Shiksha Mandal's

Bajaj College of Science (Autonomous), Wardha

Syllabus

B.Sc. Microbiology

B.Sc. Semester I (Microbiology)

History and Microbial Morphology

Unit-I: A. History of Microbiology

i) Discovery of microbe

ii) Theory of biogenesis and abiogenesis.

iii) Contributions of Louis Pasteur, Robert Koch, Sergei Winogradsky, Martinus Beijerink, John Tyndal and Joseph Lister.

B. Scope of Microbiology: Basic Branches of Microbiology: Bacteriology, Mycology, Phycology, Virology Applied Branches Biotechnology: Medical Microbiology, Biotechnology, Geomicrobiology, Exobiology, Environmental Microbiology, Food and Dairy Microbiology

Unit -II: Classification of Bacteria

i) Definition:Taxonomy, classification, Identification, Nomenclature.

ii) Approaches in Bacterial Classification, Bacterial Classification: Whittaker Five Kingdom System, Intuitive Method of Classification, Numerical Taxonomy, Genetic Relatedness: GC: AT Ratio, DNA Hybridization, 16SrRNA Cataloguing iii) Bergey's Manual of Systematic and Determinative Bacteriology.

Unit-III: A. Prokaryotic Cell structure

i) Concept and difference between Eukaryotes and Prokaryotes.

ii) Typical Bacterial cell structure: Structure of cell wall (gram +ve, gram-ve), Cell membrane: Fluid mosaic model, Mesosomes, Ribosomes, Nucleoid, plasmids, Storage granule, Capsules, slime layer, Pili, Flagella (including types and structure).

iii)Endospore structure, formation and germination

iv) Exospores, Myxospores.

v) Significance of Dormancy

Unit-IV: Eukaryotic Microbes

i) Fungi and yeast: General characters, Asexual and sexual mode of reproduction, slide culture techniques.

ii) Algae: General characters and industrially important algal cells

iii) Protozoans: General characters and life cycle of trypanosome

Unit-V: Microbial Nutrition

i) Basic nutritional requirements. ii) Nutritional classification of bacteria
iii) Types of culture media: selective, enriched, enrichment, synthetic, non synthetic
iv) Pure culture v) Axenic cultures, Diauxic cultures.
i) Isolation of pure culture: various techniques.
ii) Determination of C, N, P by auxanographic and replica plate technique

Unit-VI: Unit-III: Acellular Microbes:Viruses

i)Discovery of viruses, General structure, symmetry and classification
ii) Cultivation of viruses:chick embryo,tissue culture
iii) Detection of viral growth iv) T4-Bacteriophages and Lambda viruses.
v) lytic and Lysogeny cycle

Practicals Sem I

1. General concept of basic equipment's and apparatus
2. Preparation of media: Nutrient agar, nutrient broth, PDA, selective & differential media.
3. Demonstration of microbes from air, water, soil
4. Performance of simple, Grams, acid fast and spores staining
5. Isolation of pure culture by streak plate, spread plate and pour plate method.
6. Enumeration of microorganisms by SPC
7. Demonstration of Micrometry
8. Cultivation of fungi by slide culture technique
9. Isolation of bacteriophage from sewage
10. Isolation of staphylococcus from contaminated food

Note: Minimum 8 experiments (4*+4) should be performed in each semester.

Distribution of marks for practical exam **(Total: 30 Marks)**

1) Major one experiment (Marks **08**)

2) Minor two experiments (Marks **08**)

3) Spotting (Marks **04)**

4) Viva (Marks **05**)

5) Record book (Marks **05)**

Duration of practical exam: 8 Hours (4 Hours each day)

