



GULBARGA UNIVERSITY

DEPARTMENT OF MICROBIOLOGY

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SYLLABUS FOR M.PHIL/ PH.D. ENTRANCE EXAMINATION IN MICROBIOLOGY GULBARGA UNIVERSITY KALABURAGI

UNIT -I: Fundamentals of Microbiology

1. History of Microbiology: Origin, Development and scope of Microbiology.
2. Microbial structure and Organization:
3. Pure culture techniques -
4. Microscopy:
5. Sterilization and Disinfection:
6. Microbiological media: Components,
7. Staining techniques: Nature of Stains,
8. Identification and nomenclature of microorganisms
9. Maintenance and Preservation of microbial cultures -
10. Distribution of microorganisms - ubiquitous nature of microorganisms
11. Overview of instruments used in microbiology laboratory -
12. Advanced instrumentation techniques

Books:

1. Booth C, 1971, Methods in Microbiology, 4th Ed., Elsevier
2. Alfre Pingond, 2002, Biochemical Methods, Wiley VCH Publ.
3. Jeffrey C Pommerville, 2011, Fundamentals of Microbiology, Bartlett Series.
4. Roger Y Stanier, 1987, General Microbiology, MacMillan Publ.
5. Reddy et al, 2007, Methods for General & Molecular Microbiology, ASM Press.
6. Lammart JM, 2006; Techniques in Microbiology - a student handbook, amazon.com
7. Madigan MT et al, 2008; Brock - Biology of Microorganisms, amazon.com.
8. Atlas RM, 1995; Principles of Microbiology, Mosby Yearbook Missouri
9. Pelczar, Chan & Kreig, 1982; Microbiology, McGraw Hill Book Co, New York
10. Bernard D.Davis et al, 1990; Microbiology Vol I & II, Himalya Publ., New Delhi
11. Cappuccion & Sherman, 1990; Microbiology - a Laboratory Manual, Addison Wesley
12. Ram Reddy S & SM Reddy (2005); A Text Book of Microbiology, Vol I & II,

UNIT -II: Microbial Ecology and Environment Microbiology

1. Introduction: History, concepts, prospective and scope of ecology and environmental microbiology
2. Development of microbial communities -
3. Quantitative ecology:
4. Physiological Ecology of microorganisms
5. Microbial interactions
6. Water pollution
7. Waste water treatment
8. Handling and treatment of solid wastes
9. Air pollution
10. Radiation hazards and safety measures
11. Biodegradation of xenobiotics
12. Bioremediation

Books:

1. Brock T.D. Principles of Microbial Ecology. Prentice Hall Publ. Co. Philadelphia.
2. Mason. Biology of Fresh Water Pollution. Longman Sci. Tech., New York.
3. Martin Alexander. Microbial Ecology. John Wiley & Sons. New York.
4. Atlas & Bertha. 1998. Microbial Ecology. 3rd Ed.
5. Gabriel Britton, 1994, Wastewater Microbiology, John Willey & Sons, New York.
6. Ralph Mitchell, 1995, Environmental Microbiology, Wiley Liss, New York.
7. Criston J. Hurst, Manual of Environmental Microbiology, ASM Publ., New York.
8. Felcher, M. & Grey TRG, 1987, Ecology of Microbial Communities, Cambridge Univ. Press.
9. Rehinheimer G., 1991, Aquatic Microbiology, John Wiley & Sons, New York.

10. Rose R.D. Air Pollution & Industry. Reinhold Co., New York.
11. Raju B S N. 1998. Water Supply and Waste Water Engineering. Tata McGraw Hill Publ. Co.
12. Metcalf and Eddy. 1991. Waste Water Engineering. McGraw Hill Int. Publ.
13. APHA, 1994, Standard Methods, 17th Ed., American Public Health Association

UNIT –III: Food, Dairy, Bioprocess Engineering and Fermentation Technology

1. Concepts and scope of food microbiology
2. Food as substrate for microorganisms.
3. Contamination of foods –
4. General principles of food spoilage.
5. Preservation of food.
6. Contamination, preservation and spoilage of animal and plant origin foods
7. Food borne disease and their control –
8. Milk and its microbiology
9. Contamination, preservation and spoilage of milk.
10. Testing of milk and milk products, and safety system in dairy industries.
11. Fermented milk products
12. Probiotics and their role in controlling food borne disease.
13. Food sanitation.
14. Introduction to bioprocess -Historical development of bioprocess technology; an overview of traditional and modern applications of biotechnology in industry
15. Screening of Industrially important microorganisms their improvements and preservation
16. Media for industrial fermentations
17. Design of a fermenter
18. Sterilization - Media, Air and Exhaust air. Filter sterilization
19. Kinetics of microbial growth and product formation
20. Recovery and purification of fermentation products
21. Immobilized cells and enzyme technology
22. Biosensors
23. Fermentation
24. Industrial products produced by microorganisms
25. Patent laws

