

DEPARTMENT OF BIOTECHNOLOGY

Syllabus for Ph.D. Entrance Examination

Unit I: Cell and Molecular Genetics

The Cell: The basic unit of life, Structure of the cell, Molecules of the cell, Cell cycle. Genetic basis of inheritance, Chromosomal basis of inheritance, Nature of gene, its expressional regulation, Genetic Engineering, Cloning and Genomics

Unit II: Plant Biotechnology

Introduction to plant cell and tissue culture – media preparation, initiation and maintenance of callus and suspension culture, single cell clones, organogenesis, somatic embryogenesis. Genetic engineering for delayed fruit ripening, production of antibodies, viral antigens and peptide hormone in plants, gene silencing in transgenic plants

Unit III: Animal Biotechnology

Structure and organization of animal cell. Basic techniques of mammalian cell culture *in vitro*, maintenance of cell culture. Measurement of cell viability and Cytotoxicity. Transformation of animal cells, immortalization and cell lines. Biology of Viral vectors. Oncogenes and Antioncogenes. HIV diagnosis and therapy. Transgenic animals. Gene Knock out.

Unit IV: Microbiology

Historical perspectives of microbiology, Domain and Kingdom concepts in classification of microorganisms, Prokaryotic Cell structure & Organization, Cell membrane, Cytoplasmic and Inclusion bodies, Gram-positive and Gram- negative Bacilli of medical importance. Microorganisms in the environment - Air, Water & Soil. Food and Dairy microbiology – micro Flora of food, milk and milk products. Bioreactor design – parts and their function and type.

Unit V: Environmental Biotechnology

Natural resources, Renewable and nonrenewable resources, conservation of natural resources. Types of environmental pollution- Air, Water and Land. Global warming and Acid rain, Eutrophication. Impact of heavy metals, halogens, radio nuclides on aquatic flora and fauna, primary, secondary and tertiary treatment technologies for industrial effluent/ wastewater. Thermal pollution, soil pollution and effects. Bioremediation, Biomineralization.

Reference Books:

- Microbial Genetics (2006) by S.R. Maloy, J. E. Cronan Jr., and D. Freifelder, Jones and Bartlett Publishers, Sudbury, Massachusetts.
- De Robertis and De Robertis. 8th Eds. Cell and Molecular Biology. Lippincott Williams & Wilkins (2005).
- H.S. Chawla, Biotechnology in crop improvement, international Book Distributing Company, 1998.
- Ralf Pörtner, 2007. Animal Cell Biotechnology: Methods and Protocols (Methods in Biotechnology). 2nd Edition. Humana Press.
- R.Spier and J.Griffiths, 1994. Animal Cell Biotechnology.. Academic Press.
- Environmental Biology. P.D.Sharma. (1994) Rastogi Publishers.
- Introduction to Environmental Biotechnology. A.K.Chatterjee (2002). Printice-Hall, India.
- Microbiology (2005), Sixth edition by L.M. Prescott, J.P. Harley and D.A. Klein, McGraw Hill, Boston.