BIOTECHNOLOGY: MICROBES TO ANIMALS

Paper 18

THEORY (48 Periods)

Unit 1: Introduction (3)

Concept and scope of Biotechnology

Unit 2: Techniques in Gene Manipulation (15)

Restriction and modifying enzymes, Cloning vectors and Expression vectors, Transformation techniques, Identification of recombinants, Construction and screening of DNA libraries; Molecular analysis of DNA, RNA and proteins (*i.e.* Southern, Northern and Western blotting), DNA sequencing (Sanger's method and automation), Polymerase Chain Reaction, Microarrays, DNA fingerprinting: RAPD

Unit 3: Microbes in Biotechnology (10)

Growth kinetics of microbes, Applications of microbes in industry (Concept of primary and secondary metabolites, Fermentation/Bioreactors, Downstream processing), Bioremediation and Biosensing

Unit 4: Transgenic Animal (10)

Production of transgenic animals: Retroviral method, DNA microinjection method, embryonic stem cell method, nuclear transplantation; Applications of transgenic animals; Knockout mice; Transgenic livestock; Transgenic fish.

Unit 5: Biotechnology and Human Welfare (10)

Animal cell technology: Concept of expressing cloned genes in mammalian cells, Recombinant DNA in health (Recombinant insulin and human growth hormone), Production of recombinant vaccines, Gene therapy: *in vitro, in-vivo* and *ex-vivo*. Ethical issues concerning: Transgenesis, Biosafety and Intellectual Property Rights

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PRACTICAL

1. Isolation of genomic DNA from *E. coli* and analyze it using agarose gel electrophoresis
2. Isolation of plasmid DNA (pUC 18/19) and analyse it using agarose gel electrophoresis.
3. Transformation of *E. coli* (pUC 18//19) and calculation of transformation efficiency.
4. Restriction digestion of lambda (λ) DNA using *EcoR*1 and *Hind* III.
5. DNA ligation (lambda DNA *EcoR*1*/Hind* III digested).
6. Construction of restriction digestion maps from data provided.
7. Study of Southern blot hybridization and PCR; Analysis of DNA fingerprinting (Dry Lab)

   * Project on Animal Cell Culture

ESSENTIAL READINGS

- Brown, T.A. (1998). *Molecular Biology Labfax II: Gene Cloning and DNA Analysis*. II Edition, Academic Press, California, USA.
- Klug, W.S., Cummings, M.R. and Spencer, C.A. (2009) *Concepts of Genetics*. IX Edition, Benjamin Cummings.
- Glick, B.R. and Pasternak, J.J. (2009). *Molecular Biotechnology - Principles and Applications of Recombinant DNA*. IV Edition, ASM press, Washington, USA.

SUGGESTED READINGS

- Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2009). *An Introduction to Genetic Analysis*. IX Edition. Freeman and Co., N.Y., USA.
- Snustad, D.P. and Simmons, M.J. (2009). *Principles of Genetics.* V Edition, John Wiley and Sons Inc.
- Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K. (2007). *Recombinant DNA- Genes and Genomes- A Short Course*. III Edition, Freeman and Co., N.Y., USA.
- Beauchamp, T.I. and Childress, J.F. (2008). *Principles of Biomedical Ethics.* VI Edition, Oxford University Press.
- Sreekrishna, V. (2001). *Bioethics and Biosafety in Biotechnology.* I Edition, New Age International (P) Ltd.