

**B.Sc MICROBIOLOGY (CBCS) SYLLABUS
FIRST YEAR – SEMESTER- II**

MBT- 201 : MICROBIAL BIOCHEMISTRY & METABOLISM

TOTAL HOURS: 48

CREDITS: 4

UNIT-I

No. of hours: 10

Outline classification and general characteristics of carbohydrates (monosaccharides, disaccharides and polysaccharides).
General characteristics of amino acids and proteins.
Structure of nitrogenous bases, nucleotides, nucleic acids.
Fatty acids (saturated and unsaturated)
lipids (spingolipds, sterols and phospholipids).

UNIT-II

No. of hours: 8

Principle and applications of -
Colorimetry
Chromatography (paper, thin-layer and column),
Spectrophotometry (UV & visible),
Centrifugation and
Gel Electrophoresis.

UNIT-III

No. of hours: 10

Properties and classification of Enzymes.
Biocatalysis- induced fit and lock and key models.
Coenzymes and Cofactors.
Factors affecting catalytic activity.
Inhibition of enzyme activity- competitive, noncompetitive, uncompetitive and allosteric.

UNIT-IV

No. of hours: 10

Microbial Nutrition –Nutritional requirements and uptake of nutrients by cells.
Nutritional groups of microorganisms- autotrophs, heterotrophs, mixotrophs.
Growth media- synthetic, complex, selective, enrichment and differential media.
Microbial Growth- different phases of growth in batch cultures, Synchronous, continuous, biphasic growth.
Factors influencing microbial growth.
Methods for measuring microbial growth – Direct microscopy, viable count estimates, turbidometry and biomass.

UNIT-V

No. of hours: 10

Aerobic respiration -Glycolysis, HMP path way, ED path way, TCA cycle, Electron transport, oxidative and substrate level phosphorylation.
Anaerobic respiration (Nitrate).

Fermentation - Alcohol and lactic acid fermentations.
Outlines of oxygenic and anoxygenic photosynthesis in bacteria.

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1. Qualitative Analysis of Carbohydrates
2. Qualitative Analysis of Aminoacids
3. Colorimetric estimation DNA by diphenylamine method
4. Colorimetric estimation of proteins by Biuret/Lowry method
5. Paper chromatographic separation of sugars and amino acids
6. Preparation of different media- Synthetic and Complex Media
7. Setting and observation of Winogradsky column.
8. Estimation of CFU count by spread plate method/pour plate method.
9. Bacterial growth curve.
10. Factors affecting bacterial growth – pH.
11. Factors affecting bacterial growth – Temperature.
12. Factors affecting bacterial growth –Salts

SUGGESTED READING

Berg JM, Tymoczko JL and Stryer L (2011) **Biochemistry**, W.H.Freeman and Company

Caldwell, D.R. (1995). **Microbial Physiology and Metabolism**, W.C. Brown Publications, Iowa, USA.

Campbell, PN and Smith AD (2011) **Biochemistry Illustrated**, 4th ed., Published by Churchill Livingstone

Elliot, W.H. and Elliot, D.C. (2001). **Biochemistry and Molecular Biology**, 2 nd Edition, Oxford University Press, U.S.A.

Gottschalk, G. (1986). **Bacterial Metabolism**, SpringerVerlag, NewYork.

Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). **Principles of Biochemistry**, 2 nd Edition, CBS Publishers and Distributors, New Delhi.

Madigan, M.T., Martinkl, J.M. and Parker, J. (2010). **Brock Biology of Microorganisms**, 9th Edition, MacMillan Press, England.

Moat, A.G. and Foster, J.W. (1995). **Microbial Physiology**, JohnWiley, New York.

Nelson DL and Cox MM (2008) Lehninger **Principles of Biochemistry**, 5th Edition., W.H. Freeman and Company.

Prescott, M.J., Harley, J.P. and Klein, D.A. (2010). **Microbiology**. 5th Edition, WCB McGrawHill, New York.

Reddy, S.R. and Reddy, S.M. (2004). **Microbial Physiology**, Scientific Publishers, Jodhpur, India.

Sashidhara Rao, B. and Deshpande, V. (2007). **Experimental Biochemistry: A student Companion**. I.K. International Pvt. Ltd.

Stanier, R.Y., Adelberg, E.A. and Ingram, J.L. (1991). **General Microbiology**, 5th Ed., Prentice Hall of India Pvt. Ltd., New Delhi.

