

Introduction

The field of Molecular Biology arose by the convergence of works of Geneticists, Biochemists and Physicists on a common goal of nature of inheritance. It refers to the study of structure and function of macromolecules essential to life such as nucleic acids and proteins.

Objectives

1. To understand structure of DNA and its topological and supercoiling properties
2. To understand enzymology and the mechanism of DNA replication
3. To understand the causes of DNA damage and mechanism of DNA repair
4. To understand the techniques that revolutionize the discipline, gene cloning and the methods of expression of cloned gene.
5. To understand how the genes can be studied by using various molecular tools.

Theory

Brief history of DNA, Structure and properties of DNA, DNA topology and supercoiling, DNA Replication: types of DNA Polymerases of Prokaryotes and Eukaryotes, the detailed mechanism of replication in Prokaryotes and Eukaryotes. DNA Damage and Repair, Molecular Cloning Methods, Molecular tools for studying genes and gene activity.

Text Book

1. Weaver, R., 2007. *Molecular Biology* 4th Ed. McGraw-Hill.

Additional Reading Material

2. Kornberg, A., 2005. *DNA Replication*, 2 Ed. University Science Books.

3. Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M., Losick, R., 2007. *Molecular Biology of the Gene* (6th Ed.)

4. Lewin, B.C., 2007. *Genes IX*. 9 Ed. Jones and Barlett Publication.

5. Krebs, J.E., Goldstein, E.S., and Kilpatrick, S.T., 2008. *Lewin's Genes X*.

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Practicals

Methods of isolation of bacteria from different samples.

Methods of various culturing techniques of bacteria for molecular studies.

Extraction of plasmid DNA from bacteria.

Method of culturing eukaryotic organism (*Paramecium* sp.) by using bold basal salt medium.

Extraction of genomic DNA from eukaryotic organism.

Text Book

1. Weaver, R., 2007. *Molecular Biology* 4th Ed. McGraw-Hill.

Additional Reading Material

2. Brown, T. A., 2010. *Gene cloning and DNA analysis: an introduction*. (6th Ed.)

3. Green and Sambrook, 2012. *Molecular Cloning, A Laboratory Manual*, 4th Edition. CSH Press Publication.

4. Sean, R. and Emily, A. 2008. *Current Protocols Essential Laboratory Techniques*. John Wiley & Sons Publication.