Books:

1. Doyte MP, Loory RB & Thomas JM, Food Microbiology, ASM Pres, Washington DC.
2. Jay JM, Modern; Food Microbiology, Chapman & Hall, New York.
3. Joshi VK & Pandey Ashok; Biotechnology of Food Fermentation, Asiatech Publ. Delhi, India
4. Frazier WC & Westhof DC; Food Microbiology, 3rd Ed., Tata McGraw Hill.
5. Doyle PM et al; Food Microbiology – Fundamentals & Frontiers, 2nd Ed., ASM Press.
6. Danwart GJ., Basic Food Microbiology, CBS Publ. Delhi.
7. Pitt J & Hocking. (1985); Fungi & Food spoilage, Academic Press.
8. Sandeep Sareen; Food Preservation, Sarops & Soni, New Delhi.
9. Ananthkrishnan CP. Et al. (1994); Dairy Microbiology, Sreelakshmi Publ. Chennai.
10. Rabinson RK. (1990); Dairy Microbiology, Elsevier Applied Science, London.
11. Ali Cinar, SJ. Parulekar, et al., (2003) Batch Fermentation: Modeling, Monitoring, and Control. Marcel Dekker
12. Anke, T 1997 Fungal Biotechnology, Chapman & Hall, London.
13. Arnold D & J E.Davies, Atlas. RM 1999 Manual of Industrial Microbiology & Biotechnology 2nd Ed.
14. Berry, D.R. (Ed) 1998 Physiology of Industrial fungi BSP, Oxford University
15. Crueger & Crueger Biotechnology: A Text Book of Industrial microbiology 2nd edition
16. Casida, Industrial Microbiology
17. Demain, A.L Biology of Industrial Microorganisms
18. Diliello Methods in Food and Dairy Microbiology
19. Harold B. Reisman 1988 Economic Analysis of Fermentation Processes CRC Pr I Llc
20. Vogel A & L. Celeste Todaro 2005 Fermented and Biochemical Engineering Hand Book 2ndStandard Publishers Distribution New Delhi
21. Harvey, W., Blanch, S.Clark. 2007 Biochemical Engineering, Marcel Dekker

UNIT –IV: Microbial Biochemistry

1. Basic concepts of Biochemistry, Biological solvents, Electrolytes & Buffers
2. Bioenergetics, biological oxidation, classification structure, properties & functions of carbohydrates, Amino acids, proteins & lipids.
3. Carbohydrate, lipid, Amino acids & nucleotide metabolism

Books:

1. Felix Franks, 1993; Protein Biotechnology, Humana Press, New Jersey.
2. Stryer L, 1995; Biochemistry, Freeman and Company, New York.
3. Voet & Voet, 1995; Biochemistry, John Wiley & Sons, New York.
4. Nelson & Cox, 2000; Lehninger's Principles of Biochemistry, Elsevier Publ.
5. Freifelder D, 1982; Physical Biochemistry, Freeman & Co. New York.
6. Harper, 1999; Biochemistry, McGraw Hill, New York.
7. Colowick s P and Kaplan N D, 1955; Methods in Enzymology. Vol. I, Academic Press.
8. Sualter C H, 1985; Practical Guide to Enzymology. John Wiley & Son.
9. Price & Steeves, Fundamentals of Enzymology
10. Kapler, Advances in Enzymology, Academic Press.

UNIT –V: Microbial Physiology and Enzymology

1. Microbial growth & Microbial photosynthesis, Microbial nutrition. Types of fermentation reaction Enzyme kinetics, Mechanism of Enzyme action Enzyme activators & Regulators Allosteric enzyme, covalently modulated enzyme multienzyme complex, membrane bound enzymes.
2. Enzyme Inhibitors, Isoenzymes,
3. Isolation & purification of microbial enzymes.
4. Enzyme stability & its structural elicitation & methods of enzyme detection.

