

Session 2016-17
B.Sc. – I
MICROBIOLOGY
PAPER – I
GENERAL MICROBIOLOGY

Max. M. - 50

Min. M. - 17

Unit – 1

Unity of microbial world, scope of Microbiology, Microbiology and human health, beneficial and harmful microbes. development of microbiology (contributions of pioneers)

Unit – 2

Diversity of microbial world: Principal of classification, classification of Viruses, Bacteria (including Cyanobacteria), Algae and Fungi (including yeasts) and protozoa

Unit –3

Methods for studying microorganism: Origin of microbes, microscopy, pure culture techniques, Sterilization, Aseptic techniques, Isolation of pure culture, conditions and media for growth of microorganisms in the Laboratory

Unit – 4

General organization of microbes; Structural, functional organization and economic importance of algae (Nostoc, Anabaena, Oscillatoria), fungi (Rhizopus, Penicillium, Aspergillus), yeast and lichens

Unit – 5

Structure, functional organization and economic importance of bacteria (Gram positive, Gram negative), Viruses (Plant and Animal) and protozoa (Ciliates, Flagellates and Sporozoans)

Recommended Books

1. General Microbiology I &II - C.B. Powar and H. F. Dagainawala , Himalaya Publishing House Bombay.
2. A text book of Microbiology , R.C. Dubey and D.K. Maheshwari, S. Chand and Company Ltd., New Delhi.
3. Microbiology: Fundamentals and Applications , S.S. Purohit, Students Edition, Jodhpur.
4. Microbiology, Pelczar J., and Chan, Tata McGRAW-Hill Edition.
5. General Microbiolog ,Stanier R. Y. and Ingraham J.L.,Macmillan Press Ltd.

Session 2016-17
B.Sc. – I
MICROBIOLOGY
PAPER – II
BIOCHEMISTRY AND IMMUNOLOGY

Max.M.- 50

Min. M. - 17

Unit – 1

Structure and properties of mono and disaccharides, amino acids and peptides, bases; purines and pyrimidens, Sugars; ribose, deoxy ribose and nucleoside and nucleotide; general account of lipids.

Unit – 2

Concept of macromolecules; Structural and functional organization of polysaccharides (starch, glycogen, cellulose, mucopolysaccharides), proteins and nucleic acids (DNA, RNA).

Unit – 3

Enzymes; historical account, classification, Co-enzymes and their role. Enzyme action, Enzyme kinetic, Km, Vmax and Enzyme inhibition. Allosteric enzyme and isoenzyme, Extracellular enzymes and their role.

Unit – 4

Metabolism; general concept of metabolisms (anabolism, catabolism and amphibolism). Glycolysis, TCA cycle and HMP Shunt. Anaerobic catabolism of glucose; alpha, beta, gamma oxidation of fatty acids.

Unit – 5

Concept of immunity, Innate and acquired immunity. Brief account of cells and organs of immune system. Antigen and Antigenicity. Antibody structure and function. Antigen- Antibody reaction.

Recommended Books

1. A text book of Microbiology – P.Chakraborty , New central book agency(P) Ltd. Kolkata.
2. General Microbiology I &II - C.B. Powar and H. F. Dagainawala , Himalaya Publishing House Bombay.
3. Biochemistry, Powar C.B. and Chatwal, Himalaya Pub.

5. A text book of Microbiology – R.C. Dubey and D.K. Maheshwari, S. Chand and Company Ltd., New Delhi.
6. Microbiology : Fundamentals and Applications – S.S. Purohit, Students Edition, Jodhpur.

B.Sc. Part I
Microbiology
List of Practical Exercises
Session 2016-17

1. Basic rules of Microbiology Laboratory
2. Study of Common Glass wares and their Cleaning
3. Study of common Tools
4. Study of Microscope
5. Study of Autoclave
6. Study of Laminar air flow
7. Study of Incubator
8. Study of Hot air oven
9. Preparation of Culture Media for culturing Bacteria and Fungi
10. Preparation of Agar deep tubes and Agar Slants
11. Preparation of Agar plates (Pouring and Plating)
12. Primary isolation of bacteria and fungi by Pour Plate and Spread Plate Methods
13. Preparation of Pure Culture by Streak Plate method
14. Study of Colony Counter and Enumeration of Bacterial colonies by dilution plate method
15. Study of Bacteria by Gram- Staining (Gram Positive and Gram Negative)
16. Study the macroscopic and microscopic features of given microbial cultures (Bacteria, Fungi, Cyanobacteria, Lichen)
17. Biochemical test for Carbohydrates (Glucose and Starch), Lipids, Proteins, Amino acids
18. Demonstration of Amylase production by microorganisms
19. Demonstration of Agglutination test through Blood grouping
20. Study the control of microorganisms by physical, chemical and biological methods and compare the

Session 2016-17
B.Sc. – II
MICROBIOLOGY
PAPER – I
MICROBIAL PHYSIOLOGY AND GENETICS

Max. M. - 50

Min. M. - 17

Unit – 1

Plasma membrane and transport across membrane, Energy transformation. Physiology of bacterial growth, phases of growth, growth conditions, differentiation in bacterial cells - Sporulation, germination. Bacterial cell division - replication of chromosome, partition of chromosome into daughter cells.

