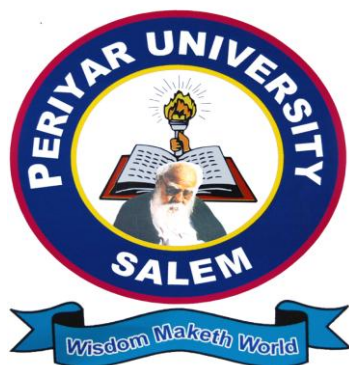


**PERIYAR UNIVERSITY
PERIYAR PALKALAI NAGAR
SALEM – 636 011**



**DEGREE OF BACHELOR OF
SCIENCE
CHOICE BASED CREDIT SYSTEM**

SYLLABUS FOR - B.Sc. MICROBIOLOGY

**FOR THE STUDENTS ADMITTED FROM THE
ACADEMIC YEAR 2012 – 2013 ONWARDS**

REGULATIONS

CONDITION FOR ADMISSION

A candidate who has passed higher secondary examination in any one of the biological sciences (Academic/Vocational stream) under higher secondary board of examination, Tamil Nadu or as per norms set by the Government of Tamil Nadu or an examination accepted as Equivalent thereto by the Syndicate subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the BSc., Microbiology degree examination of this University after a course of study of three academic years.

Duration of the course

The course for the degree of Bachelor of Microbiology shall consist of three academic years divided into six semesters.

Course of study

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.

Examinations

The theory examination shall be three hours duration to each paper at the end of each semester. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examinations. The practical examinations for UG course should be conducted at the end of the even semester.

Maximum Duration for the completion of the UG Programme

The maximum duration for completion of the UG Programme shall not exceed twelve semesters.

Commencement of this Regulation

These regulations shall take effect from the academic year 2012-13, i.e., for students who are to be admitted to the first year of the course during the academic year 2012-13 and thereafter.

Transitory Provision

Candidates who were admitted to the UG course of study before 2012-13 shall be permitted to appear for the examinations under those regulations for a period of three years i.e., up to and inclusive of the examination of April/May 2015. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

SCHEME OF EXAMINATIONS

Part	Sem	Paper code	Title of the paper	Credits	Internal marks	External marks
Part -I	I	12UFTA01/ 12UFMA01/ 12UFHI01	Tamil-I/ Malayalam-I/ Hindi-I	3	25	75
Part -II		12UFEN01	English-I	3	25	75
Part-III- Core-I		12UMB01	Fundamentals of Microbiology	5	25	75
Part-III- Allied-I		12UBCA01	Biochemistry-I	4	25	75
Part-IV- Value Education		12UVE01	Manavalakkalai Yoga	2	25	75
Part -I	II	12UFTA02/ 12UFMA02/ 12UFHI02	Tamil-II/ Malayalam- II/ Hindi-II	3	25	75
Part-II		12UFEN02	English-II	3	25	75
Part -III- Core-II		12UMB02	Microbial Physiology	5	25	75
Part-III- Allied- II		12UBCA02	Biochemistry-II	3	25	75
Part-IV- SBEC-I		12UMBS01	Microbial Diversity	2	25	75
Part-III- Core practical		12UMBP01	Major Practical-I	3	40	60
Part-III- Allied practical		12UBCAP01	Allied Practical-I- Biochemistry	3	40	60
Part-IV		12UES01	Environmental Studies	2	25	75
Part-I	III	12UFTA03/ 12UFMA03/ 12UFHI03	Tamil-III / Malayalam- III/ Hindi-III	3	25	75
Part-II		12UFEN03	English-III	3	25	75
Part-III-Core-III		12UMB03	Microbial Genetics	5	25	75
Part-III-Allied-III		12USTA06	Biostatistics	3	25	75
Part-IV-SBEC-II		12UMBS02	Principles of Bioinstrumentation	2	25	75
Part-IV – NMEC-I		12UMBN01	Bioinstrumentation-I	2	25	75

Part	Sem	Paper code	Title of the paper	Credits	Internal marks	External marks
Part-I	IV	12UFTA04/12UFMA04/ 12UFHI04	Tamil-IV/ Malayalam- IV/ Hindi-IV	3	25	75
Part-II		12UFEN04	English-IV	3	25	75
Part-III-Core-IV		12UMB04	Immunology	5	25	75
Part-III-Allied-IV		12UCSA04	Computer Applications Biology	4	25	75
Part-III- Core Practical		12UMBP02	Major Practical-II	4	40	60
Part-III- Allied Practical		12UCSAP02	Allied Practical-II- Biostatistics and Computer Applications in Biology	3	40	60
Part-IV-NMEC-II		12UMBN02	Bioinstrumentation –II	2	25	75
Part-III-Core-V	V	12UMB05	Medical Bacteriology	5	25	75
Part-III-Core-VI		12UMB06	Food and Dairy Microbiology	5	25	75
Part-III-Elective-I		12UMBE01	Medical Parasitology	5	25	75
Part-III- Elective-II		12UMBE02	Medical Mycology	5	25	75
Part-IV-SBEC-III		12UMBSO3	Recombinant DNA Technology	2	25	75
Part-IV-SBEC-IV		12UMBSO4	Extremophiles	2	25	75
Part-III-Core-VII	VI	12UMB07	Soil and Agricultural Microbiology	5	25	75
Part-III-Core- VIII		12UMB08	Environmental and Pharmaceutical Microbiology	5	25	75
Part-III-Core-IX		12UMB09	Virology	5	25	75
Part- III- Elective-III		12UMBE03	Bioprocess Technology	5	25	75
Part-IV- SBEC-V		12UMBS05	Microbial Technology	2	25	75
Part-IV-SBEC-VI		12UMBS06	Clinical Microbiology	2	25	75
Part-III- Core Practical		12UMBP03	Major Practical-III	4	40	60
Part-III- Core Practical		12UMBP04	Major Practical-IV	4	40	60
Part-V		12UEX01	Extension activities	1	-	-
Grand Total				140	1090	2910

B.Sc., Microbiology

(CBCS Pattern)

THEORY QUESTION PAPER PATTERN

Time 3 hours.

Max. Marks : 75

Part – A (10 x 2 = 20)

Answer all questions.

(Two questions from each UNIT)

Part – B (5 x 5 = 25)

(One question from each UNIT with internal choice)

Part - C (3 x 10 = 30)

Answer Any Three out of five.