Books :

1. Albert Lehninger, 1983; Biochemistry. 2nd Ed. Kalyani Publ.
2. Harper, 1971; Physiological Chemistry-Diagnostic Methods and Clinical Pathology.
3. Powar and Dhaginawala, 1994; Biochemistry, Himalaya Publ.House, New Delhi
4. Albert GM & Toter JM, 1995; Microbial Physiology, Wiley-Liss. Inc., USAI
5. Moat A g and FASTER JW, 1985; Microbial Physiology, John Wiley & Sons. New York.
6. Doelle S W, 1975; Bacterial Metabolism, Academic Press, New York
7. Dewes I.W. & Southerland JW, 1976; Microbial physiology, Halsted Press, New York.
8. Rose AH, 1976, Chemical Microbiology-An Introduction to Microbial Physiology, Butterworths, Co. Ltd
9. Zubey, 1994; Principals of biochemistry, W.C. Brown Publ. Oxford
10. Caldwell, DR, 1995; Microbial Physiology & Metabolism, Brown Publ.
11. Oren A. and R.T.Papke, 2010, Molecular Physiology of microorganisms, Caister, Academic Press
12. Berg JM JL Tymoczko & L Stryer, 2011; Biochemistry, International Edition.

UNIT –VI: Agricultural Microbiology

1. Concept & development of Agricultural Microbiology
2. Role of Microorganisms in soil formation, fertility & factors affecting soil microorganisms
3. Biogeochemical cycles, plant micro interactions, biological nitrogen fixation
4. Phosphate solubilizing microorganisms & Mycorrhizae
5. Biofertilizers, bacterial fungal & Algal production of Biofertilizers, phosphate solubilizing microbial biofertilizers. Application and evaluation of biofertilizers.
6. Green manure ,organic matter, composting
7. Plant diseases – bacterial, fungal, viral & Mycoplasmal diseases
8. Biological control, its merits and demerits
9. Biopesticides – types, production & applications of bacterial, fungal & viral. Integrated pest and plant disease management.
10. Genetically modified crops. Field application of BT cotton and BT brinjal. Advantages and disadvantages of GM crop plants

Books:

1. Subba Rao, 2000. Soil Microbiology, 4th Ed. Oxford & IBH
2. Subba Rao. Biofertilizers in Agriculture. Oxford & IBH
3. Subba Rao. Recent Advances in Biological Nitrogen Fixation. Oxford & IBH.
4. Rangaswamy and Bagyaraj. Agricultural Microbiology.
5. Alexendra and Bold. 1999. Introduction to Mycology. Academic Press.
6. Sundara Rajan S. Practical Manual of Fungi. Anmol Publication.
7. Saminathan M.S. Biotechnology in Agriculture. McMillan.
8. Steinhaus. 1963. Insect Pathology. Vol I & II. Academic Press, New York.
9. Burges H D & Hussey N W. 1971. Microbial Control of Insect and Mites. Academic Press, New York.
10. Burges H D. 1970-1980. Microbial Control of Pests and Plant Diseases.
11. Plant pathology. By George Agrios; academic press new York
12. Microbial Ecology: Fundamentals and Applications by Rinald Atlas and Richard Bartha, Benjamin/Cummings Science Publis., 2725 Sand Hill Road, Menlo Park, California 94025, USA.
13. Plant pathology. By George Agrios; academic press new York.

UNIT-VII: Bacteriology, Virology and Mycology

1. Introduction – discovery and general characters of bacteria, virus, fungi and their origin and evolution
2. Taxonomy of bacteria – Bergy's Manual of Systematic Bacteriology; classification of viruses and fungi.
3. Morphology and ultrastructure of bacterium, Virus and Fungus
4. Bacterial growth and cell division; binary cell division, septum formation, planes of cell division, control of cell division. Bacterial endospore formation, properties and germination.
5. Diversity of bacteria – Metabolic diversities – phototrophy, lithotrophy, organotrophy; Bioluminescent bacteria- characteristics, mechanism of bioluminescence & applications.
6. General characteristics, type, and economical & evolutionary importance of Archaeobacteria; Actinomycetes, Cyanobacteria, Mycoplasma, Rickettsiae and Chlamydia.
7. General characteristics, isolation, identification, cultivation and importance of bacteriophages, Cyanophages and Phages of eukaryotic cells
8. Plant viruses - General characteristics and classification; Isolation, identification, cultivation, transmission, and their significance and their control.
9. Animal viruses: General characteristics and classification; Isolation, identification, and significances; Distribution & Dissemination of animal viruses and their control.
10. Oncogenic viruses-general characters, types and mechanism of cell transformation.
11. Sub viral particles: characteristics and their significances: Prions, and virioids.
12. Mycology: a. General characteristics and classification of Major fungi;
13. Life cycle of economically important yeasts and molds.