Unit – 2

Primary and Secondary metabolism.-Introduction to metabolism, primary metabolism-(carbohydrate metabolism- Glycolysis, Citric Acid cycle, Gluconeogenesis, Hexose Monophosphate Shunt, Glyoxylate cycle) Lipid Metabolism (Fatty Acid Oxidation), Secondary Metabolism- Antibiotic, vitamins.

Unit – 3

Bacterial Plasmids: structure and properties, replication, incompatibility, plasmid amplification. Bacteriophages: Lytic development cycle – T4; lytic and lysogenic development of phage, single stranded DNA phage.

Transposition: structure of bacterial transposons, types of bacterial transposons. Mechanism of antibiotic resistance and spread of antibiotic resistance.

Unit – 4

Genetic recombination: requirements, molecular basis, genetic analysis of recombination in bacteria.

Unit – 5

DNA Repair and restriction; Types of repair systems, restriction endonuclease, various types of restriction enzymes, dam and dcm methylase

Recommended Books

1. Microbial Genetics – Vol. I & II Powar, C. B. Himalaya pub.
2. Genetics – Gupta P.K. , Rastogi Publication.
3. General Microbiology I &II - C.B. Powar and H. F. Dagainawala , Himalaya Publishing House Bombay.

4. A text book of Microbiology – R.C. Dubey and D.K. Maheshwari, S. Chand and Company Ltd., New Delhi.
5. Microbiology : Fundamentals and Applications – S.S. Purohit, Students Edition, Jodhpur.

Session 2016-17
B.Sc. – II
MICROBIOLOGY
PAPER – II
PRINCIPLES OF BIOINSTRUMENTATION AND TECHNIQUES

Max. M.- 50
Min. M. -17

Unit – 1

Colorimetry and spectrophotometry
Luminometry and Spectrofluorimetry
Turbidometry and Nephelometry
pH metery

Unit –2

Chromatography: adsorption, partition, column, gas, ion- exchange, gel filtration, affinity chromatography, HPLC

Unit – 3

Centrifugation and ultracentrifugation.
Microscopy – light, phase-contrast, fluorescence, dark field, electron microscopy.
Laser confocal microscopy and digital image analysis

Unit – 4

Tissue culture techniques; Principle and requirements of animal tissue culture.
Decontamination, sterilization and disinfection

Unit – 5

Electrophoresis techniques- types and their application, Electrophoresis of proteins, nucleic acids and Immunoelectrophoresis.
Sequencing of proteins and nucleic acids.
Radioisotope techniques: nature of radioactivity, detection, measurements, counters, and safety aspects.
Enzyme purification and assay techniques.

Recommended Books

1. Biophysical Chemistry, Principles and Techniques – Upadhyay and Upadhyay, Himalaya Pub.
2. Instrumental Analysis – Skoog and Haller

3. Analytical Chemistry – G. Chatwal and Anand, Himalaya Pub.
4. Biotechniques: Theory and Practice – S.V.S. Rana, Rastogi Pub.

B.Sc. Part II
Microbiology
List of Practical Exercises
Session 2016-17

MM. - 50

1. Determination of λ max of given coloured solution
2. Demonstration of Beer's law
3. Separation of Ink components/ chlorophyll pigments/ Amino acids by Paper Chromatography
4. Separation of Amino acids by Thin Layer Chromatography
5. Demonstration of Gel Filtration Chromatography
6. Demonstration of SDS-PAGE
7. Demonstration of Submarine Gel Electrophoresis
8. Separation of suspended particles of pond water by Centrifugation
9. Measurement of pH of given solution by pH meter and maintenance of required pH
10. Enumeration of viable cells of bacteria by Standard Plate Count (SPC)
11. Study the bacterial population count by turbidity determination method
12. Determination of fungal growth by weight measurement and colony diameter method
13. Determination of Thermal Death Point (TDP) of bacteria
14. Determination of Thermal Death Time (TDT) of bacteria
15. Study of antibiotic sensitivity by Disc Diffusion Method
16. Isolation of streptomycin resistant strain by Gradient Plate Method
17. Demonstration of extracellular Enzyme production by microorganisms

Session 2016-17
B.Sc. III
MICROBIOLOGY
PAPER – I

MEDICAL MICROBIOLOGY AND IMMUNOLOGY

Unit 1: Air Borne Diseases

Air borne diseases Types: Tuberculosis, Pertussis, Diphtheria, Influenza, Small and Chicken Pox, Mumps, Measles - Symptoms, Treatment and Preventions