(One question from each UNIT)

B.Sc., Microbiology

(CBCS Pattern)

CORE PRACTICAL QUESTION PAPER PATTERN

Time 6 hours.

Maximum marks (University Exam)	-	60
Experiment 1	-	20 marks
Experiment 2	-	20 marks
Spotters (5 x 2 marks)	-	10 marks
Record	-	10 marks

LIST OF COURSES

CORE COURSES

1. Fundamentals of Microbiology
2. Microbial physiology
3. Microbial genetics
4. Immunology
5. Medical Bacteriology
6. Food and Dairy Microbiology
7. Soil and Agricultural Microbiology
8. Environmental and Pharmaceutical Microbiology
9. Virology
10. Core Practical I
11. Core Practical II
12. Core Practical III
13. Core Practical IV

ALLIED COURSES

1. Biochemistry I
2. Biochemistry II
3. Biostatistics
4. Computer Applications in Biology
5. Allied Practical I Biochemistry
6. Allied Practical II Computer Applications in Biology

ELECTIVE COURSES

1. Medical Parasitology
2. Medical Mycology
3. Bioprocess Technology

SKILL BASED ELECTIVE COURSES (SBEC)

1. Microbial Diversity
2. Principles of Bioinstrumentation
3. Recombinant DNA Technology
4. Extremophiles
5. Microbial Technology
6. Clinical Microbiology

NON MAJOR ELECTIVE COURSES (NMEC)

1. Bioinstrumentation I
2. Bioinstrumentation II

PART IV

1. Environmental Studies
2. Value Education –Yoga

PART V

1. Extension Activities (Awareness programs, participating in Grama Shaba, Watering the Plants, Campus Cleaning and any social activity)

CORE 1- FUNDAMENTALS OF MICROBIOLOGY

- UNIT 1 -** Definition and scope of microbiology- history and recent developments- spontaneous generation-biogenesis contributions of Leeuwenhoek, Louis Pasteur, Robert Koch, Elie Metchnikoff and Fleming.
- UNIT 2 -** Microscopy- simple and compound microscopy- dark field-phase contrast- fluorescence and electron microscopy.
- UNIT 3 -** Stain and staining techniques-simple, differential and special staining (endospore, capsular and granular).
- UNIT 4 -** Sterilization – principles - dry heat - moist heat – radiation - filtration. Disinfection and disinfective agents - sterility control for dry heat, moist heat and radiation.
- UNIT 5 -** Antimicrobial chemotherapy - antibiotics - mode of actions - antimicrobial resistance-tests for sensitivity to antimicrobial agents.

REFERENCES

1. Dubey RC and Maheswari DK (2012). A text of Microbiology (**Revised edition**). S.Chand and Company Ltd., New Delhi.
2. Geeta Sumbali and Mehrotra RS (2009). Principles of Microbiology. First edition, Tata Mc Graw Hill P.Ltd., New Delhi.
3. Powar CB and Daginawala H F (2005). General Microbiology volume 1 and 2. Eighth edition, Himalaya publishing house, Mumbai .
4. Pelczar TR M J Chan ECS and Kreig N R (2006). Microbiology. Fifth edition, Tata Mc Graw-Hill INC. New York.
5. Robert F Boyd (1984). General microbiology. Times mirror/Mosby college publishers.
6. Prescott L M, J P Harley and D A Klein (2005). Microbiology. Sixth edition, International edition, Mc Graw Hill.

CORE 2- MICROBIAL PHYSIOLOGY

- UNIT 1 -** Cellular structures of prokaryotes and eukaryotes- cell wall, flagella, slime layer, capsule, pili, cytoplasmic membrane and cytoplasmic inclusions – sporulation and its mechanism- structure and functions of Cyanobacteria.
- UNIT 2 -** Growth of bacteria – multiplication - nutritional requirements - factors affecting growth - growth curve - determination of growth. Culture techniques - Pure culture, anaerobic culture - preservation of cultures.
- UNIT 3 -** Metabolism-ATP synthesis and utilization – (photophosphorylation, oxidative phosphorylation, substrate level phosphorylation).
- UNIT 4 -** Metabolic pathways – glycolysis, pentos phosphate pathways, EMP, TCA and Glyoxalate cycle.
- UNIT 5 -** Photosynthesis – characteristics and metabolism of autotrophs- photosynthetic bacteria and cyanobacteria - autotrophic CO₂ fixation and mechanism of photosynthesis.

REFERENCES

1. Dubey RC and Maheswari DK (2012). A text of Microbiology. Revised edition, S. Chand and Company Ltd., New Delhi.
2. Geeta Sumbali and Mehrotra RS (2009). Principles of Microbiology. First edition, Tata McGraw Hill P.Ltd., New Delhi.
3. Pelczar TR M J Chan ECS and Kreig N R (2006). Microbiology. Tata Mc Graw-Hill INC., New York.
4. Robert F Boyd (1984). General Microbiology. Times mirror / Mosby college publishers.
5. Moat G, John W. Foster and Michael P. Spector (2002). Microbial physiology . Fourth edition, A John Wiley sons, Inc. publication. New Delhi.

CORE 3 – MICROBIAL GENETICS

- UNIT 1 -** Introduction and history of microbial genetics. DNA as a genetic material. Physical structure and chemical composition of DNA -RNA and its types, RNA as a genetic material.
- UNIT 2 -** DNA replication- types and experimental proof of replication-enzymes involved in DNA replication.
- UNIT 3 -** Prokaryotic transcription, translation. Genetic code- regulation of gene expression in prokaryotes - Lac operon.
- UNIT 4 -** Gene transfer mechanisms- transformation, conjugation and transduction. Plasmid- characteristics and types.
- UNIT 5 -** Mutation- types of mutation- molecular basis of mutation- mutagenesis, detection of mutants- Ames test , DNA repair mechanisms .

