

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Revised Syllabus for M.Sc. Part II Medical Technology

(In force from June 2009)

A student offering Medical Technology course will be admitted to M.Sc. Part II after passing M.Sc. Part I Medical Technology Examination. He will study papers V,VI,VII and for paper VIII he will carry out research work and will prepare a dissertation.

The teaching hours per week for 4 papers are 12 and there are 12 hours per week of practicals.

The university examination for each paper (paper V,VI & VII) will be of three hours duration. For Paper VIII student will submit a dissertation. The total marks of papers are 210 for university examination distributed as 52,52,52 and 54 of papers V,VI,VII & VIII respectively. The internal evaluation is of 90 marks distributed as 23,23,23 and 21 respectively. The total 200 marks for practical examination are distributed as 140 marks for university examination and 60 marks for internal evaluation. The university practical examination is of 21 hours distributed over a period of 4 days including Viva Voce of dissertation.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Revised Syllabus for M.Sc. Medical Technology Part II (Microbiology / Biochemistry)

(In force from June, 2009)

PAPER - V INSTRUMENTATION, BIOSTATISTICS AND LABORATORY MANAGEMENT

Marks : 75 (External 52 + Internal 23)

INSTRUMENTATION

Unit-I Potentiometry and Electrophoresis

Topic-1 Potentiometry Techniques: Measurement of pH using glass electrode, pH meter and its calibration - Ion selective electrode for calcium, magnesium - Enzyme electrode

Topic-2 Electrophoresis: Principle of electrophoresis, Stain for electrophoresis, quantitation of zones, Types of electrophoresis, Techniques and applications of Agarose Gel Electrophoresis (AGE), Polyacrylamide Gel Electrophoresis (PAGE), Cellulose Acetate Electrophoresis (CAE), Isoelectric Focussing Electrophoresis (IFE), Blotting Electrophoresis including Western, Southern and Northern Blotting Electrophoresis (BE), Immunoelectrophoresis (IE) and Capillary Electrophoresis (CE).

Unit-II Spectrophotometry and Radioanalytical Techniques

Topic-1 Spectrophotometry: UV-VIS spectrophotometers, Beer's law and causes of deviation, components of instruments, single beam spectrophotometer and photoelectric colorimeter, elementary idea of double beam spectrophotometer, semi auto analyzer and auto analyzer

Principles and applications of fluorimetry and turbidimetry

Principles, instruments and applications of flame emission spectroscopy (FES) and atomic absorption spectroscopy (AAS)

Topic-2 Radioanalytical Techniques: Radioactivity, Measurement of radioactivity using Gamma counter, Radioisotopes and their uses in medicinal field, Principles and applications of techniques, Isotope dilution analysis, Radiometric titrations, Radiorelease methods and Radioimmunoassay (RIA)

Unit-III Chromatography Techniques and Centrifuges

Topic-1 Chromatography Techniques: Introduction and classification of chromatography, Principles, techniques and applications of paper chromatography, Thin-layer chromatography, Ion Exchange chromatography, Affinity chromatography, Gel permeation chromatography, Gas chromatography, mobile phase, stationary phase, flame ionization detector, thermal conductivity detector
High performance liquid chromatography (HPLC), Principle, lay out of instrument, normal phase and reversed phase chromatography, isocratic and gradient elution.

Topic-2 Centrifuges: Types of centrifuges, low speed and high speed centrifuges, ultra centrifuges

Unit-IV BIOSTATISTICS

Introduction to Biostatistics: Preliminary concepts, Sources of Data - Primary data, Secondary data, Types of variables, Presentation of Data – Textual, Tabular and Graphical; Frequency Distribution: Class interval and frequency; Graphical representation of Data – Line diagram, Bar diagram, Pie Chart, Histogram, Frequency polygon

Measures of Central Tendency: Mean, Mode, Median and other measures like Arithmetic, Geometric and Harmonic mean, Standard deviation, Coefficient of mean deviation and Coefficient of standard deviation; Measures of Variation: Dispersion, Range, Mean deviation, Standard deviation, Standard error of mean

