

SARDAR PATEL UNIVERSITY
B. Sc.- Microbiology Semester - III
US03CMIC 21- Elements of Microbiology - I
(04 Credits; 4 Hrs/week)
(Effective from June 2019)

Unit : 1

Historical development and Scope of Microbiology :

- Discovery of Microorganisms
- Spontaneous generation versus Biogenesis.
- Germ theory of Fermentation
- Germ theory of disease
- Laboratory techniques and pure cultures
- Principle of Immunization
- Widening horizons:
 - Medical microbiology
 - Agricultural and Industrial microbiology
 - Molecular biology
- Applied areas of Microbiology

Unit : 2

Ultra structure of Bacterial cell:

- Morphology of bacteria
- Basic structure of Bacterial cell
- Structure external to the cell wall:
 - Flagella, Pili, Capsules, Sheaths, Prosthecae and stalks.
 - Cell wall structure and chemical composition.
- Structure internal to the cell wall :
 - Cytoplasmic membrane
 - Protoplasts and Spheroplast
 - Membranous intrusions and Intracellular membrane systems.
 - Cytoplasm
 - Cytoplasmic inclusions and vacuoles
 - Nuclear material
 - Endospore and Cysts .

Unit : 3

Microscopic examination of microorganisms:

(A) Stains and staining:

- Introduction to Stains and Dyes
- Principles of staining.
- Steps in staining process.
- Role of intensifier, mordant & decolorizer
- Types of staining:
 - Simple staining
 - Negative staining
 - Differential staining (Gram staining and Acid fast staining)

(B) Microscopy :

- Principles of Microscopy, magnification and resolving power
- Light microscopy: Simple and compound microscope.
- Principles and applications of phase contrast, fluorescent and Electron Microscopy.

Unit- 4

Characterization, Classification and Identification of Microorganisms:

- Place of microorganisms in living world
- Whittaker's five kingdom concept
- Bergey's Manual of Systematic Bacteriology.
- Major characteristics of Microorganisms.

Microbial Classification: Taxonomic groups

General Methods of Classifying Bacteria -

- Intuitive method, Numerical Taxonomy , Genetic Relatedness.
- Nomenclature and Identification

Reference Books:

1. Microbiology - Pelczar, Chan, & Krieg , 5th edition
2. Elementary Microbiology - H. A. Modi

SARDAR PATEL UNIVERSITY
B. Sc.- Microbiology
Semester - III
US03CMIC 22- Microbial Physiology
(04 Credits; 4 Hrs/week)
(Effective from June 2019)

Unit : 1

Cultivation of Bacteria:

- Nutritional requirements.
- Nutritional types of bacteria
- Common ingredients of media
- Types of media

Isolation:

- Pure cultures
- Methods of isolating pure cultures
- Maintenance & Preservation of Pure cultures

Unit : 2

Growth of Bacteria:

- Methods of Reproduction in Bacteria
- Mathematical expression of Growth
- Measurement of Growth.
- Growth curve of Bacteria
- Synchronous Growth
- Continuous culture
- Diauxic growth
- Physical condition required for growth : Temperature, Gaseous requirements (Aerobes and Anaerobes), PH & Miscellaneous Physical requirements.

Unit : 3

Control of Microorganisms by Physical agents

- Fundamentals of control
- Definition of terms
- Condition influencing antimicrobial action
- Mode of action of antimicrobial agents.
- Physical agents: High temperature, Low temperature, Desiccation, Osmotic pressure, Radiation, Filtration.

Unit : 4

Control of Microorganism by Chemical agents

- Characteristics of an ideal antimicrobial chemical agents
- Selection of chemical agent
- Major groups of chemical Antimicrobial agents
- Evaluation of antimicrobial chemical agents
- Antibiotics: Mode of action of Penicillin, Streptomycin, Tetracycline, Nystatins & AZT.

Reference Books :

1. Microbiology - Pelczar, Chan, & Krieg , 5th edition
2. Elementary Microbiology - H. A. Modi

SARDAR PATEL UNIVERSITY
B. Sc.- Microbiology
Semester - III
US03CMIC 23- Elements of Microbiology - I (Practicals)
(02 Credits; 4 Hrs/week)
(Effective from June 2019)

1. Introduction to Laboratory apparatus.
2. Preparation of Reagents – Preparation of normal, molar & % solution of HCL, NaOH.
3. Simple staining - Monochrome staining & Negative staining
4. Demonstration of Permanent Slide.
5. Study of Bacterial motility by hanging drop preparation.
6. Gram's staining
7. Cell wall staining
8. Capsule staining.
9. Endospore staining.
10. Metachromatic granule staining
11. Demonstration of Micrometry.

SARDAR PATEL UNIVERSITY
B. Sc.- Microbiology Semester - III
Microbial Physiology (Practicals)
(02 Credits; 4 Hrs/week)
(Effective from June 2019)

1. Preparation of media – Nutrient broth / agar
2. Disposal of Laboratory waste and media.
3. Streak plate method for isolation of bacteria.
4. Spread plate technique for isolation of bacteria.
5. Use of selective and differential media (MacConkey's and EMB agar medium)
6. Effect of environmental factors on the growth of microorganisms – Temp. & pH .
7. Study of Oligodynamic action.
8. Effect of antibiotic on growth of test organisms.
9. Effect of antimicrobial agents on the growth of bacteria (Antibiotic, Phenol, Crystal violet).