Books:

1. Ananthnarayan and Panikar. Text Book of Microbiology. 8th ed. 2009. University press Hyderabad.
2. Mackie & McCartney's Practical Medical Microbiology. Vol. II. 1996; Churchill Livingstone publ.
3. Godkar PB. Textbook of Medicinal laboratory Technology. 2003; Bhalani Publish. House, Bombay.
4. Benson's Microbiological Application: Lab Manual in General Microbiology by A.E. Brown; 2008.
5. Jawetz's Medical Microbiology By GF Brooks (25th Ed.) 2007; Prentice Hall International Inc.
6. Bailey & Scotts. Diagnostic Microbiology, (2011) Elsevier publications.
7. Fraenkel-Contrat H. edited; Virology, (1988). Prentice Hall, New Jersey.
8. Aneja A.K., Experiments in Microbiology 2005.
9. Cappuccino Sherman's Microbiology- A Laboratory Manual, 7th Ed., 1994; Pearson Education India
10. Topley and Wilson's Microbiology and Microbial infections, Vol-2: Virology. 1994.
11. Dubey RC & Maheshwari DK. Practical Microbiology. 2005 ed.
12. Mathuew's Plant Virology by Roger Hull. 4th ed., (2002); Academic Press, U.K.
13. George Agrios; Plant pathology, 4th ed. 1997; Academic Press, New York.
14. Sullia SB & Shantharam S. General Microbiology. 2nd Ed. 2005; Oxford & IBH Publ., New Delhi.

UNIT-VIII: Microbial Genetics and Molecular Biology

1. History Genetics - Mendelian principles, classical genetics, microorganisms in genetic studies. Chemical basis of heredity –contributions of Griffith, Avery, Hershey and Chase, Fraenkel – Conrat.
2. Structure of nucleic acids –DNA, RNA, different models of DNA, extra-chromosomal DNA Organization of genetic material - Genome organization in viruses, bacteria and eukaryotes. Structure of nucleosome, chromatin and chromosome.
3. Perpetuation of genetic information – replication of DNA and RNA, Mechanism and enzymology of nucleic acid replication and its Regulation.
4. Co-linearity between genes and proteins -Transcription – biosynthesis of RNA in prokaryotes and eukaryotes, Post transcriptional processing; processing of mRNA, rRNA and tRNA. Reverse transcription.
5. Genetic code and translation –Involvement of ribosome, initiation, elongation and termination of polypeptide chain synthesis, post translation modifications of proteins.
6. Regulation of gene expression – Enzyme induction and repression, Operon concept, regulation of lac Operon, trp Operon, arabinose Operon, divergent Operon, attenuator regulation, translational regulation, feedback inhibition.
7. Genetic recombination – in bacteria; transformation, competence, lysogeny, generalized and restricted transduction, conjugation, sexduction, genetic and fine structure mapping Transposable elements – recombination in bacteria, yeasts, maize and drosophila
8. Mutations – Nature and types, mutagenic agents – Physical, Chemical and biological. Phage μ mutagenesis, site directed mutagenesis.
9. Methods of studying DNA – Density gradient sedimentation, zonal centrifugation, electrophoretic separation, agarose, polyacrylaide, pulse field electrophoreses, southern blotting, northern blotting, labeling – radioactive and non-radioactive labeling, isopycnic separation.
10. DNA repair mechanisms – photo reactivation, mismatch repair, recombination repair, SOS repair
11. DNA sequencing and Nucleic acid hybridization - direct, indirect, Maxam and Gilbert, Sangers methods, RNA and PCR sequencing. Nucleic acid hybridization –hybridization, liquid and solid hybridization, determination of stringency conditions their Applications.
12. Vectors - kinds and Types, construction, and their application in rDNA technology.
13. Restriction endonucleases – Type I, II & III, restriction mapping, RFLP and RAPD. Genome libraries – construction and screening of genome libraries, chromosome walking, cDNA libraries.
14. Construction of recombinant DNA, methods selection of DNA fragments for cloning, ligation with RES, linkers, monitoring restriction and ligation. Insertion of recombinant DNA – Host selection, transformation, transfection, electro -poration, lipofectoin, Screening of recombinant, Applications of rDNA technology.
15. PCR and DNA micro array – principles, types and applications, applications DNA fingerprinting antisense RNA technology, RNAi technology and their applications.

