MB - 302 Pharmaceutical Microbiology and Fermentation Technology

Section - I

Unit - 1 Pharmaceutical Microbiology

15 hours

1. Microbial aspect of Pharmaceutical processing : Microbial spoilage and prevention of pharmaceutical product; Principle and practice of sterilization, Sterile pharmaceutical product , Factory and hospital hygeny and good Manufacturing practice
2. Drug Discovery: Targets and Receptors; Drug Discovery: Small Molecule Drugs; Drug Discovery: Large Molecule Drugs: Enzymes, Vaccines (Attenuated, DNA, Subunit, vector), Antibodies(Monoclonal antibodies) , Cytokines, Hormones, Gene Therapy, Stem Cells;
3. Drug Development and Preclinical Studies; Clinical Trial : Overview, Role of microbiologist in CRO;
4. Bio safety: Principle of bio safety , Laboratory Bio safety Level Criteria; Bioterrorism; Biomedical waste management

Unit - 2 Novel Microbial products

15 hours

1. Probiotics and Prebiotic : Concept, methods and application
2. Production of Antibiotics and Anti-Tumor Agents: Classification and Nomenclature of Antibiotics; General production methods; Penicillin, Cephalosporins, Tetrcycline, Bacitracin production; Problem of Antibiotic Resistance; The Search for New Antibiotics; Combating Resistance and Expanding the Effectiveness of Existing Antibiotics; Anti-Tumor Antibiotics; Newer Methods for Searching for Antibiotic and Anti-tumor Drugs; Synthesis of commercial products by recombinant microorganism: Small Biological molecules, Antibiotics, Biopolymers;
3. Biocatalysis in Organic Chemistry: Nature and Use of Steroids and Sterols, Uses of Steroids and Sterols, Types of microbial transformations in steroids and sterols, Fermentation conditions used in steroid transformation, Asymmetric Catalysis in the Pharmaceutical and Agrochemical Industries
4. Production of Microbial Insecticides: Alternatives to Chemical Insecticides; Biological Control of Insects; Bacillus thuringiensis Insecticidal toxin ; Production of Biological Insecticides; Bioassay of Biological Insecticides; Formulation and Use of Bioinsecticides; Safety Testing of Bioinsecticides; Search and Development of New Bioinsecticides

Section - II

Unit - 3 Primary metabolites production

15 hours

1. Amino Acids: Introduction, Microbial strain employed in aminoacid production, process control in amino acid fermentation, Production of Glutamic Acid by Wild Type Bacteria, Production of Amino Acids by Mutants, Improvements in the Production of Amino Acids Using Metabolically Engineered Organisms; Vitamin: Vitamin B12, Riboflavin, Carotenodis
2. Production of Organic Acids: Citric, acetic lactic, Gluconic and Itaconic acid
3. Production of Microbial enzyme: Introduction, Development of new enzymes, Fermentation process, Recovery and finishing, Regulations and specification, Survey of enzyme and application
4. Production of Fermented Foods: Introduction; Fermented Food from Wheat: Bread; Fermented Foods Made from Milk; Fermented Foods from Corn; Fermented Vegetables; Fermentations for the Production of the Stimulant Beverages: Tea, Coffee, and Cocoa; Fermented Foods Derived from Legumes and Oil Seeds; Production of Beer, Wines and Spirits

Unit - 4 Production of Secondary metabolites and other

15 hours

1. Microbial Polysaccharides and Polyesters : Polysaccharides, Xanthan Gum, Polyesters
2. Production of Ergot Alkaloids: Nature of Ergot Alkaloids, Uses of Ergot Alkaloids and their Derivates, Production of Ergot Alkaloids, Physiology of Alkaloid Production
3. Microbial Production of Nucleocide and Nucelotides: Introduction, Methods for production
4. Single Cell Protein (SCP): Substrates for Single Cell Protein Production; Microorganisms Used in SCP Production; Use of Autotrophic Microorganisms in SCP Production; Safety of Single Cell Protein; Nutritional Value of Single Cell Protein; Yeast Production: Production of Baker□s Yeast; Food Yeasts; Feed Yeasts; Alcohol Yeasts; Alcohol Yeasts

List of Experiments

1. Production of Amino acid (Glutamic acid)
2. Production of Vitamins (Vitamin B_2 /Vitamin B_{12})
3. Production of Solvents (Ethanol, Acetone/ Butanol)
4. Production of Organic acid (Citric acid/ Gluconic acid)
5. Production of extra-cellular polysaccharide
6. Production of Antibiotics (Penicillin/ Tetracycline/ Chlormphanicol/ Streptomycin)
7. Effectiveness of antimicrobial preservatives
8. Microbial limit test
9. Physicochemical test of extracts: Preparation of extract, appearance, light absorption, pH, nonvolatile matter, residues on ignition, heavy metal, buffering capacity, oxidizable substances
10. Lal test for bacterial endotoxins

List of Reference Books

1. Mansi, Fermentation microbiology and Biotechnology, Taylor and Francis
2. Waites, Industrial Microbiology: An Introduction, Blackwell publication
3. Michal, Bioprocess Engineering Basic Concept, Prentica Hall of India
4. Biotol series, Operational Models for Bioreactor,
5. Biotol series, Product recovery in Bioprocess technology,
6. Whittaker, Principles of fermentation technology.
7. Crueger, A text book of Industrial microbiology.
8. Okafor, Modern Industrial Microbiology and biotechnology
9. Najafpour, Biochemical Engineering And Biotechnology
10. Alexander, Microbial Biotechnology
11. Volkmar, Microbial Fundamentals of Biotechnology
12. Sikyta, Techniques in Applied Microbiology
13. Laskin, Applied Microbiology, Volume 56
14. Laskin, Advances in Applied Microbiology Volume 59
15. Laskin, Advances in Applied Microbiology Volume 62
16. Walker, Microbial Processes and Products
17. Demain, Manual of Industrial and Biotechnology
18. Peppler, Microbial technology: fermentation technology
19. Waites, Industrial Microbiology: An Introduction
20. Michal, Bioprocess Engineering Basic Concept
21. Rehm, A multivolume Comprehensive Treaties: Biotechnology