

UNIVERSITY OF MUMBAI
No.UG / 168 of 2008

CIRCULAR :-

A reference is invited to the Ordinances, Regulations and syllabi relating to the B.Sc. Degree Course vide Pamphlet No. 151 and the Principals of the affiliated Collages in Science are hereby informed that ^{the} recommendation made by the Board of Studies in Microbiology at its meeting held on 8th January, 2008 has been accepted by the Academic Council at its meeting held on 27th February, 2008 vide item No. 4.12 and that, in accordance therewith, the syllabus in the subject of Microbiology for the Medical Laboratory Technology (Applied Component) at the T.Y.B.Sc. examination is revised as per Appendix and that the same will be brought into force with effect from the academic year 2008 – 2009.

MUMBAI - 400032
22nd April, 2008

for I/c. REGISTRAR

To,
The Principals of the affiliated Colleges in Science.

A.C./4.12 /27.02.2008

No.UG/ 168 -A of 2008,

MUMBAI-400 032

22nd April, 2008

Copy forwarded with compliments for information to :-

- 1) The Dean, Faculty of Science.
- 4) The Chairperson, Board of Studies in Microbiology.
- 3) The Controller of Examinations,
- 4) The Co-Ordinator, University Computerization Center,

for I/c. REGISTRAR

Copy to :-

The Director, Board of College and University Development, , the Deputy Registrar (Eligibility and Migration Section), the Director of Students Welfare, the Executive Secretary to the Vice-Chancellor, the Pro-Vice-Chancellor, the Registrar and the Assistant Registrar, Administrative sub-center, Ratnagiri for information.

The Controller of Examinations (10 copies), the Finance and Accounts Officer (2 copies), Record Section (5 copies), Publications Section (5 copies), the Deputy Registrar, Enrolment, Eligibility and Migration Section (3 copies), the Deputy Registrar, Statistical Unit (2 copies), the Deputy Registrar (Accounts Section), Vidyanagari (2 copies), the Deputy Registrar, Affiliation Section (2 copies), the Director, Institute of Distance Education, (10 copies) the Director University Computer Center (IDE Building), Vidyanagari, (2 copies) the Deputy Registrar (Special Cell), the Deputy Registrar, (PRO) . the Assistant Registrar, Academic Authorities Unit (2 copies) and the Assistant Registrar, Executive Authorities Unit (2 copies) . They are requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to in the above Circular and that, no separate Action Taken Report will be sent in this connection. the Assistant Registrar Constituent Colleges Unit (2 copies), BUCT (1 copy), the Deputy Account. Unit V (1 copy), the In-charge Director, Centralize Computing Facility (1 copy), the

27.2.08

UNIVERSITY OF MUMBAI



Revised Syllabus

For the
Medical Laboratory Technology
(Applied Component Subject)

at the
T.Y.B.Sc. examination

(With effect from the academic year 2008-2009)

T.Y.Bsc

Applied Component – Medical Laboratory Technology

REVISED SYLLABUS WITH EFFECT FROM 2008– 2009

Paper I	Diagnostic microbiology	No. of lectures	Paper II	Hematology and clinical biochemistry	No. of lectures
Unit I	Introduction to diagnostic microbiology	15	Unit I	Hematology	15
Unit II	Bacteriology	15	Unit II	Clinical biochemistry	15
Unit III	Mycology, Parasitology and virology	15	Unit III	Organ function tests	15
Unit IV	Automation and newer approaches in MLT	15	Unit IV	Clinical pathology and histopathology	15

	THEORY	PRACTICAL	TOTAL
Paper I	60 marks	40 marks	100 marks
Paper II	60 marks	40 marks	100 marks

Each theory paper and practical is of three hour duration.

T.Y.Bsc

Applied Component – Medical Laboratory Technology

Syllabus from Academic Year 2008-2009

PAPER I

DIAGNOSTIC MICROBIOLOGY

Unit I: Introduction to diagnostic microbiology. 15 Lectures

- 1.1 Safety and special precautions in clinical microbiology lab, Legislative and regulatory control, infectious waste management, methods of sterilization, classification of biohazardous agents. (05)
- 1.2 Antimicrobial susceptibility testing: Selection of antimicrobial agents. Disc diffusion test, Dilution antimicrobial susceptibility test, E test, commercial systems. (04)
- 1.3 Serodiagnostic tests: a) types of antigen antibody reactions used in diagnostic serology - Precipitin reactions, CFT, Haemagglutination inhibition, Agglutination reactions, Flocculation. b) Solid phase immunoassay methods – Enzyme immunoassay for antibody and antigen detection. C) Immunofluorescent techniques for antigen and antibody detection. (06)