List of Books Recommended For Semester I and Semester II Microbiology

1) General Microbiology : Stainer, Roger et. al.
2) General Virology : Luria, S.E.
3) Handbook of Genetics : Esser, K.
4) Fundamentals Principles of : A.J. Salle. bacteriology
5) Microbiology : Pelczar, Chan, Krieg.(TMH)
6) Fundamental of Microbiology : Frobisher
7) General Microbiology Vol. I & II : Power & Daginawala. (Himalaya Publication)
8) Zinsser Microbiology : W.K. Joklik
9) General Microbiology : W.G. Walter
10) Elements of Microbiology : M.J. Pelozar & E.C.S. Chan
11) Essays in Microbiology : J.N. Norris & M.H. Richmond
12) Microbiology : L. Mckane & J. Kandel (Essentials & Applications)
13) Basic Microbiolgy : Volk
14) Chemical Microbiology : Rose
15) Microbiology : Paul A. Ketchum. (Introduction to Health of Professional)
16) Molecular Biology of the gene : J.D. Watson.
17) Elementary Microbiology : Modi (Akta Prakashan) Vol. I & II
18) Basic experimental : Ronald M., Atlas, & Alfred Microbiology Miller E.Brown, Kenneth
W. Dobra, Lionas (1986) (Prentice Hall - 316 PP)
19) General Microbiology : Robert F.Boyd (1984) times mirror / mosby college, Pub.
20) Text Book of Microbiology : Dubey & Maheshwari (S.Chand, Publication)
21)Foundation in Microbiology:Ulhas Patil,A.B.Chaudhary,Dr.S.B.Chincholkar,J.S.Kulkarni(Neerali Publication)

List of books for practicals

1) Microbes in Action : Seely, Wander Mark Tarporewala, Bombay
2) A Mannual of Microbiology : A.J. Salle.
3) Microbiology Methods : Collins
4) Bacteriological Techniques : F.J.Baker
5) Introduction to Microbial Techniques : Gunasekaran
6) Biochemical methods: Sadashivam & Manickam
7) Laboratory Fundamentals of Microbiology: Alcamo, I.E., Jones and Bartlett Publishers

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B.Sc. Semester II (Microbiology)

Microbial Techniques

Unit-I: Microscopy: Principle and Applications

i) Bright field microscopy ii) Dark field microscopy iii) Electron microscopy (TEM, SEM) iv) Confocal microscopy v) Phase contrast microscopy
vi) Fluorescent microscopy.

Unit-II: Staining Techniques

i) Stains and dyes, chromophore, auxochrome, chromogens, types of stains.
ii) Staining techniques: simple, differential, gram staining, acid fast staining.
iii)Staining of specific structure: flagella, spores, capsule (negative), Metachromatic granule staining.

Unit-III: Microbial Reproduction and Growth.

i) Microbial Reproduction: Binary fission, Budding, Fragmentation, Sporulation
ii)Microbial growth: Principle of growth curve, Different phases and mathematical expression of growth rate
iii) Continuous culture: Dialysis, Turbidostat and Chemostat.
iii) Factors influencing microbial growth

Unit-IV: Microbial Control.

i) General Terminologies: sterilization, disinfection, disinfectants, sanitizer, antisepsis, microbiostatic, microbiocidal, sanitizer, preservation.
ii) Physical methods: Heat, moist heat sterilization, Dry heat sterilization, Low temperature, Filtration, radiation, osmotic pressure.

Unit-V: Chemical Control Agents

i) Characteristics of an ideal disinfectants, Phenolics, Alcohols, Halogens, Heavy metals, Quaternary ammonium compounds, Surface active agents, Aldehydes, Gaseous sterilization, Chemotherapeutic agents.
ii) Mechanism of cell injury, Factors influencing antibacterial activity.
iii) Phenol coefficient.

Unit-VI: Microbial interaction

i)Positive and negative interaction: Commensalism, synergism, syntropism, mutualism, parasitism, predation, antagonism, competetion
ii)Protist-Protist Interaction: Bdellovibrio
iii)Protist-Plant interaction: Root nodule bacteria
iv)Protist-Animal interaction: Rumen bacteria, insect midgut bacteria, luminescent bacteria

Practicals Sem II

1. Demonstration of Antibiosis
2. Simple, Grams, acid-fast, fungal and endopore staining
3. Determination of phenol coefficient
4. To Study the effect of salt on bacterial growth
5. To perform membrane filtration
6. To demonstrate the effect of radiation on bacterial growth
7. To cultivate anaerobic bacteria
8. Isolation of Gram negative bacteria
9. Performance of Oligodyanamic action of metals
10. Antibiotic disc sensitivity test.

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4) Viva (Marks **05**)

5) Record book (Marks **05)**

Duration of practical exam: 8 Hours (4 Hours each day)

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3) Handbook of Genetics : Esser, K.
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11) Essays in Microbiology : J.N. Norris & M.H. Richmond
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