Knowledge On Structure And Replication Of Dna

- DNA Structure - Salient features of double helix, forms of DNA.
- Denaturation and renaturation.
- DNA topology – Supercoiling, linking number, topoisomerases.
- DNA organization in prokaryotes, eukaryotes.
- Replication of DNA in prokaryotes and eukaryotes - Bidirectional and unidirectional replication, semi-conservative and semi-discontinuous replication.
- Mechanism of DNA replication – enzymes involved – DNA polymerases, DNA ligase, primase.

Unit 2: Significance And Functions Of Rna In Protein Synthesis

- Transcription in Prokaryotes.
- Concept of transcription.
- RNA Polymerases - prokaryotic and eukaryotic.
- General transcription factors in eukaryotes.
- Translation in prokaryotes and eukaryotes - Translational machinery - ribosome structure in prokaryotes and eukaryotes, tRNA structure and processing.
- Inhibitors of protein synthesis in prokaryotes and eukaryotes.
- Overview of regulation of gene expression - lac operons as example.

Unit 3: Cause And Types Of Dna Mutation And Dna

- Mutation - Definition and types of mutations.
- Physical and chemical mutagens.
- Reversion and suppression.
- Uses of mutations.
- Repair Mechanisms - Photoreactivation, Nucleotide Repair, Base Excision Repair, Methyl Directed Mismatch Repair and SOS Repair.

Unit 4: Outline The Role Of Plasmids And Phages

- Plasmid – Structure, types, replication, plasmid incompatibility, plasmid amplification and curing of plasmids.
- Bacteriophage-T4 Phage – Structure and lifecycle, Lambda phage-Structure, Lytic and Lysogenic cycle.
- Applications of Phages in Microbial Genetics.

Unit 5: Examine Mechanisms Of Gene Transfer And Recombination

- Gene Transfer Mechanisms - Conjugation and its uses.
- Transduction - Generalized and Specialized, Transformation - Natural and Artificial Transformation.

- Transposable elements - Prokaryotic transposable elements – insertion sequences, composite, and non-composite transposons.
- Transposition and Types of Transposition reactions.
- Mechanism of transposition: Replicative and non-replicative transposition.
- Uses of transposons.

Course Outcomes

CO1: Analyze the significance of DNA and elucidate the replication mechanism.

CO2: Illustrate the types of RNA and protein synthesis machinery.

CO3: Infer the causes and types of DNA mutation and summarize the DNA repair mechanisms.

CO4: Evaluate the importance of plasmids and phages in genetics.

CO5: Analyze gene transfer and recombination methods.

Text Books

1. Malacinski G.M. (2008). Freifelder's Essentials of Molecular Biology. 4th Edition. Narosa Publishing House, New Delhi.
2. Gardner E. J. Simmons M. J. and SnustedD.P.(2006). Principles of Genetics. 8th Edition. Wiley India Pvt. Ltd.
3. Trun N. and Trempy J. (2009). Fundamental Bacterial Genetics. 1st Edition. Blackwell Science Ltd.
4. Brown T. A. (2016). Gene Cloning and DNA Analysis- An Introduction. (7th Edition). John Wiley and Sons, Ltd.
5. Dale J. W., Schantz M.V. and Plant N. (2012). From Gene to Genomes – Concepts and Applications of DNA Technology. (3rd Edition). John Wileys and Sons Ltd.

Reference Books

1. Glick B. R. and Patten C.L. (2018). Molecular Biotechnology – Principles and Applications of Recombinant DNA. 5th Edition. ASM Press.
2. Russell P.J. (2010). iGenetics - A Molecular Approach, 3rd Edition., Pearson New International edn.
3. Nelson, D.L. and Cox, M.M. Lehninger(2017). Principles of Biochemistry. 7th
4. Synder L., Peters J. E., Henkin T.M. and Champness W. (2013). Molecular Genetics of Bacteria, 4th Edition, ASM Press Washington-D.C. ASM Press.
5. Primrose S.B. and Twyman R. M. (2006). Principles of Gene Manipulation and Genomics. (7th Edition). Blackwell Publishing

Web Resources

1. [PDF] Lehninger Principles of Biochemistry (8th Edition) By David L. Nelson and Michael M. Cox Book Free Download - StudyMaterialz.in
2. <https://microbenotes.com/gene-cloning-requirements-principle-steps-applications/>
3. <https://courses.lumenlearning.com/boundless-biology/chapter/dna-replication/>

4. Molecular Biology Notes - Microbe Notes
5. Molecular Biology Lecture Notes & Study Materials | Easy Biology Class