Unit II: Bacteriology

15 Lectures

Guidelines for collection, transport, processing, analysis and reporting of cultures from specific specimen sources for the following infections –

- 2.1 Infections of respiratory tract.
- 2.2 Infections of gastrointestinal tract.
- 2.3 Urinary tract infections.
- 2.4 Infections of the genital tract.
- 2.5 Infections of the bones and joints.
- 2.6 Infections of CNS.
- 2.7 Wounds, abscesses and cellulites.
- 2.8 Eye infections.
- 2.9 Infections of Blood.

Applied Component – Medical Laboratory Technology

Syllabus from Academic Year 2008-2009

PAPER I

DIAGNOSTIC MICROBIOLOGY

Unit I: Introduction to diagnostic microbiology.

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- 2.6 Infections of CNS.
- 2.7 Wounds, abscesses and cellulites.
- 2.8 Eye infections.
- 2.9 Infections of Blood.

Unit III: Mycology, Parasitology and virology

15 Lectures

- 3.1 Mycology: a) Laboratory approach for diagnosis of fungal infections – Specimen collection and transport, processing, direct examination, preparation of mounts for study, selection and inoculation of culture media, incubation of fungal cultures. b) Identification of dermatophytes and Candida. (05)
- 3.2 Parasitology: Collection, transport and processing of specimens a) Fecal specimens – Preservation of clinical specimens, visual examination, processing fresh stool specimens for ova and parasite examination. b) Examination of intestinal specimens other than stool. c) Examination of extraintestinal specimens – sputum, blood. d) Overview of life cycles of parasites of human importance. (05)
- 3.3 Virology: a) Collection of specimen for diagnosis, b) transportation and storage of specimens, c) Methods for diagnosis of viral infections (Tabulation). d) Detection of HIV, Hepatitis B viral infections in clinical specimens. (05)

Unit IV: Automation and newer approaches in MLT

15 Lectures

- 4.1 Automation: Semiautomated and automated identification systems for Enterobacteriaceae, Non fermentors, Mycobacteria, Staphylococci, Anaerobes. (07)
- 4.2 Newer approaches: Use of molecular techniques in diagnosis – a) Signal amplification methods - Nucleic acid probes, in situ hybridization b) PCR and modifications of PCR c) post amplification analysis – DNA sequencing, microarray analysis. d) Strain typing – pulse field gel electrophoresis, PCR-RFLP. (08)

PRACTICALS PAPER I

1. Parts and functions of compound microscope.
2. Study of hot air oven
3. Study of autoclave
4. Study of incubator
5. Gram staining
6. Acid fast staining
7. Alberts staining
8. Identification of Dermatophytes(Demonstration of permanent slides).
9. Identification of *Candida albicans*
10. Identification of Malarial Parasitic forms in Blood smears
11. Study of Nutrient Agar, SIBA, Mac agar, XLD, CLED, Salt mannitol, Tinsdale agar, cetrimide agar.
12. Study of transport media.
13. Widal test
14. VDRL test (Demonstration)
15. ASO test
16. Disc diffusion method.
17. Isolation and characterization of bacterial pathogens –
 - *S. aureus*
 - *S. pyogenes*
 - *E. coli*
 - *K. pneumoniae*
 - *Salmonella spp.*
 - *Shigella spp.*
 - *Proteus spp.*
 - *Pseudomonas spp.*