Tymoczko JL, Berg JM and Stryer L (2012) **Biochemistry: A short course**, 2nd ed., W.H. Freeman

Voet, D. and Voet J.G (2004) **Biochemistry** 3rd edition, John Wiley and Sons

White, D. (1995). **The Physiology and Biochemistry of Prokaryotes**, Oxford University Press, New York.

Willey MJ, Sherwood, LM & Woolverton C J (2013) Prescott, Harley and Klein's **Microbiology** by. 9th Ed., McGrawHill

**B.Sc MICROBIOLOGY (CBCS) SYLLABUS
SECOND YEAR – SEMESTER- III**

MBT- 301 MICROBIAL GENETICS AND MOLECULAR BIOLOGY

TOTAL HOURS:48

CREDITS: 4

UNIT-I

No. of hours: 10

DNA and RNA as genetic material.
Structure and organization of prokaryotic DNA.
Extrachromosomal genetic elements – Plasmids and transposons.
Replication of DNA – Semi conservative mechanism, Enzymes involved in replication.

UNIT-II

No. of hours: 10

Mutations – spontaneous and induced, base pair changes, frame shifts, deletions, inversions, tandem duplications, insertions.
Mutagens - Physical and Chemical mutagens.
Outlines of DNA damage and repair mechanisms.
Genetic recombination in bacteria – Conjugation, Transformation and Transduction.

UNIT-III

No. of hours: 10

Concept of gene – Muton, Recon and Cistron. One gene one enzyme and one gene one polypeptide hypotheses.
Types of RNA and their functions.
Genetic code.
Structure of ribosomes.

UNIT-IV

No. of hours: 8

Types of genes – structural, constitutive, regulatory
Protein synthesis – Transcription and translation.
Regulation of gene expression in bacteria – *lac* operon.

UNIT-V

No. of hours: 10

Basic principles of genetic engineering.
Restriction endonucleases, DNA polymerases and ligases.
Vectors.
Outlines of gene cloning methods.
Polymerase chain reaction. Genomic and cDNA libraries.
General account on application of genetic engineering in industry, agriculture and medicine.

MBP- 301 MICROBIAL GENETICS AND MOLECULAR BIOLOGY

TOTAL HOURS: 48

CREDITS: 2

1. Study of different types of DNA and RNA using micrographs and model / schematic representations
2. Study of semi-conservative replication of DNA through micrographs / schematic representations
3. Isolation of genomic DNA from *E. coli*
4. Estimation of DNA using UV spectrophotometer.
5. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
6. Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS-PAGE).
7. Problems related to DNA and RNA characteristics, Transcription and Translation.
8. Induction of mutations in bacteria by UV light.
9. Instrumentation in molecular biology – Ultra centrifuge, Transilluminator, PCR

SUGGESTED READING

Crueger, W. and Crueger, A. (2000). **Biotechnology: A Text Book of Industrial Microbiology**, PrenticeHall of India Pvt. Ltd., New Delhi.

Freifelder, D. (1990). **Microbial Genetics**. Narosa Publishing House, New Delhi.

Freifelder, D. (1997). **Essentials of Molecular Biology**. Narosa Publishing House, New Delhi.

Glazer, A.N. and Nikaido, H. (1995). **Microbial Biotechnology – Fundamentals of Applied Microbiology**, W.H. Freeman and company, New York.

Glick, B.P. and Pasternack, J. (1998). **Molecular Biotechnology**, ASM Press, Washington D.C., USA.

Kannan, N. (2003). **Hand Book of Laboratory Culture Medias, Reagents, Stains and Buffers**. Panima Publishing Co., New Delhi.

Lewin, B. (2000). **Genes VIII**. Oxford University Press, England

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Nicholl, D.S.T. (2004). **An Introduction to Genetic Engineering**. 2 nd Edition. Cambridge University Press, London.

Old, R.W. and Primrose, S.B. (1994) **Principles of Gene Manipulation**, Blackwell Science Publication, New York.

Ram Reddy, S., Venkateswarlu, K. and Krishna Reddy, V. (2007) **A text Book of Molecular Biotechnology**. Himalaya Publishers, Hyderabad.

Sinnot E.W., L.C. Dunn and T. Dobzhansky. (1958). **Principles of Genetics**. 5 th Edition. McGraw Hill, New York.

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Snyder, L. and Champness, W. (1997). **Molecular Genetics of Bacteria**. ASM press,
Strickberger, M.W. (1967). **Genetics**. Oxford & IBH, New Delhi.

Turner, P.C., McLennan, A.G., Bates, A.D. and White, M.R.H. (1998). **Instant Notes in Molecular Biology**, Viva Books Pvt., Ltd., New Delhi.

