M.A. M.Sc. MICROBIOLOGY Exam., Dec., 2014
First/Third Semester (Third sem)
Pages 01 to 07

FOR COLLEGE ONLY

MB: 301 MEDICAL AND PHARMACEUTICAL MICROBIOLOGY

UNIT-I

1. Infection: types of infection, sources of infection, reservoirs and vehicles of infection, predisposing factors.

2. Host-parasite relationship governing the infection and establishment of disease. factors affecting virulence.

3. Normal microflora of human body: normal flora of skin, respiratory, gastrointestinal, genital tract, role of resident flora, concept of probiotics.

4. Mode of spread of infection; Respiratory, skin, wound & burn infection, venereal infections, alimentary tract infection, blood born infection and nosocomial infection.

UNIT-II

1. Infections caused by Gram positive cocci and Gram negative cocci: Source of infection, Pathogenicity, Epidemiology & Lab diagnosis of *Staphylococcus, Streptococcus* and *Neisseria* (meningitis, gonorrhea)

2. Infections caused by Gram negative bacteria of family Enterobacteriaceae: Source of infection, Pathogenicity, Epidemiology & Lab diagnosis of *E.coli, Klebsiella, Proteus, Pseudomonas, Shigella dysenteriae* and *Salmonella typhi.*

3. Infection caused by Gram Positive bacilli: Source of infection, Pathogenicity, Epidemiology & Lab diagnosis of *Corynebacterium diphtheriae, Bacillus anthracis,Clostrodium tetani, Vibrio cholerae.*

4. Disease caused by acid-fast bacteria and intracellular bacteria: Source of infection, Pathogenicity, Epidemiology & Lab diagnosis of *Mycobacterium tuberculosis, Mycobacterium leprae, Rickettsia* and *Chlamydia.*

UNIT-III

Morphology, pathogenesis, immune response, diagnosis and prevention of
1. Pox viruses (Variola, Vaccinia, Small pox) Herpes Simplex type I and type II, Picorna viruses (Enteroviruses and Polioviruses).
2. Paramyxo viruses (Rubulavirus and Parainfluenza viruses), Orthomyxoviruses (Measles & Mumps viruses).
3. Hepatitis viruses (Type A, B, C, D, E), Arboviruses (Alphavirus and Flaviviruses), Rhabdo viruses (Rabies virus).
4. Oncogenic viruses, HIV virus.

UNIT-IV

1. Important protozoal diseases: Route of entry, Life Cycles, Immunity, disease produced, diagnosis & prophylaxis of *Plasmodium vivax, P. falciparum, P. malariae* (Malaria), *Entamoeba histolytica* & *Entamoeba Coli* (amoebiasis),

2. Route of entry, Life Cycles, Immunity, disease produced, diagnosis & prophylaxis of *Leishmania, Trypanosoma* and *Toxoplasma.* 3. Fungal infections: description & classification of pathogenic fungi, Infection caused by dermatophytes (Microsporum, Trichophyton & Epidermatophyton)

4. Definition, Causative agent, Source of infection, Epidemiology, Symptomatology & Diagnosis of Candidiasis, Aspergillosis and Histoplasmosis.

Unit-V

1. Antimicrobial agents: Histroy, Antibiotics, Antifungal and Antivirals (common drugs, their spectrum and mode of action)

2. Methodologies for testing of antibacterial, antifungal, and antiviral drugs (*in vivo* and *in vitro* infectivity models), mechanism drug resistance.

3. Preclinical development: Safety profile of drugs (Pyrogenecity, Toxicity –hepato, - nephro, -cardio and neurotoxicity), Toxicological evaluation of drug (LD_{50}, Acute, subacute and chronic toxicity), Mutagenecity (Ames test, micronucleus test) and Carcinogenicity.

4. Clinical studies: Phase I, phase II, phase III and phase IV of clinical trials –Objectives, Conduct of trials, Outcome of trials.

Reference Books

1. Textbook of Microbiology by Ananthnarayanan and Paniker's, eighth edition, Universities Press.

2. Brock Biology of Microorganisms, M.T, Madigan, J.M. Martinko and J. Parker, Ninth edition. Prentice Hall, Upper Saddle River, NJ.