Paper II

HEMATOLOGY AND CLINICAL BIOCHEMISTRY

UNIT I Hematology

15 Lectures

- 1.1 Introduction to hematology -- Composition of blood, Serum & plasma, Structure, function, & life span of blood cells, Hematopoiesis & factors required for the same, Hemoglobin : structure, types-normal & abnormal, glycosylated Hb, HbCo, Hi, SHb, Hbs, HbC, HbD, HbE, HbH, (04)
- 1.2 Collection of blood- Capillary blood by skin puncture, Venous blood by venipuncture (01)
- 1.3 Anticoagulants: types & mechanism of action (01)
- 1.4 Anemia: types - sickle cell, thalassemia, iron deficiency, aplastic, hemolytic, megaloblastic (only a brief outline) (01)
- 1.5 Abnormal forms of RBC: microcytes, macrocytes -- hypochromic, spherocytes, target cells, stomatocytes, anisocytes, poikilocytes, sickle cells, Abnormalities of WBC's : toxic granulation, vacuoles, hypersegmentation, hyposegmentation (01)
- 1.6 Haemostasis & coagulation: vascular response, platelet plug formation, coagulation (02)
- 1.7 Automation in hematology: Introduction- the automated full blood count impedance cell counters, optical cell counters, automated blood cell morphology (01)
- 1.8 Blood bank : blood groups ABO(H), Rh, secretor & Lewis systems, Isoagglutinins & their titre, concept of universal donor & universal recipient blood transfusion : cross matching, transfusion reactions, blood collection: screening of donor criteria for rejecting donor, registration of donor, blood collection procedure, transportation of blood, storage of blood. Preparation & use of blood components : whole blood, packed red cells, FFP, platelet concentrate. HDN (04)

UNIT II Clinical biochemistry

15 Lectures

- 2.1 Blood sugar level – Glucose tolerance curve and its interpretation. Evaluation methods of blood glucose – o-toluidine, Glucose oxidase – peroxidase. Diabetes and its types. (04)
- 2.2 Enzymes in diagnostics - Determination of enzymes, AST, ALT, ALP, ACP, LDH, GGT, serum lipase (03)
- 2.3 Thyroid tests –Introduction – function of thyroid hormones, determination of T-3, T-4, TSH (01)
- 2.4 Automation in clinical biochemistry – Introduction, classification of automated systems, steps of automation in biochemical analysis, computers in clinical lab with its drawbacks. Commonly used automated analyzers of biochemical laboratories – autoanalysers, clinicon corona, RxL system (04)
- 2.5 Cancer markers – Introduction, clinical application, enzymes as tumor markers – ALP, CK, LDH, PAP, prostate specific antigens, hormones, oncofetal antigens, carbohydrates, bladder specific, breast tumor markers. (02)
- 2.6 Pregnancy test – Role of hCG and testing (01)

UNIT III Organ function tests

15 Lectures

- 3.1 Cardiac Profile Test – Introduction, Functions of heart, Ischemic heart diseases and their manifestation; Groups in CPT, Lipid profile tests – total lipids, serum cholesterol, triglycerides, phospholipids, lipoproteins. (04)
- 3.2 Gastric function Tests - Introduction, gastric analysis, tests involved and gastrointestinal hormones (02)
- 3.3 Liver function test - Introduction to liver function, types of jaundice; abnormalities of bile pigment and bile acid, change in enzyme and plasma proteins and their determination (04)
- 3.4 Kidney function test - Introduction- kidney function; groups in KFT; test to determine renal blood flow; creatinine clearance; urea clearance; diseases of kidney – acute and chronic glomerulonephritis; acute and chronic pyelonephritis, acute renal failure (05)

UNIT IV Clinical pathology and histopathology

15 Lectures

- 4.1 Routine urine analysis - Physiology of urine formation, composition of normal urine, collection of urine specimens, routine examination of urine - physical, chemical & microscopic (02)
- 4.2 Routine stool analysis - Importance of stool examination, collection of faecal specimen physical examination - color & consistency, odor, presence of blood mucus & pus. Study of some common ova found in stool - Hookworm, Ascaris, Trichuris, Taenia, Schistosoma mansoni, Entobius, Strongyloides. Study of some protozoa found in stool - *E. histolytica*, *E.coli*, *Giardia lamblia*, *Trichomonas hominis*. Other findings in stool microscopic examinations- faecal fat, blood cells, crystals, occult blood test, measuring the pH & testing for Lactose (02)
- 4.3 Examination of C.S.F.- Formation of C.S.F., collection - lumbar puncture (in brief), C.S.F. analysis : color, cells, Pandy's test, stained films, C.S.F.protiens, C.S.F sugar, Trypanosomes., abnormalities of the C.S.F. suppurative, viral, Tuberculous meningitis. (02)
- 4.4 Semen analysis, clinical significance, specimen collection, laboratory investigations: physical examination, microscopic examination, sperm morphology-normal & abnormal, chemical examination (01)
- 4.5 Laboratory examination of miscellaneous body fluids - A brief account of the following body fluids w.r.t. clinical significance, specimen collection, lab. Investigations - Physical, chemical, microscopic examination. serous, synovial, ascitic fluids, & gastric juice (04)
- 4.6 Lab examination of sputum - Collection, examination: quantity, consistency, Colour, odor, examination of stained / unstained sputum, chemical examination, parasites (01)
- 4.7 Basic histopathology techniques- Basic steps for tissue processing: fixing, embedding, micrctomy, staining, mounting (to be covered in brief), cytological techniques (brief idea) (03)