Unit 2: Water Borne Diseases

Concept and cause of water borne diseases, Types: Hepatitis, Dysentery, Diarrhea, Cholera, Typhoid, Symptoms, Treatment, and Preventions

Unit 3 :Clinical Diseases and Diagnosis

Clinical Diseases: Diabetes, Asthma, Multiple Sclerosis, Rheumatoid Arthritis, Cancer, Symptoms, Treatment and Preventions

Unit 4: Basic Concept Of Immunity

Immune System, Structure and Function of the cells, tissues and organs of immune system, Types of immunity, Humoral and Cell mediated, Innate, Acquired immunity, Antigen Antibody: types, properties, Hapten, Adjuvants, Immunoglobulins: Structure, types, Properties and their function, Theory of Antibody Production

Unit 5: Immuno Disease Diagnosis

Methods based on Ag- Ab interaction- Precipitation, Agglutination, ELISA, RIA, Immuno-electrophoresis, PCR based diagnosis method for infectious diseases.

Recommended Books

1. Immunology: Kuby
2. General Microbiology by Powar and Daginawala
3. Zinssers Microbiology by K.J. Wolfgang, McGraw- Hill Company
4. Medical Microbiology: N.C. Dey and T.K. Dey, Allied agency, Calcutta
5. Biotechnological Techniques by FJ Baker
6. A textbook of Microbiology: Dubey and Maheshwari; S. Chand & Sons
7. Scott's Diagnostic Microbiology by EJ Baron

Session 2016-17
B.Sc. III
MICROBIOLOGY
PAPER – II

ENVIRONMENTAL, INDUSTRIAL AND AGRICULTURAL MICROBIOLOGY

Unit – 1: Air Microbiology

Basics of Aerobiology, Microbes in atmosphere, Source of microorganism in air, Droplet nuclei, Infectious dust, and Bio-aerosol, Factors affecting microbial survival in air, Sampling, Collection and Isolation of microbes from air.

Unit – 2: Water microbiology

Basic concept, Water zonation, Eutrophication, Microbial community in natural water. Determining the quality of water bacteriological evidence for fecal pollution, Indicator of fecal pollution. Water purification methods, Disinfection of potable water supply.

Unit – 3: Soil microbiology

Soil as an environmental culture medium, Microbes of soil. Brief account of Microbial Interaction-Symbiosis, Mutualism, Commensalism, Competition, Predation, Parasitism. Microbiological examination of soil. Rhizosphere- concept and role of microbes, Rhizosphere and non-rhizosphere micro-flora. Mycorrhiza.

Unit – 4: Industrial microbiology

Introduction and brief history and scope, Important microbes in various industries. Fermentation- definition, types- aerobic and anaerobic, Batch and SSF, Important products Bread, Cheese, Vinegar, Fermented dairy product and Oriental fermented food involving microbes. Microbial cells as food. SCP- Mushroom cultivation, Production of alcohol and fermented beverages, Beer and Wine.

Unit – 5: Agricultural microbiology

History of agricultural microbiology; Microbes and their importance in maintenance of soil, Biogeochemical cycles, Role of microbes in maintaining the fertility of soil. Biofertilizers- bacterial, azotobacter and vermiform compost. Soil micro-organism- association with vascular plants- Phyllosphere, Rhizobium, Rhizoplane associative nitrogen fixation. Bio-fertilizers- Cyanobacterial and Azolla

Text books recommended:

1. Environmental Microbiology, Banwarilal, CyberTech. Pub.
2. Introduction to Soil Microbiology, Alexander Martin, Wiley Eastern Press.
3. Agricultural Microbiology, Rangaswami G. and Bagyaraj D.J., Prentice Hall India Ltd.
4. A text book of Microbiology – P. Chakraborty, New central book agency (P) Ltd. Kolkata.
5. General Microbiology I & II - C.B. Powar and H. F. Dagainawala, Himalaya Publishing House
6. Bioremediation by KH Baker and D. Herson.

03 LIST OF PRACTICAL EXERCISES

List of Exercises

1. Preliminary identification of enteric pathogens using Triple Sugar Iron Agar (TSIA) medium
2. Study of common air born and water born diseases
3. Demonstration of antigen Antibody interaction by slide agglutination reaction
4. Identification of cells of immune system
5. WIDAL test
6. Determination of BOD and COD of water samples
7. Isolation of Aeromycoflora by Petriplate Exposure Technique
8. Demonstration of centrifugal impact air sampler
9. Microbial assessment of water quality (Presumptive test and confirmative test)
10. Water Analysis for total bacterial population by SPC method
11. Isolation and enumeration of Rhizospheric and Non-rhizospheric fungi from soil and estimation of R:S ratio
12. Microscopic observation of root colonization by VAM Fungi
13. Isolation of Rhizobium from root nodules of leguminous plants
14. Study the industrial importance of microorganisms