REFERENCES

1. David R Hyde (2010). Genetics and Molecular biology. Special Indian edition, Tata Mc Graw Hill P.Ltd., New Delhi.
2. Ramawat and Shaily goyal (2010). Molecular biology and Biotechnology. First edition S.Chand & Co.Ltd., New Delhi.
3. Peter Paoella (2010). Introduction to Molecular Biology. First edition, Tata Mc Graw-Hill P. Ltd., New Delhi.
4. Mahabal Ram (2010). Fundamentals of Cytogenetics and Genetics. First edition, PHI Learning P.Ltd., New Delhi.
5. Ajoy Paul (2007). Text Book of Cell and Molecular Biology. First edition, Books Allied (P) Ltd., Kolkata.
6. Peter Snustad D and Michael J Simmons (2003). Principles of Genetics. Third edition, John Wiley and Sons, Inc. publication, New Delhi.
7. Peter J Russel (2002). Genetics. Benjamin Cummings.
8. Robert H Tamarin (2002). Principles of Genetics. Seventh edition, Tata Mc Graw-Hill P. Ltd., New Delhi.
9. David Friefelder (1995). Molecular biology. Narosa publishing house, New Delhi.

CORE 4 - IMMUNOLOGY

- UNIT 1 -** History of immunology- host-parasite relationship - innate and acquired immunity- Humoral and cell mediated immunity.
- UNIT 2 -** Structures and functions of cells and organs involved in immune system, Primary and Secondary lymphoid organs.
- UNIT 3 -** Antigens- types, properties-Immunoglobulin's- structure, types and properties- complement- classical and alternative pathways.
- UNIT 4-** Antigen – antibody interactions – reactions – Agglutination – Precipitation - Complement fixation – Immunofluorescence – ELISA - RIA.
- UNIT 5 -** Hypersensitivity reactions- antibody mediated-type 1, type 2 and type 3 - cell mediated- type 4 – Immunohaematology.

REFERENCES

1. Madhavee Latha (2012). A Text book Immunology. First edition, S.Chand & Company Ltd, New Delhi.
2. Annadurai B (2008) . Immunology and Immunotechnology. First edition, S.Chand & Company Ltd., New Delhi.
3. Kannan I (2007). Immunology. First edition, MJP Publishers, Chennai.
4. Kuby Immunology - Richard A Goldsby, Thomas J Kindt. Barbara A Osborne, (2000). Fourth edition, W H Freeman and company. New York.
5. Tizard K (1983). Immunology. An Introduction. Saunders college publishing, Philadelphia.
6. Roitt, IM (1988). Essentials of Immunology. ELBS-Blackwell Scientific Publishers, London.
7. Bashir SF (2011). Text Book of Immunology. First edition, PHI Learning Private limited, New Delhi.

CORE 5 - MEDICAL BACTERIOLOGY

- UNIT 1-** Collection and transport of clinical specimens for microbiological examinations- Virulence factors of bacteria causing human infections- Normal flora of human body.
- UNIT 2-** Morphology, culture, biochemical, pathogenicity, laboratory diagnosis and prevention of bacterial diseases - *Staphylococcus aureus*, *Streptococcus pyogenes*, *S.pneumoniae*, *Neisseria gonorrhoeae*, *N.meningitidis*.
- UNIT 3-** Morphology, culture, biochemical, pathogenicity, laboratory diagnosis and prevention of bacterial diseases - *Mycobacterium tuberculosis*, *M.leprae*, *Corynebacterium diphtheriae*, *Clostridium tetani*, *C.botulinum*, *Bacillus anthracis*.
- UNIT 4-** Morphology, culture, biochemical, pathogenicity, laboratory diagnosis and prevention of bacterial diseases - *Salmonella typhi*, *Shigella dysenteriae*, *Vibrio cholerae*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Yersinia pestis*.
- UNIT 5-** Morphology, culture, biochemical, pathogenicity, laboratory diagnosis and prevention of bacterial diseases - *Treponema pallidum*, *Leptospira interrogans*, *Mycoplasma pneumoniae*, *Chlamydia trachomatis*.

REFERENCES

1. Chakraborty P (2003). A Text book of Microbiology. Second edition, Published by New Central Agency (P) Ltd., Kolkata.
2. Ananthanarayan R and Jayaram Paniker CK (2005). Text Book of Microbiology. Seventh edition, Orient Longman Limited, Hyderabad.
3. Satish Gupte (2005). The Short Textbook of Medical Microbiology.Eighth edition, Jaypee Brothers, Medical publishers (P) Ltd., New Delhi.
4. Baron EJ, Peterson LR and Finegold SM (1994). Bailey and Scotts diagnostic microbiology. 9th edition, Mosby publications.
5. Rajan S (2009). Medical Microbiology. First edition, MJP Publishers, Chennai.
6. Rajesh Bhatia and Ratan Lal Ichhpujani (2004). Essentials of Medical Microbiology. Third edition, Jaypee Brothers, Medical Publishers (P) Ltd., New Delhi.

CORE 6 - FOOD AND DAIRY MICROBIOLOGY

- UNIT 1 -** Food as a substrate for microbes - microbes involved in food microbiology- mould, yeast, bacteria - factors affecting the growth of microorganisms in food.
- UNIT 2 -** Principles of food preservation – asepsis - removal of microorganisms, anaerobic condition- high and low temperatures – drying- radiation- chemical preservatives - food additives.
- UNIT 3 -** Food spoilage- general principles- underlying food spoilage and contamination - cereals, vegetables, fruits and poultry products, meat, fish, sea foods.
- UNIT 4 -** Microorganisms in milk and milk products - yoghurt, cumis - butter and cheese - Quality control of milk – MBRT, Litmus Milk - Phosphatase tests.
- UNIT 5 -** Food borne diseases – food poisoning – infective and toxic bacterial food borne diseases and their diagnosis – food sanitation and its control measures (HACCP).

REFERENCES

1. Sivashankar B – Moss (2011). Food Processing and Preservation. Eighth edition, PHI Learning P.Ltd., New Delhi.
2. Vijaya Ramesh K (2007). Food Microbiology. First edition, MJP Publishers, Chennai.
3. Adams MR – Moss (2004). Food Microbiology. Second edition, Panima publishing house New Delhi.
4. Banwart GJ (2004). Basic Food Microbiology. Second edition, CBS Publishers and Distributors, New Delhi.
5. James M Jay (2003). Modern Food Microbiology. Fourth edition, CBS Publishers, New Delhi.
6. Frazier WC and West Hoff DC (1988). Food Microbiology. Fourth edition, McGraw Hill, New York.