Probability: Important terms, Concept of probability and probability distribution, Introduction of normal distribution and curve; Theorems of probability – Addition theorem and Multiplication theorem and Binomial distribution

Correlation: Types of correlation, Karl Pearson's coefficient of correlation, Spearman's rank correlation coefficient, Scatter diagram; Regression: Regression lines and Regression co-efficient, Difference between Correlation and Regression

Sampling Variability and Statistical tests: Sampling distribution & its significance, Estimation of population parameter, Testing Statistical hypothesis, Type-I and Type-II errors, Chi-square test, F-Test, Z- Test, t – test and Analysis of variance (Anova).

Unit-V LABORATORY MANAGEMENT

Finance: Budgeting, Operational expenses, Cost accounting Salary, Justification of budget.

Personal Management: Principles of personal management.

Workload Analysis: Work load analysis, laboratory space & management.

Record Keeping: Laboratory supplies, Data management & costing, Data handling and storing.

Laboratory Safety: Fire, chemical, biochemical & radiation hazards, safety measures in a laboratory.

Ethics: Ethics and Medico legal matters.

Applications of computer in laboratory.

REFERENCE BOOKS FOR PAPER - V

1. Medical Laboratory Technology (Methods and Interpretation), Sood, 3e. Jaypee Brothers.
2. Medical Laboratory Technology, Vol. I, II and III, K. L. Mukherjee, 1997, Tata McGraw Hill.
3. A Textbook of Biochemistry for Medical Students, Vasudevan and Shreekumari S., 1995, Jaypee Brothers.
4. Chromatographic and Electrophoretic Techniques, Vol. I & II, Editor Ivor Smith, 4e, William Heinemann Medical Book Ltd.
5. Instrumental Methods of Chemical Analysis, Chatwal & Anand, Himalaya Publishing House
6. An Introduction to Biostatistics - A manual for students in Health Science, P.S.S. Sundar Rao & J. Richard, 3e, Printice Hall
7. Methods in Biostatistics, B. K. Mahajan, 6e, 1997, Jaypee Brothers.
8. Laboratory Management, J. E. Newell, 1972, Boston Little, Brown.
9. Textbook of Clinical Laboratory supervision, Me. Bridge
10. Ion Exchange Chromatography - Principle & Methods, Pharmacia Biotech
11. Gel Filtration - Principle & Methods, 6e, Pharmacia Biotech
12. Affinity Chromatography - Principle & Methods, Pharmacia Biotech
13. Affinity Chromatography and related techniques, Editor-Gribnau, Visser and Nivad, 1992, Elsevier Scientific Publishing Company .
14. Electronics and Instrumentation for Clinical Laboratory, Eggert, 1983, John Wiley & Sons.
15. Instrumental Methods of Clinical Analysis, G. W. Ewing, 6e, Mcgraw Hill

**M.Sc. Medical Technology Part II (Microbiology / Biochemistry)
Revised Syllabus for Practicals on Instrumentation- Paper V**

(In force from June, 2009)

Students will perform following experiments.

1. Separation of Proteins by SDS PAGE
2. Purification of Human IgG by anion exchange chromatography.
3. Separation of amino acids by paper chromatography.
4. Separation of amino acids by TLC.
5. Estimation of KM value.
6. Estimation of V maxima.
7. Determination of effects of inhibitor on KM and V max.
8. Estimation of various proteins by spectrophotometric methods.
9. Estimation of Biochemical by autoanalyser.
10. Determination of molecular weight by Gel filtration method.
11. Determination of molecular weight of DNA by Agarose Gel Electrophoresis.

