

Unit 1

Safety measures in recombinant DNA technology, milestone in genetic engineering, introduction to host, *E. coli* strains, yeast (*Saccharomyces cerevisiae*), Fungi (*Aspergillus*), mammalian cell lines (names & genotype). Restriction enzymes: Type I, II, III & IV, mode of action, nomenclature, DNA modifying enzymes and their applications.

Unit 2

Vectors –Plasmid, bacteriophage, cosmids, expression vectors- retroviral promoter based vectors, Artificial chromosomes. Production of defined DNA fragments.

Unit 3

Cloning strategies-Insertion of DNA molecule into a vector; Detection of recombinant molecules, cloning and expression of genes in prokaryotic and eukaryotic systems.

Unit 4

Methods of gene delivery in plants and animals – microinjection, biolistic method, liposome mediated, transformation and electroporation. Transgenic organisms. Gene therapy.

Suggested readings

1. Molecular Cloning: a Laboratory Manual, J Sambrook, E F Fritsch and T Maniatis, Cold Spring Harbor Laboratory Press, New York, 2000.
2. DNA Cloning: a Practical Approach, D M Glover and B D Hames, IRL Press, Oxford (2002).
3. Gene Cloning and DNA Analysis. 5th ed. Brown TA. Blackwell Publishing, Oxford, U.K. (2006)..
4. Biotechnology-Applying the Genetic Revolution. Clark DP and Pazdernik NJ. Elsevier Academic Press, USA. (2009).

Paper V P**Laboratory****25**

1. Isolation and quantification of Plasmid DNA from bacterial cells.
2. Electrophoresis of plasmid DNA.
3. Digestion of DNA using restriction enzymes and analysis by agarose gel electrophoresis.
4. Demonstration of PCR.

Suggested readings

1. Molecular Cloning: a Laboratory Manual, J Sambrook, E F Fritsch and T Maniatis, Cold Spring Harbor Laboratory Press, New York, 2000.
2. DNA Cloning: a Practical Approach, D M Glover and B D Hames, IRL Press, Oxford (2002).

Unit 1

History and development of microbiology, germ theory of disease, concept and methods of sterilization, microbial growth curve and factors affecting microbial growth, various forms of microorganisms (bacteria, fungi, viruses, protozoa, PPLOs), gram-positive and gram-negative bacteria, nutritional classification of microorganisms, isolation and pure culture techniques.

Unit 2

Spontaneous and induced variation in microbial populations; genetic recombination in microbes (conjugation, transduction, transformation); strain improvement by selection. Microbes in extreme environments, pathogenic microorganisms. Symbiosis and antibiosis among microbes, N-fixing microbes in agriculture, biofertilizers; Industrial microbes and their uses in production of food (Dairy and SCP) and drugs (penicillin and streptomycin).

Unit 3

Modern fuels and their environmental impacts (methanogenic bacteria and biogas), microbial hydrogen production, conversion of sugars to ethanol. Treatment of municipal wastes and industrial effluents, degradation of pesticides and other toxic chemicals by microorganisms.

Unit 4

Limiting factors of environment, energy transfer and biogeochemical cycling in ecological systems; Environmental problems- ozone depletion, green house effect, water, air and soil pollution; GEMs in environment; Biopesticides, Bio-assessment of environmental quality; Role of environmental biotechnology in management of environmental problems.

Suggested readings

1. General Microbiology, Stainer, RY, Ingraham, JL, Wheelis, ML., and Painter, PR. The Macmillan Press Ltd., (2000).
2. Principles of Microbiology, Atlas RM, Mosby, (1995).
3. Environmental Biotechnology, Concepts and Applications. Hans-Joachim Jordening and Josef Winter. Winter-VCH. 2005
4. Biology of wastewater Treatment. N F Gray. Mc Graw Hill . 2004.
5. Fundamentals of ecology (5th Edition) by EP Odum and GW Barrett, Thomson Books/Cole, 2005.
6. An Introduction to Environmental Biotechnology by Milton Wain Wright. Kluwar Acad Publ. Group, Springer, 1999.

1. Aseptic techniques: preparation of media, cotton plugging and sterilization.
2. Isolation of microorganism from water and soil samples.
3. Isolation of pure cultures by colony streaking and pour plate technique.
4. Antibiotic sensitivity test.
5. Identification of microorganism: Gram and capsule staining.
6. Testing water quality – BOD and COD.

Suggested readings

1. General Microbiology, Stainer, RY, Ingraham, JL, Wheelis, ML., and Painter, PR. The Macmillan Press Ltd., (2000).
2. Environmental Biotechnology, Concepts and Applications. Hans-Joachim Jordening and Josef Winter. Winter-VCH. 2005
3. Fundamentals of ecology (5th Edition) by EP Odum and GW Barrett, Thomson Books/Cole, 2005.