

B.Sc. Industrial Microbiology

Syllabus

B.Sc. I

Paper I

Fundamentals of Microbiology

Unit 1. Definition and Scope of Microbiology, History and Development of Microbiology (contribution of pioneers), Golden Era of Microbiology.

Unit 2. Diversity of Microbial World, Prokaryotic cell, Structure of Bacterial cell, Archaeobacteria and Eubacteria, Structure and function of Plasma membrane, cell wall, capsule, flagella, nucleod, plasmid, Gram positive and Gram negative bacteria.

Unit 3. Characteristics of Fungi, Algae, Protozoans, Viruses. Principles of classification of bacteria, algae, fungi, protozoa, viruses.

Unit 4. Methods for studying microorganisms, pure culture techniques, methods of sterilization – physical and chemical, media – types, preservation techniques.

Unit 5. Microbial growth, phases of growth, conditions of growth, measurement of growth, bacterial sporulation and germination, binary fission.

References

1. M J Pelczar, E C S Chan and N R Krieg. Microbiology. Tata McGrawHill.
2. T D Brock. Biology of Microorganisms. Prentice Hall
3. R C Dubey and D K Maheshwari. A Textbook of Microbiology. S.Chand.

Paper II

Microbial Physiology and Biochemistry

Unit 1. Biochemistry of Microbes: Chemical composition of cell, molecules of living systems, pH and pK, Buffers.

Unit 2. Structure and classification of carbohydrates, lipids, proteins, DNA and RNA.

Unit 3. Biosynthesis of bacterial cell wall, transport across membrane, effect of temperature, salinity and oxygen on growth. Anaerobic bacteria, adaptations in extreme conditions.

Unit 4. Enzymes and their classification, Enzyme kinetics, allosteric enzymes, Michaelis- Menten equation, coenzyme, isozyme, enzyme inhibition and regulation.

Unit 5. Microbial photosynthesis, photosynthetic apparatus in pro and eukaryotes, anoxygenic and oxygenic photosynthesis (cyanobacteria and algae). Light and dark reactions.

References:

1. Lehninger. Principles of Biochemistry, Nelson and Cox.
2. J L Jain. Biochemistry. S. Chand.
3. A G Moat, J W Foster and M P Spector. Microbial Physiology. Wiley.

Paper III

Tools and Techniques in Microbiology

Unit 1. Microscopy – Light, phase contrast, electron, scanning and transmission electron microscopy, staining techniques for light microscopy, sample preparation for electron microscopy.

Unit 2. Common equipments of microbiology lab and principle of their working – autoclave, oven, laminar air flow, centrifuge.

Unit 3. Calorimetry and spectrophotometry, Electrophoretic techniques – proteins and nucleic acids, PCR.

Unit 4. Chromatography techniques: adsorption, partition, ion exchange, gel filtration, HPLC, FPLC.

Unit 5. Cultivation of extraordinary microorganisms, techniques used for identification of microorganisms – biotyping, serotyping, molecular techniques.

References:

1. R M Atlas, A E Brown, K W Dobra and L Miller. Basic Experimental Microbiology. Prentice Hall.
2. Gunasekaran. Introduction to Microbial Techniques.

Practicals

1. Learning the equipments of a common microbiology laboratory.
2. Preparation of culture media (agar/ broth).
3. Learning the techniques of sterilization.
4. Isolation of pure culture.
5. Enumeration of microbial population.
6. Staining techniques to study morphology of microorganisms.
7. Staining technique for endospore, Gram staining.
8. Estimation of proteins.
9. Estimation of glucose.
10. Measurement of bacterial growth spectrophotometrically.
11. Isolation and cultivation of anaerobes.
12. Checking the motility of bacteria by hanging drop method.
13. Paper chromatography.
14. Enzyme assays – amylase, gelatinase, catalase etc.