REFERENCE BOOKS FOR PRACTICALS

1. Medical Laboratory Technology, Vol. I, II & III, K. L. Mukherjee, 1997, Tata McGraw Hill.
2. Ion Exchange Chromatography - Principles & Methods , Pharmacia Biotech.
3. Gel filtration - Principle & Methods, Pharmacia Biotech.
4. Affinity Chromatography - Principle & Methods, Pharmacia Biotech.
5. Instrumental Methods of Chemical Analysis, G. W. Eving, 6e, McGraw Hill.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Revised Syllabus of M.Sc. Medical Technology Part-II (Microbiology)

(In force from June, 2009)

PAPER VI CLINICAL BACTERIOLOGY

Marks : 75 (External 52 + Internal 23)

Unit-I

1. Sample collection from different anatomical sites; preliminary observations- macroscopic and microscopic observations (wet and dry smear preparations, simple, differential and special staining techniques).
2. Processing of clinical samples: cultures techniques- isolation and identification of Human pathogenic bacteria- aerobic and anaerobic, identification techniques: biochemical, serological and molecular biological methods, antimicrobial susceptibility tests.
3. Interpretation, reporting and quality control approach in laboratory.
4. Safety in clinical microbiology laboratory.
5. Universal precaution
6. Bio-waste management

Unit-II Gram positive bacteria

1. Cocci
 - i) *Staphylococcus*
 - ii) *Streptococcus*
 - iii) *Strept pneumoniae*

2. Bacilli
 - i) *Bacillus*
 - ii) *Listeria*
 - iii) *Corynebacteria*
 - iv) *Clostridia*

Unit-III Gram negative bacteria

1. Cocci
 - i) *Neisseria*
 - ii) *Coxiella*

2. Bacilli
 - I. Enterobacteriaceae
 - i) *Escherichia*
 - ii) *Salmonella*
 - iii) *Shigella*
 - iv) *Yersinia*
 - v) *Enterobacter*
 - vi) *Klebsiella*
 - vii) *Proteus, Providencia, Morganella*

II. Other than Enterobacteriaceae

- i) *Pseudomonas*
- ii) *Bordetella*
- iii) *Vibrio*
- iv) *Haemophilus*
- v) *Brucella*
- vi) *Legionella*
- vii) *Acinetobacter*

Unit-IV Miscellaneous bacteria

1. Acid-fast bacteria and filamentous bacteria
 - i) *Mycobacteria-Typical & Atypical M. tuberculosis , M.leprae & MIC complex*
 - ii) *Nocardia*
 - iii) *Actinomyces*
2. Obligate intracellular bacteria
 - iv) *Chlamydia*
 - v) *Rickettsia*
3. Spiral shaped bacteria and curved rods
 - vi) *Treponema*
 - vii) *Borrelia*
 - viii) *Leptospira*
 - ix) *Campylobacter*
 - x) *Helicobacter*

Unit-V

1. Molecular diagnosis: (1) FISH (2) PCR (3) Insitu hybridization techniques
2. Automation in laboratory diagnosis of bacterial diseases
3. Emerging and Remerging infection
4. Bio-terrorisim – Laboratory management

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Revised Syllabus of M.Sc. Medical Technology Part-II (Microbiology)

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PAPER VII CLINICAL VIROLOGY, MYCOLOGY AND PARASITOLOGY

Marks : 75 (External 52 + Internal 23)

Unit-I: Virology

1. Structure, physical characters, configuration and classification of viruses producing human diseases.
2. Replication of viruses and different cultivation techniques.
3. Collection, transport and laboratory diagnostic techniques in the diagnosis of viral diseases.

Unit-II: Clinical Virology

Morphology, classification, pathogenesis, clinical manifestations and laboratory Diagnosis of the diseases caused by:

- 1 Orthomyxo and Paramyxoviruses.
- 2 Picorna virus, Rhabdovirus, Arena virus.
- 3 Arboviruses: Flavivirus and Toga virus.
- 4 Viruses producing gastroenteritis.
- 5 Herpes virus.
- 6 Adenovirus.
- 7 Pox virus.
- 8 Hepatitis virus.
- 9 HIV.