3. Microbiology: An introduction, G.J. Tortora, B.R. Funke and C.L. Funke.

4. Virology; Renato Dulbecco and Harold S. Ginsberg, Fourth edition, J.B. Lippincott Company, USA

5. An Introduction to viruses, S. B. Biswas and Amita Biswas. Forth edition, Vikas Publishing House PVT LTD New Delhi.

6. Medical Microbiology; Jawetz, Melnick, & Adelberg's, Fifth edition, MacGrow Hills

7. Medical Bacteriology, Medical Mycology and AIDS; N.C.Dey, T.K. Dey and D. Sinha, New Central Book Ajency (P) Ltd.

8. Principles of Therapeutics, Burn J. H., Blackwell Scientific Pub. O. Ltd. Oxford.

9. Principles of Drug Action, The Basis of Pharmacology, Goldstein A., Aronow L., and Kalman S. M., Harper international edition New York.

10. Mannfred A. Holliger, (2008), *Introduction to pharmacology*, 3rd Ed., CRC Press

MB: 302 RECOMBINANT DNA TECHNOLOGIES

UNIT-I

1. Enzymes used in DNA technology: Restriction and modification enzymes, DNA polymerases, ligase, kinases and phosphatases . Linkers and adapters.
2. Cloning vectors: Plasmids, Phages (Lamda and M13) Phagmids, Cosmids and Expression vectors.
3. Cloning vectors for Yeast (shuttle vector and YAC) and cloning vector for animal cells: SV40, Vaccinia and Retroviruses.
4. Cloning techniques: DNA isolation (Bacteria, Fungi, Plant and animal), Insert preparation, Ligation, Transformation methods (chemical methods, Electroporation and microinjection), Transfection.

UNIT-II

1. Screening of clones from libraries: Expression based screening, Interaction based screening.
2. Gene Expression: Expression vectors, factors affecting expression of cloned gene in *E.coli*.
3. Mutagenesis: Site directed mutagenesis, Transposon mutagenesis.
4. Principles of hybridizations and hybridization based techniques: Colony, plaque, Southern, Northern, Western and southwestern blotting, *in situ* hybridizations.

UNIT-III

1. DNA Sequencing: Sangers method, Maxmam Gilbert method, Thermocycle sequencing and Pyrosequencing
2. Principles of hybridization and hybridization based techniques: Colony, plaque, Southern, Northern, *in-situ* Hybridization.
3. Oligonucleotide synthesis, Restriction mapping, S1 nuclease and RNase mapping.
4. Polymerase Chain Reaction (PCR): Principle, Types and variants of PCR (Touch-Down PCR, Hot start PCR, Inverse PCR, RT-PCR, multiplex PCR, nested PCR), Real time PCR.

UNIT IV

1. Molecular typing: RFLP (Ribotyping, IS based), RAPD, AFLP, VNTR, SNP, Whole genome sequence, GIS
2. Promoter characterization: promoter analysis through reporter genes, electrophoretic mobility shift assay, DNA foot-printing & DNA fingerprinting.
3. Transgenic animals: Strategies and methods.
4. Construction of knockout mutants.

UNIT-V

1. Applications of Recombinant DNA Technology in Medicine, Molecular diagnostics, recombinant and DNA vaccines.
2. Gene therapy: somatic and germ line gene therapy.
3. Applications of Recombinant DNA Technology in Agriculture and Industry.
4. Biosafety & ethical considerations for GMOs.

eference Books

1. Molecular Biotechnology. Glick BR, Pasternak JJ. ASM Press Washington D.C.
2. Principles of Gene Manipulation. Old and Primrose. Blackwell Scientific Publications
3. Gene Cloning. T. A. Brown, Blackwell Publishing.
4. Molecular cloning- A laboratory manual. Sambrook, Fritsch and Maniatis. Cold Spring Harber Laboratory Press
5. Molecular Biotechnology 2nd Edition by S.B. Primrose. Blackwell Scientific Publishers Oxford.
6. Genetic Engineering and Introduction to Gene Analysis and Exploitation in Eukaryotes by S.M. Kingsman and A.J. Kingsman, Blackwell Scientific Publications, Oxford.
7. PCR Technology - Principles and Applications for DNA Amplification by Henry A. Erlich (Ed.), Stockton Press.
8. Genes and Genomes: A Changing Perspective; Maxine Singer and Paul Berg. University Science Books, Mill Valley, CA, 1991