CORE 7 - SOIL AND AGRICULTURAL MICROBIOLOGY

- UNIT 1 -** Introduction to soil microbiology – Properties of soil (structure, texture, formation). Types and significance of soil microbes – Factors affecting microbial population - Soil fertility test.
- UNIT 2 -** Biogeochemical cycle – Carbon, Phosphorous, Nitrogen – Biological nitrogen fixation- Nitrogen fixers - Root nodule formation - Nitrogenase, Hydrogenase.
- UNIT 3 -** Microbial interaction between microbes Neutralism, Commensalism, Synergism, Mutualism, Amensalism, Symbiosis, Competition, Parasitism and Predation. Interaction of microbes with plants - Rhizosphere and *Mycorrhizae* - interaction of microbes , insects and rumen.
- UNIT 4 -** Plant pathology (symptoms, disease cycle and control measures) –Bacterial diseases - Blight of rice, Citrus canker-Fungal disease-Red rot of sugarcane, Wilt of cotton , Tikka leaf spot of ground nut.
- UNIT 5 -** Biofertilizers - *Rhizobium* and *Azotobacter* , Cyanobacteria , *Azolla*.

REFERENCES

1. Subba Rao NS (2004). Soil Microbiology. Fourth edition, Oxford and IBH Publishing Co.Pvt. Ltd., New Delhi.
2. Mishra RR (2004). Soil Microbiology. First edition, CBS Publishers and distributors, New Delhi.
3. Rangaswami G and Mahadevan A (2002). Disease of Crop Plants in India. Fourth edition, PHI Learning (P) Ltd., New Delhi.
4. Rangaswami G and Bagyaraj DJ (2002). Agricultural Microbiology. Second edition, PHI Learning (P) Ltd., New Delhi.
5. Robert, L Tate (1995). Soil Microbiology. First edition, John Wiley and Sons, Inc. New York.

CORE 8 - ENVIRONMENTAL AND PHARMACEUTICAL MICROBIOLOGY

- UNIT 1 -** Microbiology of air- Sero microbial pathways - Enumeration of bacteria from air - Air sampling devices - Air sanitation - Air borne diseases.
- UNIT 2 -** Microbiology of water - Potability of water - Indicator organisms- water purification- Water borne diseases and their control measures.
- UNIT 3 -** Microbiology of sewage- chemical and biochemical characteristics of sewage- BOD and COD - Sewage treatment - physical, chemical and biological (trickling filter, activated sludge and oxidation pond) treatment- disposable of wastes.
- UNIT 4 -** Sterility testing of pharmaceutical products – Injectables – IV fluids– Pyrogen testing. Antiseptics, disinfectants and their standardisation.
- UNIT 5 -** Production of Vaccine – BCG and Typhoid. Production of Toxoid – Tetanus, and Diphtheria. Preparation of Antisera and their standardization.

REFERENCES

1. Vijaya Ramesh K (2004). Environmental Microbiology First edition, MJP publishers (a UNIT of Tamil Nadu book house),
2. Joseph C Daniel (1999). Environmental aspects of Microbiology. First edition, Bright Sun publications, Chennai.
3. Mithell R (1974). Introduction to Environmental Microbiology. Prantice Hall. Inc., Englewood Cliffs, New Jersey.
4. Murugesan AG and Rajakumari C (2005). Environmental Science and Biotechnology. First edition, MJP Publishers, Chennai.
5. Singh DP and Dwivedi SK (2005). Environmental Microbiology and Biotechnology. First edition, New Age International (P) Ltd., New Delhi.
6. Hugo W B and Russell AD (1998). Pharmaceutical Microbiology. Sixth edition, The Black well Science Ltd., UK.

CORE 9 - VIROLOGY

- UNIT 1 -** General properties – Classification - Cultivation- Isolation- and identification of viruses - Sero diagnosis and molecular diagnosis of viral infections.
- UNIT 2 -** Pox viruses – Variola, Vaccinia. Herpes viruses – Herpes Simplex Virus, Cytomegalo Virus, Epstein Barr Virus – Hepatitis Viruses. Human Papiloma Viruses.
- UNIT 3 -** Picorna Viruses - Polio. Orthomyxo Virus – Influenza. Rhabdo virus. Flavi Viruses – Dengue Virus. Retro Virus – HIV.
- UNIT 4 -** Nomenclature and classification of Plant Viruses – Disease symptoms, transmission and detection of Plant Viruses. Tobacco Mosaic Virus, Cauliflower Mosaic Virus and Tomato Yellow Mosaic Virus – Potato Virus.
- UNIT 5 -** Viruses of importance – Bacteriophages – Structures, types, uses in microbiology – Typing and application in bacterial genetics.

REFERENCES

1. Saravanan P (2006) Virology. First edition, MJP Publishers, A Unit of Tamil Nadu Book House, Chennai.
2. Ananthanarayan R and Jayaram Paniker CK (2005) Text Book of Microbiology. Seventh edition, Orient Longman Limited, Hyderabad.
3. Chakraborty P (2003). A Text book of Microbiology. Second edition, Published by New Central Agency (P) Ltd., Kolkata.
4. Morag C and Timbury MC. (1994). Medical Virology. Tenth edition, Churchill Livingstone, London.
5. Dimmok NJ, Prmrose SB (1994). Introduction to modern virology Fourth edition, Blackwell scientific company publications.
6. Patric R Murray. (1990). Medical Microbiology. Mosby Publications.
7. Luria SE, Darnell JE, Baltimore D and Compare A (1978). General virology. Third edition, John Wiley and Sons, New York.

ELECTIVE - MEDICAL PARASITOLOGY

- UNIT 1 -** Introduction- Classification- Laboratory diagnosis of parasitic infections- Direct and concentration methods, blood smear examination.
- UNIT 2 -** *Entamoeba histolytica*, *Giardia intestinalis*, *Trichomonas vaginalis*, *Balantidium coli*.
- UNIT 3 -** *Haemoflagellates* - *Leishmania donovani*, *Trypanosoma brucei*, *T. cruci*, *Malarial parasite* - *Plasmodium* species.
- UNIT 4 -** *Taenia solium*, *T. saginata*, *Paragonimus westermani*, *Fasciola hepatica*, *Fasciolopsis buski*.
- UNIT 5-** *Ancylostoma duodenale*, *Ascaris lumbricoids*, *Wuchereria bancrofti*, *Enterobius vermicularis*.