SARDAR PATEL UNIVERSITY
B. Sc.- Microbiology
Semester - IV
US04CMIC 21- Environmental Microbiology
(04 Credits; 4 Hrs/week)
(Effective from June 2019)

Unit : 1

Microorganisms and their Habitats:

- Structure and function of ecosystems Terrestrial Environment:
- Soil profile and soil microflora
- Aquatic Environment: Microflora of fresh water and marine habitats
- Atmosphere: Aeromicroflora and dispersal of microbes
- Extremophiles: Microbes thriving at high & low temperatures, pH, Osmotic pressure & salinity.

Unit : 2

Soil Microbiology

Microbial Interactions :

- Microbe interactions: Mutualism, synergism, commensalism, competition, amensalism, parasitism.

Biogeochemical Cycling :

- Carbon cycle: Microbial degradation of cellulose, hemicelluloses, lignin and chitin
- Nitrogen cycle: Nitrogen fixation, Ammonification, Nitrification, Denitrification and Nitrate reduction.
- Sulphur cycle: Microbes involved in sulphur cycle

Unit : 3

Water Microbiology :

- Types of natural Waters
- Nuisance microbes in water
- Bacteriological Examination of Domestic water : presumptive test/MPN test, confirmed and completed tests for faecal coliforms , IMViC Test, Membrane filter technique.
- Purification of Water : Sedimentation, Filtration & Disinfection.
- Water borne Diseases.

Unit : 4

Waste Water Microbiology :

- Liquid waste management: Composition and strength of sewage (BOD and COD), Primary, secondary (oxidation ponds, trickling filter, activated sludge process and septic tank) and tertiary sewage treatment.
- Solid Waste management: Sources and types of solid waste, Methods of solid waste disposal (composting and sanitary landfill)

Reference Books :

1. Microbiology - Pelczar, Chan, & Krieg , 5th edition
2. General Microbiology - Vol – II - Powar & Daginawala

SARDAR PATEL UNIVERSITY
B. Sc.- Microbiology
Semester - IV
US04CMIC 22- Elements of Microbiology- II
(04 Credits; 4 Hrs/week)
(Effective from June 2019)

Unit : 1

Eucaryotic Microbes :

- (a) Fungi : General characteristics & Significance.
- (b) Algae : General characteristics & Significance.
- (c) Protozoa : General characteristics & Significance
- (d) Introduction to Lichens, Slime molds and their significance.

Unit : 2

Viruses:

- (a) General characteristics, Cultivation and Enumeration of viruses.
- (b) Bacteriophages: Introduction, Morphological groups and Introduction to Lytic cycle and Lysogeny.
- (c) Animal Viruses : Introduction and general life cycle of Animal Viruses.
- (d) Plant Viruses : TMV.
- (e) Introduction to Prions & Viroids.

Unit : 3

Microbiology of Food :

- Food as a substrate for Microorganisms.
- Microbial flora of food
- Factors affecting kinds and numbers of microorganisms : intrinsic and extrinsic
- Microbial Spoilage of food & Food Poisoning , Role of *Clostridium botulinum* & *Salmonella* spp.
- Preservation of food and Milk
 - A. General principles
 - B. Methods of preservation:
 - i. Use of aseptic handling
 - ii. High temperature: Sterilization, canning
 - iii. Low temperature: Refrigeration and freezing
 - iv. Dehydration
 - v. Osmotic pressure
 - vi. Preservatives
 - vii. Radiations: Ionizing and non-ionizing radiation
- Indian fermented food products : Pickles & Idli.
- Microbes as food: Mushrooms & Spirulina.

Unit : 4

Microbiology of milk and milk products:

- Sources of microorganism in milk
- Types of microorganisms in milk
- Milk borne diseases
- Microbiological examination of milk:
- Pasteurization of milk, Phosphatase test, MBRT & Resazurin test
- Some dairy milk products: Butter, Cheese.
- Introduction to probiotics, prebiotics, Synbiotics.

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B. Sc.- Microbiology

Semester - IV

US04CMIC 23- Environmental Microbiology (Practicals)

(02 Credits; 4 Hrs/week)

(Effective from June 2019)

1. Bacteriological analysis of Air.
2. Bacteriological Quantitative analysis of Soil.
3. Qualitative analysis of water: presumptive test , confirmed and completed tests.
4. Quantitative analysis of Water : SPC
5. Detection of Coliforms in water by MPN test .
6. Determination of Potability ratio of water.
7. Determination of Dissolved Oxygen by Winkler's Method.
8. Study of Nitrogen fixing Bacteria : Rhizobium & Azotobacter.

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B. Sc.- Microbiology

Semester - IV

Elements of Microbiology- II (Practicals)

(02 Credits; 4 Hrs/week)

(Effective from June 2019)

1. Microbiological analysis of food - Standard plate count
2. Microbiological analysis of milk - Standard plate count
3. Determination of microbial load by use of MBRT.
4. Detection of Acid fast bacteria in milk.
5. Detection of Bacteriophage
6. Isolation of Yeast.
7. Study of Fungi - Wet mounting of Aspergillus, Penicillium, Rhizopus & Mucor.