Twynan, R.M. (2003). **Advanced Molecular Biology**. Viva books Pvt. Ltd. New Delhi.

Verma, P.S. and Agarwal, V.K. (2004). **Cell Biology, Genetics, Molecular Biology, Evolution and Ecology**. S. Chand & Co. Ltd., New Delhi.
Washington, D.C., USA.

**B.Sc MICROBIOLOGY (CBCS) SYLLABUS
SECOND YEAR – SEMESTER- IV**

MBT- 401 IMMUNOLOGY AND MEDICAL MICROBIOLOGY

TOTAL HOURS: 48

CREDITS: 4

UNIT-I

No. of hours: 10

Types of immunity – innate and acquired; active and passive; humoral and cell-mediated immunity.
Primary and secondary organs of immune system – thymus, bursa fabricus, bone marrow, spleen and lymph nodes.

Cells of immune system.

Identification and function of B and T lymphocytes, null cells, monocytes, macrophages, neutrophils, basophils and eosinophils.

UNIT-II

No. of hours: 10

Antigens – types, chemical nature, antigenic determinants, haptens.

Factors affecting antigenicity.

Antibodies – basic structure, types, properties and functions of immunoglobulins.

Types of antigen-antibody reactions - Agglutinations, Precipitation, Neutralization, complement fixation, blood groups.

Labeled antibody based techniques – ELISA, RIA and Immunofluorescence. Polyclonal and monoclonal antibodies – production and applications.

Concept of hypersensitivity and Autoimmunity.

UNIT-III

No. of hours: 10

Normal flora of human body.

Host pathogen interactions: infection, invasion, pathogen, pathogenicity, virulence and opportunistic infection.

General account on nosocomial infection.

General principles of diagnostic microbiology- collection, transport and processing of clinical samples.

General methods of laboratory diagnosis - cultural, biochemical, serological and molecular methods.

UNIT-IV

No. of hours: 8

Antibacterial Agents- Penicillin, Streptomycin and Tetracycline.

Antifungal agents – Amphotericin B, Griseofulvin

Antiviral substances - Amantadine and Acyclovir

Tests for antimicrobial susceptibility.

Brief account on antibiotic resistance in bacteria - Methicillin-resistant *Staphylococcus aureus* (MRSA).

Vaccines – Natural and recombinant.

UNIT-V

No. of hours: 10

General account on microbial diseases – causal organism, pathogenesis, epidemiology, diagnosis, prevention and control

Bacterial diseases – Tuberculosis and Typhoid

Fungal diseases – Candidiasis.

Protozoal diseases – Malaria.

Viral Diseases - Hepatitis- A and AIDS

MBP- 401 IMMUNOLOGY AND MEDICAL MICROBIOLOGY

TOTAL HOURS: 48

CREDITS: 2

1. Identification of human blood groups.
2. Separate serum from the blood sample (demonstration).
3. Estimation of blood haemoglobin.
4. Total Leukocyte Count of the given blood sample.
5. Differential Leukocyte Count of the given blood sample.
6. Immunodiffusion by Ouchterlony method.
7. Identify bacteria (*E. coli*, *Pseudomonas*, *Staphylococcus*, *Bacillus*) using laboratory strains on the basis of cultural, morphological and biochemical characteristics: IMViC, urease production and catalase tests
8. Isolation of bacterial flora of skin by swab method.
9. Antibacterial sensitivity by Kirby-Bauer method
10. Study symptoms of the diseases with the help of photographs: Anthrax, Polio, Herpes, chicken pox, HPV warts, Dermatomyces (ring worms)
11. Study of various stages of malarial parasite in RBCs using permanent mounts.

SUGGESTED READING

Abbas AK, Lichtman AH, Pillai S. (2007). **Cellular and Molecular Immunology**. 6th edition Saunders Publication, Philadelphia.

Ananthanarayan R. and Paniker C.K.J. (2009) **Textbook of Microbiology**. 8th edition, University Press Publication

Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)

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Publication

Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's **Essential Immunology**. 11th edition
Wiley-Blackwell Scientific Publication, Oxford.

Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' **Medical
Microbiology**. 4th edition. Elsevier

Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's **Immunology**. 6th edition W.H.
Freeman and Company, New York.

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Microbiology. 4th edition. Elsevier Publication

Richard C and Geiffrey S. (2009). **Immunology**. 6th edition. Wiley Blackwell Publication.

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Microbiology. 9th edition. McGraw Hill Higher Education