Unit-III: Clinical Mycology

1. Classification, taxonomy and reproduction of human pathogenic fungi.
2. Laboratory approach to the diagnosis of fungal infections.
3. Isolation and identification of human pathogenic fungi.
4. Yeasts: Classification, clinical significance and laboratory diagnosis.
5. Superficial and deep mycosis.
6. Opportunistic fungal infections, laboratory diagnosis and significance among immunocompromised hosts.
7. Common laboratory contaminant fungi.
8. Invitro techniques for susceptibility of antifungal agents.

Unit-IV: Clinical Parasitology

Morphology, classification, pathogenesis, clinical manifestations and laboratory diagnosis of the diseases caused by:

1. Protozoa: *Entamoeba, Giardia, Trichomonas, Plasmodium, Leishmania, Trypanosoma.*
2. Cestodes: *D. latum, Taenia, Echinococcus, H.nana.*
3. Trematodes: *Systozomia, Fasciola, Paragonimus.*
4. Intestinal Nematodes: Round worm, Hook worm, Thread worm, Pin worm, *S. stercoralis.*
5. Tissue nematodes: *Filaria, Dracunculosis.*

Unit-V

1. Techniques of stool examination for parasitic diseases.
2. Recent advances in the laboratory diagnosis of parasitology.
3. Importance of parasitic diseases in immunocompromised hosts in reference to clinical picture and laboratory diagnosis.

REFERENCE BOOKS FOR PAPER VI & VII :

1. Clinical Microbiology Procedures Handbook, Henry D Isenberg, Vol. 1 & 2, ASM Press, 1994.
2. Essential Procedures for Clinical Microbiology, Henry D Isenberg, ASM Press, 1998.
3. Mackie and McCartney Medical Microbiology, A Guide to Laboratory Diagnosis and Control of Infection, 13th ed., J.P. Duguid, B.P. Marmion and R.H.A. Swain, The English Language Book Society and Churchill Livingstone.
4. Diagnostic Microbiology, Finegold and Martin, 6th ed., The C.V. Mosby Co.
5. Bailey and Scott's Diagnostic Microbiology, Sydney M. Finegold and Ellen Jo Baron, 7th ed., The C.V. Mosby Co.
6. Practical Medical Microbiology, Collee Duguid, Fraser, Marmion, 24th ed., Churchill Livingstone.
7. Microbiology, Davis, Dulbecco, Eisen and Ginsberg, 3rd ed., Harper International Edition.
8. Manual of Clinical Microbiology, Murray, Baron, Pfaller, Tenover, Tenover, Yolken, 6th ed., American Society for Microbiology.
9. Topley & Wilson's Microbiology and Microbial Infections, Leslie Collier, Albert Balows, Max Sussman, Vol. 2 & 3, 9th Ed.
10. Prescott/Harley/Klein's Microbiology, Joanne Willey, Linda Sherwood and Chris Woolverton, 7th Ed., 2007, McGraw Hill Higher Education.
11. Fundamental of Medical Virology, LS Kucera, QN Myrvik, 2nd Ed. , Lea & Febiger.
12. Molecular Biology, David Freifelder, 2nd Ed. , Jones and Bartlett Pub., Boston
13. Molecular Biology of the Gene, JD Watson, NH Hopkins, JW Roberts, 4th Ed. The Benjamin Cummings Pub. Co.

14. Diagnostics Molecular Microbiology; Principle and Applications, DH Persing, TJ White, 1993, American Society for Microbiology
15. Molecular Diagnostics for the Clinical Laboratory, WB Coleman, GJ Tsongais, 1997, Humana Press.
16. Diagnostics Bacteriology Protocols, Jenny Howard and DM Ehicombe, Humanna Press, 1995.
17. Medical Parasitology; A practical approach, SH Gillespie and PM Hawkey, 1995, IRL Press.
18. Medical Parasitology; A self-instructional text, Ruth Leventhal and RF Cheadle, 3rd Ed., 1989, FA Davis Co.
19. Medical Parasitology, EK Markell, M Voge and DT John, 6th Ed., 1986, W.B. Saunders Co.
20. Textbook of Medical Parasitology, CK Panikar, 4th ed.,1999, Jaypee Brothers.
21. An Introduction to Fungi, HC Duby, 1990, Vikas Publishing.
22. Basic Laboratory Procedures in Clinical Bacteriology, J Vandepitte, K Engbaek, 1991, World Health Organization.
23. Clinical Mycology By William E. Dismukes, Peter G. Pappas, Jack D. Sobel
Contributor William E. Dismukes, Peter G. Pappas, Jack D. Sobel Published by
Oxford University Press US, 2003

