

**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.

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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

Maloy, S.R., Cronan, J.E. and Freifelder, D. (1994). **Microbial Genetics**, Jones and Bartlett Publishers, London.

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.

Smith, J.E. (1996). **Biotechnology**, Cambridge University Press.

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.

SUBJECT:: B.Sc., MICROBIOLOGY (CBCS) MODEL QUESTION PAPER
SECOND YEAR – SEMESTER III
MBT-301 : MICROBIAL GENETICS AND MOLECULAR BIOLOGY

Time 3 hrs Max marks -75

SECTION-A

I ANSWER ANY FIVE OF THE FOLLOWING 5 x 5 M= 25 marks

Draw labeled diagrams wherever necessary

1. Z-DNA structure
2. Define plasmid
3. Tandem duplication
4. Define Transduction
5. Role of Nitrous acid
6. t-RNA structure
7. Functions of Stop codon
8. Structure of ribosome

SECTION- B

II ANSWER ANY FIVE OF THE FOLLOWING 5 x 10 M= 50 marks

Draw labeled diagrams wherever necessary

9. a) Write about Transposons and their function in detail.
Or
b) Differentiate the function of DNA and RNA.
10. a) Write the Semi conservative mechanism of DNA replication.
Or
b) List out the Physical mutagens and write their effect on mutagenesis.
11. a) Differentiate the mechanism of Conjugation and Transformation in genetic recombination of bacteria.
Or
b) Explain One gene and One enzyme hypothesis in detail.
12. a) What is Genetic code? Discuss in detail about various genetic codes in prokaryotes.
Or
b) Explain the mechanism of regulation of gene express in bacteria in related to *lac-operon*.
13. a) Discuss the basic principles of Genetic engineering with suitable examples.
Or
b) What is PCR ? Explain the principle and application of PCR in genetic engineering.

**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, Dermatomycoses (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)

Janeway, Melnick and Adelberg's **Medical Microbiology**. 26th edition. McGraw Hill 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

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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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SUBJECT:: B.Sc., MICROBIOLOGY (CBCS) MODEL QUESTION PAPER

SECOND YEAR – SEMESTER IV

MBT-401 : IMMUNOLOGY AND MEDICAL MICROBIOLOGY

Time 3 hrs Max marks -75

SECTION-A

I ANSWER ANY FIVE OF THE FOLLOWING 5 x 5 M= 25 marks

Draw labeled diagrams wherever necessary

1. CMI functions
2. Eosinophils function
3. ELISA principle and applications
4. Define Nosocomial infections
5. Define Virulence and Opportunistic infections
6. Role of Pencillin
7. Attenuated vaccine means
8. Function of Acyclovir

SECTION- B

II ANSWER ANY FIVE OF THE FOLLOWING 5 x 10 M= 50 marks

Draw labeled diagrams wherever necessary

9. a) Classify the and Write about the functions of Primary lymphoid organs.
Or
b) Differentiate the function innate and acquired immunity.
10. a) Write the factors affecting the antigenicity mechanism with suitable examples.
Or
b) List out the functions of B and T lymphocytes.
11. a) Classify the antibodies and explain with diagrammatic representation.
Or
b) List out various antigen and antibody reactions and write their principle in detail.
12. a) Discuss various types of host pathogen interactions with suitable examples.
Or
b) Explain the biochemical methods used in laboratory diagnosis of microbial diseases.
13. a) Discuss various tests used for antimicrobial susceptibility in the laboratories
Or
b) What is a vaccine? Classify the types of vaccines and write their applications in detail.