REFERENCES

1. Subhas Chandra Parija (2004). Text book of Medical Parasitology. Second edition, All India Publishers and Distributors, Medical Books Publishers, New Delhi.
2. Jayaram Paniker CK (2004). Text book of Medical Parasitology. Fifth edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.
3. Ratan Lal Ichhpujani and Rajesh Bhatia (2004). Essentials of Medical Microbiology. Third edition, Jaypee Brothers, Medical Publishers (P) Ltd., New Delhi
4. Karya Karte RP and Damle AS (2005). Medical Parasitology. Revised edition, Books and Allied (P) Ltd., Kolkata.
5. Monica Cheesbrough (2003). District Laboratory Practice in Tropical Countries. Part 1 & 2 Low-Price edition, Cambridge University Press.

ELECTIVE - MEDICAL MYCOLOGY

- UNIT 1 -** Introduction to Medical Mycology - Morphological features of fungi - Classification of medically important fungi, isolation, identification and diagnosis of fungi from clinical specimens.
- UNIT 2 -** Superficial mycosis- *Pityriasis versicolor*, *Taenia nigra* - Cutaneous mycosis- Dermatophytosis.
- UNIT 3 -** Subcutaneous mycosis- Sporotrichosis, Mycetoma, Chromoblastomycosis.
- UNIT 4 -** Systemic mycosis – Blastomycosis, Histoplasmosis. Opportunistic mycosis - Candidiasis, Cryptococcosis - Aspergillosis.
- UNIT 5 -** Antifungal agents – Sensitivity tests - Mycotoxins.

REFERENCES

1. Rajan S (2009). Medical Microbiology. First edition, MJP Publishers, Chennai.
2. Chakraborty P (2003). A text book of Microbiology. Second edition, Published by New central book agency (P) Ltd., Kolkata.
3. Monica Cheesbrough (2003). District Laboratory Practice in Tropical Countries. Part 1 & 2 Low-Price edition, Cambridge University Press.
4. Dey NC, Dey TK and Sinha D (1999). Medical Bacteriology including Medical Mycology and Aids. Seventeenth edition, New central book agency (P) Ltd., Kolkata.
5. Jagadish Chander (1996). A text book of Medical Mycology. Interprint, New Delhi.
6. Mehrotra RS and Aneja KR (2006). An Introduction to Mycology. New age international publishers.

ELECTIVE – BIOPROCESS TECHNOLOGY

- UNIT 1-** Industrially important microorganisms - Screening Techniques- Primary and Secondary - Preservation of cultures - Strain improvement- Development of inoculum for various fermentation processes.
- UNIT 2 -** Media for industrial fermentation - Submerged and Solid State fermentation- Downstream processing - Recovery and purification of intra cellular and extracellular products.
- UNIT 3 -** Fermentor – Components, Types of fermentors, Control systems in fermentation – pH, Temperature, Oxygen and foam. Computer applications in fermentation technology.
- UNIT 4 -** Microbial production of Wine, Ethanol. Organic acids - Citric acid and Lactic acid, Acetic acid.
- UNIT 5 -** Microbial production of Amino acid – Lysine. Enzyme - Alpha amylase. Vitamin B12 – Antibiotics – Penicillin, Streptomycin

REFERENCES

1. Sivakumar PK, Joe MM and Sukesh K (2010). An introduction to Industrial Microbiology. First edition, S.Chand & Company Ltd, New Delhi.
2. Agrawal AK and Pradeep Parihar (2006). Industrial Microbiology. Student edition, Jodhpur.
3. Patel AH (2005). Industrial microbiology. Published by Mac Millan India Ltd., Chennai.
4. Stanbury PF, Whitaker A and Hall SJ (1997). Principles of Fermentation Technology. Second edition, Pergmon Press.
5. LE Cassida JR (2005). Industrial Microbiology. New Age International (P) Ltd., New Delhi.
6. Purohit SS, Saluja AK, Kakrani HN, (2004). Pharmaceutical Microbiology. First edition, Agrobios (India).
7. Hugo WB and AD Russel (1998). Pharmaceutical Microbiology. Sixth edition, Black Well Scientific Company Ltd.
8. Purohit SS, Saluja AK, Kakrani HN, (2004). Pharmaceutical Biotechnology. First edition, Agrobios (India).

SBEC - MICROBIAL DIVERSITY

- UNIT 1 -** Diversity of microbial world - Organizing, classifying and naming of microorganism - Whittaker's five system of classification.
- UNIT 2 -** Bacterial Taxonomy - Methods in bacterial identification - Bergey's systematic classification of bacteria.
- UNIT 3 -** Fungal classification - Alexopolous method.
- UNIT 4 -** Photosynthetic Protists - Algal classification.
- UNIT 5 -** Classification of viruses and Medically important protozoa.

REFERENCES

1. Dubey RC and Maheswari DK (2012). A text of Microbiology (**Revised edition**). S.Chand and Company Ltd., New Delhi.
2. Geeta Sumbali and Mehrotra RS (2009). Principles of Microbiology. First edition, Tata Mc Graw Hill P.Ltd., New Delhi.
3. Powar CB and Dagainawala H F (2005). General Microbiology volume 1 and 2. Eighth edition, Himalaya publishing house, Mumbai.
4. Pelczar TR M J Chan ECS and Kreig N R (2006). Microbiology. Fifth edition, Tata Mc Graw-Hill INC. New York.
5. Robert F Boyd (1984). General microbiology. Times mirror/Mosby college publishers.
6. Prescott L M, J P Harley and D A Klein (2005). Microbiology. Sixth edition, International edition, Mc Graw Hill.
7. Jagadish Chander (1996). A text book of Medical Mycology. Interprint, New Delhi.

SBEC - PRINCIPLES OF BIOINSTRUMENTATION

- UNIT 1 -** Centrifugation Principles of sedimentation – Types of centrifuges (low speed, high speed and ultracentrifuges) – Differential centrifugation – Density gradient centrifugation.
- UNIT 2 -** Chromatography principle of separation, detection and uses of thin layer chromatography – Ion exchange chromatography – Gel filtration (molecular sieve chromatography – Ion exchange chromatography)
- UNIT 3 -** Electrophoresis and blotting, classification of electrophoretic methods – Agarose gel electrophoresis – SDS - PAGE – Southern blotting – Northern blotting - Western blotting - Dot blotting - Colony blotting.
- UNIT 4 -** Spectrophotometric methods - Beer - Lamberts law – Principle, operating mechanism and applications of colorimeter, Spectrophotometer and Fluorescence spectrophotometer.
- UNIT 5 -** Radioisotope methods types of radioactive decay - Half life and radioactivity- GM counter – Scintillation counter - Autoradiography.