M.Sc. Medical Technology Part II (Microbiology)
Revised Syllabus for Practicals on Paper VI & VII

(In force from June, 2009)

Students will perform following experiments.

- 1) Microscopic techniques: Bright field and Dark field
- 2) Staining procedures for various bacterial cellular structures
- 3) Measurement of Growth: SPC, MPN and turbidometry
- 4) Cultivation of anaerobic bacteria
- 5) Biochemical tests for identification of Gram negative and Gram positive bacteria
- 6) Serological tests for identification and diagnosis.
 - a) Precipitation tests.
 - b) Flocculation tests.
 - c) Direct agglutination tests.
 - d) Direct hemagglutination tests.
 - e) Indirect agglutination tests.
 - f) Indirect hemagglutination.
 - g) Complement fixation tests
 - h) Immunodiffusion
 - i) Neutralization tests – Toxin / viral.
- 7) Susceptibility test: Dilution method and Disk diffusion method
- 8) Preservation of cultures: Routine methods and Cryopreservation
- 9) Isolation and identification of pathogenic microorganisms from Clinical samples
 - i) Urine
 - ii) Blood
 - iii) Stool
 - iv) Pus
 - v) Aspirates
 - vi) Sputum
- 10) Isolation and identification of Mycobacteria
- 11) Cultivation of viruses: Bacteriophage isolation
- 12) Isolation and identification of Mycobacteria
- 13) Isolation and identification of Fungi
- 14) Cultivation and Identification of protozoa

REFERENCE BOOKS FOR PRACTICALS

1. Practical Medical Microbiology, Collee Duguid, Fraser, Marmion, 24th ed., Churchill Livingstone.
2. Collection and Handling of Specimens; A practical guide, Slockbower and Bhumenfeld, 1983, Lippincott Co. USA
3. Laboratory Exercises in Microbiology, 2nd Ed. M Pelczar, McGraw Hill Pub.
4. Molecular Diagnostics for the Clinical Laboratory, WB Coleman, GJ Tsongais, 1997, Humana Press.
5. Diagnostics Bacteriology Protocols, Haward and Ehicombe, 1995, Human Press.
6. Clinical Microbiology Procedures Handbook, Vol.1 & 2, Isenberg, ASM Press.
7. Manual of Clinical Microbiology, Murray, Baron, Pfaller, Tenover, Tenover, Yolken, 8th ed., American Society for Microbiology.
8. Textbook of Medical Laboratory technology, 2nd Ed., Godkar & Godkar, Bhilani Pub. House, Mumbai.
9. Experimental Microbiology, Patel & Patel, 2000, Aditya Pub., Ahmedabad.
10. Methods in Microbiology: Microscopy & Staining, Desai & Desai, Prashant Pub., Vidhyanagar.
11. Medical Laboratory Sciences: Theory & Practical, Orchel & Kolhatkat, Tata McGraw Hill Pub.
12. Mackie and McCartney Medical Microbiology, Aguide to Laboratory Diagnosis and Control of Infection, 13th ed., J.P.Duguid, B.P. Marmion and R.H.A. Swain, The English Language Book Society and Churchill Livingstone.

M.Sc. Medical Technology Part II (Microbiology/Biochemistry)

PAPER – VIII DISSERTATION

Total Marks : 75(External 54 + Internal 21)

A student will carry out research work on a project and will prepare and submit a dissertation.