Books :

1. William Hays, 1980; The genetics of bacteria and their viruses, CBS Publ. New Delhi.
2. Jenkins JB, 1995; Genetics, Houghton Mifflin Co., Boston.
3. Strickberger MW, 1990; Genetics MacMillan Publ. Co. Inc. New York.
4. Stem GS & Calendar R, 1978; Molecular Genetics, Freeman & Co., San Francisco.
5. Roger L. Adams et al, 1986; The Biochemistry of nucleic acids, Chapman & Hall, London.
6. Benjamin Lewin, 2005, Genes - VIII, John Wiley & Sons, New York
7. Watson JD et al, 2004; Molecular biology of the Gene, Pearson Education India
8. Hartwell LH et al, 2000; Genetics – from Genes to Genomes, McGraw Hill Publ., New York.
9. Griffith Miller et al, 1996; An introduction to Genetic Analyses, Freeman & Co., NY.
10. Maloy, Cronan & Freifelder, 1994; Microbial Genetics, Jones & Bartlett Series.
11. Streps UN & Yasbin RE, 2005, Modern Microbial Genetics, Wiley Blackwell Publ.
Bhoj Raj Singh, 2009; Microbial Genetics.....LAP Lambert
12. Brown TA. Ed. Homes BD & Richwood D, 1998; Molecular Biology – LABFAX, Academic Press.
13. Turner PC. Et al, 2001; Instant notes on Molecular biology, Viva Books Pvt. Ltd.
14. Gerard Karp, 1999; Cell and Molecular Biology, John Wiley & Sons Inc., New York.
15. Miller G et al, 1996; An introduction to Genetic analysis, Freeman & Co., New York.
16. Click & Pasternak, 1998; Molecular Biotechnology & applications of Recombinant DNA, ASM press.
17. Watson JD et al, 1992; Recombinant DNA, Scientific American Books.
18. Desmond ST & Nicoll, 1994; An introduction to Genetic Engineering, Cambridge Uni. Press.
19. Nicholl DST, 1994, An introduction to Genetic Engineering, Cambridge Univ. Press.
20. Trapp BE & Freifelder D, 2007; Molecular Biology – Genes to proteins, Jones & Bartlet Publ. Inc. Learning
21. Morange M & M Cobb, 2000, A Hisotry of Molecular Biology, Harward Uni. Press
22. David P Clark, 2005; Molecular Biology, Academic Press
23. Harvey F Lodish, 2008; Molecular Cell Biology, W.H. Freeman
24. Cornell Mehardt, 2007; Molecular Biology & Genomics, Academic press

UNIT-IX: Immunology and Immunotechniques

1. History of immunology and definition and types of immunity and Complement system – Components, pathways of component activation and disease.
2. Cells and organs of immune system; Hematopoiesis, structure and function of lymphoid organs, lymphatic system.
3. Biology of immune cells – B-cells and T-cells – development, maturation and their surface molecules; MHC molecules– types, structure, genetics and their functions. Structure, genetics and functions of TCR, BCR and co-stimulators.
4. Antigens and Antibodies– Physical and chemical properties and types;of antigens, epitopes, immunogenicity and types of antigens; Production of polyclonal and monoclonal antibodies and their applications. Antigen-antibody interactions- types and their measurements-RIA,ODD,CFT,ELISA and Immunoblotting
5. Immune response –antigen processing and presentation; activation, differentiation and formation of functional T cells and activation of B cells; Differentiation of B cells and formation of plasma cells and memory cells; Cytokines- types and their detection (tests) &functions; Types immune response-Primary and secondary, non-specific immune response; immune response to infections, and immunotolerance.
6. Hypersensitivity – Mechanism and types of hypersensitivity; Autoimmunity –autoimmune diseases and their treatment.
7. Immune deficiency syndrome –Causes and type's syndromes.
8. Tumor and Transplantation immunology – tumor antigens and Immunomodulators; transplantation immunology –and HLA typing; Methods of detection of cellular & humoral immunity. Molecular approaches for clinical analysis of immune systems.
9. Vaccines- types and immunization schedules.

