

B.Sc. in Industrial Microbiology

B.Sc. II

Paper I

Microbial Genetics and Molecular Biology

Unit 1. Genetic recombination in bacteria: transformation, transduction and conjugation, gene mapping.

Unit 2. Extra chromosomal genetic material: plasmids, cosmids, transposons, silent genes, exons and introns.

Unit 3. DNA as genetic material, basic mechanism of replication, enzymes involved in replication, transcription mechanism, translation, genetic code, regulation of gene expression, reference to prokaryotes.

Unit 4. Mutations: spontaneous and induced – chemical and radiations, base pair changes, frameshift, deletions, inversions, tandem duplications, insertions, useful phenotypes – auxotrophy, conditional lethal, resistant.

Unit 5. DNA repair and restriction: Types of repair system, restriction endonucleases, various types of restriction enzymes – properties and uses, methylation – dependent restriction enzymes.

References:

1. S R Maloy, D Freifelder and J E Cronan. Microbial Genetics. Jones and Barlett Publishers.
2. Prescott

Paper II

Environmental Microbiology

Unit 1. Aerobiology: droplet nuclei, aerosol, assessment of air quality, airborne diseases and their control, enumeration of microbes from air.

Unit 2. Soil Microbiology: soil microflora and its enumeration, rhizosphere, phyllosphere, microbial interactions, mycorrhizae, lichens.

Unit 3. Nitrogen fixation: mechanism of symbiotic and asymbiotic, nitrogenase complex, nif genes and their regulation, *Rhizobiaceae*, *Frankia*.

Unit 4. Biogeochemical cycling: role of microorganisms in carbon, nitrogen, phosphorus and sulfur cycles. Biodegradation of xenobiotics, bioaccumulation, biodeterioration.

Unit 5. Water microbiology: ecosystems – fresh water and marine, zonations, eutrophication, water borne diseases and their control. Waste treatment – solid liquid, aerobic and anaerobic methods.

References:

1. Bagyaraj and Rangasamy. Agricultural Microbiology..
2. N S Subba Rao. Soil Microbiology. Oxford and IBH.
3. Atlas and Bartha. Microbial Ecology. Pearson.

Paper III

Computers, Bioinformatics and Biostats

Unit 1. Introduction to Computers – classification, computer generation, low, medium and high level languages, software and hardware, operating systems, compilers and interpreters, personal, mini, main frame and super computers, characteristics and application, computer memory and its types, data representation and storage.

Unit 2. Microsoft excel, data entry, graphs, aggregate functions, formulas and functions, number systems, conversion devices, secondary storage media.

Unit 3. Overview of bioinformatics, database types, computer tools for sequence analysis, finding and retrieving sequences, similarity searching.

Unit 4. Nature and scope of statistical methods, compilation, classification, tabulation and applications in life sciences, graphical representation, introduction to probability theory and distributions.

Unit 5. Correlation and regression – concepts of sampling and sampling distribution, tests of significance based on t, chi square and F for means, variances and correlations. Sampling methods – simple Random, stratified systematic and cluster sampling procedures, analysis of variance.

References:

1. G W Snedecar and W G Cochran. Statistical Methods. Oxford.
2. R White. How Computers Work. Techmedia.
3. Higgins and Taylor. Bioinformatics. OUP.

Practicals

1. Isolation of *E. coli* plasmid.
2. Transformation in *E. coli*.
3. Replica plate technique for detection of auxotrophy.
4. Isolation of DNA from bacteria.
5. Electrophoretic analysis of proteins and nucleic acids.
6. Isolation of root nodulating bacteria.
7. Enumeration of microorganisms from air.
8. Isolation of bacteria from rhizosphere.
9. Coliform test.
10. Determination of standard deviation.
11. Determining ANOVA
12. Learning to use EXCEL and Word.