

BIOTECHNOLOGY SEMESTER -3

BTECH-201 Concepts in Biotechnology

(40 Hours)

Introduction to Biotechnology

Historical background, Definition of Biotechnology, Contribution from related disciplines
Major area of biotechnology
Impact of biotechnology on National and Global economies
Challenges and Future

Current Status of Biotechnology

Leading industries within the state and country and US
Promotional agencies: Biotech Government policies, Agencies ICGEB, GSBTM, DBT and CSIR
Case study for any one Biotechnology product / Industry

Biotechnology Enterprise

Entrepreneurship development
Process economics and Plant management
Importance quality, Role of BIS, Certification ISO and Idea of TQM
Enterprise: Component, Road map, Development strategy, Success indices
Human resource: R&D, Operation, Production and QA, Regulatory and Managerial sectors
Setting up and administering laboratory
Automation in Laboratory and GAMP, GLP, GILSP, GMP
Validation process, Role of regulatory agencies

Ethical, Social and Legal Aspects

Social and Ethical issues: Genetic privacy, Patent of Gene, Trading human, Human cloning, Stem cell and Embryo
Genetic counselling, Threats from GM organisms,
Hazardous Waste (Management and Handling) Rules, 1989
IPR, Patent, TRIPS, WTO, GEA Committee

Reference

1. Das HK (2007) Textbook of Biotechnology, (3rdEd), Wiley India
2. Barnum Susan R (2006) Biotechnology: An Introduction, (2ndEd), Thomson
3. Rastogi SC (2007) Biotechnology Principles and Applications, Narosa
4. John E. Smith (1996) Biotechnology, (3rdEd), Cambridge Low Price Edition
5. Aluizio Borem, Fabricio R. Santos, David E. Bowen (2003) Understanding Biotechnology, Low Price Edition, Pearson Education.
6. Gimble Jeffrey M (2005) Academia to Biotechnology, Elsevier
7. Thieman William J and MA Palladino (2009) Introduction to Biotechnology, (2ndEd), Pearson Education
8. Dorf Richard C and TH Byers (2008) Technology Ventures: From Idea to Enterprise, (2ndEd), McGraw-Hill
9. Jogdand SN (2007) Entrepreneurship and Business of Biotechnology, Himalaya
10. Kumar HD (1998) Modern Concepts of Biotechnology, Vikas
11. Prave Paul, Faust U, Sitting W and DA Sukatsch (1987) Basic Biotechnology: A Student's Guide, Wiley
12. Indian Standard Specifications, Bureau of Indian Standards
13. Reinhard Renneberg (2008) Biotechnology for Beginners (Ed Arnold L Demain), Academic Press

Instrumental Methods

- (A) Precipitation and Solvent extraction
- (B) Centrifugation Principle, Stoke's law, RCF, Ultracentrifugation, EDGC
- (C) Chromatography - Partition coefficient, Partition, Absorption, Ion-exchange, GC, HPLC, Affinity, Molecular exclusion
- (D) Principle of filtration, Bacteria proof filters, RO, Ultrafiltration
- (E) Electrophoresis - Principle, Electrophoretic mobility, Isoelectric focusing
- (A) Principles and Applications of UV-vis, NMR, Fluorescence, IR, AA, MASS, Raman and CD spectroscopy and X-ray diffraction

Methods of assay

- (A) Immunoassay Gel diffusion, ELISA, RAST, RIA, Immunofluorescence
- (B) Radioactivity based analyses: Commonly used radio isotopes, Scintillation counting, Safety aspects, Dosimetry, Geiger Muller counter, Radioactive tracer technique
- (C) Biological assay of Antibiotics and Growth promoters, Reporter gene bioassay

Methods in Molecular Biology

- (A) PCR: Principle, Primers, Polymerases, Thermal cycler, RT-PCR, Immuno-PCR
- (B) Molecular hybridization: Denaturation and Annealing, T_m, DNA, DNA-RNA, RNA
- (C) Blotting techniques: Southern-, Northern-, Western-blot and Dot-blot
- (D) Microarray: Matrix, Study of Gene expression, Applications

Microbial methods

- (A) Cultivation of Bacterial, Plant and Animal cells
- (B) Cultivation of Bacterial, Plant and Animal viruses, Cytopathic effect, Enumeration of Viruses
- (C) Industrial culture: Desirable properties, Screening, Strain improvement and Preservation

Reference

1. Wilson K and Walker J (2005) Principles and Techniques of Biochemistry and Molecular Biology, (6thEd), Cambridge
2. Willard HH, Merritt LL, Dean JA, and FA Settle (1986) Instrumental Methods of Analysis, (7thEd), Wadsworth / CBS
3. BIOTOL Series (1991) In vitro Cultivation of Animal Cells (Biotechnology by Open Learning), Butterworth Heinmann
4. CA Reddy, Ed (2007) Methods for General and Molecular Microbiology (3rd Ed) ASM Press

BTECH-203 Practical BIOTECHNOLOGY PRACTICALS (40 Hours)**Practical Concepts in Biotechnology, Methods in Biotechnology (201, 202)**

1. Determination of protein by UV absorbance / spectra / Molar Extinction Coefficient
2. Separation of Amino acids by Paper chromatography technique
3. Isolation of microorganism from extreme environment / polluted site
4. Identification of Gram-negative bacterial culture based upon rapid biochemical test kit
5. Isolation of Bacteriophage from sewage
6. Bioassay of Penicillin using *B. subtilis*.
7. Designing PCR primer for browsed sequence from database