REFERENCES

1. Bajpai PK (2010). Biological Instrumentation and Methodology. Revised edition, S.Chand & Co. Ltd., New Delhi.
2. Palanivelu P (2004). Analytical Biochemistry and Separation techniques. Third edition, MKU Co-op, Press Ltd., Palkalai Nagar, Madurai.
3. Gurumani N (2006). Research Methodology for Biological Sciences. First edition, MJP Publishers, A Unit of Tamil Nadu Book House, Chennai.
4. Subramanian MA (2005). Biophysics – Principles and Techniques. First edition, MJP Publishers, A Unit of Tamil Nadu Book House, Chennai.
5. John G Webster (2004). Bioinstrumentation. Student edition. John Wiley and Sons, Ltd.
6. Ravishankar S (2001). A Text Book of Pharmaceutical Analysis. Third edition. Rx Publications, Tirunelveli.

SBEC- RECOMBINANT DNA TECHNOLOGY

- UNIT 1 -** Achievements of DNA technology - cloning vectors Plasmids (pBR 322, pUC 18) - Bacteriophage vectors (λ vectors) - cosmid - Phagemid - Artificial chromosome (YAC).
- UNIT 2 -** Nomenclature and classification of restriction endonucleases - ligases - gene cloning in prokaryotes – Cloning strategies – construction of genomic libraries and cDNA libraries.
- UNIT 3 -** Methods of gene transfer in bacteria - Transformation - Microinjection - Gene gun - PCR methods and application.

REFERENCES

1. Mitra (2005). Genetic engineering. Published by Macmillan India Ltd., Chennai.
2. Jogdand SN (2005). Gene biotechnology. Himalaya Publishing House, Mumbai.
3. Satyanarayana (2005). Biotechnology. First edition, Books and Allied (P) Ltd., Kolkata.
4. Preeti Joshi (2002). Genetic engineering and its application. First edition, Agrobios (India).
5. Dubey RC (2005). A Text of Biotechnology. Multicolour Illustrative edition, S.Chand and Company Ltd., New Delhi.
6. Bernad R Glick (2003). Molecular Biotechnology - Principles and Applications of Recombinant DNA. Third edition, ASM Press, Washington, D.C.
7. Ramawat K and Shaily Goyal (2010). Molecular Biology and Biotechnology. First edition, S.Chand and company Ltd., New Delhi.

SBEC - EXTREMOPHILES

- UNIT 1 -** Survival at extreme environments - Starvation - Adaptive mechanisms in thermophilic, alkalophilic, asomophilic and barophilic, psychrophilic microorganisms – Hyperthermophilies and halophiles - Importance in biotechnology.
- UNIT 2 -** Classification and characteristics of Archaeobacteria. Halophiles – Dead Sea – halotolerance – Applications of halophiles and their extremozymes. Barophiles – High pressure habitats, life under pressure, barophily, death under pressure.
- UNIT 3 -** Microbes in toxic environments like acid mine drainage, coal desulphurisation, wastes containing cyanides, xenobiotics and radio isotopic materials.

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1. Johari BN (2000). Extremophiles. Springer Verlag, New York.
2. Kushner DS (1978). Microbial life in extreme environments. Academic Press Inc. New York.
3. Prescott L M, J P Harley and D A Klein (2005). Microbiology. Sixth edition, International edition, Mc Graw Hill.
4. Geeta Sumbali and Mehrotra RS (2009). Principles of Microbiology. First edition, Tata McGraw Hill P.Ltd., New Delhi.
5. Robert F Boyd (1984). General microbiology. Times mirror/Mosby college publishers.

SBEC - MICROBIAL TECHNOLOGY

- UNIT 1 -** Biotechnology - definition and history, Range of fermentation processes and their significance - Microbial biomass - Microbial enzymes - Microbial metabolites - Recombinant products - Microbial transformations.
- UNIT 2 -** Production of Biotechnological products and their significance - Biofertilizer - VAM - Biopesticide - *Bacillus thuringiensis* - Biopolymer - Xanthan - SCP - Yeast - Cultivation of mushrooms.
- UNIT 3 -** Commercial production of microbial products - Insulin - Interferon - Growth Hormone, Immobilization - Principles, methods and significance.

REFERENCES

1. Dubey RC (2005). A Text of Biotechnology. Multicolour Illustrative edition, S.Chand and Company Ltd., New Delhi.
2. Satyanarayana (2005). Biotechnology. First edition, Books and Allied (P) Ltd., Kolkata.
3. Jogdand SN (2005). Gene biotechnology. Himalaya Publishing House, Mumbai.
4. Singh BD (2005). Biotechnology. Second revised and enlarged edition, Kalyani Publishers, Chennai
5. Bernad R Glick and Jack J Pasternak (1998). Molecular Biotechnology. Principles and Applications of Recombinant DNA. Second edition, ASM Press, Washington, D.C.
6. Ramawat K and Shaily Goyal (2010). Molecular Biology and Biotechnology. First edition, S.Chand and company Ltd., New Delhi.

SBEC - CLINICAL MICROBIOLOGY

- UNIT 1 -** Clinical diagnosis of acute Respiratory Tract Infections (RTI), Diphtheria, Sore throat, Tuberculosis and Pertusis.
- UNIT 2 -** Clinical diagnosis of Meningitis, Tetanus, Gas gangrene, Diarrhoea and Cholera.
- UNIT 3 -** Clinical diagnosis of Pyrexia of Unknown Origin (PUO), Urinary Tract Infections (UTI), Sexually Transmitted Diseases (STDs) and Hospital acquired infections.