PRACTICAL PAPER II

Hematology

1. Blood collection :capillary & venous
2. Hemoglobin estimation : acid hematin and drabkin's method
3. Total RBC & WBC count, Differential WBC count
4. ESR ,PCV
5. Red cell indices
6. Bleeding time & clotting time
7. Blood grouping ABO(H) & Rh
8. Cross matching

Clinical pathology & histopathology

9. Physical, Chemical ,Microscopic examination of :
 - a. urine
 - b. sputum
10. Pap staining for the demo. of barr bodies
11. Embedding of tissue in paraffin wax
12. Visit to a pathology lab attached to a hospital to see the working in various departments
13. Report writing for various analyzed pathological samples (CBC, Complete Haemogram, urine, stool, C.S.F., semen and sputum)

Clinical Biochemistry & Organ Function Test

14. Estimation of Glucose by GOD – POD.
15. Estimation of SGPT/ ALT
16. Estimation of SGOT/AST
17. Estimation of Cholesterol – total, HDL, LDL
18. Estimation of total bilirubin
19. Estimation of creatinine in serum and urine.
20. Estimation of blood urea.

Textbooks: (PAPER I)

1. Koneman's Color Atlas and Textbook of Diagnostic Microbiology, 6th edition, Washington Winn, jr and others. Lippincott Williams & Wilkins
2. Essentials of Diagnostic Microbiology. 1998. Lisa Anne Shimeld, Anne T. Rodgers. Delmar Publishers.

Textbooks: (PAPER II)

1. Text book of medical laboratory technology, 2nd edition, Balani Publishing House. Authors: Praful Godkar and Darshan Godkar.
2. Introduction to MLT 6th ed F.J.Baker & R.E.Silverton Butterworths
3. Medical laboratory technology, A procedure manual for routine diagnostic tests, Volume I. Kanai Mukherjee. Tata McGraw Hill
4. Medical laboratory technology, A procedure manual for routine diagnostic tests, Volume II. Kanai Mukherjee. Tata McGraw Hill
5. Medical laboratory technology, A procedure manual for routine diagnostic tests, Volume III. Kanai Mukherjee. Tata McGraw Hill
6. Hand book of MLT -Vellore ed-Dr (Mrs) C. Bharucha, Wesley press, Mysore
7. A medical lab for developing countries- Maurice King-ELBS & Oxford uni press

References:

1. Bailey & Scott's – Diagnostic microbiology, 11th ed., Betty Forbes, Daniel, Alice Weissfield. Mosby publisher
2. Atlas of Medical Helminthology and Protozoology, 4th ed. P. L. Chiodini, A. H. Moody, D. W. Manser. Churchill Livingstone
3. A hand book of medical laboratory technology, V. H. Talib 2nd ed.
4. Fundamentals of Biochemistry. New central book agency. Author: A. C. Deb

T.Y.Bsc

Applied Component – Medical Laboratory Technology

Annual practical examination assessment pattern.

PRACTICAL I	MARKS	PRACTICAL II	MARKS
1. Diagnostic microbiology	15	1. Hematology	15
2. Report	10	2. Clinical biochemistry	10
3. Spot	15	3. Clinical pathology	10
		4. Quiz	05
Total	40	Total	40
Grand Total = 80			

- Laboratory journals and reports are to be duly certified by the head of the departments. Examiners are required to sign the journal and report at the end of the examination.
- A report of about 10 – 15 pages on recent advances in last five years in the field related to the syllabus should be submitted.
- The HOD, teacher in charge of practical should ensure the topics given to the class as a whole should cover entire syllabus. They should also take care that the newer topics are assigned to student s every year and repetition from the previous years can be avoided.

Annual theory examination assessment pattern.

1. Every paper will have five questions of 12 marks each.
2. four questions will be from each of the four units in curriculum. There shall be internal choice as per UGC guidelines.
3. Fifth question shall comprise of any one essay or any three notes / short questions from all the units.

—X—X—X—X—X—