

St. Aloysius College (Autonomous), Jabalpur, M. P.

Department of Botany and Microbiology

Department of Higher Education, Govt. of M. P.

Under Graduate Industrial Microbiology Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.
Session 2021-22

Class: B.Sc.

Semester: II Year

Subject: Industrial Microbiology

Paper: I

Title of Paper: Microbial Physiology and Metabolism

Max. Marks: 40 (TH) + 10 (CCE) = 50

Course Outcome: Completion of course imparts skill regarding isolation and identification of microbes from various samples, techniques to estimate size and shape of microbes, culture of photosynthetic bacteria and an application for farmers and various sections of sustainable agriculture.

UNIT – I: MICROBIAL GROWTH

Definition of growth, Mathematical nature and expression of growth, Generation time, Growth curve of Bacteria, Measurement of Growth (cell number, cell mass and cell constituent), Effect of environment on the microbial growth (temperature, pH and Oxygen), Continuous culture, Synchronous culture and Batch culture.

UNIT – II: MEMBRANE TRANSPORT PROCESS

Different models of cell membrane, Biochemical properties of cell membrane, functions of cell membrane, Types of cellular transport (diffusion, gaseous exchange, osmosis, plasmolysis, active and passive transport, group translocation).

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UNIT – III: BACTERIAL PHOTOSYNTHESIS AND FUELING REACTION

Classification of photosynthetic bacteria (oxygenic and anoxygenic photosynthetic bacteria), Photosynthetic structure, Photosynthetic pigments, Photosynthetic electron transport system, Mechanism of Photosynthesis (Cyclic and Non Cyclic)

UNIT – IV: METABOLIC PATHWAYS

Respiratory Pathways (Glycolysis, Entner Doudoroff Pathway, Penrose Phosphate Pathway, Krebs cycle), Calvin cycle, Substrate level and Oxidative phosphorylation, Fermentation process and products.

UNIT – V: MICROBIAL ASSIMILATION AND BIOENERGETICS

Assimilation of Ammonia, Nitrogen and sulphate; Methanogenesis and Methylootrophs, Principles of Bioenergetics, ΔG , Endergonic and Exergonic reaction, oxidation, reduction reaction, Redox potential.

TEXT & REFERENCE BOOKS

1. Doelle H. W. 1975, Bacterial metabolism 2nd edition. Academic press.
2. Moat A.G. and Foster J.W. 1988 Microbial physiology 2nd edition. Springer Verlag.
3. White D. 2000, Physiology and Biochemistry of Prokaryotes 2nd edition. Oxford University press, New York.
4. Caldwell D. R. 1995 Microbial physiology and metabolism. Wm. C. Brown publishers, England.
5. Madigan M. T. Martinko J. M. Stahl D. A. and Clark D. P. 2012, Brock Biology of Microorganisms 13th edition. Benjamin Cummings, San Francisco.

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Session 2021-22

Class : B.Sc.

Semester : II Year

Subject : Industrial Microbiology

Paper: II

Title of Paper : Microbial Genetics and Molecular Biology

Max. Marks: 40 (TH) + 10 (CCE) = 50

Course Outcome: Scholars develop basic concepts and techniques regarding microbial physiology and metabolism. It develops understanding of various applications of microbial techniques in the field of molecular biology.

UNIT – I: DNA REPLICATION AND PROTEIN SYNTHESIS

Types and Mechanism of DNA Replication; DNA topology; DNA Replication in prokaryotes and eukaryotes, Protein synthesis.

UNIT – II: GENE REGULATION IN PROKARYOTES AND EUKARYOTES

Operon concept, Lac and trp Operon; Britten Davidson Model of gene expression.

UNIT – III: MUTATION

Types of mutation; Molecular basis; Mutagenic agents; DNA damage and repair mechanism; Auxotrophs; Prototrophs and ame's test.

UNIT – IV: GENETIC RECOMBINATION IN BACTERIA

Transformation, Transduction and Conjugation; Genetic mapping; Extrachromosomal genetic material; Plasmid; Cosmid; Transposon; Overlapping genes; Silent genes.

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UNIT - V: RECOMBINANT DNA TECHNOLOGY

Isolation of DNA; Enzymes used in recombinant DNA technology; Uses of vector - PBR₃₂₂, PUC 8 phage vectors - M13, λ , Cosmid, phagemid, Ti Plasmid, SV40; Gene cloning in prokaryotes; Southern and Western blotting. rDNA products - Insulin, Interferons and Immunotoxins.

TEXT & REFERENCE BOOKS

1. Primrose S. Twyman, R. and Old B. 2001 Principles of Gene Manipulation 6th edition. Blackwell Science Ltd.
2. Chakravarty A. K. 2013 Introduction to Biotechnology. OUP India.
3. Chaudhuri K. 2012 Microbial Genetics. The energy and resource institute [FR]
4. Sridhar S. 2005 Genetics and Microbial Biotechnology. Dominant publishers and distributors.
5. Nicholl D. S. T. 1994 An introduction to Genetic engineering. Cambridge University press.
6. Old R. W. and Primrose S. B. 2008 Principles of Gene Manipulation 4th edition. Blackwell Scientific publications, London.
7. Recombinant DNA Technology by Sardul Singh Sandh, L. K. International, New Delhi.

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