Books:

1. Bradley and Mecharty. Clinical Immunology. Oxford University Press, New York.
2. Abbas AK, Lichtman and Pober. Cellular and Molecular Immunology. W.B. Saunders Co.,
3. Coleman. Fundamental Immunology. Brown Publishers. Bubuone Zowa.
4. Catty. Maintenance of Laboratory Animals and Production of antibodies.
5. Janis Kubey. Immunology. Freeman & Co., New York.
6. Janeway and Travers et al. Immunology. Churchill Publishers.
7. Stites, Tessa and Parslow. Medical Immunology. 9th Ed. Appleton & Lange, Connecticut.
8. Benjamin E, Coice R and Sunshine G. Immunology – A Short course. 4th Ed. Wiley-Liss
9. Topley and Wilson. Principles of bacteriology, Virology and Immunity. Edward Arnold
- Roitt I.M., 1994, Essential of Immunology, Raven Press, New York.

UNIT-X: Medical and Diagnostic Microbiology

1. Historical development, major milestones and significant contributions; Germ Theory of disease, Koch postulates, Recent trends
2. Overview of Human Anatomy and physiology- Concept of Disease, Disorder, Syndrome - Communicable Diseases – Microbial Infections and Diseases
3. Microbial (Communicability infectivity Virulence).
4. Source of Infection and Microbial Pathogenicity: (Primary, reservoir) Spread, Modes and Routes of entry, Zoonotic, epizootic diseases; Pathogenicity – factors responsible for Microbial pathogenicity; Epidemiology - epidemic, endemic, sporadic, pandemic nature of diseases, WHO guidelines on epidemiology.
5. Chemotherapy – Chemotherapeutic agents – antibiotics and their Classification based on chemical structure, mode of action. Drug resistance and its consequences, Antibiotic policy, NCCLS (CLSI) and WHO guidelines.
6. Systematic study of important pathogenic bacteria –Salmonella, Shigella, E-coli, klebsiella Mycobacterium, Staphylococci, Streptococci, *Vibrio cholerae*, Treponema, Brucella, *Clostridium welchi* & *C. tetani*, *Camphylobacter*, *Corynebacteriam diphtheriae*,
7. Imp viral diseases – Pox, Herpes, Papovo, Picarno, myxoiviridae, retrovirus, arboviruses, hepatitis and Rabies viruses.
8. Brief account of fungal and protozoan diseases –dermatomycosis, deep mycosis and dimorphic fungi; Amoebiasis, Malaria, Kala azar, Taxoplosma.
9. Diagnostic Microbiology – Collection of samples, culturing, identification and AST of pathogenic microorganisms, Direct and Indirect methods for diagnosis - Upper respiratory

tract Infections, Pyogenic Infections, acute diarrheal diseases; cholera, Endemic Fever; tuberculosis, Leprosy, Urinary tract infections, Skin infection /pyogenic infections, Dental Caries/ plaque, Sexually Transmitted Diseases, Nosocomial infections.

Books :

1. Topley and Wilson. Principles of bacteriology, Virology and Immunity. Edward Arnold.
2. David Greenwood, Richard C and Slack B. Medical Microbiology. ELBS Churchill Livingstone.
3. Rajesh Bhatia R. Essentials of Medical Microbiology. Jayjee Brothers.
4. Kenneth jR. Medical Microbiology – Introduction to Infectious Disease. Prentice Hall Int.
5. Joanstokes, Ridewaywren and Sir ashleymiles. Clinica Microbiology. Edward Arnold.
6. Douglas J and Slekh. Medical Bacteriology. Churchill Livingstone.
7. Bailey and Scotts. Diagnosite Microbiology. C.V. Mosry Company
8. Hoghl and Moffet. Clinical Microbiology. JB Lippincott Company.
9. W D Frost and E. F. McCampbell, 2010; Text Book of General Bacteriology, Bibliobazaar, Publ.
10. N.Woodford & A.P. Johnson 1996; Molecular Bacteriology, Human Press Inc.
11. J.K.Struthers & R.P.Westram, 200; Clinical Bacteriology, Manson Publ. Ltd.
12. William Henarl, 2000, Bergy's Manual of Determinative Bacteriology, 9th Ed., Lippincott
13. A.J.Salle, 1974; Fundamental Principles of Bacteriology, Tata McGraw Hill Edition.
14. S.H.Gillespie & P.M.Hawkey 2006; Principles and Practice of Clinical Bacteriology; John Wiley
15. G.G.Meynell & Elinor Meynell, 2000; Theory & Practice of Experimental Bacteriology, Cambridge University Press.
16. Peter Hawkey & Deidre Lewis 1990; Medical Bacteriology, Oxford University Press.