REFERENCES

1. Rajesh Bhatia and Ratan Lal Ichhpujani (2004). Essentials of Medical Microbiology. Third edition, Jaypee Brothers, Medical Publishers (P) Ltd., New Delhi.
2. Rajan S (2009). Medical Microbiology. First edition, MJP Publishers, Chennai.
3. Chakraborty P (2003). A Text book of Microbiology. Second edition, Published by New Central Agency (P) Ltd., Kolkata.
4. Ananthanarayan R and Jayaram Paniker CK (2005). Text Book of Microbiology. Seventh edition, Orient Longman Limited, Hyderabad.
5. Satish Gupte (2005). The Short Textbook of Medical Microbiology. Eighth edition, Jaypee Brothers, Medical publishers (P) Ltd., New Delhi.
6. Dey NC, Dey TK and Sinha D (1999). Medical Bacteriology including Medical Mycology and Aids. Seventeenth edition, New central book agency (P) Ltd., Kolkata.
7. Patric R Murray. (1990). Medical Microbiology. Mosby Publications.

NMEC - BIOINSTRUMENTATION - I

- UNIT 1 -** Basic rules of a microbiology laboratory - Basic requirement microbiology laboratory - Basic principle, operating mechanism and applications of Autoclave, Hot Air oven, Laminar air flow and pH meter.
- UNIT 2 -** Centrifugation method - Basic principles of sedimentation, Centrifugal force, Swedberg constant. Types of centrifuge- Differential, density gradient and ultra centrifugation.
- UNIT 3 -** Chromatography- Preparation, packing of columns, adsorption and elution. Paper, Thin layer, Ion-exchange and HPLC techniques and their applications.

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1. Bajpai PK (2010). Biological Instrumentation and Methodology. Revised edition, S.Chand & Co. Ltd., New Delhi.
2. Palanivelu P (2004). Analytical Biochemistry and Separation techniques. Third edition, MKU Co-op, Press Ltd., Palkalai Nagar, Madurai.
3. Gurumani N (2006). Research Methodology for Biological Sciences. First edition, MJP Publishers, A Unit of Tamil Nadu Book House, Chennai.
4. Subramanian MA (2005). Biophysics – Principles and Techniques. First edition, MJP Publishers, A Unit of Tamil Nadu Book House, Chennai.
5. John G Webster (2004). Bioinstrumentation. Student edition. John Wiley and Sons, Ltd.
6. Ravishankar S (2001). A Text Book of Pharmaceutical Analysis. Third edition. Rx Publications, Tirunelveli.
7. Rajan S and Selvi Christy (2011). Experimental procedures in life sciences. Anjana Book House, publishers and distributors, Chennai.
8. Aneja KR (2005). Experiments in Microbiology, Plant pathology and Biotechnology. Fourth edition, New Age International Publishers, Chennai.

NMEC - BIOINSTRUMENTATION -II

- UNIT 1 -** Spectrometric methods - Beer's Lambert's Law - Principles, Operating mechanisms and applications of colorimeter, Spectrophotometer and Fluorescence spectroscopy.
- UNIT 2 -** Electrophoresis - Basic principles and their application - Agarose gel electrophoresis - SDS - PAGE.
- UNIT 3 -** Blotting techniques - Southern, Western and Northern blotting - Autoradiography - Scintillation counter and Geiger Muller counter.

REFERENCES

1. Bajpai PK (2010). Biological Instrumentation and Methodology. Revised edition, S.Chand & Co. Ltd., New Delhi.
2. Palanivelu P (2004). Analytical Biochemistry and Separation techniques. Third edition, MKU Co-op, Press Ltd., Palkalai Nagar, Madurai.
3. Gurumani N (2006). Research Methodology for Biological Sciences. First edition, MJP Publishers, A Unit of Tamil Nadu Book House, Chennai.
4. Subramanian MA (2005). Biophysics – Principles and Techniques. First edition, MJP Publishers, A Unit of Tamil Nadu Book House, Chennai.
5. John G Webster (2004). Bioinstrumentation. Student edition. John Wiley and Sons, Ltd.
6. Ravishankar S (2001). A Text Book of Pharmaceutical Analysis. Third edition. Rx Publications, Tirunelveli.

CORE PRACTICAL – I

(End of the first year)

1. Handling and maintenance of compound microscope
2. Measurement of Microorganisms – Micrometry
3. Cleaning of Glassware's
4. Staining techniques - Simple, Gram's, Acid - fast, Spore and Capsular staining methods
5. Handling of laboratory instruments
 - i. Autoclave
 - ii. Hot air oven
 - iii. Laminar air flow
 - iv. pH meter
6. Microscopic examinations of
 - i. Algae - *Oscillatoria*, *Spirulina* spp.
 - ii. Fungi - *Mucor* spp., *Aspergillus* spp., *Penicillium* spp. And *Alternaria* spp.
 - iii. Protozoa - *Entamoeba* spp., *Giardia* spp., *Ascaris* spp.
 - iv. Bacteria - *Staphylococcus* spp. *Lactobacillus* spp. *Escherichia* spp. *Vibrio* spp.
7. Motility determination - Hanging drop method, Semisolid agar
8. Media preparation
 - i. Liquid media - Peptone water, Nutrient broth
 - ii. Solid media - Nutrient agar (Agar slant, Agar plate and Agar deep)
9. Culture characteristics of microorganisms
10. Demonstration of pigment production on nutrient agar medium (*Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Serratia* spp.)
11. Pure culture technique - Pour plate, Streak plate and Spread plate
12. Anaerobic cultivation (Candle Jar and Pyrogallol methods)

REFERENCES

1. Rajan S and Selvi Christy (2011). Experimental procedures in life sciences. Anjana Book House, publishers and distributors, Chennai
2. Aneja KR (2005). Experiments in Microbiology, Plant pathology and Biotechnology. Fourth edition, New Age International Publishers, Chennai.
3. Dubey RC and Maheswari DK (2004). Practical microbiology First edition, S Chand and Company Ltd., New Delhi.

4. Sundararaj T. Microbiology laboratory manual. Revised and published by Aswathy Sundararaj. No.5 First Cross Street, Thirumalai Nagar, Perungudi, Chennai.
5. James G Cappuccino and Natalie Sherman (2004). Microbiology : A laboratory manual. Sixth edition, Published by Pearson Education.
6. Kannan N (2003). Handbook of laboratory culture media, Reagents, Stains and buffers. Panima Publishing Corporation, New Delhi.
7. Kannan N (1996). Laboratory Manual in General Microbiology. First edition, Palani Paramount Publications, Palani. Tamil Nau.
8. Horold J Benson (1998). Microbiological Applications - Laboratory Manual in General Microbiology. Seventh International edition, Mc Grew-Hill, Boston.

CORE PRACTICAL – II

(End of the second year)

1. Isolation of Genomic DNA (crude method)
2. Isolation of Auxotrophic mutant by replica plate method
3. Isolation of drug resistant mutants by gradient plate method
4. Examinations of Blood Cells
 - i. Total Count
 - ii. Differential Count
5. Blood collection and plasma/serum separation
6. Blood grouping - Rh typing –Cross matching
7. Precipitation reaction
 - i. RPR card test / VDRL test.
 - ii. Ouchterlony double immunodiffusion test
 - iii. Counter immunoelectrophoresis
8. Agglutination reaction
 - i. Widal test
 - ii. ASO test
 - iii. RA test
 - iv. CRP test
 - v. Pregnancy test (Direct/Indirect)
9. Demonstration of HBsAg by Hepacard test
10. Demonstration of HIV by Tri - dot test

REFERENCES

1. Myer's and Koshy's manual of diagnostic procedures in medical microbiology and immunology/serology. Published by department of clinical microbiology, CMC and Hospital, Vellore, Tamil Nadu.
2. Rajan S and Selvi Christy (2011). Experimental procedures in life sciences. Anjana Book House, publishers and distributors, Chennai
3. Aneja KR (2005). Experiments in Microbiology, Plant pathology and Biotechnology. Fourth edition, New Age International Publishers, Chennai.

CORE PRACTICAL-III

(End of the Third year)

1. Colony morphology of pathogenic bacteria on different selective media
2. Identification of pathogenic bacteria

Preliminary tests	Biochemical tests	Special tests
<ol style="list-style-type: none">Gram StainingMotility testCatalase testOxidase test	<ol style="list-style-type: none">TSI testIndole testMR testVP testCitrate utilization testUrease activity	<ol style="list-style-type: none">Coagulase testSlide agglutination testPhenyl Pyruvic acid production testOxidation fermentation testONPG testCholera – Red reaction

a) *Staphylococcus aureus*

d) *Salmonella typhi*

b) *Escherichia coli*

e) *Proteus vulgaris*

c) *Klebsiella pneumoniae*

f) *Pseudomonas aeruginosa*

3. Normal saline/ Lugol's iodine preparation for parasitic ova /cyst examination
4. Stool examination by saturated saline technique
5. Blood smear examination for Malarial parasite (*Plasmodium vivax* and *P.malariae*)
6. Culture methods of fungi
 - Media usage – PDA, SDA, Corn meal agar
 - Moist chamber - Incubation method
7. Examination of fungi by Lactophenol cotton blue stain
8. Examination of *Candida albicans* Gram's stain, Germ tube test
9. Examination of *Cryptococcus neoformans* by Negative staining
10. AST – Kirby-Bauer disc diffusion method
11. Microscopic examination of curd
12. Methylene blue reductase test

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2. Aneja KR (2005). Experiments in Microbiology, Plant pathology and Biotechnology. Fourth edition, New Age International Publishers, Chennai.

3. Dubey RC and Maheswari DK (2004). Practical microbiology First edition, S Chand and Company Ltd., New Delhi.
4. Sundararaj T. Microbiology laboratory manual. Revised and published by Aswathy Sundararaj. No.5 First Cross Street, Thirumalai Nagar, Perungudi, Chennai.
5. James G Cappuccino and Natalie Sherman (2004). Microbiology : A laboratory manual. Sixth edition, Published by Pearson Education.
6. Kannan N (2003). Handbook of laboratory culture media, Reagents, Stains and buffers. Panima Publishing Corporation, New Delhi.
7. Kannan N (1996). Laboratory Manual in General Microbiology. First edition, Palani Paramount Publications, Palani. Tamil Nau.
8. Horold J Benson (1998). Microbiological Applications - Laboratory Manual in General Microbiology. Seventh International edition, Mc Grew-Hill, Boston.
9. Myer's and Koshy's manual of diagnostic procedures in medical microbiology and immunology/serology. Published by department of clinical microbiology, CMC and Hospital, Vellore, Tamil Nadu.
10. The HiMedia Manual (2003). For microbiology and Cell Culture Laboratory Practice. Published by HiMedia Laboratories (P) Ltd., Mumbai.

CORE PRACTICAL - IV

(End of the third year)

1. Examination of plant diseases
 - a. Tikka leaf spot
 - b. Citrus canker
 - c. Red rot of sugarcane
 - d. Wilt of cotton
2. Enumeration of bacteria and fungi from soil
3. Study of morphology of Cyanobacteria
 - a. *Ocillatoria* spp.
 - b. *Nostoc* spp.
 - c. *Lynbya* spp.
 - d. *Anabaena* spp.
4. Isolation of Nitrogen fixing bacteria from root nodules of legumes
5. Water portability test (SPC and MPN)
6. Isolation of bacteriophage from sewage
7. Paper (Pigments) and Thin layer chromatography (Amino acid and sugar)
8. SDS- PAGE Electrophoresis
9. Identification of viral antibodies/antigen through ELISA Technique
 - a. HIV 1 & 2
 - b. HBsAg
10. Antibiotic screening – Crowded plate technique
11. Determination of generation type using turbidity method
12. Batch fermentation using Erlenmeyer flask

REFERENCES

1. Rajan S and Selvi Christy (2011). Experimental procedures in life sciences. Anjana Book House, publishers and distributors, Chennai
2. Aneja KR (2005). Experiments in Microbiology, Plant pathology and Biotechnology. Fourth edition, New Age International Publishers, Chennai.
3. Dubey RC and Maheswari DK (2004). Practical microbiology First edition, S Chand and Company Ltd., New Delhi.

4. Sundararaj T. Microbiology laboratory manual. Revised and published by Aswathy Sundararaj. No.5 First Cross Street, Thirumalai Nagar, Perungudi, Chennai.
5. James G Cappuccino and Natalie Sherman (2004). Microbiology : A laboratory manual. Sixth edition, Published by Pearson Education.
6. Kannan N (2003). Handbook of laboratory culture media, Reagents, Stains and buffers. Panima Publishing Corporation, New Delhi.
7. Kannan N (1996). Laboratory Manual in General Microbiology. First edition, Palani Paramount Publications, Palani. Tamil Nau.
8. Horold J Benson (1998). Microbiological Applications - Laboratory Manual in General Microbiology. Seventh International edition, Mc Grew-Hill, Boston.
